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Exploring Critical Success Factors for Managing Complex Information Technology Projects in Federal Agencies

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Walden University
2015

Abstract

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MA, Education, Troy State University, 2003

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Dissertation Submitted in Partial Fulfillment

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Abstract

The problem addressed in this study was the lack of understanding about failures of government leadership in accomplishing complex information technology (IT) projects and the ways such failures can negatively affect organizational performance. The purpose was to query subject matter experts and leaders with the intent to identify methods to reduce complex IT project failure rates in government organizations. This qualitative study drew on the technology acceptance model and the capability maturity model integration framework to evaluate organizations' abilities to manage complex IT projects. The research questions focused on exploring senior managers' experiences, the tacit knowledge of project management methodologies, and IT governance frameworks. The Delphi method was suitable for collecting and analyzing opinions of subject matter experts to help reach group consensus. Qualitative data analysis was used to identify themes, categories, and subcategories for thematic analysis. The result of the study was the identification of critical success factors and leadership attributes to increase the success rate of complex IT projects in federal agencies. This research may be beneficial to federal government program leaders who, as the result of increased insights and knowledge, can more effectively provide online government services using technology-enabled end-users' computing devices in a cost-effective and secure method.

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Dedication

I dedicate this work to my loving wife, Amy Boyles, my family, and my coworkers for their support over the years as I have successfully made this journey from practitioner to scholar practitioner. This work is also dedicated to my classmates and the Walden faculty who have provided encouragement and support to complete this work.

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Chapter 1: Introduction to the Study

Because of technology constraints and sociocultural barriers, information management systems have become increasingly complex for managers in maintaining and transferring knowledge in an effective and sustainable manner. These challenges have resulted in well-documented failures by government leadership to complete complex information technology (IT) projects, in turn negatively affecting organizational performance. Czarniewski (2014) stated government information systems are the lifeblood for citizens to access government services, and numerous studies have been conducted to identify project success factors to bridge the gap between theoretical knowledge and IT project management methodologies to increase the success rate of complex IT projects (Gingnell, Franke, Lagerström, Ericsson, & Lilliesköld, 2014). E-government systems support community civic engagement initiatives by removing technology barriers that prevent individuals from participating, supporting, and protecting national and community activities (Jetzek, Avital, & Bjørn-Andersen, 2014).

Therefore, organizational leaders must develop new business strategies for sustainable performance by identifying key performance factors and cultural attributes that contribute to organizational goals and objectives. Brooks, Carroll, and Beard (2011) noted increasing the success rate of complex IT projects in complex organizations will require identifying successful leadership archetypes. Federal government leaders have struggled with technology implementation and have yet to develop an innovative system or methodology framework that clearly identifies the roles of project managers, IT

practitioners, and senior management for effectively handling complex IT projects (Kashiwagi & Kashiwagi, 2012). The increased implementation of cloud-computing environments has shifted the boundaries of traditional physical organizational management, challenging decision-makers seeking to manage resources that span geographical and organizational boundaries (Ryan, 2013).

Problem-solving for complex project management requires using a theoretical organizational management framework that attends to self-determining organizational behaviors that emerge during organizational transformation in large organizations (Salem, 2013). Understanding these social behaviors and relationships is critical, because organizational leaders must manage multifaceted dynamic relationships in various physical and logical systems that may have unknown causes and effects on organizational structures and stakeholders' relationships when they are under duress. Government agency leaders would benefit from embracing the technology acceptance model (TAM) to deliver effective and efficient customer-centric services to increase organizational performance in a cost-effective and sustainable manner (Ahmad, Amer, Qutaifan, & Alhilali, 2013).

Birekul and Dogerlioglu (2011) asserted senior-level managers could be more effective problem-solvers if they used the collective tacit knowledge of the entire organization instead of relying solely on the acquired knowledge of a temporary project management team formed to implement a specific IT project. The capability maturity model integration (CMMI) is an effective framework for improving project management

success rates by helping senior leaders determine whether their organization has the capability and maturity to implement and manage organization transformation (Curry, Conway, Donnellan, Sheridan, & Ellis, 2013). Sasikala (2011) noted implementing innovative technology solutions can increase organizational performance but requires senior-level managers to have tacit knowledge of IT service management frameworks to champion high-risk IT projects in organizations.

Maintaining information and communication technology (ICT) infrastructures in a sustainable, cost-effective manner requires negotiating various complex IT governance frameworks, employing industry best practices, and aligning IT services with business requirements (Alonso, 2009). Knowledge management sharing and project management frameworks are inadequate decision-making mechanisms for overseeing complex organizational transformation and maintaining acceptable organizational performance (Buschmann, 2012). According to Mr. Kundra, the U.S. federal chief information officer (CIO), embracing new and innovative adaptive technologies in the federal government, has been part of an aggressive and ambitious IT strategy to achieve federal sustainability goals but has failed because of senior-level managers' resistance to (a) implementing innovation leadership strategies and (b) working collaboratively to develop shared IT services to reduce the costs (Kundra, 2011).

Adopting the cloud-computing infrastructure can increase green computing capabilities, lower capital investment, and increase return on investment (ROI) to meet mandatory sustainability goals and objectives (Marston, Li, Bandyopadhyay, Zhang, &

Ghalsasi, 2011). Babu and Saikiran (2013) noted new research is necessary to developing a knowledge-management and innovation performance framework for adopting cloud-computing services in federal agencies. Alegre, Sengupta, and Lapiedra (2013) recommended using the complex adaptive systems theory to increase the success rate of complex IT projects in dynamic environments.

Background

Researchers have explored leaders' inability to recognize shared IT services can reduce operating costs, increase organizational performance, and help employees meet organizational goals and objectives. For example, Stantchev and Stantcheva (2013) noted isolated information management systems (a) restrict collaboration of information and sharing resources across physical, security, and logical boundaries; and (b) impede the ability to implement innovative strategies in organizations. Developing a theoretical systems framework enables organizational leaders to identify and manage obstacles for the successful transformation from a traditional organization to a learning organization (Gangadharan, Kuiper, Janssen, & Luttighuis, 2013). Organizational leaders must focus on long-term strategies, knowledge transfer, and investing in new technology to remain profitable and sustainable (Mishra & Dwivedi, 2012). This objective presents problems because large government organizations have unique challenges outsourcing their information management systems, and many senior managers are resistant to dynamic changes within their organizational hierarchy structure (Fishenden & Thompson, 2012). Senior-level managers have different perspectives on the best method by, which to

evaluate organizational performance, align organizational goals with organizational transformation, and effectively communicate strategic goals to stakeholders (Venus, Stam, & van Knippenberg, 2013).

According to Sultan and Bunt-Kokhuis (2012), some senior managers within government organizations have acknowledged the need to implement emerging technologies to support internal and external stakeholder business requirements such as (a) reducing the complexity of maintaining business systems and (b) providing online government services to citizens to gain economies of scale to reduce total operating costs. Further, leaders of government organizations must implement new technologies, at once reducing the complexity of maintaining business systems with a cost-effective sustainable method and providing value to stakeholders (Sultan & Bunt-Kokhuis, 2012).

Innovation management theory provides organizational leaders with a conceptual framework to adopt emerging cloud-computing technologies that coexist with current core business technologies (Volberda, Van Den Bosch, & Heij, 2013). Organizational transformation in complex adaptive systems requires a paradigm shift to applying complex adaptive systems theory rather than project management methodologies to increase the success rate of complex IT projects in federal agencies (Nan, Zmud, & Yetgin, 2013). According to Haider and Haider (2012), organizational management methodologies are ineffective frameworks for developing strategic business initiatives and IT portfolio management in large, complex environments. IT governance frameworks provide an accountability mechanism for IT portfolio management, including investment

decision-making, but are ineffective frameworks with which to manage business processes (Irani et al., 2014).

IT portfolio management is critical because organizational transformation requires a significant financial investment to maintain separate IT infrastructures during the project transition phases and places stress on the organization to support current and future business goals concurrently (Wang, Feng, & Zhao, 2013). Innovation diffusion provides a theoretical lens through, which to view individual leaders' innovation decision-making capabilities, approaches, interactions, and constructs to understand the complexities of making technology-adoption decisions while managing negative behavior in large government organizations (Rana, Dwivedi, & Williams, 2013).

Problem Statement

Research indicates the lack of an IT governance framework to successfully manage IT projects in the federal government. However, research on effectively managing and sharing knowledge across organizational barriers is lacking. Correspondingly, understanding how federal agencies can increase complex IT project success rates is lacking. Unfortunately, researchers have focused on improving IT governance models and change management processes for static information systems and not on flexible management tools that may increase the success rate of technology adoption projects such as cloud-computing (Fizzanty, Russell, & Collins, 2013).

However, research is limited in explaining why private and nonprofit organizations have had a higher success rate in adopting innovative technologies and

managing complex IT projects than federal government agencies have had (Lecy & Van Slyke, 2013). Instead, the primary focus of research in the information-system management field has been on using organizational management methodologies to manage complex IT projects and not on an organization's capacity to embrace new technology, which is a key attribute for successful organizational transformation.

Implementing new technology and business processes requires project managers to address and resolve user resistance to technology change. These aims are stymied by limited scholarly research on how leaders can effectively manage the unpredictable behavior of groups reacting to the implementation of complex IT projects (Salem, 2013). More specifically, new technology that changes the IT infrastructure and business processes requires leadership and effective change management strategies to manage organizational resistance to change.

Barcenilla-Visús, Gómez-Sancho, López-Pueyo, Mancebón, and Sanaú (2013) recommended not using traditional organizational transformation management frameworks, because these frameworks were a contributing factor to the federal government's high failure rate of complex IT projects. According to Salem (2013), traditional project management methodologies are ineffective in managing the continuously changing environments in complex organizational hierarchy structures.

Purpose of the Study

The purpose of this study was to understand the experiences of senior leaders who had participated in large, complex IT projects within the federal government and

successfully managed IT-enabled organizational changes. Data analysis revealed the attributes, elements, characteristics, and archetypes needed to increase the success rate of complex IT projects in federal agencies. Traditionally, federal agencies have worked with project management frameworks designed to coordinate internal business functions from an internal, centralized, and stabilized environment in, which coordinating with multiple external stakeholders to provide IT services has been unnecessary (Rana et al., 2013). This is an organizational management and performance issue because managers are not able to effectively manage complex information management systems that have aging and legacy IT systems, and proprietary technologies are not suitable for adopting technologies that are external to the organizational structure, such as cloud-hosting services (Purdy, 2012).

Research Questions

The purpose of the study was to understand the experiences of senior leaders who had participated in large, complex IT projects within the federal government as they successfully managed IT-enabled organizational changes.

RQ1: What critical-thinking and problem-solving processes do federal managers use to justify IT investments for providing government services involving ICTs to meet citizens' expectations and organizational requirements?

RQ2: What leadership characteristics and experiences affect the collaborative decision-making process to manage complex ICT projects within federal agencies successfully?

Conceptual Framework

This study drew on the TAM and CMMI as theoretical frameworks to understand how to (a) manage organizational transformation and (b) identify emergent behavior associated with adopting new, innovative technology (Curry et al., 2013). Managing users' acceptance of technology requires studying individual attitudes and perceptions of organizational culture archetypes toward innovative or disruptive technologies in the digital work environment (Parthasarathy, 2013). Song, Shin, and Kim (2013) discovered that organizational management theories have limited application to managing virtual communities' behaviors because stakeholders are in working environments that span states, regions, and international boundaries that have different bounded rationality due to various cultures, languages, and value systems. Effective decision-making across hybrid organizational boundaries requires developing a flexible organizational hierarchy structure to remove organizational barriers and share tacit knowledge among stakeholders (Jay, 2013).

Technology acceptance model. The TAM theory by Ahmad et al. (2013) was appropriate for this study because it provides decision-makers the tools to measure an employee's attitude to accept or reject innovative IT. The rapid advancement of innovative technology has led researchers to study the organizational factors that influence the perceived usefulness and perceived ease of using new technology in traditional and learning organizations (Hsiao & Yang, 2011). Senior leaders are unable to predict future obstacles and challenges associated with implementing new technology and

must develop strategic plans to provide cost effective and quality e-government services to citizens (Hwang & Ng, 2013).

Capability Maturity Model Integration. The CMMI process is important for senior-level managers to understand how stakeholders acquire and reframe knowledge at the tactical level to make informed strategic and operational-level business decisions in complex dynamic environments (Xu, Zhang, & Barkhi, 2010). To gain support for adopting new, adaptive technology in traditional and learning organizations, change agents must persuade stakeholders to overcome innovation resistance to new computer-based technology products, demonstrating the business value of doing so while promoting corporate social responsibility (Austin & Seitanidi, 2012). CMMI provides a technical governance management framework to help organizational leaders make realistic decisions about their enterprise architecture, develop decision trees, and create logical constructs to support complex dynamic information management systems (Fang, DeLaurentis, & Davendralingam, 2013). In addition, organizational management strategies are limited in their ability to manage project teams and stakeholders to promote a common organizational culture within large working environment (Pinto, 2014).

Research into the theoretical bases of IT service management methods has switched focus from IT portfolio management to change management processes and effective communication strategies because of the management challenges associated with virtual environments (Kaganer, Carmel, Hirschheim, & Olsen, 2013). To address the problem of organizational resistance associated with adopting new technologies,

researchers have started exploring phenomena related to organizational behavior in knowledge-sharing cultures (Hall, Lazarus, & Swannack, 2014).

Nature of the Study

This Delphi study investigated the archetypes of senior managers and the experiences of IT practitioners to understand organizational relationships and organizational performance in complex IT projects. The Delphi method is an effective methodology for understanding the critical skills of senior executives and information systems project managers, as well as their ability to manage risk and control negative behavior that might impede IT projects (Keil, Lee, & Deng, 2013). This method was suitable for investigating the experiences of senior leaders who had orchestrated organizational transformation following the implementation of IT projects within a branch of the federal government.

Reviewing federal government project management artifacts such as performance metrics, project plans, and financial data help develop a theoretical framework for identifying critical IT project management attributes (Buschmann, 2012). New research was necessary to explore how leadership attributes can empower organizational leaders to increase elaborate IT projects in complex social-economic environments (Love & Edwards, 2012). Federal senior managers, program managers, and IT practitioners need an implementation plan for streamlining IT projects and sustaining innovation technologies in federal government agencies (Brenken, Schmitz-Urban, & Gudergan, 2013).

Multiple project methodologies, such as Agile, Spiral, and Waterfall, present organizations a project management framework to manage IT services (Kapsali, 2011). Using project management concepts for ICT in federal government environments requires redefining theoretical organizational management aspects to consider how end-users, policy-makers, and IT practitioners interact across organizational hierarchies and political boundaries (Stantchev & Stantcheva, 2013). Senior managers must implement effective strategic communication and collaboration methods among relevant stakeholders to share implicit knowledge across multiple organizational boundaries to meet organizational goals and objectives (Falkheimer, 2014). This is a formidable challenge, because leaders using traditional project management processes have been unable to manage negative performance caused by external systems that provide critical business functions and capabilities to an organization (Fizzanty et al., 2013).

Definitions of Terms

Throughout the dissertation, the following definitions were used:

Capability maturity model integration (*CMMI*): A process improvement model to help organizational leaders improve business processes using industry best practices to deliver enterprise services (Curry et al., 2013).

Chief information officer (*CIO*): The individual responsible for delivering IT services to support internal and external business requirements (Kundra, 2011).

Cloud-computing: A large number of geographically separate servers connected to allow centralized data storage and provide information processing capability in a virtual environment (Purdy, 2012).

Complex adaptive systems: The dynamic interactions of elements and attributes of agents' behavior in complex systems, especially behavior that increases its survivability as a macro-structure (Alegre et al., 2013).

Critical success factors: Elements used in organizations to determine operational or project management success by measuring the value of the activity to meet the organization performance goals (Belanger, 2011).

Delphi method: A research technique used to understand group decision-making constructs by interviewing subject matter experts in the focus area (Keil et al., 2013).

Federal sustainability goals: Requirements to reduce operating costs associated with the delivery and sustainment of IT management systems (Kundra, 2011).

Information and communication technology (*ICT*): The strategic roadmap of organizations that ensures the interoperability of devices to share information using different communication protocols and computer systems (Alonso, 2009).

Information management systems: The collaborative effort of people, IT capabilities, and structured business processes that enables organizations to provide services effectively and efficiently (Kapsali, 2011).

Information technology governance framework: A toolset used in managing and standardizing information management services using industry best practices to solve complex service management issues within organizations (Wang et al., 2013).

Innovation diffusion theoretical model: A framework explaining the communication and acceptance of technical advancements and innovation adoption (Rana et al., 2013).

Innovative system methodologies: A framework to manage the implementation of new technology within complex IT systems to minimize risk to the organization (Brooks et al., 2011).

Knowledge management: A management strategy to identify knowledge within an organization and share the information in a collaborative method to increase organizational performance (Buschmann, 2012).

Learning organization: Senior leaders have the ability to identify and evaluate accurately the factors and forces that affect negative behavior within the organizational structure and to correct negative behavior (Cousins & Bourgeois, 2014).

Office of Management and Budget: A government agency under the Executive Office of the President that oversees and manages federal agencies' budgets (Kundra, 2011).

Project management methodologies: Various conceptual frameworks of control mechanisms and structured processes to manage workflow processes, monitor risk, measure performance, and minimize negative behavior toward the project (Salem, 2013).

Systems thinking: A conceptual framework for understanding how individual attributes and elements of different systems can influence the behavior of a single element or the whole system (Gangadharan et al., 2013).

Technology acceptance model (*TAM*): A framework to predict staff's acceptance of innovative technology based on consumer and work-related attitudes (Ahmad et al., 2013).

Traditional organization: Senior leaders have the ability to identify negative behavior within the organizational structure but are unable to correct negative behavior because of organizational hierarchy structure and inefficient business processes (Cousins & Bourgeois, 2014).

U.S. General Accountability Office: An independent nonpartisan government agency whose staff investigates the use of public funds by government agencies (Mishra & Mishra, 2012).

Virtual communities: A group of individuals who interact using IT applications over the Internet or other networks to share information in a collaborative manner (Kaganer et al., 2013).

Assumptions

The Delphi method relies on participants' life experiences and expert knowledge. This study was based on the assumption that the individuals interviewed would accurately identify themselves as meeting the criteria of having been involved in the decision-making and funding approval of a complex IT project at a federal agency within

a 12-month time frame. Another assumption was that decision-makers participating in the present study (a) understood the political and economic factors to consolidate data centers and (b) would truthfully answer the interview questions. A final assumption was the participant sample accurately represented the population and the sample represented the attitudes of senior leaders and senior managers within federal agencies.

Scope and Delimitations

For convenience in the interview process, I selected participants for this study from the Washington, DC, metropolitan area. Participants were senior directors, deputy directors, project managers, and chief architecture officers within the CIO members of cabinet agencies such as the U.S. Department of Homeland Security, Veteran Affairs, U.S. Department of the Treasury, U.S. Department of Justice, U.S. Department of Transportation, and the General Services Administration. Individual participants had been with the agency for at least one year and were key stakeholders in an organization-wide IT project.

Limitations

A random sample of individuals in an agency was not feasible due to time constraints for gaining approval from top level senior leaders to conduct a survey within their organization. However, the convenience sample accurately represented the population and the attitudes of senior leaders and senior managers in federal agencies. I selected senior leaders from federal agencies located in the Washington, DC, metro area

with whom I had professional associations, which made it easier to gain cooperation for the study.

Nonresponse bias was an issue for this study due to participants who were unwilling or unable to participate in all three rounds of data collection. In addition, the inclusion requirements for the sample limited the sample size, which inhibited the generalizability of this study's findings. Therefore, seven new participants for the study were recruited using snowball sampling during the personal interviews. Participants provided individuals' contact information and e-mailed letters of introduction to coordinate interview scheduling. According to Janesick (2011), recruiting new subject matter experts by snowball sampling can increase sampling bias because of the lack of control of the sampling method, as new participants may not have had the exact characteristics required for participant selection. However, to mitigate the impacts of this bias I ensured that all individuals referred to the study met the criteria that they had (a) provided or prepared expert testimony to congressional panels and consumer advocates groups or (b) participated as panel members on the federal CIO Council regarding IT adoption.

Cultural environments were an issue when trying to coordinate interviews with senior managers in this sample, which inhibited their willingness to participate in a survey to increase organizational efficiency and effectiveness (Schmiedel, Vom Brocke, & Recker, 2014). Several participants declined to participate in the study due Office of General Counsel (OGC) legal concerns of providing confidential or sensitive information

during the data collection. Another limitation of the study was participants might have provided only positive responses that gave the impression that all IT projects under their leadership were successful completed on time and within budget. Using survey tools and Delphi method techniques helped mitigate threats to rigor, reduced bias, and increased the reliability of the interview data collected, thereby improving the trustworthiness of the data (Keller & von der Gracht, 2014).

Significance

Exploring an organizational culture to understand political and social ideologies provided a multidimensional construct of how high-performing organizations have a greater capacity to evaluate make-buy-or-lease business decisions and manage power imbalances within an organizational hierarchy structure. Mishra and Mishra (2012) noted the inability of government leaders to successfully manage risk and complexity in IT projects contributes to the federal government's inability to promote positive social and economic changes in a sustainable manner. The application of this research could help federal senior leaders increase organizational productivity to improve the success rate of complex IT projects to support economic development programs and public health programs. Many management controls and technical barriers are associated with developing a strategic IT governance framework, and it is critical that senior leaders develop a knowledge-management and knowledge strategy for sustainable growth (Enberg, 2012).

Analysts at the Office of Management and Budget identified various areas in, which senior leaders within federal agencies could increase organizational effectiveness by consolidating physical infrastructure and management functions and thus reducing overlapping technology capabilities using cloud-computing services (Kundra, 2011). This finding contradicted a report from the U.S. Government Accountability Office in, which Song et al. (2013) concluded that federal IT projects for cloud-computing services were counterproductive and ineffective, resulting in the loss of human capital and financial resources. Further, the U.S. Department of Homeland Security's CIO cancelled the virtual fence program because of the organization's inability to manage multiple critical success factors using traditional project management methodologies to implement innovative adaptive technologies, which resulted in the loss of $1 billion to U.S. taxpayers (Belanger, 2011). Managing complex IT projects within cloud-computing environments requires organizational change agents to identify and manage negative behavior within the IT infrastructure and organizational business structure (Dodaro, 2011). Scholars and IT practitioners need decision-making tools and techniques to implement a double loop-learning framework. A learning framework is necessary to maintaining organizational equilibrium and managing risks during the adoption and implementation of emergent technology can be disruptive because it involves change to typical business procedures (Khanagha, Volberda, Sidhu, & Oshri, 2013). Agarwal and Selen (2011) urged that organizational leaders use a holistic systems approach to identify

gaps in technical and business core competencies and that adaptive innovative technology advancements can help organizations remain sustainable and profitable.

Project managers and technical practitioners must understand system dynamics to communicate and negotiate within and across organizational boundaries to promote collaboration and knowledge sharing with internal and external stakeholders to manage complex IT projects (Buschmann, 2012). Organizational leaders must also increase the use of environmental scanning of internal and external social collaboration communities to develop a communication strategy to address social, economic, and environmental issues. Government agencies are using social media sites such as Facebook and Twitter to interact with the public to share information and solicit ideas from the public to improve services and cost saving ideas. Senior-level managers must foster a shared vision of innovative approaches to build knowledge-management and information-sharing environments that will mitigate organizational resistance in traditional and learning organizations.

Morris, Dailsey, Wheeler, and Boyer (2015) recommended managers develop a conceptual image of all interrelated business relationship such as political, social, and organizational culture to manage organizational transformation and organizational resistance to change. It is critical that senior leaders develop new organizational management methods to increase the success rate of complex IT projects that involve IT adoption and transformation within large, complex adaptive environments (Birekul & Dogerlioglu, 2011). Leaders of federal, state, and local government agencies can improve

the standard of social services offered to citizens such as e-government services to file taxes, apply for health care services, disability claims, and retirement benefits. Providing convenient and accessible online government services is an effective way to increase the interaction between government agencies and citizens and thus promote positive social change in communities (Haque & Pathrannarakul, 2013). The ability for citizens to access government forms from federal agencies to read, file a complaint, or apply for benefits and assistance programs helps promote positive social responsibility and environmental change.

The results of this study include a theoretical management framework that organizational leaders may use to develop effective and efficient services based on stakeholders' requirements and a process for addressing issues related to adopting online government services. This work is important for social change because, as Chen and Liu (2013) have noted, the introduction of new technology services could help leaders of government organizations provide critical social and educational services while reducing financial pressures on government agencies to maintain existing services for communities. Senior leaders cannot increase organizational performance by implementing new hardware or software solutions to manage chaotic and rapidly changing environments; therefore, leaders must have an effective strategic management plan for organizational transformation (Khajeh-Hosseini, Sommerville, Bogaerts, & Teregowda, 2011). Decision-makers and IT practitioners may use the findings of this study to understand how adaptive technology innovation can save hundreds of millions of

U.S taxpayer dollars, enhance organizational performance, and create a positive work environment for internal and external stakeholders alike (Alonso, 2009).

Summary

In Chapter 1, I addressed the deficiencies of project management tools, techniques, and the inability of a simplistic leadership model to enable successful complex IT projects in large, complex dynamic organizations. I also discussed the need to embrace shared IT services in government agencies as a way to increase productivity and provide online government services to citizens in a sustainable manner. This is critical because a theoretical IT governance management framework can serve as a tool for reducing system management complexity and providing a strategic roadmap for long-term sustainable growth (Parthasarathy, 2013; Settu & Raj, 2013).

In Chapter 2, I provide a literature review of organizational management theoretical foundations for critical thinking and problem-solving associated with adopting innovative technology in large, complex organizations. This literature serves as the theoretical foundation for this study. Sustainability performance strategies require a top-down management commitment to increase social and environmental performance. Researchers have demonstrated that integrating highly qualified IT practitioners' recommendations into decision-making efforts can provide different perspectives that help organizational leaders solve complex IT project problems (Heredia, Garcia-Guzman, Amescua, & Sanchez-Segura, 2013).

The literature review explores risk-management and IT portfolio management strategies used for information systems projects and organizational leaders' capabilities to implement innovative and adaptive technologies to meet organization goals and objectives. The alignment of IT governance frameworks, IT outsourcing, and IT portfolio management provides a theoretical model for optimizing cloud-computing technology to create new value for an organization (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013). In Chapter 3, I include a discussion of the research design methodology, data collection, and analysis. In Chapter 4, I discuss the process used to collect, record, code, categorize, and identify themes. In Chapter 5, I present the interpretation of the study, recommendations for future research, and reflections.

Chapter 2: Literature Review

The purpose of this study was to understand the experiences of senior leaders who have participated in large, complex IT projects within the federal government to articulate how to successfully manage IT-enabled organizational changes. To date, research lacks tools and techniques for change agents to implement new, innovative technology for increasing organizational performance while minimizing disruption to the organization (Babu & Saikiran, 2013). This gap in the research is a problem because even the best-performing organizations experiences a 25% failure rate of technology projects due to decision traps caused by complex dynamic environments, information filters, and flawed decision-making (Van Oorschot, Akkermans, Sengupta, & Van Wassenhove, 2013).

A literature review revealed enterprise governance models and leadership archetypes are complex linkages that influence the success or failure of complex IT projects in organizations (Briody, Pester, & Trotter, 2012). This literature review explores organizational behavior and performance in federal agencies' decision-making as they relate to increasing organizational performance (Cooper & Edgett, 2012). Specifically, I applied the decision-making construct to issues concerning managing and monitoring IT resources to provide online government services using a secure and cost-effective method for meeting organizational mission goals and objectives in a sustainable manner.

Literature Search Strategy

The primary sources used for the literature review included scholarly peer-reviewed journal articles and federal government publications. Academic journals used for this literature review came from the databases available through Walden University, namely ProQuest Central, EBSCOhost, and Science Direct. Key words used for the literature review search included the following: *complex IT projects*, *organizational transformation*, *Delphi study*, *TAM*, *CMMI*, *project management methodologies*, and *IT investment*.

In the literature review, I examined the management attributes and organizational barriers to creating a positive organizational environment for increasing the success rate of complex IT projects. Successfully implementing new business processes requires change agents to understand social dynamics of change and the magnitude of change within an organization. Effective decision-making based on individual experiences and tacit knowledge can increase IT project success rates in complex environments (Zanini & Musante, 2013). This chapter includes a review of the literature on decision-making factors that influence organizational innovation adoption and the integration of new technology in complex organizations (Lee, Lee, Hui-Lin, & Lin, 2012). Evaluating project managers' abilities to manage organizational transformation projects can help senior leaders identify individuals with demonstrated visionary leadership and management skills that are invaluable for overseeing complex IT projects (Parthasarathy, 2013).

Technological innovation is an issue in federal agencies, as many senior government leaders are reluctant to embrace new technologies in their organizations because of security concerns, legal risks, disruptive changes, and the lack of an industry standard for a federal information management system (Kundra, 2011). A high degree of senior leadership commitment and dedicated resources are required for innovative technology projects to succeed within federal agencies. Acquiring and implementing new technologies are long-term organizational commitments requiring leaders to develop a strategic management plan to manage the human aspects of organizational change (Hollen, Van Den Bosch, & Volberda, 2013).

Conceptual Framework

Stantchev and Stantcheva (2013) noted isolated information management systems (a) restrict the collaboration of information and shared resources across physical, security, and logical boundaries; and (b) impede senior leaders' abilities to implement innovative strategies. Organizational innovation requires collaboration across all business functions and trust among stakeholders to embrace implementing new technologies. Stantchev and Stantcheva (2013), however, did not address the successful identification of a specific management competency, organizational maturity level, or leadership archetype to improve organizational performance.

Effective strategic communication and strategic leadership are important because successfully introducing new, innovative technologies to an organization depends on stakeholders accepting new technology and the perceived level of operational efficiency

of the new services in an organization (Melton & Hartline, 2013). Melton and Hartline (2013) stated project managers should use IT governance frameworks already implemented in their organizations to manage stakeholders for adopting new technology and business processes to minimize organizational resistance. Organizational leaders need to adopt new technology strategies to reduce operating costs, increase organizational performance, and meet organizational goals (Yigitbasioglu, MacKenzie, & Low, 2013). Cloud-hosting services are effective business strategies to increase organizational performance and reduce operational costs; however, leaders of federal agencies are still reluctant to embrace cloud services because of legal and operational concerns about outsourcing their IT infrastructure (Yigitbasioglu et al., 2013).

Organizational leaders must focus on long-term strategies, sustain knowledge transfer, and invest in new technology to remain profitable and sustainable. According to Sasikala (2011), large technical, financial, and research communities have experienced a paradigm shift in accepting cloud-computing for delivering information system services with a secure and cost-effective method. The leaders of more than 80% of Fortune 500 companies in 2011 used cloud-computing strategies to outsource computing services, which resulted in increased organizational performance and reduced total operating costs of IT services (Babu & Saikiran, 2013). According to King and Raja (2013), regulatory policies for safeguarding data present unique cloud security challenges because cloud service providers must comply with legal and regulatory requirements on international, national, federal, and state levels.

Grispos, Glisson, and Storer (2013) identified a gap in the research regarding security standards and guidelines related to data security and provisioning of cloud services for the private sector and the government sector. The inability to identify security risks associated with cloud-computing services is a major concern that prevents leaders of government agencies from adopting such technology (Paquette, Jaeger, & Wilson, 2010). Fortune 500 companies have developed effective security and access control mechanisms for data stored in various physical locations that meet all federal regulatory and compliance requirements; therefore, new research is necessary to examine government decision-making processes for adopting cloud-computing services (Demirkan & Delen, 2013; King & Raja, 2013).

Challenges and Opportunities of Complex IT Projects in Organizations

Reduced IT budgets, legislative requirements, and increased demand to produce mobile computing applications has placed new pressure on federal agencies to produce consumer-like products and adopt alternative technologies to meet citizens' requirements. To deliver needed services in a more efficient manner, the government must undergo a technology transformation using innovated adaptive technology, and change the paradigm of managing IT services by using a social entrepreneurship model for social value creation (Haque & Pathrannarakul, 2013). Briody et al. (2012) determined that leaders of federal CIO organizations unsuccessfully used various IT governance models, IT Infrastructure Library (ITIL), and software development lifecycle frameworks to migrate to cloud service providers. Using ad hoc and immature IT governance processes

complicates provisioning systems, billing, and developing pricing models for various cloud service brokers. The inability of senior-level managers to implement a knowledge-management system using common-reference architecture resulted in missed opportunities to eliminate redundant capital investments required by federal mandates (Navarra & Bianchi, 2013).

Leaders of government agencies are under increasing financial and political pressure to maintain IT infrastructure with predictable costs while upholding acceptable levels of service to communities, which serves as a primary reason to continue using the current infrastructure that has predictable behavior and sustainment costs. The overdependence on legacy proprietary systems, system integrators, and stovepipe IT service domains is preventing leaders of federal agencies from (a) investing in open standard Internet-enabled platforms and (b) providing cost-effective Internet-based social services (Cordella & Willcocks, 2010). A sustainable IT infrastructure is important because the U.S. electrical power delivery infrastructure cannot support current energy demands of IT equipment and requires the development of a smart grid for sustainable digital growth (Osmani, Zhang, Gonela, & Awudu, 2013).

Patnaik and Sahoo (2012) noted that recent exponential demand for IT devices has created significant institutional investment imbalances in government IT spending that requires new research for green IT investments and sustainable development. IT investment is a significant management issue because, as Saunders (2014) has noted, larger and wealthier government agencies have more financial resources and IT personnel

capable of successfully implementing new technology projects. Mengistie, Heaton, and Rainforth (2013) noted that the success of complex technology projects depends on effective leadership, user acceptance, and political support.

Azzone and Palermo (2011) stated project management and risk management methodologies are not applicable to government agencies because the basis of these methodologies is the assumption that insurance can minimize risk in the private sector to offset any potential financial loss triggered by a failed IT project. Some senior decision-makers view mandatory IT services consolidation as a threat to organizational culture, self-identity, and their professional careers. These senior-level managers seem to lack a theoretical organizational management framework to perform environmental scanning. This omission places the organization at risk that Azzone and Palermo (2011) have contended insurance cannot absorb. Thus, the identification and remediation of negative behavior that is personally self-protective but not beneficial to the organization is a critical step toward increasing organizational performance and meeting organizational short-term and long-term goals. The identification of key attributes, elements, and stressors associated with organizational transformation requires (a) identification of employees' ability and readiness to embrace change and (b) recognition of management's ability to create a shared vision appreciated across all organizational boundaries (Babu & Saikiran, 2013).

Management Strategies for Large, Complex IT Projects

Xu et al. (2010) conducted project management research and viewed IT framework methodologies for project governance as a single research topic based on individual and team member relationships, which contradicted a contention by Ahola, Ruuska, Artto, and Kujala (2010) that project governance has an external phenomenon attribute for any project and an internal constraint attributed to economic conditions. The focus of IT governance framework research has been on increasing IT project success only from the perspective of risk management and economic cost, rather than exploring political risk management from a strategic perspective. IT portfolio management is critical because, as Jay (2013) has noted, the number of abandoned IT projects is increasing as political policy decision-makers pressure senior decision-makers to implement ad hoc change management processes that eventually result in the lack of executive support and resources required to complete a project. The increased failure rate of IT investments suggests a systemic weakness of federal agencies project managers' ability to use project management methodologies, investment frameworks, and IT governance models effectively to manage complex interactions (Young, Young, Jordan, & O'Connor, 2012).

Borges (2013) demonstrated that program managers in the private sector were more successful than federal program managers. Private sector program managers also demonstrated their ability to identify and remediate project risks using a governance, risk, and compliance (GRC) framework and earned value management. Earned value

management is a critical concept because an IT project's success is largely dependent on the project manager's ability to simultaneously manage known and unknown changes in the organizational structure while creating value within the organization for stakeholders.

IT project failures decrease the trust level among stakeholders, restrict senior leaders' ability to maintain social order, and reduce the change agent's ability to manage organizational transformation (Salem, 2013). More federal government innovation projects fail due to leadership abandonment than to technical difficulties or performance-related issues, because the project managers were not able to demonstrate the financial and political value of the project (Carassus, Favoreu, & Gardey, 2013).

Federal agencies experience a higher failure rate of IT investments than the private sector because of deviant behavior that affects the project manager's ability to manage complex relationships and minimize negative reactions within a project management team (Pinto, 2014). Senior-level managers of government agencies are often reluctant to adopt innovative technology such as cloud-computing because complex IT projects have high political visibility, and senior executives' careers usually end because of IT project failures (Thompson, 2012). According to Grewal and Pateriya (2013), organizational leaders must develop a strategy for provisioning services from a cloud broker while continuously seeking innovative solutions to leverage current resources to remain sustainable in a global market. Government agencies such as the U.S. Department of Homeland Security must develop new innovative strategies for protecting critical

national infrastructure and key assets to fulfill mandates and protect U.S. citizens in a cost effective manner (Murray & Grubesic, 2012).

Effectively managing organizational transformation requires change agents to gain an understanding of (a) staff perception of accepting technology and (b) the social dynamics of change within an organization (Lecy & Van Slyke, 2013). Jarvenpaa and Lanham (2013) explored the complex relationship between technology and organizations, and contended that leaders of mature organizations can leverage tension to ensure the success of evolutionary complex systems in dynamic environments. Mishra and Mishra (2012) noted that leaders of government agencies have a difficult time improving business functions and sustaining long-term objectives because of the inability to develop and implement best practices cost-effectively within the government.

Inherently Government Functions Are Obstacles for IT Projects

Senior government leaders cannot outsource integral governmental functions to commercial services and must insource complex IT projects, even though their agency has not achieved industry standards such as CMMI, ITIL, International Organization for Standardization, and Six Sigma (Hu, Lin, & Pan, 2013). This is an issue because nongovernment IT practitioners who have IT certifications and IT governance framework experience can positively influence the outcome of federal Internet-based projects (Janvrin, Payne, Byrnes, Schneider, & Curtis, 2012; Vidal, Marle, & Bocquet, 2013). Government agencies exist to provide services to citizens and not to compete with the private sector, which produces a paradox of managing perspectives for government

innovation, entrepreneurship strategies, and creating public value related to innovative adaptive technologies (Navarra & Bianchi, 2013).

According to Alegre et al. (2013), managing organizational technology innovation requires favorable organization conditions, a high level of subject matter expertise in technology, and a knowledge-management process such as CMMI to improve organizational processes for the delivery of IT products and IT-related services. Various federal, state, and local government regulations prevent agencies from delivering IT services in a cost-effective manner and restrict the ability of federal senior leaders to manage IT investments and develop strategic roadmaps for organizational transformation (Bao, Wang, Larsen, & Morgan, 2013). Government information management and security policies create a complicated legal framework that presents challenges for senior leaders in government agencies that outsource information systems to IT service providers. For example, a government agency is unable to transfer legal liabilities to a cloud service provider because federal agencies must maintain ownership of all data and produce data in the native format to respond to any legal requests (Hoover, 2013). A paradigm shift of restricting contractors from performing high-risk technical activities that are inherently governmental functions will require restructuring government acquisition and contracting strategies that are mandated federal law and federal regulations (Azzone & Palermo, 2011).

Senior leaders in government agencies lack the expertise and knowledge to quantify the risk, costs, and benefits of outsourcing information management systems to a

cloud service broker (Cordella & Willcocks, 2010). Sultan (2013) noted that embracing and adopting cloud-computing services business positively influenced private sector organizational performance but required the use of industry best practices to lower total operating cost and increase the reliability of business systems. Tassey (2013) also confirmed that cloud-computing environments and shared IT services have fundamentally changed the way organizational leaders manage critical information management systems.

Reducing the complexity of managing systems within IT such as using cloud-computing environments will require the development of a government cloud-computing architecture model (Ranjan & Zhao, 2013). The most difficult and complex IT governance tasks for IT practitioners and project managers are to define (a) the logical and physical IT system boundaries and (b) the legal responsibilities associated with integrating federal infrastructure with IT systems hosted by organizations in the private sector (Leavitt, 2013). Senior leaders must constantly monitor organizational technical capabilities to ensure that the IT infrastructure and IT practitioners can support innovative adaptive technologies required to support the organizational mission, goals, and objectives (Parthasarathy, 2013).

Tacit Knowledge-Sharing Between Federal Agencies for IT Projects

Organizational transformation is an iterative process that requires strong leadership commitment to removing organizational cultural obstacles. To overcome organizational resistance to change, solve problems to keep a project on schedule and on

budget, the project management team must be flexible and resourceful (Liu, Zhang, Keil, & Chen, 2010), which is a problem for senior leaders because the solicitation of tacit knowledge between government agencies is lacking. Senior leaders of government organizations usually maintain IT knowledge at the individual or team level; therefore, senior-level managers must develop supportive social interactions to help with creating knowledge-management and information-sharing (Borges, 2013).

The complexity associated with cross-sectional organizational coordination often results in lower success rates for IT projects because organizational bureaucratic procedures interfere with competent decision-making (Love & Edwards, 2012). No single leadership style is effective for all IT projects; however, leaders with technical acumen and project management experience have had a higher project success rate than nontechnical project managers managing complex IT projects (Yang, Wu, & Huang, 2013). For government agencies, project management methodologies do not provide effective decision-making tools in complex IT environments because organizational structures use a top-down management approach that is a barrier for collaboration and innovation strategies (Cordella & Willcocks, 2010). New theoretical management frameworks are necessary to managing government environments to meet stakeholders' expectations, satisfy regulatory and legal requirements, and reduce the current failure rate of complex IT projects (Kapsali, 2011).

Senior leaders must develop strategic tools to increase productivity; adopting new technologies can increase organizational performance to meet mission, goals, and

objectives by providing services to internal and external stakeholders (Agarwal & Selen, 2011). Managers should use knowledge-management activities such as social media and informal meetings among teams and groups within the organization to help in the transfer and creation of knowledge for complex engineering projects (Venkitachalam & Busch, 2012). Collaboration and managing tacit knowledge across organizational boundaries can actually be seen as problems by managers who have a negative view of sharing knowledge inside and outside the organization due to competing personal and professional values (Borges, 2013). Services driven from the top down can be technically sophisticated and costly to implement, and sharing knowledge about the design and implementation can cause tension between internal stakeholders who maintain the systems and external stakeholders who request information about the life-cycle management cost of the system (Mishra & Dwivedi, 2012).

Effective Technology Business Strategies in Large Organizations

A review of the literature revealed themes of project management identities and leadership archetypes associated with project abandonment versus support of projects at different levels within an organizational structure. Kapsali (2011) studied project managers' tacit knowledge and identified that previous experiences of IT governance frameworks, CMMI processes, and knowledge-management are critical factors to improve organizational effectiveness in traditional and learning organizations. Effective leadership skills and knowledge sharing are critical attributes because, as Alonso (2009) has demonstrated, different management and leadership approaches are necessary for

high-priority, high-risk, and innovative IT projects versus IT projects that are low -risk and routine.

Diverse management and leadership approaches are also necessary to managing tension for technology projects that disrupt normal operating procedures in order to reduce organization conflict and increase organizational performance (Sultan & Bunt-Kokhuis, 2012). Effective decision-making and problem-solving tools related to complex IT projects are lacking because of the inability of financial modeling instruments to determine costs and benefits associated with outsourcing IT services. Complex IT projects also have a poor success rate in government agencies because senior-level managers cannot agree on a recommended course of action and are averse to criticism about their competence to manage risk within a project (Müller & Turner, 2010).

Leaders must eliminate flawed individual decision-making or groupthink decision-making and manage groups and teams to meet organizational goals and objectives (Fishenden & Thompson, 2012). Developing new business strategies to adapt to rapidly emerging technology requires new organizational leadership strategies and practices that support the effective management of high-knowledge and virtual employees across an organization's physical and logical boundaries (Navarra & Bianchi, 2013).

New flexible management tools and techniques are necessary to empower project managers to confront negative behavior within physical and virtual systems (Lindström, Plankina, Lideskog, Löfstrand, & Karlsson, 2013). Mapping project management

processes according to CMMI guidelines provides organizational leaders a tool for managing complex IT processes and capturing all costs associated with IT projects for in-depth analyses of performance value (Löhe & Legner, 2013). According to Briody et al. (2012), technical and organizational culture clashes are key attributes that lead to project termination. Early detection of negative organization culture and remediation is critical for a successful and sustainable organization.

Gaps in Current Literature

A review of current empirical literature revealed that an increased failure rate in IT projects in the federal government is the result of the agency leaders' inability to manage multiple processes across multiple organizational structures. Research has focused on Agile project management methodologies and not exploring the key critical success factors that determine the successful implementation of complex IT projects. Government information systems over the last decade have evolved from isolated brick-and-mortar infrastructures to geographically distributed environments.

This is an issue because senior leaders are unable to manage the physical or logical security boundaries of their infrastructure or manage human resources outside their organizational boundaries that maintain their information management systems. This is a problem because senior leaders currently view IT infrastructure as a technology asset and not as a critical business asset that is essential to meet long-term business goals and objectives. Project managers' technical skills and organizational management

experience are critical attributes for identifying system interdependencies and managing negative behavior of systems within systems.

Summary and Conclusions

A review of literature revealed a requirement for research to identify the qualities associated with users' acceptance and adoption of innovation technology in dynamic environments. Private sector information management systems do not have the same security, auditing, and reporting requirements as federal systems; therefore, decision-makers need a theoretical framework to understand how senior leaders can manage IT systems in accordance with all applicable federal laws and regulations in a cost-effective manner. The literature review revealed a lack of research that addresses the experiences of senior managers and their tacit knowledge of IT project management methodologies.

Such research may be useful for understanding how senior leaders successfully managed people, processes, and resources to increase the success rate of complex IT projects in federal agencies. The literature review indicated that decision-makers face unique challenges in managing and modernizing IT systems in a cost-effective manner. For the current project, decision-making models and management theories serve as the theoretical foundation for examining the success and failure of IT projects and therefore to provide decision-makers different viewpoints on managing people, processes, and resources in complex environments.

Chapter 3: Research Methodology

The purpose of this study was to understand the experiences of senior leaders who had participated in large, complex IT projects within the federal government to efficiently manage IT-enabled organizational changes. In this chapter, I address the research questions, rationale of theory selected, role of the researcher, methodology, participants, instrumentation, data collection strategy, data analysis procedures, issues of trustworthiness, ethical issues, and summary of the findings. The research methodology for this study appears in the following subsections.

Research Design

In this investigation, I focused on understanding the complex social relationships formed by senior leaders, project managers, and stakeholders to reduce organizational resistance for adopting and accepting new technology within large, complex organizations (Patanakul, 2014). The research questions for this study were as follows:

RQ1: What critical-thinking and problem-solving processes do federal managers use to justify IT investments for providing government services involving ICTs to meet citizens' expectations and organizational requirements?

RQ2: What leadership characteristics and experiences affect the collaborative decision-making process to manage complex ICT projects within federal agencies successfully?

Delphi Method

Qualitative research provides the framework to observe organizational learning and business management processes from the participant's perspective to gain insights and meaning in studying complex behavior (Weerawardena, Mort, Salunke, Knight, & Liesch, 2014). The Delphi method is a systematic and interactive interviewing method for eliciting consensus from a group of selected experts to answer follow-up questions in two or more rounds, allowing the researcher to gather reliable expert opinions without face-to-face meetings (Pincombe, Blunden, Pincombe, & Dexter, 2013). Following each round, the facilitator gives each expert participant an anonymous summary of all the experts' responses from the previous round and encourages the experts to comment further or to revise earlier responses to account for the divergence of others' opinions, converge toward an answer acceptable by the majority, and possibly reach consensus. During this process, the range of answers typically decreases, and the group advances toward group consensus. The process concludes after completing a predefined criterion such as number of rounds, reaching consensus, or stability of results (Heiko, 2012).

Rationale for Delphi Study

A qualitative study methodology using the Delphi method was suitable because I sought to understand the bounded rationality and social behavior of senior leaders' critical thinking and problem-solving for managing complex IT projects (Liu et al., 2010). The Delphi method is a valuable research tool for studying critical influential factors in organizational hierarchical structures and for exploring how subject matter

experts use acquired knowledge in multi-criteria decision-making (Shabani, Saen, & Vazifehdoost, 2013).

The Delphi method is a mechanism for exploring complex topics and soliciting responses from a panel of experts and for synthesizing and consolidating data collected from individuals and groups (Keil et al., 2013). Organizational factors and cultural aspects can result in inconsistent performance due to complex issues associated with adopting new technology and business practices, yet studying such phenomena is difficult because of tendencies such as groupthink, follow the leader, and concurring with the opinions of individuals with similar sociocultural backgrounds. The Delphi method is a structured process for collecting information from subject matter experts to facilitate the formation of consensuses that can lead to effective decision-making while preventing direct social interactions that may compromise the validity of the study (Golkar & Crawley, 2014).

The focus of qualitative research is on observing participants in their natural setting and making sense of the observed behavior by reporting the results through an unbiased approach (Venkatesh, Brown, & Bala, 2013). For this study, the natural setting was the participants' work environments rather than focus group interviews or experimental conditions. The Delphi technique is suitable for obtaining expert opinions from subject matter experts to anticipate IT trends and potential obstacles associated with project management, technical management, and team core competencies to manage technology innovation projects successfully (Janssen et al., 2013).

Comparing and Contrasting Research Methods

I did not use a quantitative research methodology because the goal was not to test hypotheses. Instead, the goal was to gather in-depth descriptions through participant responses to unstructured and structured narrative interview questions (Janesick, 2011). A phenomenological study was not suitable because my research goal was to explore personally encountered learning experiences for effective problem-solving and critical thinking but not to explore the personal meaning of those experiences (Baetzgen & Tropp, 2013). An ethnography research method was not suitable because the focus of the research problem was not on understanding key events associated with organizational culture or organizational behavior (Golkar & Crawley, 2014). Finally, a case study was not suitable as the research methodology because I sought to understand the relationships among experiences, organizational culture, and organizational performance, not to analyze historical events using different disciplines to explain past events (Abdul Rasid, Wan Ismail, Mohammad, & Long, 2014).

Delphi Method Used

For Round 1, I conducted personal interviews and used open-ended questions developed by subject experts who were not participants in the study. Data from Round 1 were thematically analyzed and synthesized to understand individual judgments and attitudes to obtain consensus of opinion. The criterion for defining consensus was if 70% or more participant responses were in agreement, which provided group stability. In

categories where consensus was not achieved, I developed questions for Round 2 for further analysis.

I developed Round 2 questions based on a synthesized review of the literature and framework analysis of Round 1 responses. Questions were e-mailed to participants with instructions to return their responses within 2 weeks. Data from Round 2 were thematically analyzed and synthesized to understand individual judgments and attitudes to obtain consensus of opinion. The criterion for defining consensus was if 70% or more participant responses were in agreement, which provided group stability. In categories where consensus was not achieved, I developed questions for Round 3.

I developed Round 3 questions based on a synthesized review of the literature and thematic analysis of Round 2 responses. Questions were e-mailed to participants with instructions to return their responses within 2 weeks. Data from Round 3 were thematically analyzed and synthesized to understand individual judgments and attitudes to obtain consensus. The criterion for defining consensus was if 70% or more participant responses were in agreement, which provided group stability. Due to time constraints no further rounds were conducted for this study.

Instrumentation

There are various research methods for collecting data for qualitative research. web-based surveys, polls, e-mail, and questionnaires are effective data collection tools to gather information from participants. I used semi-structured interviews with follow-up questions developed by three subject matter experts with industry project management

and IT certifications to gain greater insight into the problem. To acquire in-depth knowledge about individual experiences, opinions, and emotions, Janesick (2011) has recommended using in-person interviews to gain the trust of the participants. I used personal interviews as the primary method of collecting data, using telephone interviews only when the participants' schedule did not permit a face-to-face meeting.

Allowing participants to share their experiences can provide insight into critical thinking tools and techniques for effective problem-solving, helping shape the logic of inference in the research process (Zachariadis, Scott, & Barrett, 2013). The questions in Round 1 were derived from a literature review of peer-reviewed articles and scholarly journals regarding complex IT projects. I developed interview templates with the research questions to record the participants' verbal and nonverbal responses during interview sessions for data collection.

I conducted a pilot test to validate the interview questions, estimate the amount of time to conduct an interview, and ensure the ability to record the interview conversation using a digital recorder. Pilot studies help validate the research instrument and verify trustworthiness; they should also reveal defective data collection and analysis procedures prior to conducting a full study (Elo et al., 2014). Pretesting a research instrument can provide valuable insight for conducting a full-scale study, potentially identifying cultural barriers or ethical issues with the research approach (Schmiedel et al., 2014).

Sampling Method and Population

Patanakul (2014) noted the Delphi method depends on identifying and selecting subject matter experts; thus, it is critical that individuals selected for this study have tacit knowledge of IT service management domains and understand project management methodologies to provide expert opinions. I collected data from 30 senior federal managers who had (a) provided or prepared expert testimony to congressional panels and consumer advocates groups or had (b) participated as panel members on the federal CIO Council regarding IT adoption.

Due to limitations imposed by my geographical location, I did not include some members of the population in the convenience sample, and I could not determine the entire population size for this study. A random sample of the total population of senior managers in federal agencies would not have been practical because of time and resource constraints. Convenience sampling was appropriate for this study because of the small population of subject matter experts who have established themselves as having project management, technical management, and IT core competencies in federal agencies (Janssen et al., 2013). I selected participants by identifying individuals within the federal government who perform the role of a CIO, senior program manager, enterprise architect, business architect, or senior technology advisor. Individuals had been with the organization for more than one year and had participated in an organization-wide IT project.

I selected participants by reviewing the organizational structure of CIO federal agencies within the Washington, DC, area and e-mailing individuals to request their participation. The subject matter experts selected were from federal agencies' CIO departments and had worked on complex IT projects. I determined that a finite number of government key decision-makers make IT policy decisions that influence organizational policies, goals, and objectives. The group of participants constituted a convenience sample because of the centralized location of all participants and their active membership in interagency federal CIO Council meetings within the Washington, DC, area.

Data Collection

Data collection is an important aspect of any research study to ensure the trustworthiness of the results (Elo et al., 2014). Data collection began after receiving approval from the Walden University Institutional Review Board (IRB) to conduct the research. The participants were assigned identifiers P1 to P30 during Round 1 during the initial data collection to remain anonymous.

Procedures

I identified individual potential participants by reviewing the Open Government Working Group website for senior representatives responsible for government IT systems and government services (Open Government Initiative, n.d.). In addition, the federal CIO Council website (https://cio.gov/about/members) included a listing of federal agencies and CIO members as knowledgeable representatives for this study. I contacted individuals by phone to invite them to participate in the study. Those who agreed

received a formal consent letter along with an invitation to schedule an appointment for the interview.

I read an approved IRB interview protocol at the beginning of each interview. Interviews also included a request for permission to conduct an audio recording, take field notes, and explain the methods to safeguard the participant responses and their identities. I used descriptive questions to explore participants' views on the challenges and obstacles of managing complex IT projects and organizational resistance to change. I summarized and categorized subject matter experts' responses from Round 1 interviews. A strategy for ensuring trustworthiness was member-checking to validate the accuracy of the information provided during the interviews. I provided participants with a transcript of the interview to solicit feedback and validate the accuracy. I corrected and resubmitted inaccurate interpretations to the participants to validate that the findings were correct, and summarized responses from Round 1.

Data Management

Qualitative research generates large amounts of textual data. Researchers must record, classify, and analyze interview transcripts and nonverbal signs including symbolic gestures to gain greater insight into meanings (Golkar & Crawley, 2014). I developed interview templates with research questions to record the participants' verbal and nonverbal responses during interview sessions for data collection. The structured matrix used included space to record nonverbal behaviors or gestures that accompanied speech and related to some degree to the semantic content of speech (Janesick, 2011).

Data Verification

I conducted Round 1 interviews in person. I transcribed the interviews and e-mailed participants their transcripts with instructions to correct any mistakes and e-mail me their approval or corrections to their transcripts. Participants' reviewing their own transcripts help elicit additional insights and provided the opportunity to provide additional information for the study (Heiko, 2012). Member-checking for Rounds 1 and 2 was performed by telephoning and e-mailing participants to ask if there were any questions about the questioners provided and to validate that their feedback was received. Following up with participants is critical because generalized questions may not be understand and inappropriate response may be provided for the study (Jay, 2013).

Data Analysis

I collected data from participants using structured interviewing and questionnaires. I analyzed the data using NVivo 9.0 to identify themes for analysis. Here is the process I used for content analysis. I assigned codes for the same or similar words and phrases until I identified all relevant themes and patterns. I used code frequency to identify the significant codes for further analysis and assigned labels to themes for thematic analyses. I identified relationships between codes and grouped these similar codes as subcategories. I identified major key themes from each subcategories and labeled these groups as categories to identify recurring themes and develop different perspectives (Baetzgen & Tropp, 2013). I converted participant responses to text to identify themes and explore relationships between themes.

I discovered common themes by the thematic content analysis of words, unique words, and similar phrases in blocks of text. NVivo software aided in identifying relationships, behavioral patterns, and themes, enabling me to generate word trees to depict participants' statements (QSR International, 2014). Software can assist researchers in creating data flow diagrams, visual displays, and matrixes from participants' statements and researchers' field notes by creating different views of relationships based on content, themes, and categories. Conceptual labels are used for discrete expressions to identify themes and concepts are discovered when compared to each other (Hastings et al., 2013). Common concepts are grouped together to form a hierarchy and the results of the analysis creates a category. Frequency and variations of categories provides the ability to identify subcategories for additional analysis.

Coding and Categorization

Analyzing text requires discovering themes, subthemes, determining, which themes are important, building hierarchies of themes, and linking themes to a theoretical model. Developing thematic categories provides the ability to describe and compare data to gain insight into individual attitudes and expressions for analysis (Hickey, Reynolds, & McDonald, 2015). Themes are abstract constructs of expressions found in text, images, sound, and objects that link very specific expressions (Taylor, Thorne, & Oliffe, 2014).

The criteria for identifying themes and developing categories for thematic analysis are based on how often the expression appears, how people react when theme is violated, and the degrees of variety of the theme's expression within the dataset (Hasting

& Payne, 2013). Interview audio recordings from Round 1 were transcribed to text. Coding and categorization for Rounds 1, 2, and 3 used an iterative approach to identify emerging patterns from the data. Inductive analysis involved multiple rounds of revisiting the data to gain insight and to identify (a) codes, (b) themes and patterns, (c) relationships between themes and patterns, (d) common themes, (e) major or key themes, (f) categories, and h) subcategories.

Coding and categorization requires viewing data through an analytical lens to gain insight and understanding of emergent patterns in the data (Heiko, 2012). Categories emerged from comparing similarities of text across themes and grouping these common themes together and variations in the degrees of relationships with categories resulted in identification of subcategories. Table 1 describes the technique to discover themes and categories for the Delphi study.

Table 1

Thematic Analysis Methodology

Data collection	Data structure	Data analysis
Written responses	Text	Develop codes, search for same or similar words
Audio recordings	Audio files transcribed to text	Themes, patterns, and code frequencies emerge
		Relationships between patterns and among themes emerge
		Common themes emerge
		Major or key themes emerge
		Categories identified
		Subcategories identified

Note. Process model for identifying themes, categories, and subcategories. Data were analyzed from a generalized viewpoint to a focused point of view by reducing the dataset. Adapted from "Understanding community to engage community: The use of qualitative research techniques in local government community engagement," by A. Hickey, P. Reynolds, and L. McDonald, 2015, *Asia Pacific Journal of Public Administration, 37(1),* pp. 4–17. Copyright 2015 by the *Asia Pacific Journal of Public Administration*.

Consensus and Lack of Consensus

A critical component of a Delphi study is the ability to measure consensus and the lack of consensus. Determining adequate consensus threshold for consensus and lack of consensus is critical since obtaining full consensus is rarely achieved in a Delphi study.

Heiko (2012) defined stability or consensus as when the consistency of responses is more than 50% and lack of consensuses is 50% or less of the responses. I defined consensus as when more than 70% of the participants were in agreement and additional rounds of the study omitted those categories for further analysis. I defined *lack of consensus* as when less than 70% of the participants were in agreement and additional rounds of the study included these categories for further analysis.

Validation

This study included controls to ensure that research data and research findings met research validity requirements. Through the individual interviews, experts expressed their opinions about the success and failure of IT projects without the bias of groupthink or the negative consequences of expressing an unpopular opinion that might contradict senior policy makers' decisions (Alomari et al., 2014). Member-checking was done by providing participants a transcript of the interview sessions by e-mail. Participants were asked to verify the accuracy of the transcripts, make edits as necessary, and e-mail their corrections or approval of the transcript. To reduce the effect of self-bias, an independent researcher can review the audio recordings, transcripts, and questioners. I managed internal validity using an iterative process to identify theme saturation for Round 1, Round 2, and Round 3 data collection.

Ethical Procedures

Conducting research with human subjects requires maintaining open and honest two-way communication and maintaining a collaborative environment so that the

participant can trust not only the researcher but also the research process (Plewa et al., 2013). I submitted a written application to the Walden University's IRB (see Appendix E) for permission to conduct this project. I used an approved interview protocol for interviewing participants.

I explained the purpose of the study, data collection methods, the voluntary nature of participation, the confidentiality of information, and that I would encrypt all data files to protect the privacy of participants. I also notified individuals that they could withdraw at any time, and indicated I would destroy all field notes, paper artifacts, and digital artifacts after five years. Maintaining research data will allow other researchers to conduct their own research using raw data from this study. Individual participation did not have a physical, social, or financial impact, and participants had the opportunity to review the findings of the study before publication to provide feedback.

Role of the Researcher

For this study, I performed the role of an active listener and data collector to listen to and record individual experiences that involved making decisions about complex IT projects as a job function (Janesick, 2011). Data collected from interviews required not self-projecting any ideas or subjective themes during interviews. I am a senior federal supervisor with numerous industry technical certifications, IT governance certifications, and project management professional (PMP) certification**.** I have collaborated with federal agency CIOs and their staffs and have established a relationship as a trusted advisor with senior managers within the federal government. Golkar and Crawley (2014)

stated that acting as an independent observer requires objective reality testing during interview sessions and a potential issue of concern were business relationships with participants working together on IT projects. To avoid potential conflicts of interest or ethical issues, I did not interview any individuals with whom I had a personal or business relationship.

Issues of Trustworthiness

It was critical to maintain objectivity and to ensure that academic learning and professional training does not result in biased data collection. As an observer, I took care not to introduce my views into the study or to interject personal experiences to influence the data collected. Participant observation strategies require ensuring that a researcher takes self-expression, verbal cues, and nonverbal cues into consideration while interviewing and taking field notes (Houghton, Casey, Shaw, & Murphy, 2013). Golkar and Crawley (2014) noted that research techniques, collection methods, and analysis methods must result in an accurate, unbiased interpretation of data that meets the standards of acceptable qualitative research.

Understanding the dynamic nature of human behavior in, which the novice researcher is the primary instrument for interviewing, data collection, and analysis can minimize the risk of personal bias or reflectivity (Borges, 2013). In the Round 1 interviews, I did not interject my personal experiences. To prevent myself from doing so, I kept a research journal to increase my understanding of the research process, and my committee members provided guidance and a different perspective on the method of

inquiry. Member-checking occurred during the interview process by allowing participants to review their interview transcripts and provide feedback to validate the accuracy of the transcript and add rigor and reliability to the project overall (Goldblatt, Karnieli-Miller, & Neumann, 2011).

Summary

In Chapter 3, I provided an explanation of the research methods used to conduct this research. I developed the research design using the Delphi method as the conceptual framework; the methodology used to conduct interviews included a convenience sampling of the population, as well as a description of the approach to collecting, categorizing, coding, and analyzing data using NVivo software to identify common themes. In the chapter, I discussed rigor, self-bias, and trustworthiness using member-checking and reflexivity to contribute to the validity of the study.

The Delphi method was the tool used to gain insight into the individual experiences of subject matter experts to explore the topic of managing complex IT projects in large organizations. A review of the literature served as the foundation for selecting the Delphi method as a research tool and developing the data collection methodology for Chapter 4. In Chapter 4, I discuss the process used to collect, record, code, categorize, and identify common themes. In Chapter 5, I present my interpretation of the study, recommendations for future research, and reflections.

Chapter 4: Results

The purpose of this study was to understand the experiences of senior leaders who had participated in complex IT projects within the federal government to increase the success rate of complex IT projects in federal agencies. The research questions in this study were as follows:

RQ1: What critical-thinking and problem-solving processes do federal managers use to justify IT investments for providing government services involving ICTs to meet citizens' expectations and organizational requirements?

RQ2: What leadership characteristics and experiences affect the collaborative decision-making process to manage complex ICT projects within federal agencies successfully?

Method

Using the Delphi method, I identified and analyzed the critical success factors federal agencies have employed to deliver IT services that increased organizational performance in an efficient and sustainable manner. The Delphi method requires several cycles of anonymous data collection, and in this study I conducted three rounds of data collection. Round 1 was face-to-face interviews or phone interviews (see Appendix A: "Round 1 Interview Questions: Subject Matter Expert Interview Questions"). Rounds 2 and 3 were follow-up questions delivered via e-mail (see Appendix B: "Round 2 Questions" and Appendix C: "Round 3 Questions").

I contacted potential participants via e-mail or phone. Those who consented to participate received a brief summary of the study, instructions, and a consent form via e-mail (see Appendix D). On receiving their consent forms, I coordinated with the participant or his/her executive assistant to set up an interview appointment. I made clear that participation was voluntary and individuals could quit at any time during the process. All individuals were cooperative and enthusiastic, and several individuals made e-mail introductions to other individuals within their organization suggesting their participation in the study. In compliance with the Delphi method, the participants were not informed of other participants in the study.

I conducted one-on-one interviews, which I recorded with the digital recorder application Voice Recorder by TapMedia Ltd. on an iPad tablet at each participant's office location. The application allowed me to record each interview, and I took field notes during the interview to aid in data analysis. I labeled all audio recordings with the individual name, date, and time of the interview. For interviews conducted by phone, I used the speaker feature for recording purposes. Following the interviews, I uploaded and encrypted participants' audio files to an external hard drive for security. I used NVivo qualitative data analysis software to identify and clarify relationships within the dataset to determine common themes and category frequency for thematic study and interpretation.

The Delphi method generated large amounts of raw data from Rounds 1, 2, and 3 that were very time consuming to code and analyze. The interviews and surveys required participants to provide essay responses that provided in-depth knowledge and expertise

related to the research questions. Using a 5-point Likert-type scale with responses of (a) strongly agree, (b) agree, (c) neutral, (d) disagree, and (e) strongly disagree would not have provided the in-depth tacit knowledge to identify the critical success factors for increasing the success rate of complex IT projects. Participants understood the data collection process and were very supportive during Round 1. Participants' participation started to decrease after Round 1 and I was concerned about the rate of abandonment for the study. Pre-existing relationships with participants were critical to gain participants' trust and support for a study that was conducted during a three-month period.

Participants

Participants were from the Washington, DC, area and worked in the following federal agencies: U.S. Department of Homeland Security, U.S. Department of Veterans Affairs, U.S. Department of Education, U.S. Department of the Treasury, U.S. Department of Transportation, U.S. Department of Justice, and the General Services Administration. Recruiting participants from different federal agencies allowed me to explore diverse management archetypes and individual experiences in, which participants had successfully managed complex IT projects. All participants were senior federal employees who had decision-making authority involving a complex IT project in the last 12 months. The 30 participants included senior-level managers and technical leadership positions; among them were federal CIOs, federal deputy CIOs, federal chief technology officers, chief architects, program managers, project managers, senior managers, and midlevel managers. All participants described their individual experiences in managing

complex IT projects in a federal agency, including their leadership approaches to gaining end-users' buy-in for adopting new technology within their organization.

Data Collection

Round 1 data collection in the form of interviews took place from July 11, 2014, to July 25, 2014. Thirty individuals participated in Round 1. Round 2 data collection (e-mail questions) was conducted from August 7, 2014, to August 14, 2014. Round 3 data collection (more e-mail questions) took place from August 28, 2014, to October 12, 2014. I e-mailed Round 2 and Round 3 questions to all participants with instructions to return their responses back to me. Thirteen individuals responded to Round 2 questions and 11 individuals responded to Round 3 questions. Several individuals were not able to respond to Round 2 and Round 3 questions due to their work schedules. For those cases, I only had interview data to analyze for this study.

I conducted Round 1 interviews using a structured question format, in person or over the phone due to geographical location restrictions or scheduling conflicts. Face-to-face and phone interviews lasted between 20 and 45 minutes. I transcribed each participant's interview into a Microsoft Word file and sent the file via e-mail to the interviewee for validation. I assigned all interview participants pseudonyms during the analysis phase to ensure confidentiality of both personal and organizational information. The original audio recordings, transcribed copies of interviews, and follow-up responses for Round 1, Round 2, and Round 3 questions are stored on a password-protected universal serial bus (UBS) storage device for archival purposes.

Data Analysis

The Delphi method procedure I used in my research involved conducting three rounds of data collection. I collected and analyzed data from each round into common themes to discover similarities in participants' comments. I deconstructed common themes into categories to identify patterns and trends using keyword-in-content analysis (KWIC). The objective of Round 1 was to identify relevant common themes to develop categories and subcategories for further analysis for Round 2 and Round 3. I conducted personal interviews for Round 1 and transcribed the interviews and analyzed the data. I developed new questions for Rounds 2 and 3 to explore the categories and subcategories that emerged from Round 1.

I e-mailed Round 2 and 3 questions to participants with instructions to return their responses back to me in two weeks. I analyzed the data from Round 1, Round 2, and Round 3 for common themes for further analysis. I used data coding for content analysis to discover and describe causal relationships for critical thinking, problem-solving, leadership characteristics, and experiences associated with managing complex IT projects in federal agencies.

Methodology for Coding, Common Themes, and Categories

I used NVivo qualitative data research software to gain insight and to identify relationships between and among participant responses in Round 1, Round 2, and Round 3. I analyzed the data and then segmented the data into categories and subcategories, and

measured their frequencies. I organized text in a logical, hierarchical structure to identify specific words and phrases for further analysis.

Thematic content analysis was used to identify themes across the textual data set based on word content. I grouped similar themes together to form initial categories. I used an iterative process to reduce the data by combining overlapping categories and removing redundant categories. Variations within categories were labeled as subcategories to identify relationships and any new emerging themes. I used NVivo software to develop the coded responses into categories and measured the frequency of words based on the number of times the word appeared in the word frequency result list. I also recorded subcategories to assist in the management and analyzing the qualitative data. Tables 2 through 4 show the most significant categories, subcategories, and frequencies that emerged from the participant responses.

Round 1 Results

Round 1 results produced large amounts of textual data that were analyzed to identify core themes to determine if consensus was achieved. If consensus was not achieved, additional investigation was conducted for Round 2. The objective of Round 1 was the identification of critical success factors to increase the success rate of complex IT projects. Round 1 results provided participants' opinions and views to produce Round 2 questions to focus on decision-making and problem-solving skills for managing complex IT projects in federal agencies. Consensus was achieved in five categories and questions associated with those categories were removed for Round 2. Categories that did not

achieve consensus were identified for analysis in Round 2 and new questions were developed in the same format for Round 1. I defined the criterion for consensus for a category to be if more than 70% of the participant responses were in agreement.

Areas of Consensus

The interview data analysis from Round 1 resulted in consensus for five categories. Table 2 shows a summary of Round 1 thematic analysis identified from the data analysis of personal interviews. I used a hierarchical tree structure to observe individual responses and test the level of agreement or disagreement of the participants. I used key words and conceptual themes to identify common themes for further analysis. The following sections elaborate on the thematic analysis for categories, subcategories, and category frequencies.

Table 2

Round 1 Categories, Subcategories, and Category Frequencies

Categories	Subcategories	Category frequencies
Triple constraints	Budget, scope, and schedule	30
Balanced scorecard	Cost management, IT investment management, risk management	21
Performance metrics	IT operations, project execution, service level agreements, customer satisfaction	25
Federal acquisition management	Procurement law, logistic management, outsourcing, asset management	30
IT governance frameworks	Strategic alignment, IT service management, information resource management	30

Note. The categories represent the data analysis from Round 1. Adapted from "Bridging the qualitative-quantitative divide: Guidelines for conducting mixed methods research in information systems" by V. Venkatesh, S.A., Brown, and H. Bala, 2013, *MIS Quarterly, 37*(1), pp. 21–54. Copyright 2013 by *MIS Quarterly*.

Triple constraints. The three most important project constraints are budget, scope, and schedule and are referred to as the triple constraints. Consensus indicated that project managers must understand the utility and practical application of project management methods. The data indicated that project managers must monitor and report to senior leaders any variations to the project instead of waiting to report any issues at a major milestone review. Participants' stated project managers must complete projects on time, on budget, and in scope to meet stakeholders' expectations.

P16, P17, and P21 asserted project supervisors must understand how managing scope, time, and budget (i.e., the triple constraints) can reduce risk in managing projects. P24 stated, "It is the project manager's responsibility to recognize risk to the project," and a major issue is having "knowledgeable project managers who can predict risk to a project." It is not under the purview of project managers to manage funds or change the baseline; so multiple stakeholders must help to get a project back on track when there is slippage in the triple constraints (P27).

Balanced scorecard. Consensus indicated that project managers must integrate knowledge of multiple financial disciplines to develop an effective performance measurement framework for measuring and controlling project performance. Participants

stated using a balanced scorecard enables project managers to plan, monitor, and report to senior leaders' project performance. The data indicated that this is critical since senior leaders need the ability to monitor, audit, and measure financial performance to identify problems and opportunities to remediate risks to a project.

P10 stated project managers really do not use a balanced scorecard and have a tendency to just "measure the outcome of a project and not measure how the team performed along the way." Senior leaders measure too many things and because of budget cuts, project managers do not have adequate resources for measuring how well the organization is providing services to stakeholders (P5). Leaders focus only on customer satisfaction such as help-desk tickets and not on the performance of IT projects (P12). On this subject, P15 stated measuring the baseline performance of IT projects requires using "earned value management processes, which is not always easy."

Performance metrics. Consensus indicated that project managers can reduce project costs and reduce project delays by measuring and managing costs using performance metrics. Data indicated senior leaders must reduce financial risk by measuring the total cost associated with providing services to their stakeholders. Participants stated senior leaders must identify underperforming projects and take appropriate corrective actions to remediate poor performing projects to meet mission goals and objectives.

P18 stated government leaders are missing opportunities to increase performance because of "service level agreements and contracting constraints" for managing IT

projects. Program managers try to measure performance linked to the project schedule and hold people accountable to achieve the goals, but federal agencies are "big and diverse with different levels" (P21), making it difficult to evaluate progress. P28 stated project managers should use "two week sprints" to measure how well program managers are delivering on projects, which has increased the value of providing services to their customers.

Federal acquisition management. Consensus showed that project managers need expert knowledge of federal acquisition management, federal acquisition, and capital IT investment planning to manage ICT projects. Participants stated project managers must demonstrate expert leadership skills to collaborate and communicate with various stakeholders by viewing acquisitions and contractual problems from the perspective of the federal acquisition workforce. Data also indicated project managers must demonstrate in-depth expert knowledge of federal budget processes, financial management processes, and the ability to resolve budget activities.

Project managers must understand federal acquisitions and budgeting processes in order to have a stronger acquisition planning piece for federal IT projects (P25). P2 stated many programs "are too big with delivery cycles that are too big," and there is an inability to "kill poor performing projects soon enough." Leaders are too slow in making decisions, which means that a lot of money is wasted while senior managers are waiting to make decisions (P9).

IT governance frameworks. Data indicated that project managers trained in IT governance are able to identify the strategic goals of senior leaders to help meet performance goals. Participants' stated that IT governance framework strategies provide project managers clarity and a structured business process to implement and support innovation. Data also indicated senior leaders must develop effective IT governance policies to identify and assign critical resources to manage stakeholders' resistance to change.

P6 stated IT governance is essential and helps project managers manage IT projects throughout their life cycle. IT governance is critical and senior leaders need project managers who have "breadth and depth of industry best practices" (P7) in all business areas. The ability to effectually use IT governance frameworks in a business setting requires all project team members have an understanding of micro and macro business requirements to solve problems (P9). Developing a baseline of education and certifications relevant in the business areas and developing a training program will help all employees understand senior leaders' missions, goals, and objectives (P13, P15, P30).

Areas Lacking Consensus

The following sections explore the areas of no consensus from Round 1 data analysis. I applied the 70% consensus level to Round 1 responses and categories that did not reach this level were classified as no consensus. Some of the participant responses and opinions were not consistent with each other and I selected these categories for

further analysis. Examples of Round 1 responses are provided below along with content analysis of text and themes.

Education level. Consensus for federal employee's education level was not achieved for Round 1. This category was selected for further investigation for Round 2. This was an area of conflicting opinion because experience is a substitute for a college degree for the federal government. A combination of education, training, and experience can be used to meet the qualification standard for an occupational series. However some qualification standards require specific educational requirements, licenses, and certifications for an occupational series. The participants did not demonstrate knowledge of current existing federal laws; participants were not aware of existing federal guidelines for grading and classifying federal IT project managers. Federal regulations state the requirements for experience; therefore, conflicting opinions exist between federal law and the opinion of the participants for the minimum amount of education required for a project management position within the federal government (Kundra, 2011).

P3 cited "low federal labor rates" as challenges to attracting and retaining a highly skilled and educated federal staff. The private sector pay scale is higher than the federal pay scale making it extremely difficult to attract and retain federal workers with advanced educational degrees that have the talent and skill to manage complex IT projects (P3). Many of the contractors who support IT projects have masters degrees and Ph.D degrees with relevant experience in computing research fields, whereas federal employees have degrees only in management (P9, P14, P20). As P18 stated, "federal

employees in the IT field need a degree in information systems" to be on the same professional level as those operating in the private sector. Senior leaders should have the "CIO certification from the Federal CIO University" (P8) and a federal program management certification.

Experience level. Participant responses did not reach consensus for the minimum number of years of project management experience to manage a complex IT project. The data indicated a disagreement that training is an acceptable alternative for experience. I did not select this category for Round 2 since the major disagreement was within a range of 5 to 10 years of project management experience to manage a complex IT project. I assumed that consensus would be not reached since the participants also stated that training and mentoring can be used to remediate any risks to an IT project.

Analysis of the data for experience level indicated that 5 years or more of private project management experience was the minimum acceptable experience level (P6, P7, P8). Five to 10 years or more of federal and private project management experience were adequate levels of workforce experience (P23, P25, P29). P14 and P15 stated that individuals managing complex IT projects should have 10 years or more of combined private sector and federal project management experience. The experience level required to manage a complex IT project should be calibrated according to the dollar amount of the project, the risk of the project, and the necessary knowledge of federal budgeting and financial management processes (P15). This is in conflict with the Federal Acquisition Certification for Program and Project Managers (FAC-P/PM) competency model, which

states that senior project managers have at least 4 years of project management experience, and a minimum of 1 year federal project management experience in the last 10 years.

Leading large IT projects. Consensus was not achieved for the identification of leadership attributes needed to manage large IT projects. The data indicated a wide range of reasons such as inherit government roles and scope changes cannot be approved by contractors. Project sponsors in federal agencies do not interview and approve individuals assigned to their IT project. I selected this category for further analysis for Round 2 to identify acceptable federal leadership and management attributes to manage ICT projects.

Effectively managing a large IT portfolio requires relying on contractor support, because federal agencies do not generally have individuals with the appropriate skill sets (P13). Having the right person in the right position is a widely accepted competency model in the private sector; however, leaders of federal agencies use occupational series to determine project assignments by whoever is available for a project (P11). P15 stated that managing a complex IT project requires a team effort, a trait leaders in the federal government should adopt from the private sector.

IT certifications. The data indicated that consensus was not achieved for IT certification. Participant responses varied for the perceived business value of federal employees having technical expertise and relying on contractors' to provide technical expertise. There was a conflicting opinion among participants that federal employees must have technical expertise to develop business requirements and to evaluate best value

proposals submitted by contractors. Participants' also stated federal employees have distinctive roles and responsibilities that require technical expertise to validate that information systems implemented by contractors meet or exceed Federal Information Security Management Security Act (FISMA). I selected this category for further analysis for Round 2 to identify acceptable IT certifications for federal employees.

The project management professional (PMP) certification has value in the government, and senior managers are requiring federal employees to earn one to qualify for managing IT projects (P30). P6 and P7 stated that federal acquisition program level certifications and technical training should be a requirement for midlevel and senior managers. The Project Management Institute (PMI) PMP certification is preferred, but emphasis must also be on the experience level that project managers have reached in their careers (P15). This is in conflict with the federal FAC-P/PM competency model, which states that senior project managers have at least 4 years of project management experience and a minimum of 1 year federal project management experience in the last 10 years. Federal regulation established the criteria for experience level; therefore, this category was not selected for Round 2 study.

Strategic communication. Consensus was not achieved for strategic communication for an effective method to inform stakeholders on the status of projects. Participants disagreed on using a top-down management or bottom up style approach communication method to share information. I did not select this category for Round 2 since strategic communication to stakeholders is not the role of the project manager. The

project manager role is to communicate and inform stakeholders only on the status of the project at the operational level and not the strategic level. The senior leader is responsible for developing the vision and communicating the vision to all stakeholders in the organization, not the project manager.

P26 asserted that senior leaders need to communicate in a vertical manner with program managers, project managers, and all stakeholders to increase the success rate of IT projects. There is a fundamental leadership issue around marketing upcoming changes in order to inform end-users and to solicit their feedback (P12). The process is normally ad hoc on the way that senior management communicates to project stakeholders (P18). Program and project managers need to engage with stakeholders early and throughout the project phases, receive feedback from the business stakeholders, and include more than just the project management and technology subject matter experts in project meetings (P17, P22, P26). Communication with and training of personnel is critical, as is a method to measure the success or progress of change inside the organization (P16). There was disagreement among the participants that the project sponsor needed to be present at all project management meetings to increase communication among project stakeholders and resolve any risks to the project schedule, scope, or budget.

Industry certifications. The data indicated consensus for industry professional certifications was not achieved. Participates stated that federal technology practitioners must keep abreast of new innovative technology. Data also revealed a conflicting opinion that industry certifications such as PMP and Certified Information System Security

(CISSP) are preferred by senior leaders for project managers. No participant stated they had an industry performance management or quality control certifications such as Six Sigma or CMMI certifications. Only a few participants stated they have current industry certifications in IT service management domains. I selected this category for Round 2 to identify the preferred technical expertise to assist senior leaders and project managers in developing alternative courses of actions to solve technical issues in ICT projects.

P1 and P2 stated that the ITIL foundation and project management certification are key industry certifications for all federal employees. On this subject, P12 stated, "project managers want a good mixture of individuals with industry certifications to understand industry best practices" and the tacit knowledge of how to apply those best practices frameworks to federal IT projects. P8 stated that the project management office should have PMP, Lean Six Sigma, and dedicated IT staff to help communicate and push agendas more quickly within the organization. P14, a senior manager, asserted, "I do not have any project management certifications" and I have no issues managing IT projects. Staff members should demonstrate their ability to manage IT projects, and program management certifications are good indicators of the individual's ability to manage an IT project in the federal government. (P15). Project and program management certifications such as "PMP and Federal Acquisition Certification in program and project managers" should be requirements to be a federal project manager (P16).

Quality monitoring. Consensus was not achieved that quality monitoring provides the project manager the ability to monitor performance. Participants were in

disagreement if quality performance monitoring process is the government responsibility or the contractor responsibility. This is an area of conflicting opinion since contractors are required to submit their performance management process for approval to senior leaders; however, the majority of participants stated the lack of a performance management process within their own organization for IT portfolio management. I selected this category for Round 2 to study performance monitoring methodologies to increase the success rate of complex IT projects.

Business managers need a performance management tool to monitor and manage all costs associated with IT capabilities more efficiently (P6). P9 stated, "I would like to have a Six Sigma Green Belt on my support staff" to manage projects changes and not waste resources. P17 stated that there is "no punishment for projects that slide to the right," because it is now an "accepted practice in the government to allow IT projects to miss schedule and delivery dates."

Round 1 Summary

Round 1 involved conducting interviews, collecting data, analyzing data, coding data, identifying categories, and interpreting the data. Twelve categories emerged from Round 1. Of these, consensus was achieved for the following five categories: triple constraints, balanced scorecard, performance metrics, federal acquisition management, and IT governance frameworks. These categories were omitted for Round 2 analysis since consensus for these categories were achieved for Round 1. Round 1 did not obtain consensus for the following seven categories: education level, experience level, leading

large IT projects, IT certifications, strategic communications, industry certifications, and quality monitoring. Individual categories that had overlapping themes were combined into new higher order categories to decrease the data set to identify new themes for Round 2.

Participants expressed very different viewpoints on effective strategic management strategies for implementing and managing new technology. There was disagreement in the areas of industry certifications, education, experience, project management methodologies, inherently federal employees' roles, monitoring contractor's performance, earned value management, and federal acquisition methods. The data suggested that participants' did not view project management certifications and IT certifications as critical skills for project management positions in the federal government.

The data indicated that participants' believe project managers should have project management certifications, IT certifications, CMMI certification, quality assurance certifications, understanding of performance metrics, and knowledge-management expertise as critical success factors to successfully manage complex IT projects. Knowledge of triple constraints, balanced scorecard, performance metrics, federal acquisition management, and IT governance frameworks emerged as critical strategic management skills required by all personnel supporting complex IT projects in federal agencies. All participants stated practical knowledge of IT governance frameworks are critical skills for managing an IT project; however, the majority of the participants had

never received IT governance training nor earned a certificate in an IT governance framework.

I viewed the non-consensus categories through a theoretical lens to understand the core competencies associated with leading IT projects, the types of preferred IT certifications and industry IT certifications, and managing a quality assurance program. I modified questions from Round 1 to continue to explore if consensus could be achieved in the areas of IT projects, IT certifications, industry certifications, and quality monitoring.

Round 2 Results

The objective of Round 2 was to further examine common themes and categories where a consensus was not reached during Round 1. I developed Round 2 survey questions based on the thematic analysis of the 12 categories from Round 1 categories where consensus was not achieved. I e-mailed 30 participants and 13 participants responded and provided responses to the Round 2 questions. The data analysis from Round 2 resulted in four new major categories that emerged that were not identified in Round 1. New themes emerged based from investigating the relationships of IT project experience, different types of IT certifications within the federal government and private sector, and quality monitoring processes.

Areas of Consensus

The data analysis from Round 2 resulted in four new major categories for, which a consensus (70% response) was achieved (see Table 3). The following sections elaborate

upon Table 2 categories and subcategories from Round 2 data analysis. Examples of content analysis, thematic analysis, and data analysis are provided below.

Table 3

Round 2 Categories, Subcategories, and Category Frequencies

Categories	Subcategories	Category frequencies
Quality assurance	Data management, maintainability, cost management, quality assurance surveillance plan, quality management	13
IT project certification	PMP, agile, federal program and project manager	13
IT certification	Information security, network, application, system engineering, hardware	13
Technical competencies	IT Frameworks, enterprise architecture, solution architecture, business architecture	10

Note. The categories represent the data analysis from Round 2. Adapted from "Bridging the qualitative-quantitative divide: Guidelines for conducting mixed methods research in information systems" by V Venkatesh, S.A., Brown, and H. Bala, 2013, *MIS Quarterly, 37*(1), pp. 21–54. Copyright 2013 by *MIS Quarterly*.

Quality assurance. The data indicated that quality assurance monitoring provides project managers a process to monitor users' experiences and the quality of service delivered to stakeholders. Participants reached consensus that the contracting officer representative (COR) role is an inherent government function to ensure positive contractual outcomes for a project and not the role of senior leaders or project managers. Data also indicated senior leaders must provide effective leadership to ensure that proper

auditing and monitoring controls are implemented to provide oversight of federal employees and contractors 'performance. Consensus was achieved for this category and it was not selected for Round 3 analysis. P1 stated, "complex IT projects need some kind of quality assurance monitoring program." In contrast, P2 stated, "the contractor is responsible for management and quality control" based on the conditions of the contract. Monitoring a federal employee's performance provides some support for managing complex IT projects, but a multipronged approach that involves training, mentoring, and experience are necessary to meet mission goals and objectives (P8). Monitoring federal employees may shift focus away from the IT project, cause human resources problems, or contract violations (P6).

IT project certification. The data indicated that consensus was achieved for IT project certification as a requirement for project managers. Participants' achieved consensus that project managers must demonstrate high competencies to manage multiple complex activities associated with ICT projects. Data also indicated federal program and project manager (FAC-P/PM) and PMP certifications are predictors of project managers' competencies to effectively communicate, lead, and manage change. Consensus was achieved for this category and it was not selected for Round 3 analysis.

IT certifications should not be mandatory but are good indicators of experience and acquired knowledge (P13). IT certifications are "ideal but not required by project managers" to manage IT projects (P11). P3 stated there should be a minimum level of qualification and experience based on the complexity of the project. There should not be

a requirement to have both "program and project managers (FAC-P/PM) and PMP certifications" (P6); although it may be desirable, requiring employees to have both may limit having the right people available to manage a complex IT project.

IT certifications. Consensus was achieved that project managers must or should have at least one IT certification to validate professional knowledge as an IT practitioner. Senior leaders manage IT resources and have limited knowledge and hands-on experience in software engineering and system engineering industry best practices. The data indicated that project managers obtain an IT certification to demonstrate proficiency in at least one IT service domains. Consensus was achieved for this category and this category was not selected for Round 3 analysis.

P3 stated that "certifications are not substitutes for experience" but there is nothing wrong with having IT certifications as criteria for selecting project managers for an IT project. Senior leaders should have certifications to validate their knowledge and capabilities to manage a complex IT project (P4). Project managers have access to IT resources, so managers do not have to be subject matter experts to manage projects (P11). Project managers should have "ITIL certification and at a minimum a Green Belt Certification" to manage complex IT projects (P12). There is a shortage of qualified project and program managers in the government, and making IT certifications a requirement "would only exacerbate the problem of attracting qualified individuals (P8)."

Technical competencies. The data indicated that consensus was achieved for technical competencies as a critical factor for influencing project performance. Data also

indicated project managers demonstrate critical thinking skills to understand critical work functions. Consensus was achieved that project managers must establish and maintain a positive, professional relationship, and communicate effectively to technical and non-technical staff members to successfully manage team work assignments. Consensus was achieved for this category and it was not selected for Round 3 analysis.

P10 stated having technical knowledge depends on the role of the individual in supporting a complex IT project. Knowledge of technical frameworks would go a long way toward enhancing the success of federal complex IT projects (P1). Along these lines, P3 stated, "Ten years of experience and technical knowledge may be too excessive for some projects." Having a requirement of "10 years' experience of complex IT projects" (P7) will exclude project managers not familiar with current technologies from being assigned to project.

Round 2 questions generated several responses with the generalization that project managers were only required to report contractors' performance for major milestones and at the end of the contract's performance period. Several participants stated that implementing a federal quality assurance surveillance plan (QASP) would be too complex and difficult to define, and the government's role was to monitor contractors' performance, not federal employees' performance. Several participants stated that program reviews are more effective than having a QASP and that monitoring federal employees will result in uninspired, disengaged employees and conflicts with human resources policies.

Areas Lacking Consensus

The following categories did not have consensus and were bought forward for analysis for Round 3: Acquisition experience, strategic sourcing, knowledge-management, IT strategic acquisitions, decision-making authority within team, senior leader oversight of projects, and resource allocation of IT staff.

The following sections explore the areas of no consensus from Round 2 data analysis. I applied the 70% consensus level to Round 2 responses and categories that did not reach this level were classified as no consensus. Some of the participant responses and opinions were not consistent with each other and examples and analysis are provided below. I selected these categories for further analysis in Round 3 and developed new questions to identify new themes. Examples of Round 2 responses are provided below along with content analysis of text and themes.

Acquisition experience. The data indicated that project managers have acquisition experience and comprehensive knowledge of federal regulations to support senior leaders' mission goals and objectives. Understanding federal acquisition regulations provides project managers a tool to identify issues that directly or indirectly affect project performance. P1 noted operational experience and understanding business processes help project managers gain insight into how technology is acquired and deployed inside the federal government. Certifications and years of experience are not substitutes for an effective hiring and employee development process to train staff support all business activities (P3). Project managers should have tools to understand key

performance measures; contract deliverables and quality assurance checks within the contract (P6). The participants for Round 2 were equally divided as senior leaders, senior IT practitioners, and senior program mangers expressed different attitudes about the value of acquisitions experience to manage ICT projects.

Strategic sourcing. The data indicated project managers must have breadth, depth, and practical knowledge of procurement strategies to help drive down the costs of acquiring IT services. Data indicated that senior leaders need to use strategic sourcing contract vehicles to develop innovative sourcing strategies to reduce costs. Data also indicated that project managers must understand total cost management to establish a cost baseline to control and manage costs for an IT project.

Knowledge and experience in IT governance and IT service management are beneficial along with training to manage IT projects (P2). There must be a federal workforce dedicated to learning their profession and stay informed about IT and cost management practices (P1). The processes to manage projects are complicated and don't provide a lot of value to agency when leaders only hire individuals with strong IT project management skills (P3). Assessing quality deliverables and measuring performance is difficult to define because of the experience level of the individual doing the assessment (P9).

Knowledge management. The data indicated that senior leaders do not have a model for continuous sharing of information throughout the life cycle of a large, complex IT project. Senior leaders need to change the negative perceptions that sharing

information and requesting assistance creates risk to the project. Data also indicated that conflict exist within team dynamics because senior leaders are unable to implement effective strategies to identify and remediate negative performance in a timely manner.

Risk management and technical experience in the area of risk are critical skills to support IT projects (P1). I have worked with people with "a laundry list of certifications that could tell you how to run a program" but could not manage their way out of a paper bag (P2). We need federal employees that are "committed to learning their profession and staying informed "about present-day IT and management practices (P3). The project manager needs to know where to find expertise for large projects if they do not have the expertise for a specific project (P9).

IT strategic acquisitions. The data indicated that senior leaders must implement a technology development strategy to address technology obsolescence and the development of high knowledge employees' to maintain business systems. Project managers must be aware of historical spending and forecasting techniques to manage the actual cost throughout an ICT project. Data also indicated the lack of federal employees with strategic acquisitions competencies restricts senior leaders' ability to develop long-term strategic acquisitions plans because of the inability to influence acquisition procurement decisions.

P1 stated understanding technical competencies frameworks and mapping federal employees with technical skills would be a great tool to develop business requirements. Building small increments and testing is a good way to build quality into an IT project;

however, that requires knowledge of how to acquire IT services in the federal government (P4). There are many training areas specific to the "federal acquisition process" and having project managers that understand federal acquisition is critical to managing IT projects (P6). P9 stated that having federal employees that have exposure to "federal budgeting and federal procurement systems" would be beneficial in managing federal IT projects.

Decision-making authority within team. The data indicated senior leaders are reluctant to delegate authority to project managers because of a risk adverse culture associated with complex IT projects. Information is shared from a bottom-up method and decisions are made from a top-down approach, which causes delays in solving problems. Data also indicated senior leaders are not able to resolve funding or contract issues because of the lack of authority to obligate federal funds, which is contracting officer inherent function.

The current method for selecting project managers does not necessarily result in the best people being selected for the positions; therefore their decision-making ability may be limited (P4). A complex IT project has many dependencies that can be across various organizations and project managers must use extreme care because of potential human resource issues (P6). P13 stated project managers must be able to "communicate and negotiate on behalf of the project" when dealing with the project sponsor, vendors, and stakeholders to manage changes within the project.

Senior leader oversight of projects. The data indicated senior leaders' lack of a strategic management framework for the planning and oversight of complex IT projects results is a major factor in project delays. The lack of senior leaders' involvement to provide overall technical direction creates confusion among team members resulting in quality performance issues. Data also indicated the lack of two-way communication between senior leaders, project managers, and stakeholders magnify problems because of inadequate communication flow within the team to solve problems.

Management and oversight of the project should be designed in such a way to build quality into the project (P3). Senior leaders need a team of subject matter experts with solid understanding of technology help facilitate the management of active projects (P6). Finding and fixing problems requires a communication feedback loop and senior leader must execute to drive project improvements (P13). Senior leaders need a mechanism to meet with team members regularly to address problems instead of waiting until there is major milestone briefing to "mentor and provide leadership to the team" on how to resolve problems (P8).

Resource allocation of IT staff. The data indicated that project managers are unable to manage human capital in an effective method to reduce risks in projects. Inefficient management and the inability to attract and retain high knowledge individuals increase the risk of project failures. Data also indicated that project managers need the authority to manage human resources and assign individuals to mitigate project risks.

A skills set framework could identify skills and knowledge for project managers to seek assistance from individuals with the required expertise to solve a problem (P2). There must be a federal workforce dedicated to oversee the IT project management practices in the organization to develop standardize project management processes (P6). Projects fail because senior leaders "will start cannibalizing staff from a successful project" to ensure success for failing project and then the original project starts failing (P9).

Round 2 Summary

Consensus (70% response) was achieved for the following four categories: quality assurance, IT project certification, IT certifications, and technical competencies. These categories were omitted for Round 3 since consensus for these categories were achieved for Round 2. Round 2 did not obtain consensus for the following seven categories: acquisition experience, strategic sourcing, knowledge-management, IT strategic acquisitions, decision-making authority within team, senior leader oversight of projects, and resource allocation of IT staff. I viewed the non-consensus categories through a theoretical lens to combine similar categories and modified questions from Round 2 to explore if consensus could be reached in the areas of IT acquisitions, decision-making techniques, program oversight, shared IT services, and communication processes.

Round 3 Results

The objective of Round 2 was to further examine common themes and categories where a consensus was not reached during Round 2. I developed Round 3 survey

questions from Round 2 data analysis. I e-mailed 30 participants and 11 participants responded to Round 3 questions. Data analysis from Round 3 questions resulted in five categories (see Table 4). Table 4 includes a summary of Round 3 thematic analysis. New themes emerged for strategic IT acquisitions, decision-making authority, senior leadership oversight, IT staff resource pool, and strategic communication.

Areas of Consensus

The data analysis from Round 3 resulted in five major categories for, which a consensus (70% response) was achieved (see Table 4). The following sections elaborate upon Table 4 categories and subcategories from Round 2 data analysis. Examples of content analysis, thematic analysis, and data analysis are provided below.

Table 4

Round 3 Categories, Subcategories, and Category Frequencies

Categories	Subcategories	Category frequencies
Strategic IT acquisitions	Strategic sourcing, acquisition life cycle management, procurement strategies	11
Decision-making authority	Organizational hierarchy structure, group authority, delegated authority	11
Senior leadership oversight	Strategic business initiatives, risk management, monitor performance, political environment	7
IT staff resource pool	Human resource management framework, project managers, IT practitioners, acquisition specialists	11
Strategic communication	Communication objectives, vision statement, media events	11

Note. The categories represent the data analysis from Round 3. Adapted from "Bridging the qualitative-quantitative divide: Guidelines for conducting mixed methods research in information systems" by V. Venkatesh, S.A., Brown, and H. Bala, 2013, *MIS Quarterly, 37*(1), pp. 21–54. Copyright 2013 by *MIS Quarterly*.

Strategic IT acquisitions. The data indicated that senior leaders and project managers have experience and knowledge of strategic IT acquisitions. A performance-based acquisition service strategy requires all project team members demonstrate knowledge of federal acquisition laws to develop innovative and cost-effective methods for ICT projects. Data also indicated knowledge of federal acquisition processes provide

the foundation for knowledge sharing and developing strategic alliances with external and external stakeholders.

P1 stated that program managers need to be part of the acquisition activities to understand "the critical dependencies and constraints" to develop an effective mitigation strategy to manage risk. Project managers should know the organization environment and problems better than anyone; therefore, they should also know the challenges related to the procurement process and award process for their IT project (P3). Having the project manager involved across all phases of the project including the acquisition phase is "key to the long term success of any project (P6)." P12 stated if a project manager is expected to deliver, "he or she should have a role in the upfront planning" or will they will not understand the decision-making process used for the procurement.

Decision-making authority. The data indicated that delegating decision-making authority to a project manager is a conflicting opinion because only the contracting officer is authorized to make changes to the scope of work. Data also indicated that is critical to develop relationships between the contracting officer, contracting officer representative, and project manager to resolve contractual issues within a project. Resolving contractual issues is outside the authority of project managers; therefore, clear lines of authority must be established and communicated to all project members to avoid conflict and delays within the project team.

P2 acknowledged that delegation of authority is not necessary in all cases to manage an IT project. From a slightly different viewpoint, P4 offered that project risks

would be “reduced significantly if senior project managers” had permission to make critical decisions when managing projects. The notion that “one person knows all, sees all, and makes all the right decisions” can sabotage a project from the beginning (P6).

Senior leader oversight. The data indicated that the inability of senior leaders to monitor and manage project status is a factor for failures in IT projects. The data also indicated senior leaders with cross cultural project management experience have the ability to structure and manage team dynamics to effectively manage stakeholders’ resistance. The data indicated that project managers need to manage project risks and escalate significant issues to senior leaders that will impact a major activity or milestone as soon as variance in the schedule is identified.

P10 stated having an “experienced project manager versus a junior project manager” and having senior leaders more involved in the organization to solve problems may mitigate project risks. P5 confirmed this assessment that experienced project managers can resolve operational risks within a project. Problems initially arise in a project because of the inability senior leaders to “manage strategic risks, funding, scope creep, and escalated time frames” for complex IT projects (P29).

IT staff resource pool. The data indicated that a shared service organization using an IT resource pool for shared IT services will enable project managers to increase the success rate of IT projects. Identifying opportunities for federal shared services is a key challenge along with establishing a shared IT service model to reallocate resources within an organization. Data also indicated senior leaders must ensure that IT investments

and human resources are properly aligned to govern the technology strategic roadmap for future ICT projects**.**

Having a "pool of talented resources to work on projects would be a value added win-win for the government (P5)." P7 stated, "much of my success is that I know where the skeletons are buried," and an experienced and trusted project manager or subject-matter expert knows whom to contact inside the agency for assistance. P7 also stated that after a project manager establishes a relationship with people, he or she can ask for "a favor to quickly solve a problem that would normally take days or weeks to resolve." IT projects fail because "people without the proper competencies are trying to deliver complex IT projects" (P13), and these individuals also do not understand the organizational culture to meet mission goals and objectives.

Strategic communication. The data indicated that senior leaders must provide leadership across multiple organizational levels. Managing human capital and IT investments requires open two- way communication and a strategic vision that can be embraced by all stakeholders. Data also indicated senior leaders' must articulate and execute their strategic vision across political social, cultural barriers, and be the architecture for organizational change for stakeholders to embrace and support ICT projects.

P15 observed that large-scale IT projects "push out new technology to the masses in an Orwellian or authorization style," without collaborating with end-users, which results in a negative experience for everyone. If an effective communication procedure

"were developed, it would help with quality assurance" (P11) and increase support for the deployment of new technology in the agency. One of the primary reasons projects fail is that they "are almost completed before the end-user is engaged" (P1), and there is no support to adopt or support the program. As such, P5 stated that a "communication plan and media campaign" for new adaptive technology would be "tremendously successful" for orchestrating a smooth transition from old technology to new technology.

Areas Lacking Consensus

The following sections explore the areas of no consensus, conflicting opinion, and unexpected responses from Round 3 data analysis. I applied the 70% consensus level to Round 3 responses and categories that did not reach this level were classified as no consensus. Examples of Round 3 responses are provided below along with content analysis of text and themes

Collaborative sharing environment. The data indicated that senior leaders must create a collaborative culture of creating and sharing content among multiple stakeholders across organizational boundaries. Data also indicated senior leaders unconsciously create silos or barriers to sharing information because of the lack of personal engagement to promote and foster collaboration. The data indicated that senior leaders must implement a sense of shared ownership to establish a collaborative environment where individual and team ideas and insights can help identify and solve problems.

This was an area of no consensus among the participants: when to escalate problems to senior management and the appropriate method to communicate risk to the project. Some participants believed in transparency and communicating risk to senior management, internal, and external stakeholders would be an opportunity to openly exchange ideas how to solve problems. Some participants believed that managing risk is an internal process and communicating problems outside the project team creates conflict because senior leaders are unable to influence stakeholders to maintain support for a project that is failing.

P11 stated a communication plan and media campaign would help gain stakeholders approval to implement new technology in the agency. The primary reason projects fail is the loss of the project manager who has all the knowledge of business requirements and the business relationships with all the stakeholders (P4). P8 stated that the "government is inherently political" and management decisions are "inherently risk adverse"; therefore sharing and collaboration of information is a fragmented process. P1 stated that project managers need to build relationships between federal employees and vendors' staff to manage influences that may cause stress to the project environment. P5 stated that "new technologies are disruptive" and requires training personnel to develop and implement a change management plan.

Strategic IT portfolio management. The data indicated that both senior leaders and project managers need to understand integrated IT governance frameworks for the early identification of risks to a project. Data also indicated senior leaders need to

understand the business process of requesting and obligating federal funds for IT projects. The data indicated that project managers understand portfolio management strategies and concepts to support long term strategic plans and goals.

This was an area of no consensus among the participants on the benefits of project managers being knowledgeable of strategic IT portfolio management business processes. Participants who were senior leaders stressed that understanding how an IT strategic portfolio aligns with business strategies is a senior leader role and not a project manager role. Senior managers and project managers stated business process and acquisition strategies are not aligned with project objectives and resources. Senior managers stated that project selections are often made by senior leaders without validating that an effective contract vehicle can be used or resources are available to support the project.

P6 stated that understanding acquisition management is important but not critical for project managers because "good common sense" can be applied to each environment to solve a strategic problem. A critical project manager role is to understand the "federal acquisition framework environment" and failure to understand the senior leader's overall vision will result in project failure (P11). A project portfolio management process is required to identify, which type of operational risks can be solved at the project manager level and strategic risks must be escalated to the senior leader for them to resolve (P7).

Round 3 Summary

A consensus was achieved for IT strategic acquisitions, decision-making authority, senior leadership oversight, IT staff resource pool, and strategic

communication. Data analysis established that organizational management competencies and organizational maturity methodologies were critical leaderships attributes required to manage highly complex IT projects. Coding identified that change agents must develop and establish a mutually beneficial relationship with internal, external stakeholders, and contractor personnel assigned to the project. A consensus was not achieved in the categories of collaborative sharing environment and strategic IT portfolio management.

Results Related to Research Question 1

Research Question 1 was as follows: What critical-thinking and problem-solving processes do federal managers use to justify IT investments for providing government services involving ICTs to meet citizens' expectations and organizational requirements?

The data collected from interviews and surveys revealed areas of consensus that provided insight for the research question. The data from Rounds 1, 2, and 3 indicated a relationship that federal managers need to demonstrate collaborative leadership since ICT projects may be in conflict with the allocation of limited resources within an organization. Data also indicated that federal managers must understand federal acquisitions and procurement process to manage conflicting policies and complicated relationships with internal and external stakeholders. The results of Rounds 1, 2, and 3 also indicated strategic planning and performance management methodologies provide federal managers a structured integrated approach to manage business transformation and the ability to define the value of ICT projects to stakeholders. Data also indicated federal

managers must establish measureable performance goals to demonstrate to citizens that program objectives have been achieved as promised.

Senior leaders and project managers must understand federal acquisition regulations and procurement laws to interpret the boundaries of delegating authority to solve project risks at the lowest level within the organization to prevent project delays. Developing a performance management plan and aligning the IT project portfolio will enable senior leaders to meet long-term strategic goals and business objectives. A strategic plan provides critical alignment to support project management activities; however, senior leaders are not aligning acquisition strategies and quality assurances strategies throughout project lifecycles to strategic goals. This lack of alignment between senior leaders and project managers creates inefficient communication silos that restrict project managers' ability to manage risks to a project. Senior leaders must develop an innovative IT governance framework that links IT portfolio management, shared decision-making, and strategic communication tools to provide greater insight into resource constraints to manage high-risk projects.

Results Related to Research Question 2

Research Question 2 was as follows: What leadership characteristics and experiences affect the collaborative decision-making process to manage complex ICT projects within federal agencies successfully?

The data from Rounds 1, 2, and 3 indicated that effective leaders see a complex problem from multiple perspectives to frame the problem to avoid misinterpretation of

the problem. Leaders develop the strategy to share and communicate the vision statement to stakeholders using an open two-way communication plan using a bottom-up approach and not a top-down approach. Data also indicated that shared leadership is critical when using shared IT services to effectively manage change for complex IT projects. The ability to manage information is critical to meet performance requirements and project goals. The data collected from interviews and surveys indicated that managing human resources and developing close interpersonal relationships with employees creates a culture of trust and encourages innovative thinking among employees to help solve problems in a collaborative method. Leadership characteristics and experiences affect the collaborative decision-making and are factors that contribute and influence leaders' decisions. Collaborate leadership and group decision-making require developing a culture of shared decision-making authority, which does not exist inside the federal government.

Summary

In Chapter 4, I presented the results of the Delphi study. I used interviews and questionnaires to examine the experiences and leadership archetypes of 30 participants. After analyzing the data gathered from three rounds of interviews and survey questions, I identified the leadership attributes for effective critical thinking and problem-solving for ICT projects within federal agencies. Responses related to Research Question 1 indicated that specialized knowledge of IT service domains, IT governance frameworks, and federal acquisition experience were critical leadership and life experience factors. Responses related to RQ2 revealed project management training, project management

experience, organizational communication, and performance management are leadership characteristics required for effective collaborative decision-making to manage ICT projects. In Chapter 5, I include an interpretation of the outcomes, conclusions, and recommendations based on the results described in Chapter 4.

Chapter 5: Summary, Conclusions, and Recommendations

The purpose of this study was to gather and examine the experiences of senior leaders who had participated in large, complex IT projects within the federal government and successfully managed IT-enabled organizational changes. Using the Delphi method, I explored the leadership archetypes of senior leaders, project managers, and IT practitioners to understand organizational relationships and organizational performance in complex IT projects. I identified the critical-thinking and problem-solving processes senior leaders use to justify IT investments to increase the success rate of such projects in federal agencies. I also identified the leadership characteristics and experiences that affect the collaborative decision-making process to manage complex ICT projects within federal agencies. In Chapter 5, I discuss organizational hierarchy structures, change management processes, critical thinking, and decision-making processes. I also make recommendations for future research and identify the social implications of this study.

Summary of Research Problem and Purpose

The problem addressed in the study was the lack of an IT governance framework to successfully manage complex IT projects in the federal government. Successful implementation of IT projects requires an effective project management methodology framework that incorporates IT governance frameworks to manage project risks. An effective project management program will also help senior leaders create an environment to increase the success rate of complex IT projects.

The purpose of this study was to understand the experiences of senior leaders who had participated in large, complex IT projects within the federal government and successfully managed IT-enabled organizational changes. Using the study results, I identified key leadership archetypes to increase the success rate of complex IT projects. Change management strategies are critical for senior leaders to manage project risks, reduce projects costs, and improve the success rate of IT projects in the federal government.

Summary of Results

I answered the research questions for this study using a three-round Delphi method study. Personal interviews were conducted with 30 participants for Round 1. I e-mailed Round 2 and 3 questions to all participants with instructions to return their responses back to me in two weeks. Thirteen individuals responded to Round 2 questions and 11 individuals responded to Round 3 questions.

The Delphi approach was appropriate for the study since the purpose was to gain insight how federal agencies can improve the success rate of complex IT projects in a sustainable manner. Identifying the critical success factors could improve the success rate of IT projects and provide a framework to deliver IT projects at a reduced cost, lower project risk, and improve the quality of service to citizens. Senior leaders' oversight of IT projects and effective two-way communication among all stakeholders are critical success factors to increase the success of complex IT projects. A shared decision-making

process to solicit opinions and recommendations from stakeholders across organizational boundaries is required to identify and solve ICT project risks.

Interpretation of Results

The data indicated a consensus that professional knowledge of IT service domains, IT governance frameworks, and federal acquisition experience are critical leadership and life experience factors required to manage complex IT projects in federal agencies. The majority of respondents validated that project management methodologies, IT governance frameworks, and performance monitoring surveillance techniques are critical professional skills for overseeing such work. Federal employees with advanced academic degrees and advanced technical certifications emerged as critical human capital resources required to provide nonbiased recommendations to senior leaders. Senior leaders need trusted federal technical advisors to develop short-term and long-term IT strategic objectives to meet future mission goals.

Life experiences also emerged as an essential leadership attribute to communicate effectively with internal and external stakeholders. Sharing individual experiences with stakeholders is an effective leadership method to reduce organizational resistance and gain stakeholders trust. Data analysis revealed that federal employees would ideally have an IT project management certification such as the PMP or FAC-P/PM certification. Data analysis also revealed that complex IT projects might have higher success rates if the project managers have (a) 5 to 10 years of federal IT project experience, (b) certification in at least one IT service domain, or (c) certification in an IT governance framework. The

majority of participants agreed that leaders of federal agencies should implement a technical competencies framework to identify federal employees who are subject matter experts who could support complex IT projects internal and external to the organization.

Creative thinking, adaptive leadership, creativity, environmental awareness, and the ability to think through unstructured problems are critical-thinking and problem-solving attributes to justify IT investments to meet citizen's expectations and organizational requirements. Data analysis also revealed performance-based techniques to measure business value, performance, quality of service, and total operating costs of IT services provided citizens. Data analysis revealed an integrated performance management framework incorporating key performance indicators to effectively manage capital investments and human resources for optimal project performance. Another critical leadership factor is the ability to implement performance metrics as a management tool for problem identification and remediation of project risks throughout the life cycle of a project.

Data analysis revealed a simplified business process of ensuring that IT projects are completed on time and on budget. The literature and the results of my study were consistent in indicating that business requirements for high-quality outcomes without executive support will create negative stress among project teams, reduce productivity, and restrict innovation to solve project risks. To justify IT investments senior leaders should consider the intangible benefits of attracting, motivating, educating, and retaining highly skilled federal employees for future ICT projects.

A knowledge gap existed among federal senior leaders and senior managers on methods to recruit and retain high knowledge federal employees to support strategic IT initiatives. Organizational performance benchmarking, process improvement tools and techniques, and quality management are critical success factors to meet organizational performance requirements. Leadership characteristics that encourage and support trust, knowledge creation, information-sharing, and innovative entrepreneurship life experiences are critical to increasing the success rate of complex ICT projects in federal agencies.

Data analysis revealed that the use of collaborative problem-solving and innovative thinking provides the mechanism for creative problem-solving among groups and teams. The ability to communicate openly and honestly provides a bottom up method of communicating to all stakeholders, which is critical to reduce stakeholders resistance to change. Data analysis also revealed that diverse stakeholders support senior leaders to make best value decisions and ensure that quality services are delivered in a cost effective method. Data analysis revealed that creative problem-solving requires understanding of how technology can help with the alignment and sustainment of IT business strategies by assessing current IT capabilities to support new business initiatives.

The results of the study indicated that effective leaders possess the following leadership behaviors: (a) support and promote knowledge sharing among project teams, (b) share decision-making authority with full team participation, (c) acknowledge diversity and cultural barriers within the team, and (d) develop and promote an effective

communication strategy for internal and external stakeholders. These leadership behaviors enable leaders to gain insight to understand complex situations and accurately respond using the correct decision-making process to make an informed decision. The results of the study indicated that managers should have (a) a minimum of 5 to 10 years of federal IT project experience, (b) certification in at least one IT service domain, and (c) certification in an IT governance framework to support business goals and objectives.

Data analysis revealed that open and honest two-way communication is critical during the early planning stages and not only during the implementation phase of an IT project. Data analysis also revealed the maturity of their organization should be based on the recommendations from trusted technical advisors instead of relying solely on personal experiences. Strategic communication and organizational management expertise are critical leadership attributes required to reduce and manage organizational resistance for adopting new innovative technology within federal organizations. Data analysis revealed that an effective collaborative knowledge-management environment can remove organizational barriers to encourage high-knowledge federal employees to mentor and share their knowledge with other employees.

Theoretical Framework

My research was based on theoretical inferences related to information-sharing and knowledge-management for increasing the success rate of complex IT projects in federal agencies. The TAM and CMMI frameworks guided the research study of senior leaders and project managers to manage organizational transformation and identify

emergent behavior associated with adopting new innovative technology and new business processes within an organization. The study indicated gaps in organizational communication, information-sharing, knowledge-management, ineffective critical thinking, and problem-solving techniques.

The study validated the TAM theory that the perceived usefulness and perceived ease of use are critical constructs that influence individual behavior toward using technology to improve job performance. Senior leaders can use the TAM as a management tool to predicate stakeholder's acceptance of new technology and identify factors that influence the adoption of using the technology (Ahmad et al., 2013). Senior leaders must communicate and demonstrate the benefits of new technology to internal and external stakeholders to manage organizational resistance. The introduction of new technology and innovation produces uncertainty within an organization; therefore, senior leaders must use formal and informal communication methods to manage organizational resistance. Individuals interpret changes to their environment as perceived threats and senior leaders must use a structured approach to identify and interpret individual and group perceptions to effectively manage organizational resistance.

The study validated CMMI as an effective framework for senior leaders to evaluate their organization's ability to successfully manage complex IT projects (Curry et al., 2013). Managing change in large organizations presents unique challenges for senior leaders because no single individual or department has the ability to view, understand, and manage all interdependencies to achieve the organization's strategic vision. Senior

leaders must use project team members to help monitor, manage workflow activities to successfully manage organizational resistance for the adoption of new technology and business processes. Senior leaders must be able to identify and remediate organizational barriers for the implementation and adoption of new technology to improve the quality of services delivered in a cost-effective method.

Researchers have proposed various IT governance framework models to identify key leadership attributes that are critical to influence organizational behavior during transformation phases. My research indicated that project management methodologies to manage change are not consistent with the TAM and CMMI literature because the adoption and acceptance of new technology is not a static workflow event. Combining TAM and CMMI may provide senior leaders a theoretical framework to effectively manage strategic resources to reduce organizational resistance for the adoption of new technology. Organizational transformation is influenced by end users accepting and promoting new technology through an iterative process of collaboration among members. The key constructs for the successful adoption of new technology are managing social influences, encourage and support peer influence inside the organization, and assign complex activities to individuals with expert knowledge within the technical domain.

Knowledge-sharing requires a simplified strategic communication method to create, share, and transform knowledge into useful information to increase organizational performance. Senior leaders must use an enhanced management framework that uses

mechanisms to ensure accountability of multiple stakeholders and implement a continuous learning culture to support the exchange of information and knowledge.

Implications

This study contributes to the body of knowledge for project management literature by providing insights into the critical success factors and leadership attributes to increase the success rate of complex IT projects. Trying to conform to complex regulatory requirements has led to (a) an increasing number of complex IT project failures and (b) missed opportunities to develop a successful IT governance roadmap to stay current with new and emerging technologies. Providing enterprise-shared IT services in a cost-effective and ecological manner in federal agencies can allow for the reallocation of human capital and fiscal resources to support social programs at the regional, state, and local government levels. Successful government-wide enterprise infrastructure projects can support research programs and provide a mechanism for delivering government information and services in a sustainable manner. An example is that project managers plan for numerous changes for a software project and may use a waterfall or spiral project management methodology to increase the quality of the product and control the project cost.

The study confirmed a relationship between flawed critical thinking, ineffective problem-solving, and the lack of shared decision-making authority among project team members. The study confirmed that senior leaders and project leaders must use an adaptive leadership style and create an environment that provides open communication

among all stakeholders to increase the success rate of complex IT projects in federal agencies. The study also confirmed that senior leaders believe that a top-down management approach is effective to manage complex IT projects, but the results of the study indicate that a bottom-up approach provides better communication and buy-in from stakeholders.

Professional Practice

The results of this study can be used by all government agencies to deliver IT services in cost effective and sustainable manner for programs such as health care, education, and social services to promote positive social change and improve the quality of life for all citizens. Senior leaders and IT practitioners would benefit greatly from viewing strategic initiatives and IT investment management methodologies through a theoretical enterprise architecture lens. Doing so would allow them to manage IT systems that are part of other IT systems, such as cloud-hosting infrastructures. Effectively consolidating and sharing federal government information management systems such as cloud technology to reduce operating costs requires multiple theoretical frameworks to ensure performance goals are achieved.

The recommendations from this study could lead to a change in federal project management methodologies that would improve strategic communications and, in turn, improve the business relationships with project management team members and end-users. Having employees contribute their knowledge and skills could create a holistic approach to improve organizational culture, increase the acceptance of new technology,

and improve performance. The recommendations could eliminate uncooperative and negative behavior to increase the success rate of complex IT projects in federal agencies. The lack of collaboration mechanism for shared experiences is key organizational obstacle for effective decision-making and problem-solving to manage end-users' expectations associated with adopting new and emerging technologies (Enberg, 2012). In turn, these IT governance frameworks can be used to promote an entrepreneurial culture and develop a shared vision of the utility of technology (Ranjan & Zhao, 2013). According to participants in this study, senior leaders need to develop a knowledge-management and collaboration mechanism for shared experiences.

The inability of project team members to have access to individuals with tacit knowledge of previous IT projects and artifacts prevents the early identification and remediation of project risks. The reference model in Figure 1 represents four major knowledge categories: acquisition policies, project management methodologies, performance management, and tacit knowledge of IT governance frameworks. Utilization of this model by project team members would provide a useful a frame of reference for collaborative knowledge-management in managing complex IT projects in federal agencies.

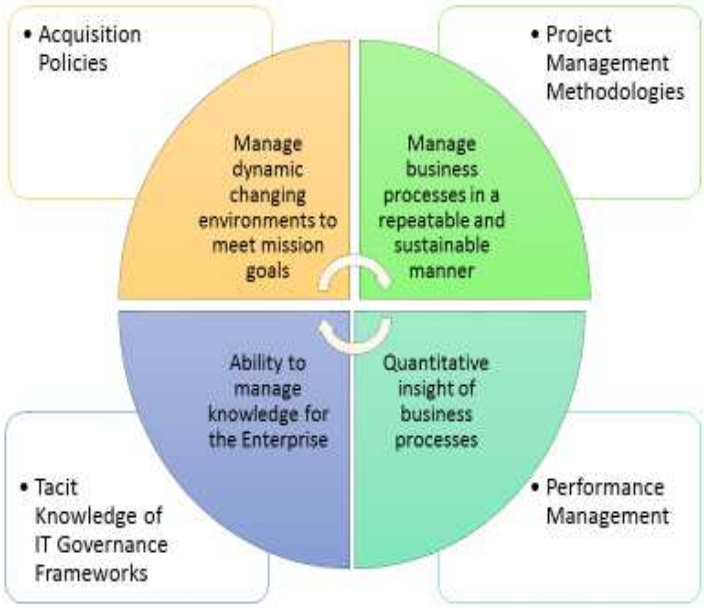

Figure 1. A theoretical framework to identify critical success factors for managing complex IT projects in federal agencies. Adapted from "Strategic alignment and misalignment of knowledge-management systems: A social representation perspective" by A. Dulipovici and D. Robey, 2013, *Journal of Management Information Systems*, 29(4), pp. 103–126. Copyright 2013 by the *Journal of Management Information Systems*.

To increase the success rate of complex IT projects, organizational leaders should alter IT governance frameworks by modifying elements, attributes, and characteristics that are unique to their organization. I adapted the knowledge-management framework model in Figure 1 based on the statements by individuals who shared their personal and professional experiences as part of this research. The knowledge-management framework presented in Figure 1 can assist future researchers in advancing the success rate of IT projects, exploring as it does emerging themes of end-user resistance and end-user acceptance of new technology.

Senior leaders need to attract and retain high-knowledge federal employees who will serve as trusted technical advisors to aid senior management in effective decision-making. Based on the participant responses there are problems with project managers' ability to monitor contractor performance and their authority to correct problems. Leaders should assign mentors to project team members to develop their knowledge and expertise and help reduce stress managing current IT projects.

The rate of advancement in IT solutions in the private sector is outpacing the ability of leaders in the federal government to drive innovation and develop well-defined business requirements for stakeholders. Senior leaders need to retain high-knowledge federal employees who supported previous complex IT projects and encourage their participation to solve project risks. Individuals with industry project management certifications, federal project management certifications, and IT governance framework certifications can provide different perspectives to communicate effectively with stakeholders to gain their trust.

Limitations of the Study

The sample was a self-selected sample of federal employees within the Washington, DC, commuting area and did not include federal employees in other geographical locations. In addition, the inclusion requirements for the sample limited the size of the sample, which may inhibit the statistical strength of this study. However, the participant sample accurately represented the population and the sample represented the attitudes of senior managers in federal agencies.

A limitation of the study was that 13 participants provided feedback for Round 2 and 11 participants provided feedback for Round 2 from the original 30 participants from Round 1. As a result, the recruitment of additional subject matter experts by snowball sampling may have increased sampling bias because the lack of control of the sampling method resulted in a knowledge gap about whether new participants had the exact characteristics required for participant selection (Janesick, 2011). Further, time constraints were an issue in trying to coordinate interviews with senior managers and having individuals respond to follow-up questions for Rounds 2 and 3 of this study. Data analysis software was used to identify trends and patterns to develop categories and dimensions, and self-bias may have influenced the strength of relationships and frequencies for this study.

Recommendation for Further Study

Private sector businesses models accept IT project risk to gain market share, increase profits, and reduce total operating costs. Senior leaders cannot accept IT project risks and are not motivated to maximize profits; therefore, current industry IT portfolio management and risk management business processes are not aligned with the business goals of federal agencies. Therefore, research should be conducted to more clearly understand the differences and similarities in private industry and federal government IT educational and training programs, and to understand strategic initiatives and business processes to increase organizational performance.

Research should be conducted on developing a federal IT project manager career development program with rotational assignments in the public and private sectors to mentor key federal employees. Senior leaders need to address that the federal government IT workforce skillsets are out of alignment to support their own IT systems without contactor support. Senior leaders should also develop a human capital strategic plan that aligns with the agencies IT strategic roadmap to recruit, train, and retain IT professionals to support future complex IT projects (Kashiwagi & Kashiwagi, 2012).

Another suggestion for future research is the development of a survey tool to compare the responses of project team members before a project kickoff meeting and at the project completion. This study may provide a richer understanding of project team members' experiences and opportunities to identify core competencies to manage resistance to change and promote more effective change management processes. I further

recommend studying the retention rate of federal project team members after an unsuccessful complex IT project with the retention rate of public and private team members.

Conclusions

Project managers have the ability to support senior leaders' long-term strategic and operational goals. It is critical that project managers' analyze and calculate the project team's overall level of expertise to support a complex IT project inside complex dynamic environments. Project managers must ensure proper resources are assigned and re-allocated throughout the finite life cycle of a project to manage risk to the project. It is essential for project managers to understand that they are limited in their ability to influence senior leaders to assign resources to their IT project; therefore it is critical for project managers to manage the scope, budget, and schedule to avoid risks to the project.

Based on participant responses there are problems with senior leaders', project managers', acquisition managers', and procurement managers' ability to communicate effectively and in a timely method to remediate project risks. Senior leaders must be able to identify and reduce barriers to communicating effectively and clearly with stakeholders in order to reduce organizational resistance to adopting new technology. Using TAM and CMMI provides organizations a theoretical framework for creative thinking, logical reasoning, and problem-solving techniques in complex IT environments (Curry et al., 2013). Senior leaders must have a theoretical framework for collecting, analyzing, and interpreting information to determine if the organization has achieved a

level of maturity to support current and future IT business requirements with acceptable risk to the organization. The establishment of both (a) an effective enterprise IT governance approach for program management and (b) a quality surveillance control plan to monitor and manage uncertainty should help increase the success rate of complex IT projects in federal agencies. Developing an effective government IT strategy could improve the performance of government digital services and knowledge-sharing initiatives and promote positive social change for citizens.

Senior leaders in federal agencies may use the results of this study to develop and promote a digital government knowledge strategy to provide innovative social services solutions efficiently and sustainably. Government managers must be able to monitor and measure the impact of ICT projects at various levels of their agency to develop an effective strategic management framework that builds a trusting relationship and identifies opportunities that should help increase the success rate of complex IT projects. Findings from this study support a recommendation that senior leaders, project managers, and IT practitioners receive additional training and education in the areas of strategic communication, strategic planning, and performance management.

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Appendix A: Round 1 Interview Questions

Subject Matter Expert Interview Questions

Round 1: Determining the effectiveness of project management methodologies, education, experiences, and industry certifications to manage complex IT projects.

1. Are you familiar with the Triple Constraint as defined by the Project Management Institute? (Scope, time, budget)
2. Describe a project that was sliding to the right? (Time Constraint) Did you overcome it? If so how did you overcome it? Did you decrease scope? Did you increase budget? If you increased budget, describe a better way to get the project back on track without occurring an additional spend.
3. Describe a top down approach to retraining your organization to adopt newer technologies often found in the private sector. Describe a time when you led a change from the top. Did it work? Tell about a time when it didn't work and what could you have done better to make it work?
4. What would be a good "bottom up" or "grass roots" way to instill change in your organization? What kind of training would you require? How would you measure your success or failure?
5. Describe what IT governance means to you. Is it something every organization needs? If so why, if not why?
6. As defined by the IT governance Institute: Strategic Alignment is aligning business units and IT to work together. Describe how to conduct proper planning with your

business units. When in the planning process should your IT leaders engage your LOB (lines of business) managers?

7. As defined by the IT governance Institute: Performance Measures involve putting structure around measuring business performance. An IT Balanced Scorecard is one popular method. How would you implement a Balanced Scorecard? What metrics would you track in its first 3 months?
8. What are the industry certifications that you have related to project management, IT governance frameworks, and information technology?
9. What are the major obstacles in successfully managing federal IT projects that do not exist in the private and public sector?
10. How does your organization determine their maturity level to manage complex IT projects?
11. How does your organization handle changes in requirements that occur in the early, middle, and late stages of a large IT project?
12. What mechanisms exist to ensure proper consideration of emerging technologies, both within a program and within the organization as a whole?
13. What obstacles to IT project success exist within government organizations that differ from non-government entities?
14. How is a program manager's performance evaluated throughout the life-cycle of an IT program/project?

15. How are the team members' performance evaluated throughout the life-cycle of an IT program/project?
16. Which industry certifications are required/desired for program managers?
17. What are the experience levels required for program managers of large IT projects?
18. Which certifications/degrees/experience levels are required for junior-level, mid-level, senior-level, and subject matter experts?

Appendix B: Round 2 Questions

1. Please explain if you agree or disagree that to effectively manage a complex IT project requires a quality assurance surveillance program to monitor federal employee's performance.
2. Please explain if you agree or disagree that federal IT project managers managing complex IT projects should have the following minimum experiences:

   (a) The agency's Federal Acquisition Certification for Program and Project Managers Senior Level Certification (Senior Level-FAC-P/PM) and the Project Management Professional (PMP) certification.

   (b) More than 10 years' of IT project management experience in managing federal IT projects.

   (c) At least one industry certification in Information Technology Service Management (ITSM) or a certification in IT governance framework to help managers bridge the gap between business requirements and technical issues to manage program risks.
3. Do you agree or disagree that a technical competencies framework that maps federal employee's subject matter experts (SME) capabilities to business requirements would be an effective tool to support complex IT projects?

Appendix C: Round 3 Questions

1. Please explain why you agree or disagree that the project manager should be a participant of the pre-award, competition and award, postaward, and selected acquisition activities for a complex IT project.
2. Please explain why you agree or disagree that federal project managers' competencies and federal subject matter expert's competencies should include training in information technology acquisition frameworks to help support agency's enterprise technology initiatives.
3. Please explain why you agree or disagree that project risks could be reduced if senior leaders would delegate decision-making authority and accountability to the project manager in coordination with the contracting officer to resolve technical and contractual problems.
4. Please explain why you agree or disagree that government agencies should have a dedicated resource pool of experienced federal IT project managers and federal technical subject matter experts to provide management and technology consulting services for strategic IT projects.
5. Please explain why you agree or disagree that federal agencies information and communication technologies (ICTs) projects failures could be reduced by developing communication strategies to increase end-users support for the adoption of new adaptive innovative technology solutions.

Appendix D: IRB Approval Letter

Dear Mr. Boyles,

This email is to notify you that the Institutional Review Board (IRB) has approved your application for the study entitled, "Exploring Critical Success Factors in Managing Complex Information Technology Projects in Federal Agencies."

Your approval # is 06-20-14-0226560. You will need to reference this number in your dissertation and in any future funding or publication submissions. Also attached to this e-mail is the IRB approved consent form. Please note, if this is already in an on-line format, you will need to update that consent document to include the IRB approval number and expiration date.

Your IRB approval expires on June 19, 2015. One month before this expiration date, you will be sent a Continuing Review Form, which must be submitted if you wish to collect data beyond the approval expiration date.

Your IRB approval is contingent upon your adherence to the exact procedures described in the final version of the IRB application document that has been submitted as of this date. This includes maintaining your current status with the university. Your IRB approval is only valid while you are an actively enrolled student at Walden University. If you need to take a leave of absence or are otherwise unable to remain actively enrolled, your IRB approval is suspended. Absolutely NO participant recruitment or data collection may occur while a student is not actively enrolled.

If you need to make any changes to your research staff or procedures, you must obtain IRB approval by submitting the IRB Request for Change in Procedures Form. You will receive confirmation with a status update of the request within 1 week of submitting the change request form and are not permitted to implement changes prior to receiving approval. Please note that Walden University does not accept responsibility or liability for research activities conducted without the IRB's approval, and the University will not accept or grant credit for student work that fails to comply with the policies and procedures related to ethical standards in research.

When you submitted your IRB application, you made a commitment to communicate both discrete adverse events and general problems to the IRB within 1 week of their occurrence/realization. Failure to do so may result in invalidation of data, loss of academic credit, and/or loss of legal protections otherwise available to the researcher.

Both the Adverse Event Reporting form and Request for Change in Procedures form can be obtained at the IRB section of the Walden web site or by e-mailing irb@waldenu.edu: http://researchcenter.waldenu.edu/Application-and-General-Materials.htm

Researchers are expected to keep detailed records of their research activities (i.e., participant log sheets, completed consent forms, etc.) for the same period of time they retain the original data. If, in the future, you require copies of the originally submitted IRB materials, you may request them from Institutional Review Board.

Please note that this letter indicates that the IRB has approved your research. You may not begin the research phase of your dissertation, however, until you have received the **Notification of Approval to Conduct Research** e-mail. Once you have received this notification by email, you may begin your data collection.

Both students and faculty are invited to provide feedback on this IRB experience at the link below:

http://www.surveymonkey.com/s.aspx?sm=qHBJzkJMUx43pZegKlmdiQ_3d_3d

Sincerely,
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Information about the Walden University Institutional Review Board, including instructions for application, may be found at this link:
http://researchcenter.waldenu.edu/Office-of-Research-Ethics-and-Compliance-IRB.htm