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An Acceptable Cloud Computing Model for Public Sectors

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Walden University

College of Management and Technology

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Eswar Kumar Devarakonda

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Walden University
2021

Abstract

An Acceptable Cloud Computing Model for Public Sectors

by

Eswar Kumar Devarakonda

MS, Walden University, USA, 2018

MS, Old Dominion University, 2003

BS, Chaitanya Bharathi Institute of Technology, 2000

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Information Technology

Walden University

August 2021

Abstract

Cloud computing enables information technology (IT) leaders to shift from passive business support to active value creators. However, social economic-communication barriers inhibit individual users from strategic use of the cloud. Grounded in the theory of technology acceptance, the purpose of this multiple case study was to explore strategies IT leaders in public sector organizations implement to utilize cloud computing. The participants included nine IT leaders from public sector organizations in Texas, USA. Data were collected using semi-structured interviews, field notes, and publicly available artifacts documents. Data were analyzed using thematic analysis: five themes emerged (a) user-centric and data-driven cloud model; (b) multi-cloud, (c) visibility, (d) integrations, and (e) innovation and agility due to cloud. A key recommendation is for IT leaders to strategize for individual user behavior through the top-down approach. The implications for positive social change include the potential to improve civic services, civic engagement, collaborations between the public and government, policymaking, and added socioeconomic value.

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Dedication

I devote this work to my fellow individuals in the United States of America, both present and past, who believe in, and contribute to, continued growth in the field of information technology and drive its business use.

Acknowledgments

I want to acknowledge all my faculty, staff, and officials of Walden university for successfully conducting online education based on information technology and cloud computing, especially the Degree in Doctor of Information Technology. Walden University facilitated a complete campus-like atmosphere and tools online through information technology services. I am thankful to my chair Dr. Habib Khan, my committee members Dr. Nicholas Harkiolakis and Dr. David Wagner, and my university research reviewer Dr. Bob Duhainy. It takes great courage and will to lead diligently through unknown and uncharted educational matters to students. However, my chair et al. held me on the righteous path together during this endeavor. I am grateful to my entire family, especially my spouse Vasantha Lakshmi and my three children Ekaparnika, Eshan, and Eshita. My family always inspired me to remain liberated and conducive to my upbringing at this doctoral level. I also want to mention special thanks to my late father-in-law Uppaliah and my parents Venkateshwarlu and Koteshwari for their understanding and commitment to my doctoral degree.

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Section 1: Foundation of the Study

Background of the Problem

Cloud computing enables organizational and economic value for public sector services at both strategic and tactical levels, triggered by innovative technological opportunities such as full virtualization and pervasive access to the internet (Potter et al., 2017). However, significant challenges hinder the public sector from gaining strategic and tactical leverage through cloud computing (Potter et al., 2017). Establishing an integrated proprietary business line with cloud commodity suppliers presents inherent risks and challenges for the public sector (Bellamy, 2013). Leaders in the field of information technology (IT) face challenges regarding the strategic use of cloud computing due to barriers such as a lack of the following factors: interdepartmental collaboration, top management support, personalization to user experience, and technology readiness and data breaches (Raut et al., 2018). Organizations adopt cloud solutions to benefit from its strategic and operational flexibility, enhanced usability, and microeconomic value (e.g., the low total cost of ownership; Andreas, 2018; Priyadarshini et al., 2017). However, significant barriers prevent its strategic utilization from improving the business performance of public sectors (Potter et al., 2017). IT leaders enable strategic value appropriation and customized cloud business model creation by reducing the discrepancy between usability and diffusion of cloud technology innovation (Giessmann & Legner, 2016). In this study, I explored the cloud business models that contribute to strategic value appropriation and improved performance of public sector services.

Problem Statement

As a result of cloud implementation, IT organizations can now gain direct tangible monetary benefits, but fail to create business value due to socio-technical inhibitors such as a lack of trusted cloud models that meet service level agreements (SLAs), an absence of provider practices' visibility, dependability between shared responsibilities of consumers, providers, and vendors, and IT complexity (Benlian et al., 2018). The paucity of strategies and innovative capabilities to create business value through cloud implementation have been forecast by the international data corporation (IDC) to incur capital expenditures of $554 billion by 2021 (Linthicum, 2018; Raguseo & Vitari, 2018). The general IT problem that I addressed in this study is that perceived vulnerabilities of pre-configured cloud computing solutions prevent IT departments in public sector organizations from realizing their continued strategic value. The specific IT problem that I addressed in this study is that some IT leaders in public sector organizations lack the strategies required to utilize cloud computing to improve their organization's service performance.

Purpose Statement

The purpose of this qualitative multiple case study was to explore the strategies that IT leaders in public sector organizations implement to utilize cloud computing to improve their organization's service performance. The population of this study comprised IT leaders from public sector organizations in Texas, USA. The target population of IT leaders includes chief information officers (CIOs), IT solution leaders, cloud business process champions, and business process owners. Cloud-digitized public services are

likely to result in positive social change for users, such as through improved civic services, civic engagement, collaborations between the public and government, policymaking, and added socioeconomic value.

Nature of the Study

Researchers use qualitative methods ontologically to observe reality as the subjective context of an individual participant (Chunfeng, 2017; Dodgson, 2017). Qualitative researchers analyze the underlying intentions and behaviors of participants and epistemologically explore evidence with participants as post-positivist observers (Chunfeng, 2017; Dodgson, 2017). Therefore, the qualitative methodology offers the researcher an opportunity to focus on the problem domain as a set boundary and to gain an in-depth understanding of a particular social phenomenon (Dodgson, 2017; Yin, 2018). However, quantitative approaches limit researchers to measuring facts from parts of reality—such as people, products, and processes—as relationships between variables within the selected study population (Almalki, 2016; Dodgson, 2017). In this study, I examined the contemporary phenomenon of cloud computing in terms of strategies used by organizational IT leaders to enhance business performance through holistic recognition and analysis of evidence with participants. Therefore, I selected the qualitative approach for this study rather than the quantitative research methodology. In a mixed-methods study, the researcher combines qualitative and quantitative research elements to obtain a comprehensive and in-depth understanding of a specific phenomenon (Alavi et al., 2018). I did not select the mixed-methods approach because

this context-sensitive research focuses on exploring strategies used in the field of cloud implementation.

Researchers use the case study design to define the problem-setting as a contextual boundary and conceptual framework as a case boundary (Ridder, 2017). Researchers use multiple case studies to analyze similarities and differences (Ridder, 2017). Therefore, I used a multiple case study design for this study. Ethnography research considers not only subjective experiences but also accounts for general societal trends and cultures (Tai & Ajjawi, 2016). Thus, ethnography research is beyond the scope of this study. Phenomenology research explores the everyday subjective lived experiences of users, for example, the experience of using an email system based on cloud computing (Haradhan, 2018). Therefore, I did not use the phenomenology method as the purpose of this study is to explore the implementation of the cloud for the strategies used by IT leaders in public sector organizations. Grounded theory and narrative inquiry are out of scope for DIT study as per Walden university guidelines.

Research Question

What strategies do IT leaders in public sector organizations implement to utilize cloud computing to improve their organization's service performance?

Interview Questions

I used the following semi-structured interview question guide to investigate the stages of cloud adoption as pre-, during, and post-implementation for the participating public sectors of the government library and city department in Texas, USA.

Demographic Questions

- What cloud computing model did your organization implement, and what combined responsibilities of business and IT did you perform?
- What is your overall experience and background in the IT and public sectors?

Pre-implementation Questions

- What was the initial state of experiences of IT leaders' voluntariness to adopt cloud and output quality of IT services that led your organization to cloud implementation?
- For the pre-implementation stage, how did your organization estimate the subjective usability of cloud adoption, including socioeconomic value and individual user characteristics (e.g., job relevancy and self-efficacy)?
- What were the usefulness perceptions—that is, the likelihood of cloud improving IT and business users' job performance—during the pre-implementation stage that led your organization to cloud implementation?
- How did your organization estimate objective usability—that is, value independent of the consumer experience—of the cloud in terms of risks, attractiveness, learnability of cloud solutions, complexity and effectiveness for IT, and integration into existing business practices?
- What innate cloud characteristics (that serve as anchors to perceived ease of use) such as cloud capabilities, cloud security, cloud provider processes, vendor SLAs, and technology advantages led your organization to cloud implementation?

- What was the pre-implementation perceived ease of use (the degree to which a user expects the target system to be effortless) of the cloud that led your organization to cloud implementation?
- What was the strategic value appropriation expected from the cloud that resulted in your organization implementing a cloud approach?

Implementation Questions

- What type of cloud did your organization utilize, and how was it implemented?
- What strategies were employed to improve user experience, voluntariness to adopt the cloud, and output quality of business IT services in implementing cloud computing?
- How did your organization design the cloud business model to account for subjective usability, such as socioeconomic value, individuals' job relevance, and self-efficacy?
- How did your organization strategize for objective usability such as reduction of risks due to cloud usage, learnability of cloud solutions, effectiveness for IT, and integration into existing business practices?
- How did your organization implement innate cloud characteristics (that serve as anchors to perceived ease of use) such as cloud capabilities, cloud security, cloud providers processes, vendors SLAs, and technology advantages?

- What adjustments—such as branding, personalization, and setup of team works and collaborative processes—did your organization use to improve user experience?
- What strategies were employed to improve perceived usefulness/ease of use of cloud computing applications and services?
- How did your organization model and adopt the cloud to account for business agility, such as instantaneously responding to changes in business needs (e.g., alterations to public policies and service needs)?
- How did your organization implement the cloud for improved IT–business alignment?
- How did your organization implement the cloud for improved business performance?

During Usage Questions

- How did cloud computing improve the use of IT services at your organization?
- What improvements have you noticed to facilitating conditions such as IT support infrastructure, organizational capabilities, and computing system characteristics?
- What improvements did you observe for individual characteristics of IT and business users such as job relevancy, personal innovation, and self-efficacy?
- What IT–business alignment improvements did you note at your organization?

- What is the social and economic impact of cloud computing at your organization?
- How did cloud computing contribute to improved business performance?

Follow-up Questions

- How did the strategic implementation of cloud computing improve business performance?

Conceptual Framework

In 2008, Venkatesh and Davis combined the theory of technology acceptance (TAM) with the factors that promote strategic planning and adaptability of computing systems as an integrated framework termed TAM3. I decided to use TAM3 as the conceptual framework for this study. TAM3 comprises two central tenets, perceived use (PU) and perceived ease of use (PEOU; Wook et al., 2017). TAM3 explains PU and PEOU in the context of subjective norms, social processes, individual user characteristics, and system characteristics (van den Berg & van der Lingen, 2019). Davis defined PEOU as the degree to which a user expects the target system to be effortless and PU as the subjective likelihood that the use of technology contributes to the user's job performance (Asadi et al., 2017).

Researchers use TAM3 to explore usability associated with the implementation of cloud computing and determine the design factors that affect user behavior in the working environment (Shana & Abulibdeh, 2017). The objective of this study was to explore the strategies that IT leaders in public sector organizations use to implement cloud computing to improve their organization's services. TAM3 aligns with the study

requirements to explore strategies that IT leaders in public sector organizations can implement to utilize cloud computing for improved business performance. For instance, users of TAM3 can explain difficulties with cloud access by specific devices that minimize PEOU (Bachleda & Ouaaziz, 2017). PU indirectly influences PEOU over time due to the user's improved familiarity with cloud application (Bachleda & Ouaaziz, 2017). Researchers use TAM3 explicitly for use in IT. However, a survey of 220 IT professionals revealed that known TAM3 cloud computing factors together explained only 63% of the variance in an individual users' adoption of cloud computing (Bachleda & Ouaaziz, 2017; Prasanna et al., 2017). Thus, I use more holistic business IT contextual factors in the use of TAM3 as the conceptual framework.

Definition of Terms

Business process owners: Business process owners display leadership characteristics and perform the combined roles of business and IT. They are empowered with decision-making abilities and are involved in several project activities such as planning, analyzing user experience, supervising change management, team composition, and user support, dealing with technology uncertainty, and fulfilling the organization's vision and mission (Ahimbisibwe et al., 2017).

Cloud-based services and the cloud: According to NIST, cloud services can be classified into the following three categories: infrastructure as a service, platform as a service, and software as a service (SaaS; Cearnau, 2018). According to NIST, the cloud (cloud computing), comprising three infrastructure (services) and four delivery (deployments) models, enables an easy-to-access computing resource pool accessible

over the internet as self-services with state-of-the-art technology capabilities that require minimal effort in use and are delivered as per consumer service requirements (Al-Sayyed et al., 2019; Caithness et al., 2017).

IT solution leaders: IT solution leaders take part in the continuance of governance and management of cloud models and the development, implementation, monitoring, and improvement of IT controls for cloud computing; they provide a unified framework for the cloud, IT, and business (Bounaguia et al., 2019).

Post-positivist: A positivist considers reality as being measurable and quantifiable; in contrast, a post-positivist observes the reality of being context-aware, as being sought and understood by naturalistic contexts varied by an individual's perceived experience, rather than objective truth (Giraldo, 2020). For example, post-positivists interpret teaching as a situated practice, not merely as the demonstrable reality with quantifiable actions and measurable facts (Bisel et al., 2020; Giraldo, 2020).

Role of CIO: CIOs take on a crucial but active role in IT with combined responsibilities of managing IT resources, innovativeness, data security, establishing SLAs, contract facilitation, monitoring, communications, establishing a clear vision, devising business goals, and dealing with contexts, technology, and socioeconomics that influence the perception of IT services (Govindaraju et al., 2018; Wang et al., 2019). Public sector CIOs' role with IT involves a broader enterprise perspective, the impact of IT on their organization capabilities, and public sector strategy (Newcombe, 2019).

Strategic IT: The strategic nature of information systems conceptualizes strategic business IT and classifies IT into two broader domains of micro and macro levels based

on usage (Merali et al., 2012). Macro-level usage comes from social technology and includes ways to organize work, people, business practices, social structures, and conventions based on IT (Merali et al., 2012). IT leaders derive micro-level usage from the physical technology of IT (Merali et al., 2012). The strategic IT use of cloud computing co-evolves physical and social systems to obtain economic and societal benefits from the implementation of IT.

Assumptions, Limitations, and Delimitations

Assumptions

I adopted an open-world assumption (OWA) definition because this study involves a contemporary phenomenon of cloud computing. Adopting an OWA helps incorporate available data across a more diverse range of domains compared to traditional closed-world assumptions with sparse data (Loyer & Straccia, 2005). When studying next-generation context-aware systems, OWA enables the researcher to improve the levels of intelligence, personalization, and decision support with the emotional response (Bleiker et al., 2019; Moore & Pham, 2015). Therefore, assumptions are defined as the revelation of facts that are clear and historically infallible and not those that are genuinely asserted but revealed as an object of belief (Burton-Jones, 2018; Friethoff, 2017). Assumptions function as a filter through which an individual experiences the environment (Moore & Pham, 2015). The researcher operates within a set of assumptions, norms, and acceptability that remains expected and respected (Burton-Jones, 2018).

While selecting the research method and design, I assumed cloud computing phenomena as a localized practice. The ontological position of the individual researcher forms the basis for philosophical and epistemological assumptions (Bleiker et al., 2019). My philosophical assumption is that cloud-based services as context-conscious systems extend usage beyond their measured objectives and facts. I followed this assumption to my epistemological assumption of the existence of rich data that the researcher can elicit from the context-based case study. I assume that researchers cannot measure rich text data as hypothetical user status variables, such as time and location. However, I assume that the researcher can analyze textual data for suitable meanings based on inductive reasoning within the study design to explore the underlying concepts, behaviors, and thematic explanations. My assumptions about the population of the study include they are available for interviews, and they are willing to contribute their experiences to the study. I also assumed that the population of the study believes in the research study to create positive social change. Therefore, I assumed that motivation exists for participants to participate in the study. I also assumed the population of the study is qualified and telling the truth as they perceive it. I believed the population size chosen is adequate to achieve data saturation. I assumed that semi-structured interviews were designed not to influence the responses of the participant, but to structure the study within the conceptual framework. I also assumed that transcribing the interviews would convey meaningful information.

Limitations

Limitations are potential weaknesses in research methodology, constraints, and other factors that are beyond the control of the researcher (Theofanidis & Fountouki, 2018). Qualitative research can become procedural and generate large volumes of data (Glenton et al., 2019). Therefore, researchers limit sample size and collecting evidence until data saturation (Glenton et al., 2019). I limited the methodology for this to the qualitative research method and data collection based on subjective observations of reality from a post-positivist perspective. I did not include quantitative measurements of objective reality. Also, my assumptions became limitations to this study. I limited the sample size based on the established criteria to achieve rich data collection and data saturation. In the qualitative method, the researcher is the primary instrument in data collection and analysis. Researchers limit observations to executive functions based on personal traits, skills, domain experience, and personal worldviews.

Delimitations

Researchers enforce delimitations as constraints to improve objective, scope, and descriptions (Theofanidis & Fountouki, 2018). The delimitations applied to the context of this study are public sector organizations, cloud computing technology area, and focuses on exploring the strategies used. I delimited the research questions into three stages—pre-implementation, implementation, and post-implementation usage—of cloud implementation. I delimited the research geographically to United States of America. Delimitation of research inquiry aims to improve the objectivity of identifying strategies that lead to improved business performance.

Significance of the Study

Contributions to IT Practice

This study might lead researchers and practitioners to strategically utilize the transformative value of cloud capabilities in generating business IT value. The current cloud computing technologies and services impact businesses only at the micro-usage level, such as in total cost reduction of IT services. However, in this study, I explored qualitative aspects of cloud computing phenomena for macro usages, such as for business-IT value creation. The three major external environmental factors that contribute to the adoption of cloud technology include public administrators, availability of success cases, and research institutions (Juan et al., 2017). Public services through cloud computing drive innovation in cloud technology in several countries, such as grid-IT facilities in Europe, British G-Cloud, US Apps Gov, Japan's Kasumigaseki, and South Korea's government cloud computing plan (Juan et al., 2017). Future researchers must recognize the advancement of cloud business model designs for improved IT practice with better security and data privacy (Kathuria et al., 2018). I explored potential collaborations between cloud consumers, cloud vendors, and providers and study the trusted service model. I also inquired about security, vulnerability detection, IT practices, and data privacy. In this research, I focused on the intentions and behavior of IT leaders within the context of cloud computing. In this work, I aimed to provide insight into the field of cloud computing that could help IT practitioners to achieve effective utilization of cloud services. I aimed to expand on knowledge of IT-business alignment to offset a shortage of strategies that IT leaders need to improve business performance. In this study,

I researched the evidence for the lack of strategies in using cloud computing for IT practice. Thus, I aimed to help IT practitioners reduce cloud computing failures resulting from the existing risks of cloud services. This study is likely to contribute to the strategic value of cloud computing for better business performance.

Implications for Social Change

With this qualitative research study, I aimed to lead positive social change by identifying strategies contributing to the improvement of public sector services using cloud computing. Suggestions from this study could improve cloud-based public services. The cloud-enabled public sector gains strategic and operational advantages for policymaking. Citizens gain time, effort, money, and improved civic services from cloud-based public sector services (Mazen et al., 2018), thereby leading to faster reforms, collaborations between the public and policymakers, promotion of social inclusion, and improved sharing of knowledge, information, and ideas. Therefore, contributions from this study can lead to improved civic engagement and collaborations.

Public sector organizations can use cloud computing to reap benefits such as cost savings, faster transactions in public services, and increased openness and trust with the public leading to reduced backlogs of public issues and transparency (Mohammed et al., 2018). Improved public services would contribute to improved career satisfaction among public sector organization workers. Public services based on cloud computing are likely to enhance user satisfaction. Cloud computing enables public sectors with high-performance machines with unlimited capacity accessible through any device with the same efficiency. Further, cloud computing enables public sector organizations to transfer

and analyze large data sets in real-time for citizen services (Yong et al., 2017). Thus, improved citizen services contribute to economic efficiency, resulting in positive social change. Therefore, this study can contribute to improved public services and the public sector, thereby enhancing social and economic growth.

A Review of the Professional and Academic Literature

The purpose of this qualitative study was to explore the strategies that IT leaders in public sector organizations implement to utilize cloud computing to improve their organization's service performance. The literature review aims to answer the central research question: What strategies do IT leaders in public sector organizations implement to utilize cloud computing to improve their organization's service performance? I examined essential areas of the TAM3 concept model, other relevant conceptual frameworks such as diffusion of innovation, unified acceptance and use theory, social cognitive theory, the theory of reasoned action, and lazy user theory. The literature review sets the context and scholarly dialog for the observable phenomenon of cloud computing, strategic IT, and user acceptance for this research.

The review of the literature included 92 scholarly articles, journals, reports, and conference proceedings. The search included several research libraries and databases: ProQuest central, science direct, IEEE Xplore digital library, academic search complete database, ABI/Inform collection, business source complete, CINAHL Plus, computer science database, ERIC database, and Medline. I used Google Scholar as an additional search engine and Ulrich periodical directory to check the status of peer reviews of articles used in this literature review. The keywords used in the search focused on *cloud*

computing, TAM3, perceived usefulness (PU), perceived usage, and *IT strategy*. I have reviewed 92 professional and academic articles, of which 83 (90%) were published during the last five years of anticipated graduation date, and 89 (96%) are peer-reviewed.

I focused my review of TAM3 on central tenets of PU and perceived ease-of-use as it applies to cloud computing. I reviewed the literature design features concerning the influence of PU and perceived ease of use (PEOU). The literature review includes TAM3 moderators (e.g., experience/output quality) and TAM3 facilitating conditions (FCs) (e.g., IT support infrastructure, organizational factors). And TAM3 inhibitors for subjective usability (e.g., socioeconomic values, external factors, individual characteristics). I have also reviewed TAM3 anchors (e.g., technology anxiety, security, technology capabilities), TAM3 objective usability influencing factors (e.g., effectiveness, learnability, integration), and TAM3 adjustment factors (e.g., branding, complexity, and risks). Literature reviews and bibliometrics analyses revealed several theoretical frameworks used by researchers to explore the utilization of cloud computing, such as the TAM theory, theory of diffusion of innovations (DOI), theory of reasoned action (TRA), lazy user theory (LUT), unified theory of acceptance and use of theory (UTAUT), technology task fit (TST) theory, and social cognitive theory (SCT). The following sections address relevant cloud computing implementation theories. I primarily reveal TAM3 as a preferred theoretical framework for exploring IT leaders ' actual use of cloud services in strategic alignment with business values, goals, and business performance needs.

The Technology Acceptance Model

The actual usage (as intangible and substantial usage) and acceptance of a particular technology vary significantly depending on the enterprise IT architectural elements such as the process of implementation, IT systems, strategic alignment to business goals, departmental collaborations, and FCs (Onan & Simsek, 2019). In his Ph.D. thesis in 1985, Fred Davis proposed a model for accepting a technology (TAM) theory. The TAM theory developed in 1989 by Davis originated from the theory of reasoned action (TRA), specifically for use in IT (Bachleda & Ouaaziz, 2017). TAM assumes that the individual user's perceived ability to perform relevant tasks using technology affects their usage behavior (Bachleda & Ouaaziz, 2017). Davis' TAM model enhances the causal relationship between belief–attitude-intent-behavior of TRA (Tripathi, 2017). TAM model suggests that the actual use of technology depends on the user's motivation to use an IT service (Tripathi, 2017). With TRA, the researcher identifies how beliefs and expectations affect behavior intention (BI) attitudes and norms (Lidan et al., 2017). TAM replaces TRA's concepts of sense and control of attitude to achieve intended behaviors with IT-related PEOU, and PU constructs to framework the actual use and acceptance of technology (Lidan et al., 2017). TAM predicts the actual use of computer technology in terms of a user's behavioral intention (Onan & Simsek, 2019). Thus, the TAM framework is instrumental in the prediction and adoption of various IT systems (Shana & Abulibdeh, 2017).

In 1989, Davis defined PEOU (in terms of self-efficacy) as the extent to which a user expects the target system to be effortless (Yoon, 2018). Davis defined PU as the

subjective likelihood that using technology will improve the user's job performance (Yoon, 2018). An increase in an individual user's PEOU due to the higher objective usability of an IT influences the subjective usability of an individual user's PU in a positive manner (Prasanna et al., 2017). In 2000, Venkatesh and Davis applied TAM principles to TAM2 (Tripathi, 2017). Researchers use TAM2 to describe the variance in PU and PEOU in terms of socio-cognitive mechanisms such as user-friendliness of technology, pre-existing cloud capacities, task significance, and the demonstrability of expected outcomes (Tripathi, 2017). For instance, TAM2 can help organizational IT leaders develop required enterprise IT support and process structure to integrate modern technologies into everyday routines and job relevance (Onan & Simsek, 2019). In 2008, Venkatesh and Davis extended TAM2 into the TAM3 model (Lai, 2017). Researchers use TAM3 in explaining PU and PEOU in terms of design characteristics that can be varied to bring improvements to usage behaviors and resulting technology impact on the organization (Lai, 2017). This literature review and the study focuses on TAM3 as a conceptual framework for cloud computing implementation.

TAM3. TAM3 overcomes the original TAM weakness, allowing IT leaders to predict and strategize positive behavioral changes for cloud adoption and application (Hamutoglu, 2018). TAM postulates that the adoption, acceptance, and continuous use of technology, such as cloud computing, primarily depends on PU and PEOU factors; TAM3 includes the factors that affect PU and PEOU (Vareberg & Platt, 2018). TAM's initial model predicted the adoption behavior of users after a short interaction with new IT systems. However, TAM3 provides actual usage-based explanations, such as in terms

of system characteristics and critical mass (socioeconomic value of technology use) (Patel & Patel, 2018; Tripathi, 2018). Researchers integrate TAM3 with other theories to explore PU and PEOU for modeling enterprise-IT solutions, organizational process influencers, and the end-to-end models of business-IT goals (Patel & Patel, 2018; Qashou, & Saleh, 2018). For example, TAM3 integrates with the technological contexts of the TOE framework (e.g., cloud-based innovative properties), organizational contexts (e.g., employee awareness, complexity, financial factors), and the environmental context of government support, competitors, and partners (Qashou & Saleh, 2018). Most CIO's consider perceived IT security to be a significant concern with cloud computing, despite the cloud becoming more secure than internal infrastructure (Prasanna et al., 2017). TAM3 design features and individuals' subjective norms help researchers in actual use analysis (Tan et al., 2018). In terms of cloud computing, TAM3 design features include a trusted cloud (SLAs), cost-effectiveness, security, and data privacy. Subjective norms include individuals' self-efficacy in the use of technology, organizational capability integrations, perceptions of external control for the overall assessment of usage behaviors in cloud implementations. Thus, TAM3 enables researchers to focus on the critical elements that drive the acceptance of technology (Patel & Patel, 2018). For example, social processes, individual user characteristics, system characteristics, perceived ease of use (e.g., technology interaction), and effectiveness of using technology to accomplish a task (Vareberg & Platt, 2018).

Most CIO's consider perceived IT security as a significant concern with cloud adoption. However, cloud providers offer more trusted service models to IT leaders that

meet the SLAs than managed infrastructure (Prasanna et al., 2017). Modern technology services scarcely influence an individual user's trust. The researchers need more research to understand the strategic implementation of the cloud (Sharma et al., 2018). Individual users' PU influences their behavioral intent to use cloud technology (Tripathi, 2017). TAM3 successfully illustrates an individual's beliefs and attitudes. For example, socioeconomic values and enterprise-IT design features influence individual users' acceptance of modern technology based on PU and PEOU (Qashou & Saleh, 2018). Further, researchers use TAM3 as an analytical pathway model to predict intentions, actual usage, and root-cause assessments that hinder the strategic adoption of cloud computing for business use (Qashou & Saleh, 2018). The conceptual elements of TAM3—experience, computer self-efficiency, objective usability, and subjective norms—constitute the antecedents of individual users' PU and PEOU (Demoulin & Coussement, 2018). Focusing on individual users' direct influencing factors helps researchers understand the facilitating conditions and social processes that influence technology usage for better business-IT alignment (Wu et al., 2017). For example, Researchers use the TAM3 factor of an individual's technological self-efficacy to model the perceived ability to perform technological tasks skillfully (Almarazroi et al., 2019). The individual's interactivity construct illuminates high-level engagement and communication between users and technology or its providers for strategic recognition, customization, branding, and recall for improved PEOU (Tan et al., 2018). Additional cloud computing design features that influence actual usage of users include job relevance, experience, age, trust transfer (through SLAs), critical mass (socioeconomic

value), and perceived benefits (Tripathi, 2018; Wu et al., 2017). Moreover, TAM3 explains cloud adoption in terms of personal innovation, technology anxiety, job relevance, actual use, PU, and PEOU (Almarazroi et al., 2019). Findings from previous studies on cloud computing in the public and non-government sectors show that the most critical factors influencing acceptance include trusted model (cloud model that meets the SLAs), complexity, security/privacy, cost, compliance, interoperability, and agility/flexibility (Asadi et al., 2017). Experience and voluntariness moderate the relationship among the TAM3 constructs (Almarazroi et al., 2019). In terms of TAM3, there are three scenarios in which the individual user switches to cloud computing: a change to modern technology (through the diffusion of innovation, subjective standards, PU, and PEOU), a move to different but uniform PEOU services, and a switch to various PU services (Wu et al., 2017). TAM3 also encompasses push-pull-mooring (PPM) of individual users' personal and contextual factors with considerations of risk and attractiveness in exploring user behavior for switching to cloud services (Wu et al., 2017). Favorable social norms, such as perceived risks/costs/ability to personalize, in addition to PU and PEOU, influences the user's continuous intention to utilize cloud technology (Tripathi, 2017; Wu et al., 2017). In this research, I used the conceptional framework TAM3 to research the strategic utilization of the cloud for public sector business performance. I adopted the TAM3 framework for this study (Figure 1). The following section discusses TAM3 concepts in detail as they relate to cloud computing.

TAM3 Perceived Usefulness (cloud computing). PU is a significant factor in technology acceptance by individual users. PU positively impacts the actual usage

behaviors of users during the strategic implementation of cloud computing in public sectors (Arpaci, 2017). Identification of different strategies used by IT leaders that lead to perceived usefulness requires extensive examination because use-related decisions depend on individual and contextual factors (Sohn, 2017). Analyzing the factors influencing system use—including the social process and developing the usage paradigm—ensures its success and cost-effectiveness (Al-Emran et al., 2018). Based on information integration theory (IIT) of valuation, integration, and action, the norms and usefulness perceptions (PU) differ based on stages of cloud computing adoption (pre-implementation, during implementation, and post-implementation) (Anderson, 2016). The perceived output quality of services, SLAs (trusted clouds), and individual users' innovativeness dominates PU during pre-implementation (Sohn, 2017). Cloud computing's technical features, aesthetics, context-awareness, and security influence post-implementation PU (Sohn, 2017).

Moreover, the valuation of integrated subjective experiences from related observable activities are all combined to form PU during the strategic implementation of IT (Sohn, 2017). For example, the cloud computing model influences pre-implementation decisions of IT services and is a popular choice due to its various PU or benefits, such as scalability, ability to learn quickly, and perceived security/speed of access/cost of usage (Changchit & Chuchuen, 2018). PU directly influences the individual user's ability to perform the role of decision-maker implementing the cloud with social demographic factors, security concerns, and self-efficacy (Zeqiri et al., 2017). Thus TAM3 construct of

PU helps researchers in the analysis of operationalization and strategic value appropriation through cloud services.

Further, design features that originate from technical aspects, organizational requirements, practices, and environmental factors influence the user's cognitive response of PU (Matemba & Li, 2018). PU is the Degree to which a user's work performance improves due to the usage of a specific technology or system (Buabeng-Andoh, 2018). Evaluation of PU helps in strategic cloud implementation (Prasanna et al., 2017). Thus, PU analysis of cloud computing provides IT leaders with guidance to strategically utilize cloud technology for improving business performance (Chinho & Meichun, 2019). The researcher uses TAM3 as a guide and a framework for exploring the determinants and valuation of usefulness perception.

TAM3 Perceived Ease of Use of TAM3 (cloud service). Underutilized and unused technology hinders business. Because IT improves organizational performance, IT leaders must forecast, assess, and enhance the individual user's PEOU of technology (Baki et al., 2018). A meta-analysis of technology acceptance research across 41 different countries revealed that out of 129 external variables influencing PEOU, the most significant determinant was the self-efficacy (Baki et al., 2018). A user-friendly and responsive cloud computing system leads to individual users' innovations that contribute to the growth of organizations, industries, and national economies (Normalini, 2019). Self-efficacy represents an individual's judgment of their skills and traits to organize and execute functions to meet an organizational performance (Bhatiasevi & Naglis, 2016). An individual may enhance self-efficacy (self-confidence, self-esteem, and beliefs) through

firsthand experiences, practices with others, or through direct observations (Hsieh et al., 2019). Self-efficacy significantly influences continued intention and attitude towards using cloud-based services (Wang et al., 2017). Individual users' knowledge and understanding of the importance of cloud services improve self-efficacy, improves motivation to adapt, and achieve better results (Hahm, 2018). Individual self-efficacy in using cloud computing promotes creativity, leads to higher commitment, reduces stress from job performance with technology, lessens the influence of negative factors related to acceptance, and promotes the use of the cloud for an individual's business use (Hahm, 2018). PEOU measures the effort required by the user to use the target technology or application (Buabeng-Andoh, 2018). PEOU positively influences PU (Buabeng-Andoh, 2018; Prasanna et al., 2017). For example, in cloud computing, the difficulty of accessing data from specific devices could decrease PEOU (Bachleda & Ouaaziz, 2017). Over time, PEOU becomes an indirect influence via PU with an increase in familiarity with modern technology (Bachleda & Ouaaziz, 2017).

TAM3 facilitating conditions (internal factors/subjective norms) and external factors (social processes/anchors). Increased digitization has led IT business leaders to use service-oriented designs with use case-based software development cycles (Chihung et al., 2016; Kim et al., 2019). The TAM3 design factors represent user-contexts that characterize context-aware computing services (Kim et al., 2019). These user-contexts extend beyond the current computing environment of the individual entity, such as in terms of perceived location context/time/activity, user-state, and perceived social and perceived technical inhibitors (Kim et al., 2019). Individual users' attitudes towards use

significantly influence actual use of technology, and subjective norms and external factors influence users' attitudes (Buabeng-Andoh, 2018). Understanding motivational factors, such as social influence, leads to predicting and explaining cloud adoption and usage (Ratten, 2019). Thus, in this research study using TAM3, I employed social influence factors and FCs as attributes of PU and PEOU to observe the phenomenon of cloud implementation.

There are two ways to understand cloud adoption: examining overtime or using the process approach of evaluating individual behaviors to changing environments (Ratten, 2019). Social processes (such as practices with vendors and users) significantly change pre-adoption PEOU, and FCs influence post-implementation behavior (via PEOU) related to cloud adoption (Wang et al., 2017). FCs include organizational processes and technical infrastructure that influence an individual's PU and PEOU to perform a task (Wook et al., 2017). IT leaders use system characteristics and organizational structure to create favorable or unfavorable individual user perceptions about the ease of use and usability of technology (Herrenkind et al., 2019). For example, ease of connectivity and availability of resources influence self-service technology adoption and its usage (Mika & Jouni, 2018). Thus, FCs, in addition to external processes, most strongly measure PU and PEOU (Baki et al., 2018; Izuagbe et al., 2019).

TAM3 adjustments (objective usability/branding). The user's subjective usability in terms of efficiency is the emotions such as joy, anxiety, and satisfaction of performing a task (Christmann et al., 2017). In contrast, objective usability stands for the effectiveness with which the user interacts and receives feedback from the system such

that it improves task completion rates (Christmann et al., 2017). Evaluation of the objective usability of a cloud service, such as in terms of time to complete tasks, perceived effectiveness of personalization, and branding, enables IT leaders with design features to make adjustments towards the PEOU of the individual user (Ghaith et al., 2018). Objective usability evaluation of cloud technology, such as the rate at which a user completes a task, helps IT leaders to improve the suitability of technology services during the execution of the task for the individual user with or without experiences (e.g., by providing learning guides, integrated experience, and color branding) (Germann et al., 2019; Ghaith et al., 2018). The researcher measures objective usability in terms of task completion rates and efficiency of the system services influencing the PEOU of individual users (Ghaith et al., 2018; van den Berg & van der Lingen, 2019). Strategically designing for objective usability of technology influences the Degree of PEOU of the individual user (van den Berg & van der Lingen, 2019). Objective usability characteristics include learnability through guided procedures, effectiveness, and integration owing to reduced complexity or personalization (van den Berg & van der Lingen, 2019).

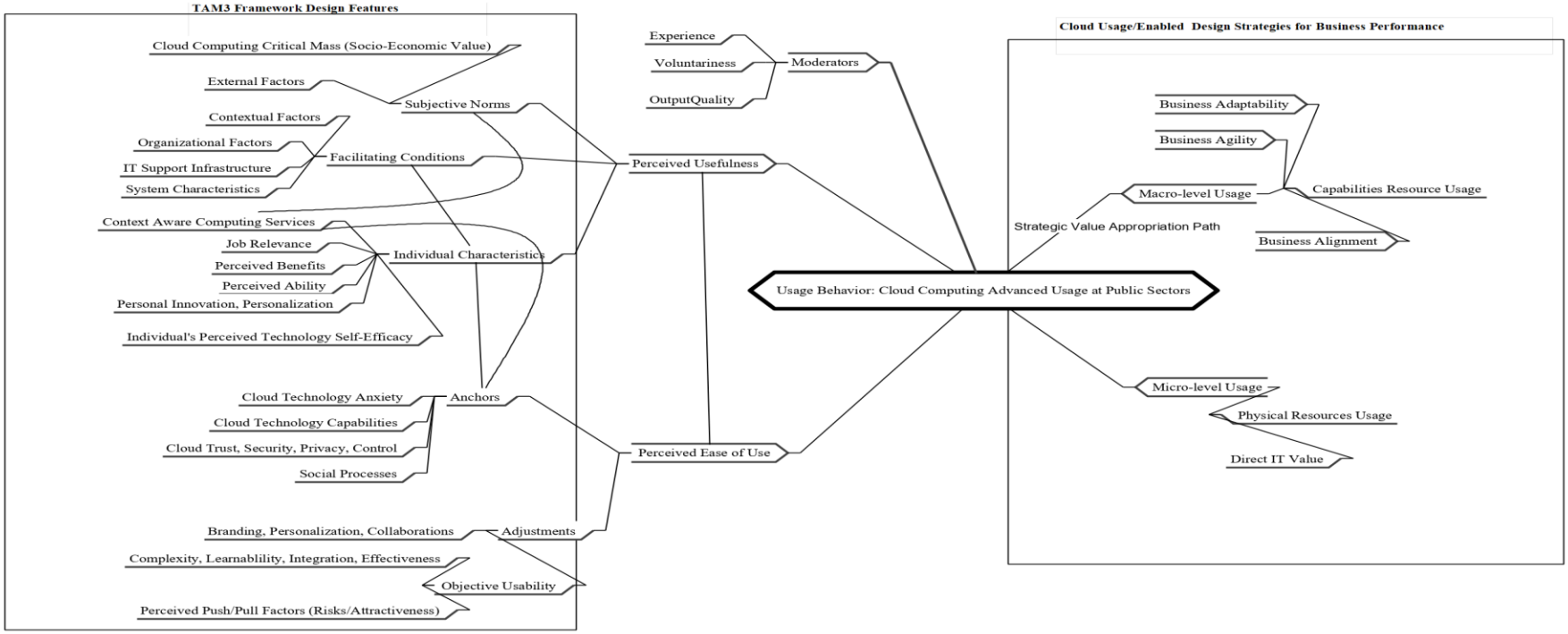
TAM3 security aspects. Strategic alignment of security and usability paves the way for better utilization of cloud services. However, it requires a value-based approach to reduce afterthought in security and usability and a plan towards a familiar format of goals and preferences for individual users (Oliveira et al., 2016). Perceived security is a significant concern with cloud computing, despite the cloud being more secure than internal infrastructure (Prasanna et al., 2017). Strategic intent analysis of cloud security

shows that structural layer interface security functions combine with operating layer (network) virtualization (Dunbar et al., 2020). IT leaders need to maintain a policy translation between high- and low-level security mechanisms to enable a security mechanism that can be automated and virtualized (Dunbar et al., 2020). Perceived security is the degree to which an individual user believes that an IT system is secure for transmitting information and that it is free from known vulnerabilities (Patel & Patel, 2018). Perceived cloud IT security concerns arise due to a lack of structural trusts such as lack of URL filters, anti-virus options on operating systems from cloud infrastructure without impeding usability (Bachleda & Ouaaziz, 2017).

TAM3 moderators (experience/voluntariness/output quality). The free will with which individual users use cloud services continually or at a set point within the contextual role represents TAM3's voluntariness (Elshafey et al., 2020). Individual users' characteristics, such as experience, intention stability, and user experience, leads to familiarity with the technology (Chihung et al., 2016). Familiarity with technology increasing willingness to use technology for individual usage and overrides the perceptions of social influence factors (Chihung et al., 2016). The output quality of cloud services moderates the relationship between job relevance and PU; voluntariness moderates subjective norms; experience positively moderates numerous TAM3 design features, such as computer anxiety, computer playfulness, perceived enjoyment, and actual usability, but it negatively moderates subjective norms (Al-Gahtani, 2016). The inclusion of moderating factors in TAM3 studies increases the exploration of variance in PU (Izuagbe et al., 2019).

Figure 1

The TAM3 Conceptual Model Mind Map for Strategic Business Use



Note. Figure 1 depicts the TAM3 conceptual model mind map for strategic business use. Adapted from "Empirical investigation of e-learning acceptance and assimilation: A structural equation model by Al-Gahtani, S. S, 2016. *Applied Computing and Informatics*, *12*(1), p. 32. Copyright 2016 by Elsevier. Adapted with permission (Appendix E).

Figure 1 depicts the TAM3 conceptual model mind map for strategic business use. Adapted from "Empirical investigation of e-learning acceptance and assimilation: A structural equation model by Al-Gahtani, S. S, 2016. *Applied Computing and Informatics*, *12*(1), p. 32. Copyright 2016 by Elsevier. Adapted with permission (Appendix D).

Other Relevant Theories

Diffusion of innovation. The extent of disruption affects user acceptance and diffusion of cloud computing innovation (Choi et al., 2018). Roger developed the diffusion of innovation (DOI) theory in 1962. Researchers use DOI theory to analyze the innovation diffusion relationship with individual technical acceptance over time in social communication networks (Frank et al., 2018). For example, a trusted cloud label serves as a communications mechanism in cloud computing (Choi et al., 2018). DOI innovation: the process or trust with which the user accepts a modern technology system depends on internal/external environmental variables, service agreements, and individual characteristics such as leadership (Carreiro & Oliveira, 2019). Researchers analyzing the cloud using the DOI framework discovered that firm size, top management support, technological readiness, complexity, and relative advantage significantly influence cloud technology diffusion (Raut et al., 2017). Complexity, relative advantage, and compatibility are the coherent attributes of perceived innovation in DOI theory (Stieninger et al., 2018). Compatibility: the degree to which innovation meets current and future requirements of cloud users; complexity: the perceived relative difficulty in the adoption of cloud technology (Stieninger et al., 2018). Cloud computing creates a relative advantage through its innate capabilities, such as on-demand resources, load balancing, elastic compute capacity, and storage (Stieninger et al., 2018). DOI theory explains cloud adoption from the perspective of both the consumers and cloud providers (Choi et al., 2018). It answers critical research questions, such as factors that guide cloud professionals in the adoption of cloud-based services and innovations (Olufemi, 2019).

According to DOI theory, the rate of adoption conveys the speed at which the firm adopts innovation with internal and external characteristics (Carreiro & Oliveira, 2019). DOI theory focuses on temporal aspects of innovation adoption through phases of intention to adopt, implementation, and post-stabilization (Ali et al., 2018).

The decision-making process involved in the implementation of cloud-based technologies involves five steps: (1) introducing new cloud technology; (2) encouraging the benefits of cloud services; (3) embracing the decision on cloud-based IT; (4) designing a firm's cloud services' architectures; and (5) continued intention to use cloud-based services (Olufemi, 2019). DOI theory in cloud computing explains the variation in innovation characteristics and the rate of diffusion within the organization (Choi et al., 2018). Challenges in the diffusion of cloud innovation include the complexity of IT with cloud integration, legal issues, and organizational factors (Choi et al., 2018). The weakness of DOI lies in the false assumption that socializing and communication factors are sufficiently supportive of the individual user's adoption criteria (Olufemi, 2019). However, cloud adoption involves non-communicative and neutral factors (Olufemi, 2019). For example, the inability of users to adapt due to external influences that alter perceptions and beliefs about the practical benefits of cloud to individuals or businesses. DOI explains the adoption of cloud service innovation within a firm (Carreiro & Oliveira, 2019). Understanding the cloud implementation process in terms of DOI involves long periodic cycles (Choi et al., 2018). It cuts the possibility of investigating alternative products or cloud services (Choi et al., 2018).

Unified theory of acceptance and use of theory. In 2003, Venkatesh, Davis, and Morris developed a unified theory to incorporate the prevalent technological acceptance factors into the literature on information management systems (Hwang et al., 2016). TAM theory developed before the growth of technology usage and did not include factors influencing PU (Buabeng-Andoh, 2018). The researcher uses UTAUT for combing PU with extrinsic motivation, job-fit, relative advantage, and outcome expectation (Lin et al., 2018). Users use UTAUT for analysis of performance expectancy intending to explore and improve a user's job performance (Lin et al., 2018). UTAUT attempts to overcome limitations such as the nature of respondents/technology/measurement/the context of the phenomenon (Hwang et al., 2016). Venkatesh, James, and Xin in 2012 developed a second unified theory of acceptance and use of technology (UTAUT2) (Najantong et al., 2018). to explain behavioral intent (BI) using factors of performance expectancy, effort expectancy, social influence, FCs, hedonic motivation, price value, and habit (Najantong et al., 2018). UTAUT2 assumes that consumer behaviors are voluntary and suggest the hypothesis that habit directly influences behavior intention and use (Hwang et al., 2016). UTAUT2 has been employed in numerous studies to understand user intention to switch to and their continued usage of the cloud (Najantong et al., 2018). Moreover, UTAUT fills the gaps in TAM theory by focusing on mandatory environment, temporal, and leadership aspects (Hwang et al., 2016). The UTAUT2 model reveals factors for motivation to use modern technology. However, it does not explain why users still use legacy technology because the model focuses on a single solution and disregards all other solution alternatives (Milković et al., 2018).

Theory of reasoned action (TRA). Fishbein and Ajzen in 1967 developed TRA to explain factors influencing the behavioral intention of human actions. The central tenets of TRA include beliefs, attitudes, and behavioral intentions. The TRA behavioral intention model expresses the attitudes, faith, and affection evident from individual behaviors (Lin et al., 2018). TRA is extremely helpful in the study of ethical behaviors and social responsibility at the workplace and in the adoption of technology (Lin et al., 2018; Mou et al., 2017). For example, during cloud adoption, TRA helps understand the tradeoff of privacy with benefits by analyzing the privacy and trust intention model (Gashami et al., 2016). TRA assumes that intention to perform results in the actual behavior of the individual (Hwang et al., 2016). Researchers have used TRA in the analysis of individual behaviors in a variety of fields of social behavior, from marketing to IT (Lin et al., 2018). Researchers consider TRA to be the most appropriate framework for predicting and explaining the behavior intention for individuals' behaviors (Lin et al., 2018). Cloud-based services must comply with the trust requirements of users and enterprises. Trust and PU form necessary consumer behavior related to IT services (Mou et al., 2017). The trust factor measures cloud service providers' reliability, integrity, dependability, and ability to meet expectations (Mou et al., 2017).

TRA forms the basis for TAM3. According to TRA, the decision process about the adoption of the cloud begins at the formation of an individual's belief regarding the expected outcomes of the action (Gashami et al., 2016). TRA helps to examine the effect of trust and PU in the acceptance of cloud services (Mou et al., 2017). The TRA framework explains any human behavior and applies this to IT (Buabeng-Andoh, 2018).

TAM adapted based on TRA focuses on intention and motivational factors that are specific to IT (Hwang et al., 2016). TAM provides a more in-depth understanding of external variables influencing subjective norms and normative beliefs with a focus on actual usage of cloud services rather than actual behavior, as in the case of TRA (Buabeng-Andoh, 2018).

Social cognitive theory. The focus of social cognitive theory (SCT) is to understand the relationship an individual has with his/her current and future environment (Ratten, 2014). Social influence leads to variation in individual behavior in terms of the use and acceptance of technology (Hwang et al., 2016). SCT explains the self-efficacy that involves coping with challenges of service innovation and motivational aspects to achieve technology acceptance (Ratten, 2016). From the SCT perspective, cloud adoption reveals that top leadership and absorptive capacity both influence the adoption behavior of individuals (Ratten, 2016). TAM and SCT are helpful for evaluating the relationship between actual usage and the influence of environmental factors on consumer attitudes to adopting cloud computing services (Ratten, 2019). Social and cognitive factors have become critical determinants of technology acceptance and the IT adoption decisions of individuals (Ratten, 2019). SCT includes internal and external environmental conditions that influence perceived user attitudes at the workplace toward cloud adoption (Ratten, 2015). The SCT and TAM frameworks help explore adoption behavior during technology usage, before the decision of adoption, and at the implementation stage (Ratten, 2014). The primary tenets of SCT as it applies to IT include self-efficacy, social norms, and management commitment (Shao, 2018). The SCT framework analysis includes aspects

such as capability judgment, personal pleasure, and expectations and external environmental factors such as social relationships, peer influences, and organizational management (Shao, 2018).

Lazy user theory. TAM, SCT, and UTAUT explain a user's intention to accept technology. However, they do not provide information regarding how the user selects solutions (Tetard & Collan, 2009). For example, cloud products and services that provide numerous alternative solutions, methods, and processes of implementation and use. The current IT landscape consists of an intricate amount of products, solutions, processes, and practices, all of which lead to several different options to fulfill user needs and enterprise requirements (Merschbrock et al., 2015). Tetard and Collan (2009) proposed the lazy user theory (LUT) to explain the selection process of an individual to meet a set of requirements while selecting from among different available alternative solutions. Frank et al. (2018) used LUT to predict differences in usage behavior due to switching the current solution to a future solution, considering the difference in contexts, habits, and intent to use. The LUT model assumes that the user chooses a solution alternative that requires the least effort and follows the path of least resistance (Frank et al., 2018; Tetard & Collan, 2009). The term lazy user forms the central tenet of the LUT. The practitioner uses LUT to create a set of viable solutions and alternatives per user needs/states, recursively selecting based on the lowest level of effort (Milković et al., 2018). The user state defines the circumstances of the usage of IT, and it also accounts for limitations in the user's choice function (Merschbrock et al., 2015). The preferred solution reflects that the user has perceived information needs—such as the function of urgency, type, and

depth (Merschbrock et al., 2015). According to LUT, the effort conveys a combination of time, money, and energy for physical and mental work with the use of technology (Merschbrock et al., 2015). The LUT model leads to improved decision-making, economics analysis, and generates a novel perspective for exploring usage behavior in solving IT investment problems (Morgan & Ngwenyama, 2015). In comparison to the TAM, TRA, and UTAUT2 models, LUT determines actual usage considering the cost to switch to the mandatory environment, PU, and social norms for acceptance of IT (Frank et al., 2018; Milković et al., 2018).

Cloud Computing

Cloud computing converges IT strategy and business agility (Choi et al., 2018). Cloud computing presents new business opportunities and supplies unlimited resources as network-distributed infrastructure leveraging virtualization technologies (Cearnau, 2018). Cloud computing is beneficial to all users, facilitates a variety of IT products as utilities at reduced costs, and ensures improved quality of service (Mvelase et al., 2016). Regulation for cloud computing includes the cloud security alliance (CSA), Information Systems Audit and Control Association (ISACA), National Institute of Standards and Technology (NIST), European Commission (EC), and European Cloud Partnership (ECP) (Cearnau, 2018). However, adoption, implementation, and actual use of cloud services all depend on the behavioral intention of users and enterprises to accept cloud services against the risks involved. The technology adoption process involves three stages of initiation, adoption decision, and implementation (Ratten, 2019). Technology acceptance and actual usage form a critical factor in measuring the success of an IT

system or service (Hwang et al., 2016). Due to the lack of perceived value of cloud-based technology and the frustration associated with rapid technological changes, cloud implementation challenges have increased (Hartmann et al., 2017).

Although cloud computing is a rapidly growing phenomenon, researchers and IT leaders face an elaborate amount of challenges in implementing and adopting it. Globally, cloud markets have expanded by 22% per year (Attaran, 2017). Cloud attacks threaten larger communities and entities such as cloud service providers, consumers, vendors, external agencies, networks, and virtual machines (Rakotondravony et al., 2017). Over 140 million malware attacks happened in 2015 (Rakotondravony et al., 2017). Lack of trust, vulnerabilities, and security concerns hinder the economic value of cloud computing (Cearnau, 2018). According to the global IT security risks survey, cloud-related vulnerabilities lead to attacks that have an impact of $52,000 to $444,000 per incident (Rakotondravony et al., 2017). Social processes and PU significantly influence the intention-to-use of cloud technology (Utama & Sugiarto, 2018).

Further, cloud computing raises business expectations and strategic IT requirements, such as improved economic efficiency, competitiveness, data analytics, quality assurance, and service quality (Kozlove & Noga, 2018). Cloud technology makes it easier for users to develop, store, and access new and complex IT socio-communications systems comprising interconnected information sources (Lypak et al., 2018). Cloud computing improves business performance; however, integrating with modern and now all-embracing IT requires implementation strategies and individual technology acceptance (Onan & Simsek, 2019). Recognizing the role of social influence,

mandatory settings, and leadership in technology acceptance promotes a broader view of cloud services usage (Hwang et al., 2016). However, only a limited amount of research exists in strategic IT, leading to business development with cloud computing capabilities (Kathuria et al., 2018). According to the Forrester report, cloud markets are growing at a rate of 22% compound annual rate (Attaran, 2017). However, many obstacles prevent rapid adoption. For example, they are trusting the vendor security model, customer inability, support for investigations, loss of physical control, exposure of data to a foreign government, and quality of service guarantees (Attaran, 2017). A survey of 660 cloud experts from 3 different industry types revealed concerns over the lack of business performance strategies (Raut et al., 2017). Therefore, the objective of this study is to explore the successful use of cloud computing in achieving operational and strategic flexibility (business performance), particularly for public sectors.

Adoption, Acceptance, and Actual Use of Cloud Computing

Users that adopt the latest IT to improve business performance embark on diminished value without improved vision, capabilities, and innovation from IT leaders (Raguseo & Vitari, 2018). Today, all corporate leaders face the dynamic and critical question of how to innovate with rapidly evolving IT (Raguseo & Vitari, 2018). With rising cloud investment, there has also been an increase in IT complexity (Linthicum, 2018). The global generation of data in the last two years increased enormously by 90% (Olufemi, 2019). The IDC survey predicts that 70% of companies are likely to have a minimum of one cloud service and global investments reaching $530 billion by 2021 (Hai et al., 2018). However, IT complexity is likely to increase by 25% in the next five

years (Linthicum, 2018). The biggest challenge in implementing IT services is to ensure user buy-in by improving beliefs in benefits and reducing perceived risks of cloud services (Hwang et al., 2016). Integrations of the latest IT trends, such as mobile computing, IoT, fog computing, and big data analytics with cloud computing, create an overly complex IT landscape (Olufemi, 2019).

In public sector organizations, business agility, adaptability, and alignment ensure the sustainability of the latest IT (Schniederjans et al., 2016). For public and private sectors with a limited cloud implementation scope of resolving overridden business problems, it will soon become imperative to use cloud computing as a strategic option due to its increased pervasiveness (Linthicum, 2018). Business IT agility makes it easier to tackle changing socioeconomic situations and strengthens cooperation between organizations in the public sector (Schniederjans et al., 2016). Cloud computing enables public sector leaders to construct a strategic value appropriation (SVA) path (Schniederjans et al., 2016). SVA helps IT leaders improve business-IT alignment, the collaboration between its departments, and adaptability to changing public service needs (Schniederjans et al., 2016).

The PU, PEOU, and intent-driven actions governed by function, motivation, and objective to use technology facilitate strategic planning for user acceptance of cloud technology (Wang et al., 2018). Behavioral intent (BI) is the probability with which users subjectively adopt a technology (Prasanna et al., 2017). The extent of TAM3-based strategic planning suggests BI for the successful use of cloud-based technology (Shana & Abulibdeh, 2017). Adopting the cloud to achieve strategic objectives requires an

understanding of motivating factors to make informed decisions (Prasanna et al., 2017). Technology acceptance of cloud services involves a multi-stage process that the researcher explores to establish temporal aspects (Hwang et al., 2016). Further, critical factors such as perceived IT risks, strategic leadership, PU, and PEOU affect the user acceptance of cloud computing affected (Prasanna et al., 2017). PEOU influences PU and, thus, actual use (Najantong et al., 2018). In a survey involving 220 IT experts, TAM3—variables such as perceived IT risks, PU, and PEOU—contributed 60% of the user acceptance variance (Prasanna et al., 2017). Therefore, researchers need to adopt a more holistic exploration to explore strategic cloud adoption. For example, integration of TAM with social and organizational processes enables a detailed understanding of external variables influencing PU and actual usage (Abdullah & Ward, 2016). Support from the top management reflects the collective interest of business (Carreiro & Oliveira, 2019). Business support enables IT leaders with fast decision-making in an integrated environment of cloud computing (Carreiro & Oliveira, 2019).

Users of cloud innovation adopt as the early majority and the late majority (Olufemi, 2019). Early adopters of the cloud risk becoming locked in with less developed cloud offerings but reap the benefits of innovative advantage (Choe & Noh, 2018). IT leaders must explore and rank the innovative factors in cloud adoption before crucial decision-making and strategic planning (Raut et al., 2017). Uncertainties are associated with cloud-based adoption of business information systems, technology architectures, and translation of business goals to integrated services of infrastructure as a service, SaaS, and other cloud technologies (Potter et al., 2017). The technology drivers for cloud

adoptions are full IT virtualizations, pay-per-use services, and scalability. However, barriers to cloud adoption arise due to lack of capabilities within an organization, information assurance, trust in cloud vendors, cultural issues such as rigid organizational strategies, compliance, and national standardizations (Potter et al., 2017). Although market revenue for global cloud services reached the US $555 billion in 2020, organizations face hurdles in cloud adoption such as cost, reliability, and security (Luo et al., 2018). SaaS global market reached US$ 12.1 billion in 2014 and continues to grow annually at a rate of 26% (Gashami et al., 2016). However, several challenges, such as privacy, security, and perceived lack of control, might negatively impact the cloud's actual business usage (Gashami et al., 2016). Implementation of cloud computing in private clouds requires more expenditure and an efficient IT team. In contrast, public cloud deployment is subject to security, transparency, and compliance risks (Adele et al., 2017).

Strategic IT

Cloud computing brings overall performance improvements to IT, operational benefits, efficient internal operations, improved capacity utilization, and tools for employee collaborations through shared and universally accessible services (Luo et al., 2018). However, a lack of strategic focus in cloud implementation has resulted in 57% of cloud adoption failures (Khalil, 2019). Rapidly growing technology implies that companies require strategically defined IT and clear responsibilities focused on business performance in addition to software and hardware maintenance (Reichstein, 2019). Thus, I considered IT alignment with the business as a strategic linkage or the extent to which

IT supports business planning. The methods used in the IT evaluation also extend to cloud computing (Maresova et al., 2017): for example, economies of scale in IT evaluations—such as investment return, net present value, internal rate of return, economic value, or total cost of ownership—and qualitative evaluation methods, such as balanced scorecard, cost-benefit analysis, porter value model, total quality management. IT leaders create strategic IT strategies integrating IT capital, IT assets and investments, processes, expertise, process, and organizational capabilities (François et al., 2019). In today's competitive environment, alignment between IT and business remains a critical concern for business leaders (Aboobucker et al., 2019). Strategic alignment between IT and business consists of multi-dimensional, product-, quality-, and market-driven activities aimed at achieving financial returns, operational excellence, and market performance (Aboobucker et al., 2019). IT leaders realize the competitive advantage of cloud implementation by maximizing IT programs, portfolios, and strategic dimensions through an informed selection of common developments (Vasyl & Danylo, 2018). Strategic IT has grown in recent decades—with system architecture integration into business processes, resources, and socioeconomic goals—particularly with emerging technologies such as cloud computing (Merali et al., 2012).

Currently, public sector CIOs focus more on improving citizen services, value, and investments than on the technical aspects of operations (Newcombe, 2019). Government organizations undertake a dual role in cloud innovation by adopting and regulating cloud services and grid computing (Wang et al., 2019). Cloud services in the public sector require sustainable leadership, massive funding, and addressing public

policy challenges (Abu-Shanab & Estatiya, 2017). However, the cloud-based public sector is an indicator of nation-wide technological development (Abu-Shanab & Estatiya, 2017). The advent of cloud computing has shifted the public-sector IT strategy from building software systems to the socioeconomic context, managing customer expectations, and helping e-government services (Newcombe, 2019). In the field of cloud computing, IT personnel perform dual functions of business/system analysts (Vithayathil, 2018). Successful cloud implementation focuses on socioeconomic factors, such as market competition in formulating cloud-based enterprise service strategies (Khalil, 2019).

Cloud Computing, Strategic IT, and Acceptable Model

Cloud computing enables strategic value appropriation through its innate capabilities. However, individual IT professionals lack strategies to use cloud computing to improve business performance (Marchisotti et al., 2019). Cloud computing generates new peripherals for IT leaders for social integration IT strategy (Marchisotti et al., 2019). These peripherals include accessibility, security, sharing, scalability, perceived ease of use, network, and storage, and represent strategic business model adoption perceptions for organizational IT leaders (Marchisotti et al., 2019). Cloud-based IT develops competitive differentiation strategies for its organizations (Kathuria et al., 2018). Cloud computing generates sense-and-response strategies for organizational IT to continuously reinvent the value chain and opportunities, thereby resulting in better business performance, quality, and innovativeness (Kathuria et al., 2018). Cost-benefit analysis (CBA) is the most effective method in cloud computing analysis. CBA describes the

strategic management and economic criteria of the company's cloud implementation in terms of IT versatility to operate effectively with increased functionality, configuration, and responsiveness to updates and emergencies (Maresova et al., 2017). Balanced scorecard analyses reveal that cloud computing offers continual tactical innovation—such as strategically enhancing PU, PEOU—and collaborations rather than improving operations (Alharbi et al., 2016).

A study of various industries indicates that organizations use cloud computing primarily for strategic implementation to gain a business advantage than support activities (Chen et al., 2016). For example, advantages such as user experience, agility, integration, flexibility, and cost reduction. The strategic IT capabilities of cloud computing deliver macro-level usage to construct social technology for business agility, collaboration, and competitive advantage (Govindaraju et al., 2018). IT leaders gain business flexibility from cloud computing in two ways: improved organizational sensitivity to scalability and re-configuration with adaptive resources to changing needs (Kathuria et al., 2018). Partners gain a strategic advantage with the cloud to improve collaboration for economic and environmental performance (Schniederjans & Hales, 2016). The innate features of cloud computing help users with organizational agility through operations, partnering, and customer-centric innovation (Liu et al., 2018). Examples of innate cloud characteristics: reusability, scalability, and shareability. Gartner predicts that cloud computing investments are likely to amount to one trillion dollars globally by 2020 (Vithayathil, 2018). With growing benefits and increasing investment in cloud computing, the role and relevance of an on-premises IT department transforms into

a strategic value accumulator and cloud provider as a strategic utility vendor (Vithayathil, 2018).

Transition and Summary

This section consisted of a literature review with critical analysis and synthesis of the TAM3 conceptual framework and other contrasting models, as they relate to the purpose of the study. The TAM3 conceptual framework supplied the design features for a strategic value appropriation path for achieving business agility, collaborations, and adaptability in public sectors for improved business performance. The literature review focused on discussing strategic planning for adoption, acceptance, and usage of cloud computing based on the TAM3 for sensing and responding to business needs.

Section 2 describes the role of researcher, participants, research method, research design, sampling method, ethical research, data collection instruments, data collection technique, data organization techniques, data analysis and reliability, and validity. Section 3 contains rich thematic descriptions based on evidence and the qualitative data analysis strategies described in Section 2.

Section 2: The Project

In this section, I explain the conduct of the study and quality indicators or boundaries involved, beginning with the purpose statement. I outline the primary project schemes of this doctoral study by distinguishing positions, expanding the research method and research design discussion, rationalizing the population sampling, and clarifying the ethical treatment of subjects. I explain the data collection process, data organization and data analysis techniques, strategies, and the qualitative criteria that determined the trustworthiness or reliability and validity of the study.

Purpose Statement

The purpose of this qualitative multiple case study was to explore the strategies that IT leaders in public sector organizations implement to utilize cloud computing to improve their organization's service performance. The population of this study included IT leaders from public sector organizations in Texas, USA. The target population of IT leaders includes CIOs, IT solution leaders, cloud business process champions, and business process owners. Cloud-digitized public services are likely to result in positive social change for users, such as through improved civic services, civic engagement, collaborations between public and government, policymaking, and added socioeconomic value.

Role of the Researcher

In qualitative research, the researcher performs a participatory role as the primary instrument of the study to collect evidence (Clark & Veale, 2018). Researchers collect evidence not as numbers but as a text representing participants' experiences, thoughts,

and views (Clark & Veale, 2018). A qualitative researcher's role consists of multiple responsibilities, which include preparing the interview, designing the research study, interacting and communicating with participants, conducting the study ethically, and analyzing and synthesizing data (Dennis, 2018; Karagiozis, 2018). The qualitative researcher performs the role of researcher with reflection, empathy, and positionality of insider and outsider with participant organization during the case study (Macintyre & Chaves, 2017; Wesely, 2018). Thus, as the qualitative researcher of the study, I have taken roles and responsibilities such as creating interview questions, designing the study, serving as a primary instrument of the study, and eliciting evidence regarding the phenomenon of successful cloud implementation in the public sector in Texas, USA.

Successful qualitative studies depend primarily on the researcher's interpersonal skills and their degree of sensitivity, responsiveness, and adaptability to recognize participants' views, develop trustful relationships, and inquire about phenomena (Karagiozis, 2018). I have 20 years of professional IT experience, with the last 6 years in cloud computing. I am a certified cloud solution associate. I am experienced in planning, implementing, and migrating enterprise resource planning solutions and IT services to various cloud providers. I have worked as an IT professional in public sector organizations and educational institutions. I have been a resident of the state of Texas since 2014. I have worked in the region of the study since 2014 but did not work at the participating organizations of this study. I worked as an IT professional for a couple of local business organizations. However, I had not interacted with the study participants before beginning this project.

The Belmont report guides researchers in planning and ethical conduct of research (Belmont Report, 1979). The report includes, for example, guidance regarding informed consent, systematic collection and analysis of information, and selection of subjects with a focus on information collection rather than practice and by following pre-designed interview protocols (Domenech et al., 2017). The report's basic ethical principles consist of respect for persons, beneficence, and justice (Adashi et al., 2018). Its ethical principles require the researcher to meet specific requirements, such as collecting informed consent, performing risk/benefit assessment, and selecting the appropriate population for research (Belmont Report, 1979). Thus, per the report's ethical principles and guidelines, I followed an informed consent process, used systematic data collection and analysis, and used defined interview protocols. I included the protocol used for the semi-structured interview in Appendix A.

Researchers acknowledge and incorporate biases through reflexivity rather than minimizing them (Noh, 2019). The researcher implements reflexivity by taking positions in the field of research, such as insider/outsider viewpoints, to assess phenomena based on individual participants' observations and experiences (Noh, 2019). Researchers archive positionality by identifying personal values/biases and experience and by considering participants' social identities (Pena et al., 2018). Reflexivity allows researchers to perceive facts from a certain point of view in a working setting (Pena et al., 2018). Researchers not only rely on their positionality but associate with participants in every step of the research for knowledge construction while cultivating trust (Pena et al., 2018). Thus, in this study on the real-world phenomenon of cloud computing

implementation, I mitigated biases through reflexivity by adopting positionality. I adopted positionality for the social environment of the research and recognize experiences, values, and biases during the development of rapport with participants. I used cloud computing experiences, ethical values, and perspectives gained during the doctoral study to develop an understanding of key issues in cloud computing. I inferred from my experiences of IT implementations in public sectors to improve my reflexivity as an insider and outsider during the research.

Qualitative researchers adopt interview procedures consisting of instructions and a checklist to reduce observer biases (Esser et al., 2019). Interviews conducted without appropriate protocols result in researchers' biases due to incoherent and incomplete reports and inadequate protection of subjects (Navarro et al., 2019). Interview protocols control biases by reducing the cognitive overload of recalling information and distortions during recording, and the researcher relies on the concurrent interview protocol information during data collection (Muhammad, 2019). The interview protocol I used reduced biases, improved observations/coherence, and adapted to research demands for notetaking and retrospection. It improved my observations and note taking ability. Therefore, I used the correct interview protocol.

Participants

Eligibility criteria of the target population whose characteristics meet the interests of researchers form the basis for selecting participants (Martinez-Mesa et al., 2016). The qualitative study researcher uses eligibility criteria to determine the best-qualified participants to respond to research questions, such as those with experiences in cloud

computing (Sargeant, 2012). The qualitative researcher uses eligibility criteria for the study participants (Devers & Frankel, 2000). Researchers select individuals capable of answering research questions to develop information-rich cases that provide insights into the study phenomena (Devers & Frankel, 2000; Ishak & Baker, 2014). I selected participants that met all the following criteria: (A) The participant holds a job title indicating a leadership role for a minimum of 1 year in public sectors. (B) The participant holds a cloud computing certification or has participated in the cloud solution implemented at a public sector organization. (C) The participant's job duties show strategic and operational involvement in technology acceptance of cloud computing in the public sector organization. (D) The participant had at least 2 years of experience in cloud computing and a minimum of 10 years' experience in IT. Thus, this study's participants are IT leaders with experience in implementing cloud computing in a public sector organization.

Qualitative researchers gain access to participants' environment, and gaining access involves ongoing effort rather than a one-time activity (Clark & Veale, 2018). Researchers negotiate with the participating organization's guides or gatekeepers for initial access to research sites and participants, maintaining access throughout the data collection process (Amundsen et al., 2017). Securing interviewees' access often involves administrative tasks with tactical design elements such as negotiations, maintaining access, and addressing the perceptual risk of refusal throughout the access process (Peticca-Harris et al., 2016). The researcher uses a transparent process based on informed consent. Informed consent includes research study information and the voluntary nature

of participation requests with the gatekeepers of identifying potential participants based on pre-established criteria (Fiona et al., 2019). A clearly defined purpose and interview plan serve as the primary strategy for communication to research participants and consist of a four-layer model of introduction, collection of evidence, re-entry, and closing (Johl & Renganathan, 2010). Researchers must reveal the benefits of the research results to the organization to improve mutuality for rapport development in a strategic method referred to as reciprocity, without accepting any organization's benefits (Shenton & Hayter, 2004). Other communication methods include a known sponsor approach and a phased approach (Shenton & Hayter, 2004). Therefore, the strategies I used for gaining access to participants include: (a) provide the individuals of the organization under the study and its gatekeepers with full details of the study, (b) provide a clearly defined interview purpose and plan, and (c) reveal the benefits of the research study. I included the participant invitation email in Appendix B.

The relationship between the researcher and the participant begins long before the interview takes place—via initial contact through digital technologies—and working within the participants' comfort level during face-to-face interviews (DeJonckheere & Vaughn, 2019). Researchers require interpersonal traits and procedures, such as ensuring appropriate appearance and communication, to maintain distraction-free conversations during the interview (Johl & Renganathan, 2010). To achieve prolonged conversations with participants, the researcher must remain transparent and task-oriented (Shenton & Hayter, 2004). The researcher uses informed consent and conference room interview settings to ensure participants' privacy and appropriate treatment (Fetters et al., 2016).

Therefore, to develop working relationships with participants, I performed an initial orientation. I scheduled appointments and demonstrated a professional attitude that ensured an honest and task-oriented dialog and appropriate dress code and language for conducting the study.

Research Method and Design

Research Method

Three commonly used research methods are qualitative, quantitative, and mixed methods (Trochim et al., 2016). The nature of the problem, the researcher's experience, and the study purpose form essential criteria for selecting research methods (Trochim et al., 2016; Yin, 2018). Qualitative and quantitative approaches represent two distinct paradigms to describe and analyze reality accurately. Quantitative researchers, as positivists, see the reality as a phenomenon governed by unchangeable natural causes-effects, and that is quantifiable (Dodgson, 2017; Gamlen & McIntyre, 2018; Johnson, 2011). Qualitative researchers as post-positivists view reality as an observable phenomenon that enables researchers to gain insight into an individual's subjective context, essence, and underlying intentions and behaviors (Gamlen & McIntyre, 2018; Johnson, 2011). Based on the proposition that individuals do not see the world objectively, the qualitative methodology relies on understanding the phenomena as a holistic, real-world context and knowledge creation through participants' subjective experiences (Shylet, 2016; Yin, 2018). Holistic thinking stems from direct perception through intuitive and spontaneous understanding, followed by knowledge creation through evidence-based analysis and synthesis (Murshed & Zhang, 2016; Smith, 2018).

In contrast to analytical thinking, the researcher sees the objects as detached from the context by logical and formal rules with quantifiable information processing indications (Murshed & Zhang, 2016; Smith, 2018). This study's focus is to obtain a holistic understanding of the phenomenon of cloud computing implementation in the public sector. In qualitative research, the researcher brings their uniqueness to the study while exploring reality as the subjective context of an individual participant (Dodgson, 2017; Onwuegbuzie & Leech, 2005). Therefore, I have selected a qualitative methodology to explore cloud computing as a holistic observer through direct perception and gain an in-depth understanding of the phenomenon.

In a quantitative method, the researcher examines relationships among variables and objectively tests treatments' effect with the ontological stance that the nature of reality is governed by unchangeable causality (Thurairajah, 2019; Yates & Leggett, 2016). Quantitative research emphasizes the study of objective reality divided into the finite cause and effect relationships (Murshed & Zhang, 2016). The quantitative approach promotes closed-ended inquiry based on the proposition that changes in the environment or observer do not alter the outcomes and their perceived values (Dodgson, 2017; Kegler et al., 2019). Quantitative research has limited effect in addressing research questions that are designed to explore perceived usage through rich text descriptions (Trochim et al., 2016). The quantitative method limits the researchers on data collectors' role through pre-designed surveys and experiments (Trochim et al., 2016). This study focuses on gaining insights into the context of cloud computing in public sectors to explore the underlying concepts, strategies, and perceived motivations of IT leaders. A descriptive

analysis based on cause-effect would not sufficiently interpret this contemporary phenomenon, its problem-setting, and the conceptual framework involving the perceived usage of cloud computing in the public sector. Thus, I did not select a quantitative method for this study.

Mixed-method research uses both qualitative and quantitative approaches. A mixed-method researcher inquires with a central premise that a simultaneous or sequential combination of two methods to produce a more complete understanding of the phenomenon than either approach alone (Wilkinson & Staley, 2019). A decision regarding whether to use a combination of methods depends on the problem settings of the inquiry, such as the need to understand distribution frequencies, contextual exploration, providing corroborative, extended, and complementary explanations, and using contradictory data (Brannen, 2005). The mixed-method approach compensates for the weaknesses and limitations of mono-method research (Kelle, 2006). The problem setting and conceptual framework of this study were selected to attain a detailed exploration of this contemporary cloud computing phenomenon to reveal the underlying concepts, theoretical constructs, and patterns; simultaneously analyzing the factors involved in the successful implementation of cloud computing in public sectors is not suitable in this context. Therefore, I did not select a mixed methodology for this study.

Research Design

Case study design provides the researcher with a pragmatic, flexible approach to understanding practices, processes, complexities, and sensibilities to process contemporary phenomena (Helena et al., 2017). By setting contexts in the real world,

case study researchers ensure rich descriptions and accurate revelations (Helena et al., 2017). The qualitative researcher uses case studies to establish a first-person perspective on contemporary phenomena independent of space and time but contextually bound (Alpi & Evans, 2019; Helena et al., 2017). Through this approach, researchers creatively synthesize multiple streams of evidence, contextualize findings through what and how inquiry into the phenomena, set boundaries to scope the research for the richness of descriptions, and report case descriptions and case themes (Alpi & Evans, 2019; Helena et al., 2017). Qualitative researchers use case study design in IT to explore various software deployment stages and understand the underlying constructs of perceived benefits, drawbacks, and strategies employed by different stakeholders (Martínez-Fernández et al., 2017). Qualitative researchers use case study design to gather multiple stakeholder perspectives and use multiple cases for obtaining precise outcomes (Alpi & Evans, 2019; Yin, 2018). In the multiple case study design, the researcher employs a conceptual framework to guide research questions, data collection strategies, and analysis (Yazan, 2015; Yin, 2018). In this multiple case study, I explored the usage of the cloud (case boundary) and specific strategies using by IT leaders that lead to improved performance in public sectors (contextual boundary). Therefore, I selected a multiple case study design for this qualitative study.

To understand the nature of phenomena, phenomenological researchers explore the lived experiences of individuals (Bleiker et al., 2019). Phenomenological researchers adopt an ontological stance of sufficient articulation, through reconciling the description and interpretation (collective experience) of the phenomenon or by managing the

reduction of analysis (to the sum of the parts) of the phenomenon and the reflectivity of the study background (Aagaard, 2017; Bleiker et al., 2019). In contrast to other forms of qualitative research, phenomenological researcher relies on human science's complex philosophical approach. Phenomenological strategy leads to a gap in lived and understood phenomena due to the need for the researcher's experience in integrating humane practices such as joy, caring, love, and loss (Adams & Manen, 2017). Thus, phenomenological research requires training and skill in human science philosophical approaches such as reflective writings with intentionality (purpose-driven) through epoche-reduction (e.g., reducing outside noise during observation of phenomena such as methodology, self-discovery, explanations, and experiential corrections) (Begona et al., 2018). This study was not limited to understanding the participants ' experiences. In this study, I explore the context of the actual use of the cloud and case organization of this contemporary phenomenon of the successful implementation of cloud computing by IT leaders in the public sector. Therefore, I did not select the phenomenological method as a research design for this study.

An ethnography researcher does not concentrate on individuals but, instead, on demographic patterns with the underlying assumption that culture affects behaviors (Dodgson, 2017). Ethnography researchers interpret an entire cultural group through patterns of values, behaviors, beliefs, and languages through direct observations, cultural artifacts, and interviews (Yates & Leggett, 2016). In contrast to other qualitative research methods, ethnography researcher explores people’s behaviors and interactions among groups that share common cultures and beliefs over a period and analyzes specific

cultural patterns in their environment (Haradhan, 2018). This research study does not align with the ethnographic perspective of the population's collective cultural experiences. Instead, I focus on studying the strategies used by leaders of IT in the context of the contemporary phenomenon of cloud computing. Therefore, I did not select the ethnography research method as the research design for this study.

Qualitative researchers address data saturation by comparing topics and concepts across interviews, data sources such as no new data/themes/observations, and ensuring that sufficient information is available to replicate the study during analysis (Fusch et al., 2018). A large or small sample size does not guarantee data saturation (Fusch et al., 2018). Qualitative researchers determine the data saturation by quantifying the number of new observations per interview, tracking key concepts and patterns until no new topics emerge. (Forero et al., 2018). Qualitative researchers select their cases and sample size gradually until data reach a saturation point; then, the researcher stops further interviews if stories begin to repeat among participants (Ishak & Baker, 2014). Thus, I ensured data saturation based on themes and no new observations.

Population and Sampling

The criterion sampling method is defined as non-probabilistic purposeful sampling to identify participants that meet the predetermined importance for case studies (Ghaffari & Lagzian, 2018). In contrast, snowball sampling helps identify additional participants by seeking guidance for further informants (Ghaffari & Lagzian, 2018). In the criterion sampling method, the researcher establishes a questionnaire to identify participants purposively (Benoot et al., 2016). The researcher purposively includes

specific characteristics, selects information-rich participants in alignment with the case study, and provides in-depth information rather than empirical generalizations (Benoot et al., 2016). The researcher predefines the context and the boundary of case studies. The researcher uses a criteria sampling method intending to elicit data for thick descriptions and contextual information (Ridder, 2017). To best fit the research objective, the researcher uses a criterion sampling framework with the participants' inclusion and exclusion criteria (Ames et al., 2019; Suri, 2011). Thus, I used the criteria sampling method for purposive sampling in this study to invite everyone that matches the selection criteria within participating organizations.

Qualitative studies involve smaller samples (average of 12) than quantitative studies due to the collection of detailed information, which rapidly reaches data saturation (Levitt et al., 2017). Sample size in a qualitative study is justified in terms of the scale of data quality and data saturation; moreover, in a case study with participants with relatively similar experiences, a sample size of 8 and until saturation is achieved may suffice to explore their daily experiences of the phenomenon (Lamoureux et al., 2018; Yin, 2018). Qualitative interviews generate large sets of detailed information from the smaller sample. The researcher uses open-ended questions for in-depth inquiry (Rosenthal, 2016). Qualitative researcher seeks a sample to understand and combine experiences, attitudes, practical work, opinions, knowledge, feelings, and background (Rosenthal, 2016). In this study, I explored the strategies that IT leaders in public sector organizations implement to utilize cloud computing to improve their organization's services. Thus, I expect the target population of 9 participants to generate large sets of

evidence in case study research to meet the data quality and data saturation requirements for this study.

During the interview, the researcher ensures data saturation utilizing a documented process or a grid report that tabulates patterns, constructs, or concepts generated during each interview (Fofana et al., 2020). During interviews, a qualitative researcher reaches data saturation if the grid report shows all relevant topics captured and no added information (Fofana et al., 2020). During data collection, the researcher uses a codebook to highlight topics in evidence data as codes (Hagaman & Wutich, 2017). Researcher comparatively analysis the codebook for data saturation. Data saturation is achieved by gaining sufficient conceptual knowledge and an in-depth understanding of required phenomena and measured based on the topics highlighted in the codebook (Constantinou et al., 2017). Therefore, using a codebook along with a tabular grid report, which lists relevant topics (patterns, constructs, or concepts) generated during the interview, I ensure data saturation. I consider data-saturated when no new relevant topics emerge during interviews, and I have enough conceptual information to understand the phenomena thoroughly.

In a qualitative interview, the researcher conducts one-to-one conversations in a private environment, such as a secure office location or isolated open space, to avoid interruptions (Zhang et al., 2018). The researcher uses a private environment for improved collection of participants' responses and note-taking of non-verbal responses, such as intended meanings, and to make own observations based on researcher experience and understanding of the knowledge provided by participants (Zhang et al.,

2018). The interviews at the participant's workplace enable a naturalistic yet private setting for the participant to be comfortable, improves responses/immersion, promotes time efficiency, and enables the collection of rich, candid qualitative data (Fetters et al., 2016). A face-to-face audio recording interview setting must ensure participants' comfort and minimize disturbances (Dikko, 2016). Thus, I used the following criteria for selecting the location of the interview setting: (a) a location with naturalistic settings for the participants, (b) use conference rooms at the participant's workplace that provide closed doors and blinds, and (c) avoid interruption and background noises.

Ethical Research

Critical ethical dimensions in qualitative research include informed consent, ethics committee approval, and conflict of interests (Trung et al., 2017). The researcher implements informed consent through electronic information exchange between participants before the beginning of the data collection process and obtains authorizations (Sheikh & Hoeyer, 2019). I included an participant invitation form in Appendix B. Participants replied to the informed consent email consenting to their participation in the research. A qualitative researcher implements informed consent through disclosure of all ethical components of the study—including descriptions of motivational incentives provided to participants—and complies with institutional IRB guidelines to avoid dubious incentives that may function as coercion and have a negative influence on participants' self-esteem and autonomy (Trung et al., 2017). I have completed Form-A of the IRB review process, and I provided no incentives to participants to participate in this research. However, to improve reciprocity, I informed the participants about the benefits

of the research and its usefulness to society. The participants have the right to withdraw from the research at any time during the study by replying to the informed consent, and the researcher would then retract all of the data obtained from them (Cypress, 2018; Gupta, 2017). Thus, participants have the right to withdraw from the research at any point. Participants may withdraw at any time after agreeing to informed consent through responding to the emailed informed consent with the subject term “withdraw”. I did not use data from interviews with participants who choose to withdraw, and I discarded these data appropriately. Walden University's IRB approval number for this study is 12-21-20-0664777. I am certified by the National Institutes of Health (NIH) Office of Extramural Research (Certification Number: 2557465) and included in Appendix C. I am therefore trained in the protection of human research participants in the role of researcher.

I stored all raw data collected in a locked container digitally in the cloud. I used the cloud container on the S3 storage service by AWS. For five years, I protected this data by encryption, security, and other safeguards. After five years, I will permanently destroy the evidence. The researcher identifies sensitive information involved in the evidence data and research publication such as participant names, organization names, usernames, and other IT system information and performs de-identification through masking or scrambling to remove all explicit identifiers to participants and its organization (Heffetz & Ligett, 2014). Thus, I classified information of the participants, organizations, and explicit references to participating organizations in the evidence data as sensitive information and perform de-identification procedures through masking.

Data Collection

Data Collection Instruments

Semi-structured interviews enable open-ended dialog (Brown & Danaher, 2019). Qualitative researchers explore topics through a prepared agenda of questions and elicit open responses through free-flowing and emergent conversations (Brown & Danaher, 2019). Semi-structured interview methods provide the researcher with versatility and flexibility and enable reciprocity between researcher and interviewee (Kallio et al., 2016). The researcher conducts semi-structured interviews at the participant's location as a sixty-minute one-on-one interview so that participants can share their experiences in their own words during the study (Alase, 2017). Thus, I used semi-structured interviews as the primary method of data collection.

As the primary instrument, an academic researcher establishes an insider view during data collection while maintaining the position as an observer from his or her world views for understanding and knowledge accumulation (Hendy, 2020). As the primary instrument, the researcher collects data in an active-but-limited capacity as a co-creator with the participant to drive the local perspective and knowledge creation (Thomson, 2018). A qualitative researcher, as the primary instrument of the study, gathers data by thoughtfully engaging and creating participant experience in the context of the phenomena under study (Clark & Veale, 2018). Therefore, I am the primary instrument of the study in the role of researcher.

The qualitative researcher, as a direct observer, perceives the research information environment through critical and constructive skills, creative personality, and internal

motivation, all of which guide the research process and lead to discoveries, findings, artifacts, theories, and research journals (Steinerova, 2018). As a direct observer, the researcher collects data in co-creation with participants as a heuristic process of self-reflection, immersion, self-dialogue, and self-discovery that helps illuminate the observed phenomenon (Brisola & Cury, 2016). As a direct observer, the researchers ensure integrity by being reputable to oneself and consistent between one's values and actions (David & Priya, 2018). Qualitative researchers systematically explore and co-construct evidence through reflexivity while shifting between higher and lower knowledge positions in a research-participant-researched partnership (Råheim et al., 2016). Therefore, I used direct observations for data collection as the primary instrument of the study during the interview and fieldwork.

In a case study design, the qualitative researcher relies on various data sources, such as interviews, documents, field notes, and artifacts (Haamann & Basten, 2019). Qualitative researchers use other non-human sources for data collections, such as documents, records, audiovisual materials, or artifacts (Cypress, 2018). A multiple case study exploring the phenomena uses varied data sources, such as observations, archival materials, essays, responses, emails, focus groups, and documents (Peterson, 2019). Thus, I used field notes, artifacts, and company archival documents as data sources for this study.

The researcher increases the reliability and validity of data collection through the process of member checking or participant validation (Santos et al., 2017). The researcher verifies the completeness of the interpretations and establishes understanding

with additional feedback from the participants using member checking (Santos et al., 2017). The researcher conducts member checking at two stages of the research—first during data collection to verify the intended implications and second to ask some, or all the participants, to verify the concepts they conveyed (Varpio et al., 2017). Qualitative researcher reduces bias through member checking during data collection and interpretation (Birt et al., 2016). The researcher increases the trustworthiness of results and includes activities such a member checking with participants and verifying analyzed information with participants (Birt et al., 2016). Thus, I used member checking to enhance the reliability and validity of the data.

Best practices for interview protocols consist of the following core components: establishing rapport, establishing ground rules of the interviews, ensuring informed consent, and closeout procedures to complete the research project (Navarro et al., 2019). To establish rapport, the researcher promotes mutual dialog with the participants through interpersonal skills, being sensitive to participants' needs and singularities, being aware of engaging holistically, and being conscious of one's own reflexivity as a limitation and opportunity in the quest for discoveries and new knowledge (Berit & Brendan, 2018). Thus, I established an understanding and knowledge accumulation process with participants through verbal protocols, such as creating specific situations, asking questions to generate data. The two-step semi-structured interview proto includes: (a) domain-specific task performance of information processing, such as coordination of thoughts and actions, coding schemes to analyze participants' verbal responses, and member checking; (b) after-task processing protocols, such as recall, explanation, and

retrospection (van de Wiel, 2017). In the semi-structured interview technique, the researcher elicits the participants' understanding and knowledge by asking specific questions in alignment with the study's problem settings and observational strategies with the researcher as the primary instrument (Castillo-Montoya, 2016). The researcher, during a semi-structured interview, uses questions with problem settings and performs inquiry-based conversations during data collections (Yeong et al., 2018). Thus, I employ interview protocols to perform the role of a researcher. I used research questions to elicit experiences of participants' cloud computing phenomena while performing in-depth inquiry. I have detailed the interview questions in Appendix A.

Data Collection Techniques

The researcher applies data collection techniques after gaining access to the participant's work organizations (Wright et al., 2020). During data collection, the case study researcher performs multiple tasks of inquiry per interview protocol (Yeong et al., 2018; Yin, 2018). Besides, interview protocol, the data collection tasks include: following up on the conversation for clarification, performing an in-depth inquiry within the context, and reflecting upon the researcher's own experiences as an outsider (Yeong et al., 2018; Yin, 2018). The researcher maintains an insider position for mobilizing knowledge and social connection to gather data as the primary instrument of the study (Fusch et al., 2018; Wright et al., 2020). The researcher makes direct observation as an outsider to the context with critical distance and reflexivity with their own experiences and biases (Fusch et al., 2018; Wright et al., 2020). Thus, during data collection, I varied

my positionality as an insider and outsider. I conducted the inquiry-based on interview protocol and use reflexivity to gather in-depth evidence.

The researcher operationalizes data collection through a technique referred to as participant deconstruction (Wright et al., 2020). The participant deconstruction technique involves face-to-face settings, enabling audio recordings, spending time with participants with research questions, interview time, providing any hard copies, explanatory materials, taking notes, and asking clarifying questions (Moloczij et al., 2017; Wright et al., 2020). The researcher takes extensive field notes, audio recording, and captures point-in-time observations to understand phenomena, performs text analysis, and identifies data saturation levels during data collection (Renz et al., 2018). The researcher uses interpersonal skills, professional greetings and builds an initial rapport with participants with a focus on a personal voice with introspection from personal stories to improve participant comfort during interviews (Peticca-Harris et al., 2016). The data collection technique for the case study repeats to generate information until new information and themes emerge while collecting data from interviews, observations, artifacts, and documents (Tran et al., 2017; Wray et al., 2007). The case study researcher requests that participants supply related company artifacts and company documents as part of the data collection phase (Fusch et al., 2018). The case study researcher requests access to company cold storage to review related artifacts and documents (Yin, 2018).

Thus, I begin the scheduled interviews with greetings and introductions in a pre-arranged conference and meeting room. I enabled audio-recordings and took field notes, used a closed online conference rooms to avoid distractions, and briefly summarize the

meeting agenda. I began the data collection with participant deconstruction technique of face-to-face interviews and taking field notes. Field notes included direct commentary, key observations and key words. I included additional interpretation made during the live interviews in the field notes I ensured the comfort of the participant and proceed respectably. I performed the role of the primary instrument to co-create knowledge and understanding with participants. I inquired with an intent to capture intent meaning, not just direct translations. I performed a sample test of audio recording devices and begin the semi-structured interviews with demographic questions. I then started with interview questions while actively taking notes of observations made. During the fieldwork, I collected the case related documents and artifacts and request the participants for access to related document storage. Until the attainment of the point of data saturation, I repeated the data collection techniques and the process.

Apart from these advantages with data collection techniques, a few disadvantages are also associated with interview methods involving audio recordings and field notes. For example, an audio recording can be both a data collection barrier and a facilitator (Moloczij et al., 2017). Audio recordings help researchers with recall and transcribe evidence. However, barriers such as technical challenges can impact interview time, quality of interactions, and rapport (Moloczij et al., 2017; Tran et al., 2017). The researcher's task of access management goes beyond the gatekeepers' endorsement of access (Amundsen et al., 2017). It consists of tasks such as to ensure participation, interviews, and member checking with participants (Amundsen et al., 2017). Participant deconstruction requires the researcher to go beyond the gatekeepers' permission to

establish rapport and depends on the interactive skills of the researcher (Amundsen et al., 2017; Wright et al., 2020). Field notes increase the difficulty of filtering precise information to be included during the interview process (Phillippi & Lauderdale, 2018). Field notes included key phrases, significance of the sentence in relation to study and additional interpretation made during the live interviews. Such notes require the researcher to engage with the reflexivity of their own stories and experience to reflect on information observed during the fieldwork (Phillippi & Lauderdale, 2018; Renz et al., 2018).

The researcher uses member checking to verify data or findings with participants (Brear, 2019). By member checking, researchers reduce unrecognized biases, assumptions, and factual inaccuracies and improve knowledge co-creation (Brear, 2019). Researchers engage in enhanced dialog with participants during data gathering analysis by conducting member checks to deepen, repeat, and adjust the meaning of responses to research questions (Caretta & Perez, 2019). During the transcript review, the researcher asks the participant to check whether their words match the intended meaning, rather than the accuracy of transcription (Varpio et al., 2017). Therefore, I used the member checking for transcript review with enhanced dialog and review requests with participants to check the intended meaning.

Data Organization Techniques

Qualitative researchers use spreadsheets for the organization of research metadata, such as participant information, interview information, demographic labels pointing to the storage location of related data, and summaries (Karl & Kara, 2018). The researcher

uses spreadsheets for listing all the data collected, including versioning and location information (Moore & Llompart, 2017). Researchers do not store the full context of data in spreadsheets due to retrieval issues; instead, they create workspaces to store excerpts and location information (Geisler, 2018). Thus, I used spreadsheets to organize metadata, such as masked participant information, references to the entire storage location, and excerpts.

Cloud-based storage services for researchers facilitate storage redundancy, synchronization with ubiquitous access, and a multi-format content, with easy retrieval, searching, and versioning (Duha & Prybutok, 2018). According to the research data alliance (RDA), the common standards for the successful organization of research information include data preservation, accessibility, and reusability (de Waard, 2016). AWS S3 cloud storage facilitates users with economical options to pay per usage with a focus on research needs rather than preservation, hardware costs, and operational efficiency (Wadi et al., 2019). Thus, I intend to use the AWS cloud S3 storage service for data organization of all research data, including audio, documents, artifacts, text, and other formatted digital information. I enabled versioning on cloud storage used for the evidence data to prevent data loss and corruption.

The qualitative researcher uses cataloging and labeling to track and organize collected data as data sets of emerging understanding with easy learning goals (Raskind et al., 2019). Researchers use software applications to label and record the raw data to storage containers. Data collected from each participant and site results in one specimen to multiple data sets. The researcher then labels data sets on storage locations using

generated labeled folder names, which serve as the unique identifier (Oteyo & Toili, 2020). Data organization software such as NVivo offers computer-aided qualitative data organization and analysis software (CAQDAS) (Moore & Llompart, 2017). NVivo aids researchers in creating unique identifiers to label raw data specimens for storing data with learning and analysis goals (Moore & Llompart, 2017). NVivo helps researchers organize evidence from various sources and formats, such as audio recordings, literature, and documents, by generating labels (Paulus et al., 2017). Thus, I produced storage folder labels for data sets with a naming convention that combines masked participant names, masked site names, and labels. I used NVivo to generate labels and then store data sets manually with labeled folder names in AWS S3 cloud storage organized accordingly.

The researcher bridges the gap between data organization and the study purpose using reflective journaling as an organizer to preserve emerging understanding and track the related stored data set locations (Hussein, 2018; Raskind et al., 2019). Reflective journaling facilitates data organization into labeled data sets for easy tracking of evidence and organizes the data to align with the study purpose, emerging meanings, and measured data saturation (Oteyo & Toili, 2020; Power, 2017). Through reflective journals, the researcher tracks and organizes the raw data sets. (Bashan & Holsblat, 2017). The researcher uses reflective journals to recall the context of the participants' thoughts, decisions, positions and provides a means to return to the original thinking developed during data collection (Bashan & Holsblat, 2017). The researcher uses reflective journals along with labeling software such as NVivo for creating specimen IDs of data collected before organizing the information to persistent storage as labeled data sets (Cypress,

2018; Oteyo & Toili, 2020). Thus, I used reflective journaling to support the creation of data sets with labels using NVivo and organized storage to AWS cloud as folders named with labeled data sets of all raw data obtained during data collection from each participant and research site. I stored all raw data collected in a locked container digitally in the cloud. I used the cloud container on the S3 storage service by AWS. For five years, I protected this data by encryption, security, and other safeguards. After five years, I will permanently destroy the evidence.

Data Analysis

Case studies involve different data sources, such as interviews, documents, and field notes. The researcher uses method triangulation to begin the data analysis by reconstructing reality, reducing inconsistencies/prejudice, and increasing validity (Korstjens & Moser, 2018). In within-methods methodology triangulation (WMMT), researchers compare interpretations among different data sources and adopt the most suitable meanings of data sets (Marcio et al., 2018). Qualitative researchers reduce undetected errors or incorrect analysis during data analysis through WMMT of information from various sources (Joslin & Müller, 2016). Therefore, I used WMMT for the exploration of data sets for data analysis, conserving original meanings, and performing detailed analyses. Thus, as a preliminary step to data analysis, I minimized the possible inconsistencies, prejudices, and undetected errors during data analysis by reconstructing reality through the triangulation of sources (e.g., interviews, artifacts, and field notes).

Researchers immerse in evidence data through inductive reasoning during data analysis (Ridder, 2017; Zauszniewski & Bekhet, 2012). In this study, I use inductive reasoning as a tactical approach to the WMMT strategy. The researcher uses an inductive reasoning tactic to perform activities such as systematic cross-case comparison, moderating functions, increasing continuity, and congruence of descriptions (Ridder, 2017; Zauszniewski & Bekhet, 2012). During the inductive approach of data analysis, the researcher reconstructs reality as segmented patterns, inducing characteristics from individual case context, case environment, and social impact factors (Waldron et al., 2019; Zauszniewski & Bekhet, 2012). The researcher conducts inductive reasoning to create detailed descriptions, collaborations between data sources, and thematic explanations. (Waldron et al., 2019; Zauszniewski & Bekhet, 2012). Researchers develop thick descriptions from WMMT through inductive reasoning by adjusting overlapping factors, explicitly reflecting on coercing and pulling factors obtained from different data sources such as interviews, artifacts, and field notes (Zauszniewski & Bekhet, 2012). Researchers transfer the participants' social context of the case into analyzed thematic descriptions by accounting for details of behaviors, contexts, environment, commonalities (Bree & Gallagher, 2016; Korstjens & Moser, 2018). Thus, I objectively examine the evidence information with tactics from WMMT. I performed an inductive analysis to create conceptual dimensions and supply thick descriptions that reconstruct reality as themes that explore the problem context of this case study. I reflected on organized raw data sets for coercing and pushing factors, such as the social context of the individual, commonalities, continuity, congruence, and selective meanings. I objectively immersed

myself in evidence data from different data sources through inductive approach tactics to create segmented patterns of data for thick descriptions.

Qualitative researchers operationalize data analysis through the procedure of thematic coding (open, axial, and selective coding) and structurally assemble datasets into significant patterns, concepts, and thematic constructs (Williams & Moser, 2019). Once the qualitative researcher objectively immerses themselves with evidence data sets through methodology triangulation and an inductive approach, the coding begins with the paradigm of open, axial, and selecting categorizations of data (Cuellar & Mason, 2019). Thus, after immersion into evidence data through WMMT and an inductive reason approach, I began the hands-on coding of data sets. Using coding, I obtained thematic patterns, concepts, and constructs that signify business answers to research questions. I aimed at the thematic explorations of phenomena to explore strategies used by IT leaders in this case study.

The first operation involves analyzing data sets for open thematic codes in which the researcher looks for meaningful patterns towards answering research questions (Cypress, 2019; Williams & Moser, 2019). The researcher auto generates initial open codes created using an NVivo tool (Cascio et al., 2019; Ridder, 2017). The researcher then creates codes in NVivo based on words and phrases from the evidence data to identify patterns that signify the exploration of the research question (Cascio et al., 2019; Ridder, 2017). The researcher conducts an iterative inductive analysis process in the NVivo computer-aided qualitative data organization and analysis software (CAQDAS) tool to identify open codes until no new codes emerge (Lotzmann & Neumann, 2017;

Maguire & Delahunt, 2017). The NVivo CAQDAS tool facilitates researchers with building a codebook for a comprehensive analysis of large volumes of qualitative data from various sources of data (Cascio et al., 2019; Robins & Eisen, 2017). Researchers combine open codes developed from NVivo with manual efforts to identify patterns, such as using color-coding, Excel files for improved imaginative exploration, design, and creativity (Maher et al., 2018). Thus, I used the NVivo version 12 CAQDAS tool to perform the iterative inductive process with WMMT. I processed the data through analysis for open codes within the evidence data to represent thematic patterns as categories towards answering the research question.

The second operation of analysis uses axial coding to analyze open coded patterns for collaborations, communication, and commonalities (Williams & Moser, 2019). Researchers analyze data to group open codes around common axial meanings that explore the research question and create broader thematic axial codes as projects in NVivo (Cascio et al., 2019; Cypress, 2019). During axial coding, researchers objectively examine data from different perspectives, capture implicit meanings, develop core concepts, and identify higher-level data abstraction layers as categories (Cypress, 2019; Maher et al., 2018). Thus, I used the derived open codes to identify concepts along with common axial meanings as axial codes. I created axial codes as a higher abstraction that communicates a related meaning from open codes as concepts of phenomena towards exploring the strategies used by IT leaders in the phenomena. I continued axial coding through the iterative inductive reading of evidence data sets and open codes. I continued inductive reasoning of axial coding with WMMT until the complete exploration of all

available meaningful concepts and relations that signify central phenomena and strategies.

The third level of coding involves selective coding in which the researcher develops meaning expressions as the highest-level thematic constructs (Williams & Moser, 2019). The researcher codes the emerged concepts from axial coding as core categories/constructs such as to form final themes that interpret the phenomena, explore the interactions or actions, success, or failures for explorative understanding (Sedghi et al., 2018). During selective coding, the researcher explores different dimensions of the research problem as the highest level/scale constructs to represent relevant actions in the phenomena through inductive reasoning by adjusting overlapping factors, explicitly reflecting on coercing and pulling factors (Kilham et al., 2019). Thus, in selective coding, I created core categories as final themes that interpret, explore, and address the research question. I used WMMT, inductive reasoning, to include overlapping factors, push and pull factors into axial codes to form core thematic constructs. I used selective codes to identify themes that uniquely explore the phenomena as actions, interactions with included social context, and design factors leading to strategies that answer the research question. Hence, I conducted data analysis for the construction of themes by firstly becoming immersed in the data through WMMT and the inductive reasoning approach. Second, I identified thematic codes representing patterns, concepts, and core constructs towards answering research questions and signifying actions, interpretations, and strategies of the phenomena. I used NVivo CAQDAS during the analysis of large volumes of evidence data for the identification of open, axial, and selective codes. I

continued the data analysis through the iterative process of WMMT, inductive reasoning approach, and coding, and until I do not detect any new codes and themes.

The researcher identifies key themes by extending the thematic analysis of general themes identified from the evidence data with WMMT and the inductive reasoning approach to include a literature review and conceptual framework (Dadich & Jarrett, 2019; Ridder, 2017). The researcher then looks for overlapping processes, congruence, and continuity, and decreases deficiency of alignment with problem setting and the research question (Dadich & Jarrett, 2019; Ridder, 2017). The researcher performs a meta-synthesis of the literature, documenting the analysis for similarities and differences, and forming key themes (Cengiz, 2020). These key themes represent matrices or templates that encapsulate coded patterns, concepts, and topics from the evidence data and represent subjective category themes that hold a critical perspective towards the conceptual framework of the case study (Cengiz, 2020). The researcher recognizes, notes, and identifies key themes with less quantitative logic of the measured frequency of the code occurrence (Clark & Braun, 2018). The researcher captures key themes as pre-existing templates in real-world phenomena, analyzing literature reviews, evidence data, and the conceptual framework (Clark & Braun, 2018). Thus, I focused on key themes through extended data analysis of the general themes identified through coding evidence data with WMMT and the inductive reasoning approach that includes literature reviews. During the final thematic analysis, I included studies published since writing the proposal. The key themes form subjective categories of the conceptual

framework that encapsulate the general themes identified through and correlate with the literature review for similarities and differences.

Reliability and Validity

The findings' trustworthiness determines the reliability and validity of the qualitative study (Korstjens & Moser, 2018). The quality criteria of a qualitative study include dependability, creditability, transferability, and confirmability (Korstjens & Moser, 2018). Qualitative researchers seek more transferability of findings than generalizability to ensure the validity of findings (Jordan, 2018). A qualitative researcher assesses the findings beyond the postpositivist measure of objectivity, such as reliability, validity, and generalizability, to ensure the trustworthiness of the research (Nizar & Al-Shboul, 2019). I therefore, addressed the validity and reliability of this qualitative study in terms of dependability, credibility, transferability, and confirmability.

Dependability

A qualitative researcher strategizes for dependability through detailed descriptions, establishing audit trails, and stepwise data analysis to maintain agreement between coded data and raw data (Forero et al., 2018). Dependability ensures repeatability of study findings within the same context and with similar participants and involves a participant's evaluations of findings, interpretations, and synthesis (Korstjens & Moser, 2018). The researcher establishes dependability by improving traceability, logical descriptions, and documentation of research methodology (Taheri et al., 2019). Therefore, I ensured dependability by including contextual and methodology information as part of the research documentation. I used thick descriptions in the analysis and

interpretations, establish an audit trail of data changes throughout data collection, analysis, and synthesis, and perform stepwise analysis to maintain agreement between the coded and raw data.

The researcher uses member checking to improve dependability with the participant to increase the rigor of the findings and reduce the misrepresentation of the results (Glaw et al., 2017). Member checking relies on informant feedback or dependability checking. With member checking researcher follows the two-stage process: first scrutinizing the intended meanings of collected data and second by checking the participant's review of the final data analysis to validate the researcher's interpretations (Varpio et al., 2017). The researcher uses member checking to reduce the potential bias and increases the dependability of participant validation of qualitative results (Birt et al., 2016). Therefore, I used member checking with participants to perform dependability checks on intended meanings and final data analysis.

Audit trails track critical decisions and emerging themes during analysis, data collections, and documentation of qualitative research (Grealish et al., 2019). Audit trails of transcripts' analysis, coding, and emerging themes improve dependability (Nnyanzi, 2016). The qualitative researcher uses audit trails, such as tracking the characteristics of participants, creating a log of coding decisions, criteria, and other memos (Fouche & Walker-Williams, 2017; Sean et al., 2017). Researchers use audit trails to improve quality, facilitating consistency and transparency, and ensuring the rigor of the methodology to the qualitative research (Fouche & Walker-Williams, 2017; Sean et al.,

2017). Therefore, I maintained audit trails of critical decisions, analysis, and coding to maintain the qualitative study's rigor throughout.

Credibility

The qualitative researcher assesses the credibility and trustworthiness of the study by using data triangulation of sources within the same method, member checking, audit trails, prolonged engagement at the research site, analysis of negative cases, and other methods (Raskind et al., 2019). The data triangulation of diversified sources of evidence assesses credibility by reducing the risks of the shortcomings and limitations of a single source and by improving the correctness of interpretations and findings (Marcio et al., 2018). The researcher improves the credibility of a qualitative study by following appropriate measures during data collection and analysis, such as verifying data obtained from interviews with documents and using a wide range of informants with individual viewpoints (Marcio et al., 2018). Researchers use data triangulation to improve the validity and strengthen the understanding of the concepts of interests through a combination of perspectives and a variety of information sources (Kern, 2018). Data triangulation checks and improves the reliability of the results by ensuring that two or more sources and methods lead to the same results (Jari, 2017). Thus, I used data triangulation of various sources of evidence, such as interviews, artifacts, documents, and field notes to assess the credibility.

Transferability

In qualitative research, transferability compares to the external validity of quantitative research, where the conclusions of the study become referenceable to similar

contexts and case studies (Marcio et al., 2018). Qualitative researchers use thick descriptions for transferability of judgment to the audience of the study so that the results become meaningful to an outsider as well as applying to other settings (Korstjens & Moser, 2018). Researchers transfer the judgment by the inclusion of case-context information, interview procedures, research design, and social environment descriptions (Korstjens & Moser, 2018). Qualitative researchers include the contextual and positional information of an individual's perceived reality to help the transferability of results to another context (Reyes-García et al., 2019). A multiple case study improves the generalizability of findings, leading to improved transferability (Reyes-García et al., 2019). In qualitative research, researchers describe the context-bound experiences for transferability to new situations (Cook et al., 2016). Therefore, I use expanded descriptions for transferability, such as context details of case organization, social environment information, interview procedures, research process, and participant information, to facilitate transferability judgment to the audience and in future research.

Confirmability

Researchers use confirmability to improve the reliability and corroboration of results with other researchers (Forero et al., 2018). To obtain confirmability, the researcher captures context using reflexivity and data triangulation techniques (Forero et al., 2018). The qualitative researcher maintains an audit trail of the data collection process and presents original quotes and other evidence information, which leads to interpretations that improve confirmability (Ellis, 2019). The qualitative researcher presents original ideas of the study population through the inclusion of evidence

information in the findings and avoids findings from the traits and personal preferences of the researcher (Marcio et al., 2018). The researcher transfers the first person's experience of the real-world context to confirm the objectivity and completeness of the results through the triangulation of different data sources (Marcio et al., 2018). Thus, I presented the original quotes and evidence data in the findings to improve confirmability. I obtained confirmability with the triangulation of data sources and audit trails.

Data Saturation

The researcher ensures data saturation by ensuring that additional information does not contribute to new themes and data relevant to answering research questions (Lowe et al., 2018). Deciding when to stop collecting data depends on the researcher's judgment and experience. However, using a variable of the theme accumulation curve based on observed themes and unit of analysis reduces incompleteness and unnecessarily large studies (Tran et al., 2017). Qualitative researchers end further evidence collection when no new significant thematics, such as categories, concepts, and constructs, emerge (Sharman et al., 2019). Thus, I ensured data saturation through judgment about themes, such as by observation that no new thematic patterns, concepts, or constructs emerge from further data collection.

Transition and Summary

Section 2 began with restating the purpose of the research. This section detailed the researcher's role, participants, research method, research design, population, and sampling. I included details on the ethical considerations when dealing with the research participants. Section 2 describes the role of researcher, participants, research method,

research design, sampling method, ethical research, data collection instruments, data collection technique, data organization techniques, data analysis and reliability, and validity. Section 3 consists of a presentation of the findings with identified themes, provides a detailed discussion on the application of the results and themes to professional practices, the implication for social change, recommendations for action/future research, reflections, conclusions, and appended content.

Section 3: Application for Professional Practice and Implications for Social Change

Introduction

The purpose of this qualitative multiple case study was to explore the strategies that IT leaders in public sector organizations implemented to utilize cloud computing to improve their organization's service performance. Based on the evidence analysis and literature review, I included the strategies that IT leaders use to adopt cloud computing for strategic value appropriation of their services. After the IRB approval, I scheduled a total of 12 interviews with IT leaders in cloud computing at public sectors in the United States. I observed data saturation after first nine interviews because no new themes emerged. I collected data from participants by interviewing over the telephone and zoom conference. In person interviews did not take place due to the current situation of COVID-19. Five participants agreed to recorded interviews, whereas others were only comfortable with me taking field notes during interviews. I collected related reference documents and field notes and performed member checking. After data collection and organization, I analyzed the data using within-methods methodology triangulation. I immersed myself in the raw data by repeatedly interpreting the meaning in the context of study. I systematically analyzed these data for patterns, conceptual dimensions, and commonalities. Using NVivo 12 software, I began coding through open, axial, and selective coding methods. I repeated the process to obtain selective meanings, coercing, and pushing factors and to obtain thematic patterns. The major themes identified to model an acceptable cloud for public sector included: a user centric and data driven cloud model, multi-cloud, visibility, integrations, innovation, and agility due to cloud.

Presentation of the Findings

The study's primary research question was to explore the strategies used by the IT leaders in public sector organizations to utilize cloud computing to improve their organization's service performance. I discovered five different themes to represent an acceptable cloud computing model for public sector that IT leaders to improve their organizational services' performance. Each theme consists of sub-themes related to strategies IT leaders use to utilize cloud computing for strategic business gains. I further tied the findings with the conceptual framework of TAM3 and the existing literature on effective IT practice. I aligned my thematic patterns with an overarching research question to derive strategies IT leaders used in this case study. I referenced each participant as participant-1 (P1) to participant-9 (P9). The themes identified can be combined to achieve an acceptable cloud computing strategic model for public sectors.

Theme 1: User-Centric and Data-Driven Cloud Model

Through scripted integration, IT leaders take a user-centric approach to meeting on-demand business requirements and arbitrating and orchestrating between business and cloud technology (Park et al., 2020). The user-centric abstraction layer (UCAL) references a virtual usage layer existing on top of the static multi-provider cloud resource distribution layer (Lacoste et al., 2016). The UCAL enables IT leaders to strategize for interoperability, low-cost, decoupled resource production independent of underlying assets (Amato & Moscato, 2017; Lacoste et al., 2016). UCAL increases homogeneity, self-services, and improved user performance through tailored cloud services (Lacoste et al., 2016). IT leaders analyze and build the cloud resource orchestration through UCAL.

UCAL consists of the semantic construct of cloud computing, such as requirements, quality components, and patterns that bind with cloud policy, service selection, automation, and integrated usage (Amato & Moscato, 2017). The terms user-centric and data-driven occurred 107 times thought the data collection. All 12 participants emphasized it as a core building block strategy to the cloud model. The evidence confirms and extends knowledge in cloud computing. All the participants mentioned that a user-centric strategy is mandatory for achieving strategic success with the implementation of cloud computing. Participant-1 (P1) commented about "using the well-architected framework to achieve a user-centric cloud model that enabled cloud services' personalization while meeting innovation and business agility." Participant-2 (P2) mentioned "user-centric design improved learnability and business use case realization for both business users and IT." According to P1, "The user-centric strategy gave us digital board room architecture (workspace with the cloud semantic layer) to meet user needs from the cloud initiative's onset."

IT leaders adopt a decentralized and autonomous data strategy and meet immediate business user needs; this cloud-of-clouds approach to virtualizing data improves the collaborative data process, intelligent data access, and real-time analytics without relying on the persistent layer (Yang et al., 2020). The data-driven cloud implementation model consists of a multi-layered framework of intelligent applications and the user's echo hub operating based on immediate real-time data from multiple producers and consumers (Gupta et al., 2021). In contrast to the model-driven frameworks, the data-driven cloud deployment approach provides agility through

iterative control of the cloud deployment (Samea et al., 2020). It satisfies global conditions and requirements such as business goals during the multi-cloud adoption with a complex IT landscape (Samea et al., 2020; Yu et al., 2020). P3 highlighted the importance of the data-driven strategy for cloud implementation: "We focused on immediate data needs and interoperability of data through automated and scalable endpoints." P3 continued, "The data-driven approach improved learning, collaboration, the user's job function, and served us with additional controls for achieving requirements." "Due to cloud innovation and a data-driven approach, the business and IT alignment became better," said P5, "They progressed towards achieving goals." The experiences of P2 and P1 aligned with Samea et al. (2020) and Yu et al. (2020) in that the data-driven strategy is the critical factor towards achieving business goals with cloud implementation and managing complexity.

In practice, IT leaders enable "data-driven cloud models through data virtualization" (P8). IT leaders face "critical challenges in utilizing and managing the cloud for business use cases" (P9). The software-defined cloud systems (SDCS) concept helps alleviate problems associated with utilizing and managing multiple elements of a well-defined cloud framework, such as through data virtualization (Jararweh et al., 2016). This form of virtualization improves the ease of use of applications and services, enables enterprise hub runtime environment for data consumers and data providers, and provides a single source of truth with improved data intelligence, data clarity, and lifecycle management (Sawant, 2019). SDCS offers locale and centralization of data through virtualization to serve isolated user demands while enabling dynamic controls and

simplified interface design for ease of deployment (Jararweh et al., 2016). Cloud deployment involves a complex number of applications and global locations. SDCS-based data virtualization methods help IT leaders enable user-context-aware dynamic controllers, such as execution controllers, orchestration, analysis, and iterative controls and is modeled according to data demands (Mayoral et al., 2017). P3 aligned with SDCS data virtualization strategy found in the literature review: "We must still make many decisions, selections, and tuning to achieve data virtualization." P8 said, "Data virtualization improved our code pipeline, allowed continuous enablement while meeting immediate data needs to multiple target locations, and improved controls."

In practice, IT leaders achieve a user-centric strategy with a top-down approach (TDA) data-driven strategy using a bottom-up approach (BUA). BUA helps to achieve immediate business requirements, whereas TDA translates business goals to micro cloud services. With the advent of the cloud, IT leaders can now innovate with a hybrid approach of TDA and BUA to simultaneously achieve perceived ease of use and objective usability (Demoulin & Coussement, 2018; Sreedhar et al., 2017). Congruently, the SDCS implementation using TDA and BUA produces a multitude of results, such as shared data systems, business alignment, user preferences, continuous development flows, decentralization of data from its hardware and application properties with adequate controls, and use-as-you-go architectures (Sreedhar et al., 2017; Yang et al., 2020). IT leaders achieve individual stakeholder goal-specific microservices architecture in a TDA of cloud implementation rather than monolithic capability through the vertical business domain layer to the horizontal operations layer of both technical service and

infrastructure providers (Bruschi et al., 2019). BUA helps meet the emerging and immediate data needs of the business users. BUA empowers the public sector to cloud IT leaders to shift away from current closed-loop and isolated IT practices and toward data fairness (Wilkinson et al., 2017). The increased data fairness results in processing disparate data iteratively for continuous deployment (Wilkinson et al., 2017). IT leaders use cloud-based tools, stakeholder engagement, and service delivery models to achieve data fairness (Bruschi et al., 2019; Wilkinson et al., 2017). P9 noted, "the top-down user-centric application design approach complemented the bottom-up data-driven approach for agile and innovative undertakings towards building smart city systems." The findings are confirmed with the knowledge base in cloud computing. P4 mentions "using a continuous deployment data pipeline with a bottom-up data-driven strategy to implement immediate user data needs."

Table 1

Theme Analysis: User-Centric and Data-Driven Cloud Model

Theme	Participant references count	Participant references count	TAM/ literature concept/ central research question alignment
User centric and data driven cloud	9	107	It relates to AM3 central tenets of PEOU and PU and aligns with the cloud's user efficacy and objective usability. Aligns with central question explores strategies used by IT leaders. IT leaders used the related design elements and concepts such as the individual user experience, voluntariness to adopt, objective usability of innate cloud characteristics in alignment with the strategic approach of user-centric and data-driven cloud
Minor theme:			
Bottom up approach, data as driver	5	19	
Top down approach: requirements	2	25	
Decentralized data strategy	5	22	

	implementation. During usage, results confirm that IT leaders implemented the cloud for macro IT benefits and micro-level usage and directly strategized for user efficacy and business performance.

Theme 2: Multi-Cloud

IT leaders can meet specific usage requirements by adopting a multi-cloud strategy with efficiency and cost saving (Markus & Dombi, 2019; Mazen et al., 2018). The selection of the cloud depends on usage requirements. The multi-cloud service selection strategies include random-selection, cost-, runtime- (ranking methods), and context-aware forms, such as fuzzy sets and configuration evaluations with comparative analysis (Bleiker et al., 2019; Markus & Dombi, 2019). The multi-cloud approach requires integrated abstraction layers, such as an open cloud computing interface to service end-users with seamless workflow experience and administrations with unified resource management and inter-cloud computing (Huioon et al., 2017). According to P4, "the multi-cloud approach helped create a single data lake with multiple edge locations and enabled the use of SaaS applications from different providers." They continued, "The multi-cloud implementation resulted in an embedded interface to provide users real-time data and analytics to effectively make informed decisions and implement public policy." Participant P7 confirmed with the literature that the use of multiple cloud environments expectedly improved the user experience and bridged the collaboration gap between various departments' applications and data.

IT leaders use cloud policy as a strategy to optimize service composition and resolve large-scale problems associated with the implementation of multi-clouds

(Olufemi, 2019). Service composition determined using a formal regroup structure of associated objects, such as providers, vendors, services (based on their commonalities), hidden associations, capabilities road map (k-nearest in alignment with the achievement system), and user request satisfaction (Mezni & Sellami, 2017; Olufemi, 2019). IT leaders in public sectors use cloud policy as the decision support system's core function (De Maio et al., 2017). The cloud policy was established as a semantic map for multi-cloud rule mining (using time-based analysis) to map granular cloud activities to business semantics (De Maio et al., 2017; Mezni & Sellami, 2017). IT leaders solve the complex issues of multiple cloud architecture through global cloud policy. The use of such a policy resolves a wide array of metrics, optimal application use, and data placement while balancing tradeoffs to improve performance (Oh et al., 2020). P3 mentioned "cloud policy use for purchasing, estimation, service selection, and developing catalogs that consider the user's multiple job functions while improving data movement and user satisfaction." P8's experience extends the literature because a cloud-first policy by the public sector became the core building block for the entire cloud transformation initiative to decision-making during cloud service implementations: "Cloud policy filled the gaps in alignment and decision-making between IT and department through a written criteria document agreed upon by IT and business stakeholders."

However, according to a report by the international working group, multi-cloud architecture presents challenges to IT leaders, with reported annual downtimes of over 568 hours and damages of more than $71.7 million per year compared to single-cloud service downtimes of 7.5 hours per year with 99.999% reliability (Paraiso et al., 2016).

IT leaders use the service-oriented architecture feature of multi-cloud (MCSoA) to achieve a lean manufacturing model by creating artifacts, integrations, and workflows for multi-level visualizations (Jin et al., 2018). IT leaders establish capability models to achieve portability of data, customizable applications, and optimize the development and use of resources from multiple providers (Jin et al., 2018; Paraiso et al., 2016). MCSoA helps extend the manufacturing industry model to the multiple provider cloud modeling. IT leaders meet the demands of external driving forces of business performance using MCSoA (Wang et al., 2021; Zhu et al., 2021). MCSoA helped switch focus from the economic aspect of sustainable development for the traditional user base to continuous change and increased resource utilization (Wang et al., 2021; Zhu et al., 2021). According to P8, “during the pre-cloud IT environment, the IT leaders focused on implementing products for each service need despite service-oriented architecture storing and sustaining traditional users' development requirements.” According to P1, “The hybrid cloud improved the service-oriented architecture artifacts’ functions to meet the data integration needs of various departments and functions.” P1 hinted at cloud manufacturing model aspects of MCSoA during adoption: “The well-architected framework oriented our cloud model to a user-centric and data-driven multi-cloud model.”

Table 2

Theme Analysis: Multi-Cloud

Theme	Participant references count	Participant references count	TAM/ literature concept/ central research question alignment

Multi cloud, hybrid cloud	6	60	Relates to TAM 3 constructs of job relevancy, perceived benefits, personal innovation, and output quality. IT leaders used multi-cloud, data virtualization, SOA, and cloud policy as core functions of decision support and strategies to improve the output quality of services to users, increase innovation support for business, reduce the lockdown of data hardware characteristics and increase the shared data space. Literature study and participants confirm that improved data movements leads to cloud success.
Minor theme			
Data lake, data virtualization	7	20	
Cloud policy, service catalogs	5	18	
Service oriented architecture, SOA	6	15	

Theme 3: Visibility

Visibility modeling of the cloud consists of three main pillars: security, monitoring, and compliance (Diogenes, 2019). IT leaders struggle to operationalize the cloud services due to a lack of visibility. Shared-responsibility parties must meet security service-level agreements in federated and open-interface, multi-cloud implementations (security-SLA) (Halabi & Bellaiche, 2020). IT leaders use security SLA as a purposeful metric to evaluate the compute environment for user satisfaction and data stability through a cloud controls matrix by NIST or CSA (Halabi & Bellaiche, 2020; Hammoud et al., 2019). Some of the security SLA categories include disaster recovery (DR) plan and testing, authorization, authentication, and accountability (AAA) layers, governance, risk, and compliance processing (GRC), shared responsibility models, incident response services, collaborative intrusion detection systems (IDS), blockchains, and the fundamental aspects such as integrity and confidentiality (Alkadi et al., 2020). P6 confirms the benefits of a visibility framework for the cloud "by using single security

framework with that models after the business user threat, we have ensured we provide the business with high-quality security posture and business continuity."

IT leaders achieve cloud security SLA through data-driven and data-intensive security posture analysis comprising a three-step process: data collaborations, data acquisition, and data processing (security assessment) (Dickinson et al., 2021). Security SLA is measured in terms of business continuity. A trusted security cloud model based on the AAA layer consists of large-scale associations, such as data owners, data users, fully trusted authorization centers, authorization servers for the chain verification process, and semi-trusted cloud service providers (Fucai et al., 2019). The AAA layer for a trusted model demands security against data leakage and knowing who can access the system (Silva et al., 2018). The strategies include anonymizing data, improving the security aspects of interacting layers, achieving integrated, compatible security functions across different cloud components, and assessing trustworthiness through impact analysis (Silva et al., 2018). In a top-down, data-driven approach, anonymization improves data sets for sharing with different stakeholders, improves performance through edge locations, enhances privacy, and protects the underlying IT assets and data integrity (Simoes et al., 2021). According to P6, “cloud security features increased the organization's visibility, threat remediation, and business continuity”. “The cloud improved our visibility of security practices and controls” (P6). “We increased visibility to multiple cloud provider practices and shared responsibilities” (P4).

Logging the cloud-native workflows optimizes semantic object control for improved understanding of security and business continuity (Marron, 2018). The cloud's

unique aspects of logging include log formats, log levels, log performance, categorization, log moment, and processing for usage as leading indicators (Marron, 2018; Pichan et al., 2018). Continuous auditing through logging improves the security posture of the organization. Two strategies for auditing with logs consist of a pattern-detection approach for anomalies between expected vs. current states (used in threat detection) and a state transition analysis approach with a response mechanism against malicious state changes (used in threat prevention) (Torkura et al., 2021). Cloud monitoring involves gathering measurement data to diagnose anomalies in use cases during runtime (Tamburri et al., 2020). P6 stated that their "organization used a single security framework for visibility during multi-cloud implementation with a central log repository, alerting, and insights, all from one location". P4 and P3 indicated that pre-built security models of the cloud required an increased logging function to gain complete visibility and establish a trusted cloud SLA.

According to NIST 800-61, the incident response system (IRS) is the critical component of cloud computing's compliance framework (Joshi et al., 2020). Compliance failures, such as SLA violations, result in penalties for all parties involved; the cloud's service quality depends on its service performance measures, such as business continuity loss (Frank et al., 2019). IT leaders categorize IRS through known taxonomies for improving business processes, budgeting, planning, and continuous monitoring (Sacher, 2020). "A high-visibility security framework reduced barriers to cloud implementation with a user-centric and data-driven approach; it helped in continuous integration" (P6). "Users' confidence in cloud services improved with the visibility model and responsive

incident remediation system" (P7). According to P3, "cloud computing improved visibility regarding data, business needs, practices, and quality aspects that contribute to business improvement".

Table 3

Theme Analysis: Visibility

Theme	Particpant References		TAM3 / Literature Concept/ CentralResearch Question Alignment
	Count	Count	
Visibility	5	12	Relates to TAM3 anchors of the cloud system characteristics that influence the user's technology anxiety and PEOU. The literature study and participants confirm using a single visibility framework helps in modeling user threat layers and improving security posture and business continuity.
Minor Theme			
SLA, Security, Trusted	6	30	
Logging, monitoring	4	10	
Incident Response, Service Desk	5	14	

Theme 4: Integrations

IT leaders are motivated to combine testing with integration during cloud implementation to achieve consistent performance and user expectations (Nunez et al., 2021). IT leaders switch to simulated testing frameworks instead of experimentation. Simulated testing not only accommodates the functional and non-functional aspects and shared test frameworks but also improves flexibility, scalability, and cost-effectiveness (Nunez et al., 2021). IT leaders achieve a user-centric testing model consisting of an evaluation framework, feedback mechanism, internal reviews, think-aloud sessions, and guided demonstrators (Traore et al., 2019). IT leaders prioritize testing to improve integrations' effectiveness and reduce architectural, technical, and code debts (Lenarduzzi et al., 2021). P3 mentioned the testing strategy's adjustments; "the cloud implementation involved user feedback and additional interactivity through the incident response system". "All our code pipeline goes through user acceptance testing, which meets specific guidelines and survey requirements for user satisfaction and performance ease"

(P9). “We could quickly evaluate the resilience with the cloud if the user function is operating as expected: (P8). “We transform the ease with which a user uses cloud-based services” (P3). According to P3, P8, and P7, the IT continuous innovation cycle did not see meaningful change due to the cloud. However, it was more aligned with the business cycle of planning, requirement engineering, and innovation. “Our test criteria expanded beyond the code pipeline and included usability and environmental tests to ensure that the user could perform a particular task with minimal assistance and self-efficacy and measured both user and system responses” (P5).

According to Moghaddam and Nof (2018), the enterprise cloud integration problem is defined as a three-way match collaboration between services, components, and organizations to maximize service fulfillment. Cloud IT leaders use microservices, reusable integration architecture with support for big data, multi-cloud, and a user-centric design (Linthicum, 2017). IT leaders enable integrations through context-aware microservices using design science research as the guided procedure for cloud integrations, such as the use of socio-economic characteristics and functional and user requirements as contexts for the design of services to improve strategic alignment between business and IT (Muntean et al., 2021). According to P5, “cloud computing changed its organizational IT practice from a monolithic model to a rapid deployment model, with continuous integration and ease of testing”. “There were challenges to integrations, collaborations, and data movement with the legacy environment, and with minor changes, it was possible that the IT leadership did not limit cloud computing integrations” (P4). “We were not concerned about IT maintenance and falling back on

technology; instead, we focused on prioritizing user requirements and continuous integration through incremental releases" (P5). According to P3 and P4, "avoiding monolithic models through microservices and the data-driven approach is well supported by decoupled cloud service catalogs and strategies for continuous integration and modernization".

A context-aware cloud service strategy enables IT leaders to incorporate domain-specific parameters (Huang et al., 2019). Such parameters improve task planning, decomposition, and publication to match users' on-demand service needs and change business requirements (Huang et al., 2019). IT leaders use context-aware cloud models to significantly improve the user experience and facilitate personalized learning mechanisms and feedback to achieve continuous integrations and improvements (Feng et al., 2019). IT leaders improve decision-making on complex cloud services task management through end-to-end simulation tools, such as business process model and notation (BPMN) and context categorizations, such as business context, performance context, and cloud characteristics context (Rekik et al., 2017). According to P3, "integration considered numerous factors, such as user job functions, secure function, motivational factors, brandings, and compatibility with unified interfaces". P7 hinted at context-aware designs. "The organization designed the services as per multiple factors that improved individual user collaborative ability and job function" (P7). P3 mentioned that avoiding the monolith service model and decoupled services improved business performance. According to P9, "the application integrations were user centric and considered social, organizational, and functional aspects in design; however, they differ

from the literature on using context-aware service design as the strategy during continuous integrations".

Table 4

Theme Analysis: Integrations

Theme	Particpant References		TAM3 / Literature Concept/ CentralResearch Question Alignment
	Count	Count	
Integrations	5	80	Relates to TAM3 constructs of objective usability, as shown in Figure1. IT leaders improve PEOU through adjustments and use continuous integrations, test methodology, decoupled services, and context-aware design to improve learnability and manage complexity. Participants and Literature confirm the improvement to job functions through a continuous integration cloud model. However, they differ in the direct use of context-aware service design during implementation.
Minor Theme			
Testing, Code, Code Pipeline	5	20	
Continous Integration, Collaborations	4	40	
Micro Services, Context Aware, Monolithic, decouple, modernization	6	30	

Theme 5: Innovation and Agility due to the Cloud

With the advent of cloud computing, the project management role becomes obsolete (Shastri et al., 2021). Innovative IT leaders use self-organizing agile teams, a scrum master, and a product owner to increase work efficiency, task allocation, and decision-making autonomy (Shastri et al., 2021). Global digitalization trends, such as blockchains, the cloud, fog, and IoTs, create challenges for IT leaders. Due to growing digitalization, IT leaders must actively transition from the sense and control rational economic model to a plan and respond individual behavior economic model (Sergiy et al., 2018). IT leaders face challenges in implementing agile projects due to a lack of responsiveness, a broader user base, restricted budgets, and legacy functions (Karklina & Pirta, 2018). However, commonalities in traditional projects and agile projects, such as an idea-based goal metric definition, drive towards agile planning, and definition without change, while reaching the desired outcomes with reduced uncertainty (Karklina & Pirta, 2018). According to P5, "public sector users do not always perform in the same manner

as the requirements and policies change". "We established an agile backbone with collaborative teams, tailored incident response systems, cloud capabilities, resilient test management, CICD pipeline, and data virtualization to support integrations and alignment with business goals" (P3). According to P3 and P8, "IT leadership found it easier to innovate with the cloud services and adjust integration and code pipeline as per user job function at the speed of business agility".

Continuous innovation requires business IT leaders to learn from their user base, make informed decisions, and implement a data-driven ecosystem to rapidly identify data usage behaviors and perform service enhancements (Werder et al., 2020). Cloud computing requires IT leaders to adopt an innovative culture to improve individual user efficacy. Systemic leadership concepts such as transformational leadership, collaborations towards business objectives, and social change management to improve utilization and information flow contribute to innovative cultural change (Messick et al., 2019). The continuous innovation and knowledge absorption form the two-dimensional intellectual pillars (IQ) of IT leaders, directly influencing business outcomes and strategic planning (Riera & Junichi, 2019). P3 mentioned the importance of the agile backbone set up for the cloud that gave the IT leaders powerful means to counter business agility and stay on an innovation drive with a cloud-first policy. According to P3, P8, and P5," the public sector's cloud model required the establishment of an agile code stack and flow approach". "The agile project layer reduced the constraints to innovation, improved collaboration, data movement, and governed business goals" (P8).

Table 5

Theme Analysis: Innovation and Agility due to the Cloud

Theme	Particpant References		TAM3 / Literature Concept/ CentralResearch Question Alignment
	Count	Count	
Innovation and Agility	9	90	Relates to TAM construct of PU, Output quality, voluntariness, and experience. PU directly influences usage behavior and business performance. IT leaders strategize for perceived usage by adopting innovative approaches, setting up agile projects and code layers. Literature and participants confirm that the use of the agile cloud model compliments cloud computing with improved decision-making and collaborations and directly affects business performance.
Minor Theme			
Agile Code, Agile, Agile Project	7	30	
CICD, Continous Innovation	7	45	

Findings and Conceptual Framework

The TAM3 conceptual frameworks' central tenets used in the study of cloud computing technology directly correspond to the core theme of user-centric and data-driven approaches used by IT leaders in practice. Data-driven and user-centric design relate to perceived ease of use (PEOU) and perceived usability (PU). Using the TAM3 framework, IT leaders focus on user satisfaction and system usability in pre and post implementations for effective and efficient operationalization of the cloud (Alhanatleh & Akkaya, 2020). This study found that IT leaders strategized for both micro-level IT benefits and macro-level business performance benefits. IT leaders focused on TAM3 constructs of user efficacy and objective usability as design elements through various cloud adoption stages. According to P4, PEOU and PU were immediate goals of an analytics strategy during the cloud implementation. The study findings showed the acceptable cloud model for public sectors consisting of five major themes and their underlying strategies. The findings in this research study showed the applicability of the TAM3 conceptual framework to implement cloud computing for improved public sector service performance strategically. “Cloud-based analytics required ramp-up in learning for the IT team to understand the new terminologies and how to use them” (P4). “We focused on improving the visibility of SaaS provider features and a roadmap for the IT

team to build user-centric analytics applications" (P4). The degree to which the cloud is expected to improve user job function (PEOU) has led to pre-implementation decisions of increased cloud services use in public sectors. IT leaders' strategies for multi-cloud, data virtualization, and service-oriented architecture correlated with TAM3 constructs such as output quality, personal innovation, and job relevancy. According to P5, "the cloud promised usability to put the transaction's fundamental users' needs, data, collaborations, and communication first". "We used this strategy to design a single workflow-driven system that is high performing and continually evolving as per business changes" (P5). Researchers apply the TAM3 framework to study the cloud's actual use and individual influence behaviors (Shana & Abulibdeh, 2017). Thus, the theme of the user-centric and data-driven cloud model approach confirms the TAM3 conceptual framework central tenets of PEOU and PU.

The findings confirm that IT leaders used TAM3's additional constructs and the central tenets to design a cloud solution for strategic use in the public sectors. However, IT leaders did not address the disadvantages of some of the strategies that the literature reviews addressed; for example, increased downtimes due to the multi-cloud and a lack of direct use of context-aware design in microservices. Participants in the study confirmed using TAM3 adjustment constructs to strategize for increased objective usage, such as branding, learning mechanism, and collaboration to improve the user experience. The cloud's strategic use delivers not only micro-level IT benefits but also direct macro-level business value (Govindaraju et al., 2018). According to literature reviews and the TAM3 framework, the IT leaders strategized for both micro- and macro-level cloud

usage for their organizational performance, such as improved resource consumption, data virtualization, business agility, and user satisfaction.

Application to Professional Practice

I presented an applicable cloud computing model for the professional practice consisting of five major themes and underlying strategies. IT leaders could use the acceptable cloud model presented in this study to increase their organizational services' performance. The study successfully explored IT leaders' strategies in public sector organizations to utilize cloud computing to improve their organizational service performance. This study will assist IT practitioners to strategize cloud implementation for micro-IT benefits and improved business performance. The study's findings apply to before, during, and post-cloud implementation. IT leaders' top-down and bottom-up strategies in this study might help other professional practitioners achieve successful cloud implementation focusing on user job function. Using the acceptable cloud model presented in this study, IT practitioners could offer flexibility, security, scalability, and the ability to move data as per business innovation requirements. This study's acceptable cloud model could serve as the reference architecture for IT leaders who want to take strategic advantage using cloud computing. IT practitioners might develop a single visibility framework to model user threat layers and improve security posture and business continuity. The literature analysis and participants confirmed that improved data movement leads to cloud success. Using this study, IT leaders could strategize for perceived usage by adopting innovative approaches, establishing agile projects and code layers. The literature and participants confirmed that the use of the agile cloud model

complements cloud computing with improved decision-making collaborations and directly affects business performance. This study will help IT leaders strategize for improvement to individual user job functions through continuous integration cloud model and context-aware service design during their cloud implementation. During usage, the results confirmed that IT leaders implemented the cloud for micro-IT benefits and macro-level usage and directly strategized for user efficacy and business performance. These observations might assist IT leaders in avoiding the standard monolithic cloud model and switch to a microservices-based agile and innovative code pipeline and cloud model.

Implications for Social Change

The strategies used by IT leaders of the public sectors in this study might improve citizen services, civic engagement, collaborations between public and government, policy-making, and socioeconomics. This study's findings could improve the public sectors' organizational services performance due to the strategic use of the cloud in alignment with the changing needs of government policy-making. This study's results are likely to improve government adaptability to changing circumstances and sentiments, such as the current COVID-19 pandemic. Faster and more inclusive policy-building due to cloud computing's strategic use becomes possible by meeting users' primary data and functional requirements. The strategies employed in this study for decentralization data with cloud computing likely to collaborate due to shared data services and faster, legitimate information exchange and a trusted cloud model with faster incident response system and threat prevention systems are likely to improve public sentiment towards using cloud-based services, enhancing business agility and the co-creation of public

services with citizen involvement. The decoupled microservices architecture with multi-cloud and continuous integration strategies increase the public sector's innovation and agility to meet changing citizen services' changing demands. The public services based on the user-centric design of cloud computing are likely to improve user job satisfaction. Citizens would be expected to gain more time, effort, and money with improved service engagement. This study might improve the knowledge of the strategic use of cloud computing to bring positive social change. Thus, the improved legitimate data movement, analysis of large datasets in real time, and better service utilization of the public sectors due to cloud computing's strategic use will lead to improved economic efficiency, collaborations towards common goals, improved civic services, and positive social change.

Recommendations for Action

This study's results include valuable knowledge of cloud computing's strategic use by IT leaders for enhanced organizational services. IT leaders should adopt an innovative approach for implementing cloud computing. As discussed in this study, innovation and agility improved by avoiding standard monolith IT models. IT leaders should create an acceptable cloud model using the study’s results to obtain both the micro-IT benefits and macro-business benefits. Business leaders must adopt a cloud-first approach. IT leaders should create a cloud policy with selection criteria to meet user job functions and information flow requirements. IT leaders ought to directly strategize for individual user behavior through the top-down approach discussed in this study. A user-centric design improves strategic alignment with the business. The cloud model must consist of the

data-driven approach to meet the business' immediate information needs through continuous integration and a user-centric design.

IT leaders should virtualize the data layer independently of its storage properties and decouple the application from its hardware properties. The decentralized data and applications lead to a service-based model and improved shared data services within departments and with external users. IT leaders must create a trusted cloud model to improve user behavior and business continuity. A trusted cloud model must have comprehensive logging, monitoring of security SLA, and a feedback-based incident response system. IT leaders must avoid monolithic resource-based cloud and application models and switch to a micro-services-based multi-cloud model. IT leaders implementing the cloud should use agile testing and a code pipeline to efficiently meet business needs and changing public sector services' social circumstances. Business leaders should adopt a cloud-first policy and realize the benefits of cloud computing to business innovation and improved business performance. IT and business leaders wanting to utilize the cloud for strategic value creation for improved performance of their organizational services are advised to pay particular attention to this study’s results. The universities might disseminate the study results via scholarly research libraries. I will be sharing the results via email with interested parties and IT leaders who have requested these study results. I will also be applying the study’s results to current and future IT practice.

Recommendations for Future Research

The cloud's strategic use is critical for the future of IT, business performances, and positive social change. According to the international data corporation, the cloud-

based service expenditures are expected to reach a compound annual growth (CAGR) of 15.7% by 2024, surpassing $1.0 trillion annual expenditures and with an average data growth of 200 petabytes per day per smart city (Guo et al., 2020; Shirer, 2020). Future investigations by researchers should concentrate on individual themes discussed in this study. The researchers could perform deeper knowledge acquisition and understanding of IT leaders' individual strategies to successfully use the cloud to improve business performance and social change. For example, researchers could further investigate the visibility framework of the acceptable cloud model in this study's results using the TAM3 conceptual framework for understanding the influencing factors and strategic value appropriation path used by IT leaders during its implementation and usage. Investigators could extend the study to other industries and find the acceptable cloud models for different sectors. Furthermore, this research was limited to a qualitative analysis. Future researchers could explore quantitative aspects of the acceptable cloud models to understand the hypothetical variables, correlating factors, and dependencies in the cloud's strategic use for improved business performance.

Reflections

During this DIT doctoral study, I have become adept at defining real-world problems, applying the concepts of IT and research methods to understanding the specific phenomena, and strategically resolving towards positive social change. As a post-positive worldview observer, I always considered obtaining doctoral degrees as necessary for myself. I wanted to elevate my epistemological stance and gain a peaceful, unified worldview and perform specific actions to bring positive social change. However,

personal situations and motivations led me through distinct careers, timeframes, and paths towards my DIT doctoral study. I continue to lead myself through the DIT study creatively and patiently, even during the ongoing COVID-19 pandemic situation. I treated every assignment during the entire study to my dissertation as an opportunity to gather a complete and comprehensive actionable understanding in the field of IT. DIT doctoral study has had a compounding effect on my career and personal life as I have met my doctoral degree goals. I also increased my confidence in leading creatively through informed decision-making towards positive social change and personal gratitude.

I was able to objectively conduct the doctoral study process despite my field experiences in cloud computing. I used my personal biases and values during the study without influencing the outcomes to increase my subjective understanding to critically co-relate with the participants' perspective. To ensure that I did not influence the study's participant discourse and outcome, I maintained my positionality as an outside researcher during the evidence-gathering and analysis for specific IT strategies. I have learned a lot from the participants during this study. Most participants expressed that this study's results have provided them with a more comprehensive insight into their cloud implementation and enabled them to observe new usage patterns, usage behaviors, and design factors that they had not been previously aware of before knowing the study results.

Conclusion

The strategic use of the cloud benefits IT and improves business performance. IT leaders require innovative approaches to implement the cloud, with cloud computing

expenditures exceeding trillions of dollars and petabytes of data production per day. It has become critical for IT leaders to adopt innovative strategies to avoid standard time-consuming monolithic IT implementations. IT leaders must create acceptable cloud models that strategically align with short- and long-term business goals, innovation, and agility needs. The acceptable cloud model for public sectors presented in this study comprises user-centric and data-driven approaches with a visibility framework for trusted cloud, a multi-cloud approach with data virtualization, continuous integration strategies with context-aware microservices, and an agile backbone setup to support business innovation. The strategies used by IT leaders presented in this study enhance business performance and bring positive social change.

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Appendix A: Interview Protocol

Interview: An Acceptable Cloud Computing Model for Public Sectors

A. I begin the interview process by establishing a rapport that ensures comfort and respect for the participants.
B. I will then establish the interview's ground rules and provide the procedures involved, including audio recording, note-taking, and co-creation of information.
C. I will ensure that participants understand the informed consent form and clarify any doubts.
D. I will review the data collection techniques, handling, storage, and retention policies with the study participants.
E. I will perform sample test questions to ensure the functioning of audio devices and practice them with participants.
F. I will begin the semi-structured interview process using the questionnaire and adapting it based on emerging information to inquire about further relevant information.

Demographic Questions

- What cloud computing model did your organization implement? What are your responsibilities concerning cloud service enablement for public sector users?
- What is your overall professional experience and background in IT?

Interview Questions

Pre-implementation Questions

- What was the initial state of voluntariness, experience, and output quality that led your organization to cloud implementation at your organization?
- What was the perceived usefulness that led your organization to implement cloud computing?
- What was the perceived ease of use that resulted in your organization implementing cloud computing?
- How did your organization recognize the socioeconomic value, individual characteristics, objective usability, and innate cloud anchors of cloud computing in the context of being useful for public sectors?
- What was the perceived direct IT usage affected by the implementation of cloud computing?
- What was the strategic value appropriation expected due to capabilities and resource usage of cloud computing?

Implementation Questions

- What type of cloud implementation did your organization perform, and how was it implemented?
- What strategies were employed to improve user experience, voluntariness, and output quality in implementing cloud computing?
- What facilitating conditions, individual characteristics, and anchors featured in the implementation of cloud computing?

- What adjustments—such as branding, learnability, complexity, objective usability—did you use to improve the perceived ease of use of cloud computing?
- What strategies were employed to improve perceived usefulness and perceived ease of use of cloud computing?
- What were business performance improvements observed due to cloud implementation? For example, improvement in business alignment, agility, and adaptability? How was it appropriated?

During Usage Questions

- How did cloud computing improve (actual usage) business agility, adaptability, and collaboration in public sector services?
- How did cloud computing improve socioeconomic value, facilitating conditions, and individual characteristics?
- How did cloud computing anchor and adjust technology usage for strategic value appropriation to improve business performance?

Follow-up Questions

- What strategies lead to the enabling of cloud computing as a social technology to improve business performance?
- How did the strategic implementation of cloud computing improve business performance?

Appendix B: Participant Invitation

Dear [participant]:

I am Eswar Kumar Devarakonda, a doctoral student of IT at Walden University. My doctoral dissertation title: "An Acceptable Cloud Computing Models at Public Sectors." I intend to explore the question: What strategies do IT leaders in public sector organizations implement to utilize cloud computing to improve their service performance?

Your selected based on selection criteria that involve: (A) The participant holds a job title indicating a leadership role for a minimum of one year in public sectors. (B) The participant holds a cloud computing certification or has participated in the public sector organization's cloud solution. (C) The participant's job duties show strategic and operational involvement in technology acceptance of cloud computing in the public sector organization. (D) The participant had at least two years of experience in cloud computing and a minimum of ten years' experience in IT. Thus, the participants in this study will be IT leaders with experience in implementing cloud computing in a public sector organization.

Each interview will take 45 minutes. I will schedule as per your availability in the coming weeks. Interviews will take place in-person or over video conference. The interview follows a standard audio-recorded semi-structured dialog. I would be requesting information through available documents and artifacts that support the case study. Therefore, I extend this invitation to you as a participant of this doctoral dissertation

qualitative research study. Please let me know if you’re interested in participating in this study.

Appendix C: Human Subject Research Certificate of Completion

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Eswar Devarakonda** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 11/12/2017.

Certification Number: 2557465.

Appendix D: Permission to Use Figures

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