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Exploring Implementation Strategies of IoT Technology in Organizations: Technology, Organization, and Environment

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This is to certify that the doctoral study by

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

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MS, Walden University, 2017

MS, Nova Southeastern University, 2005

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Doctoral Study Submitted in Partial Fulfillment

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Abstract

After organizations successfully adopt the internet of things (IoT) technology, many corporate information technology (IT) leaders face challenges during the implementation phase. Corporate IT leaders' potential failures in implementing IoT devices may impede organizations from integrating IoT solutions and promoting business benefits. Grounded in technology-organization-environment (TOE) theory, the purpose of this qualitative, pragmatic inquiry study was to explore strategies that corporate IT leaders use to implement IoT technology in their organizations. The participants were six corporate healthcare IT leaders who successfully used implementation strategies for implementing IoT solutions for their organizations. Data were collected using semistructured interviews and industry security documents. After using the thematic analysis for the data analysis process, six themes were identified: using all identified internal project staff skills, aligning current IoT technology with business needs, using all identified current internal infrastructure, using all identified external support technologies, taking full advantage of vendor support, and using all identified external influencers and influences. A key recommendation for IT leaders is to use the IoT ecosystem from the implemented IoT solutions to promote benefits and profits. The implications for positive social change include the potential to improve technology to support and encourage benefits to organizations and increase the number of organizations successfully implementing IoT technology. Businesses and end-users can benefit from the IoT ecosystem with IoT devices in smart cities, offices, hospitals, or homes.

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Dedication

This doctoral research study is dedicated to my parents and family for their endless love, support, and encouragement to me in completing this work.

Acknowledgments

I want to thank my wife, Thanhtram, for supporting my entire doctoral journey at Walden University. Without her encouragement and understanding of my schoolwork, it would be impossible for me to complete this educational journey as a Doctor of Information Technology. There were countless times she took over family tasks and activities to spare more time for me to complete my schoolwork. I would not be able to achieve this journey without her.

Second, I would like to thank all six participants who dedicated their valuable time and honest responses to contribute to this study's findings. Without their volunteer participation in this study, I would have had no chance to interview directly with these top-notch leaders spearheading contributing IoT solutions to the world. Their contributions surely go along with the success of the study.

Last, I would like to thank Walden University's Doctor of Information Technology department instructors, who guided me through this doctoral journey. I also thank Dr. Jodine M. Burchell, my committee chair, Dr. Robert Duhainy, my second committee member, and Dr. Gail S. Miles, my university research reviewer, for tirelessly guiding me through the steps to complete this study. Without their encouragement and guidance, I would not have achieved this study successfully.

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Section 1: Foundation of the Study

Many businesses and government agencies are familiar with smart-homes, smart-offices, or smart-cities. Individuals and companies apply and practice the internet of things (IoT) technology to their daily tasks. Gohar et al. (2018) reported that some researchers enabled efficiencies of the internet of small things (IoST) by adopting the IoT technology and proposing big data analytics architecture within smart cities in South Korea. Leong et al. (2017) also noted that researchers discovered smart city communication solutions significantly improved with the adoption of IoT technology in Malaysia. From those two studies, researchers and corporate information technology (IT) leaders found significant factors to adopt IoT technology by combined multiple communication technologies and big data to enhance daily life in smart cities worldwide. Key players of IoT technology, such as planners, implementers, policymakers, or solution vendors, used determinants of factors in technology, organization, and environment to adopt and implement the IoT technology (Leong et al., 2017; Pau et al., 2018; Singh et al., 2017; Xiao, 2017).

In sum, researchers discovered the relationship between adoption and implementation factors for IoT technology and factors of other contemporary technologies to form business solutions. In this study, I explored the factors that influence implementation strategies for IoT technology. In this chapter, I covered components such as background, problem statement, purpose statement, nature of the study, research question, conceptual framework, definition of terms, the significance of the study, and literature review.

Background of the Problem

From the acknowledgment of the foundation of the study above, researchers and corporate IT leaders encountered challenges in adopting and implementing the IoT technology from realizing its benefits. There were reports regarding challenges in the implementation of IoT technology with mobile cloud computing (MCC), wireless sensor network (WSN), and medical monitors or applications such as collecting IoT data in real-time or shortening IoT device lifecycle from energy-draining on the networks (Dinh et al., 2017; Li et al., 2018; Luo & Ren, 2016). Thus, these studies' researchers reported issues with implementing IoT technology with other technologies such as MCC, WSN, or medical systems. However, some practitioners had successful strategies for adopting and implementing IoT technology to benefit their organizations such as six research participants in this study.

Cloud computing service providers and corporate IT departments could integrate cloud computing with WSN and mobile networks to realize benefits from IoT devices' mass data. Researchers and organizations proclaimed successful implementation of IoT technology with other technologies such as industrial IoT (IIoT), Industrial 4.0, WSN, and big data to improve business decision-making strategies (Castro et al., 2017; Cedeno et al., 2018; Kobusinska et al., 2018; Song, 2017). Thus, these studies' researchers reported the benefits of successfully implementing the IoT technology in industries with the convergence of cloud computing and big data. In this study, I explored the factors of implementation strategies for IoT technology that researchers and corporate IT leaders successfully used to realize IoT benefits for their organizations.

Problem Statement

The United States Department of Defense (DoD) has reported that some IT offices within government agencies have failed implementations for IoT technology (Kirschbaum, 2017). According to Ives et al. (2016), 37% of U.S. organizations strived to embrace IoT technology, with 73% of the agencies unsuccessfully integrating their IoT systems with existing resources noting that 59% failed during the implementation phase, and 14% failed during the integration phase. The general IT problem is that many IT leaders fail to implement IoT devices, which may impede an organization's ability to integrate IoT systems with existing business resources. The specific IT problem is that corporate IT leaders lack implementation strategies of IoT technology to realize IoT benefits for their organizations.

Purpose Statement

The purpose of this pragmatic qualitative inquiry study was to explore the implementation strategies that corporate IT leaders use for IoT technology implementation to realize IoT benefits for their organizations. The targeted population for this study included six corporate IT leaders from healthcare organizations in the United States holding professional positions such as chief of information officers (CIOs), chief technology officers (CTOs), and IT directors experienced in implementing IoT technology to adopt IoT systems for their organizations. The implication for positive social change includes the potential for corporate IT leaders to improve IoT technology's implementation strategies to integrate IoT systems with existing business resources and increase efficiency in healthcare treatments, operations in the hospital environment, and medicines distribution. The increasing accessibility to collect IoT data from end-users makes physicians make sufficient decisions to increase life and cost savings. Increasing IoT technology services leads to connecting more devices between home, office, hospital, and public environment to support individuals' daily lives. Lastly, end-users, providers, or patients balance better living conditions in smart office environments and living environments.

Nature of the Study

I used a qualitative methodology for this study. Qualitative studies incorporate human and social data that researchers collect and interpret to involve the in-depth exploration of a natural phenomenon (Franco, 2016). The qualitative methodology was appropriate for this study because I needed to collect in-depth data from corporate IT leaders to explore the phenomenon of IoT technology implementation strategies within their organizations. Quantitative researchers investigated the impact of variations that involve examining variables, their relations, hypotheses, and statistical analysis (Bolondi et al., 2018). The quantitative methodology was inappropriate for this study because the subject matter was the human experience better described with words and not statistical variables. Mixed-methods studies included quantitative and qualitative methods (Ferguson et al., 2017). The mixed-methods methodology was inappropriate for this study because I did not examine statistical analysis or the relationship between variables.

I used a pragmatic qualitative inquiry for this study. Researchers used pragmatic studies to explore human experience in real-world situations to understand and address the identified problem (Salkind, 2010). Because this study required in-depth data collection from professional participants' human experience in real-world situations, the pragmatic qualitative inquiry design was warranted. A case study involved the detailed exploration of an entity such as a group or organization to explore and understand the phenomenon (Lochrie, 2016). Because this study required in-depth data collection from multiple qualified research participants in the healthcare industry, a multiple case study design was inappropriate for the researcher to employ for this study because there were several difficulties in obtaining the letter of cooperation from organizations during the COVID-19 national pandemic locked down. In a narrative study, a researcher investigated the stories of daily life as a means of characterizing the phenomenon of human experience in relevant and meaningful ways to study social phenomena (Hold, 2017). The narrative design was inappropriate for this study because I did not collect data involving daily life stories or the phenomenon of human experience from research participants rather than drawing out implementation strategies for IoT technology. The phenomenological design involved collecting qualitative data from personal experiences to create specific narratives describing the meanings and daily patterns of phenomena (Lindberg et al., 2017). The phenomenological design was not appropriate for this study because I did not create specific narratives to describe any phenomenon in research participants' everyday life. The ethnography design involved collecting data from a group or several groups to understand a culture or subculture (Schober et al., 2016). The ethnography design was inappropriate for this study because I did not use the collected qualitative data to understand the corporate IT leaders' cultures sharing the sophisticated course of action to interpret related events. I used a pragmatic qualitative inquiry to explore and interpret research participants' IT implementation strategies of IoT technology as innovative technology within their organizations.

Research Question

What implementation strategies do corporate IT leaders use for IoT technology implementation to realize IoT benefits for their organizations?

Interview Questions

I used semistructured interviews in this pragmatic qualitative inquiry study. The open-ended interview questions aligned with the over-arching research question and the conceptual framework of this study. The open-ended interview questions were as follows:

1. How would you describe your experience and role with the IoT technology projects?
2. What implementation strategies do you use for IoT technology projects?
3. How do you measure the IoT benefits for your organization? How do you justify the measurements are sufficient to measure the benefits?
4. What happened when you encountered challenges during the IoT technology implementation project? How did you deal with them?
5. What strategies do you apply to redesign jobs and adjust human resource policies when aligning selected IoT technologies to the business requirements?
6. How do you assess and conclude that the project's staff has adequate technological capabilities and competencies to pursue the IoT technology implementation project?

7. How do you assess the external environment influencers in implementing IoT technology, such as limitations, opportunities, industrial organizations, and vendor support?
8. What additional information regarding implementation strategies for IoT technology would you like to provide besides your previous answers?

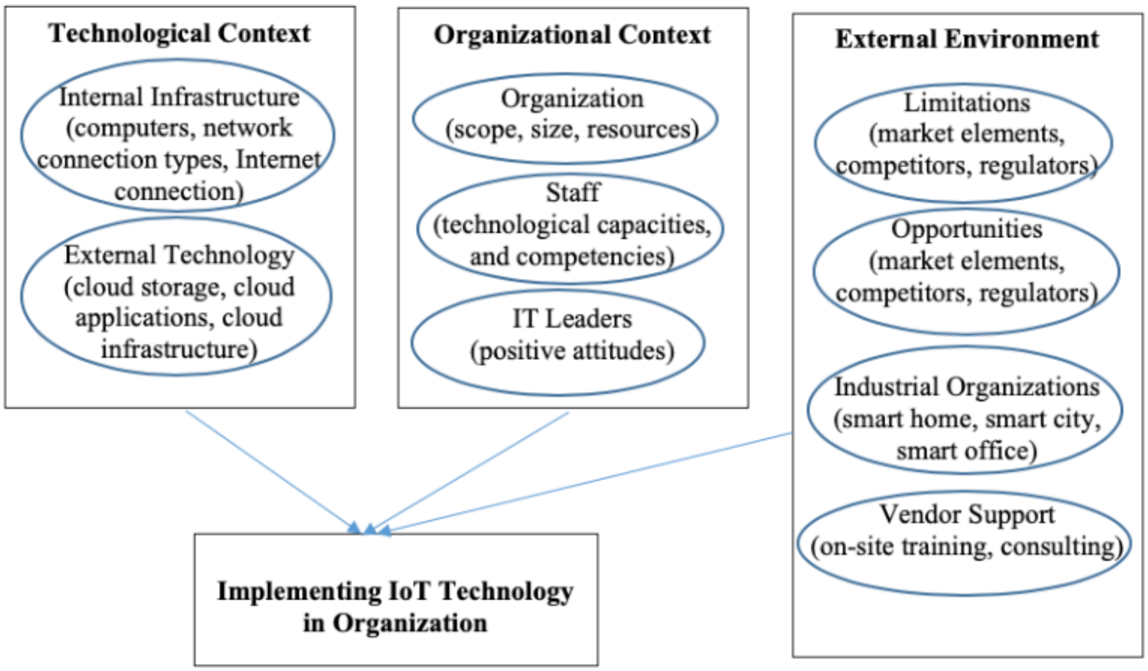
Conceptual Framework

DePietro et al. (1990) designed the technology-organization-environment (TOE) framework to decide whether to adopt and implement technological innovations by considering technological, organizational, and environmental factors. Researchers have been applying the TOE framework for their research on adopting and implementing innovative technology at the organizational level. Ahmadi et al. (2017) employed the TOE framework as the organizational level theory to adopt and implement the hospital information system (HIS) in the context of the healthcare industry by exploring the framework factors. Martins et al. (2016) referred to the three factors of the TOE framework as the technological context, including the internal and external technologies relating to the organization; the organizational context, including measures of the organization such as scope and size; and the environmental context including limitations and opportunities for adopting and implementing the technology innovation such as market elements, competitors, or regulators. The TOE framework was adapted successfully to study the adoption and assimilation of different types of IT innovation, including the user's acceptance or rejection and support of business strategies (De Mattos & Laurindo, 2017). Ruivo et al. (2016) stated that the TOE framework influenced the implementation, adoption, and usage of the technology innovation process at the organizational level from three identified aspects: technological context, organizational context, and environmental context. De Souza et al. (2017) concluded that the TOE framework would be the theory for studying the adoption and implementation of technology innovation at the organizational level. The other user-centric adoption theories include the Technology Acceptance Model (TAM), Rogers' Diffusion of Innovation (DOI) theory, and the Tri-Core Model theory.

I selected the TOE framework as the base model for this study's conceptual framework because I could use the three factors to study the implementation strategies of IoT technology in industrial organizations and government agencies. If the organization successfully implements the IoT technology to make it work and deliver the desired result, it can integrate and adapt processes to embrace IoT technology into its workflow and become more productive. The three factors of the TOE framework include technological, organizational, and environmental contexts to influence healthcare organizations to implement the IoT technology to realize the IoT data integration of healthcare business applications (Ahmadi et al., 2017). The technological context refers to internal infrastructure factors such as computing machines, network connection types, internet connection at the company, and external technology factors relevant to the organization (Martins et al., 2016). The organizational context refers to factors such as scope, size, and resources (De Mattos & Laurindo, 2017). De Souza et al. (2017) reported additional factors to be considered, such as the staff's technological capacities and competencies in innovative technology. Finally, the environmental context refers to limitations, opportunities, industrial organizations, and vendor support. Martins et al. (2016) reported market elements, competitors, and internal/external regulators as influences for limitations and opportunities that technological innovation was affecting the business decision-making. De Mattos and Laurindo (2017) emphasized industrial organizations as one of the environmental factors in developing smart homes, smart cities, or smart offices. Ahmadi et al. (2017) reported that vendors provided external support factors such as consulting or onsite training to the innovative technology in healthcare organizations. This study model would warrant success in exploring IoT technology implementation in organizations with the three factors of technology, organization, and external environment. Figure 1 presented the three factors of the TOE framework for implementing IoT technology in the organization to carry out the IoT solutions and benefits.

Figure 1

Technology-organization-environment (TOE) Framework.



Note. This figure illustrates three factors for implementing IoT technology in the organization.

Definition of Terms

Cloud Storage: Storage is available and capable of storing high volumes of varying data, such as big data (Baker et al., 2017).

Industrial Internet of Things: Industrial Internet of Things (IIoT) is the field of IoT related to responding to product information requirements in manufacturing environments (Cedeno et al., 2018).

Internet of Things: Intelligent and self-conjuring embedded devices and sensors are interconnected in dynamic and global network infrastructure, enabling scalability, flexibility, agility, and ubiquity in fields of massive scale multimedia data processing, storage, access, and communications (Kobusinska et al., 2018).

Local Storage: Consists of file storage and database to keep the files' properties and indexes in non-volatile memory in a compressed or encrypted way (Rahmani et al., 2018).

Sensing Layer: Novel sensors or sensing technologies for effectively and efficiently collecting personalized health and medical information in an IoT environment (Qi et al., 2017).

Assumptions, Limitations, and Delimitations

Assumptions

Roing et al. (2018) stated that assumptions are facts that researchers could use as evidence for their research without verifying their truthfulness. In this study, I assumed that the participants provided answers to the research open-ended interview questions based on their personal experiences and understanding of the situations. I also assumed that the data from the study's open-ended interview questions were the most current information regarding the topic of the study. Finally, I assumed the participants would be from the healthcare industry and would not include participants from other industries such as agriculture, manufacturing, or transportation

Limitations

Kissam (2018) indicated that limitations were factors limiting the research contributions, such as the researchers would hold accountable for those uncontrollable limits in their studies. One limitation of this study is that there were fewer government restrictions on IoT technology, so limitations in the number of protocols for IoT technology limit participants' experience. The collected data from interview sessions were from healthcare participants and therefore were not transferable to other industries. Finally, I targeted the IoT technology market in the United States, limiting the study to entirely relevant to other markets such as European or Asian markets.

Delimitations

Erwin et al. (2015) indicated that delimitations were scopes that researchers control the boundaries or limits of the research study. The delimitations for this study were that the study's scope included the United States and that the participants were qualified experts in IoT technology.

Significance of the Study

Contribution to Information Technology Practice

Gupta and Gupta (2016) reported that the number of IoT devices is as much as three times the world population and double the number of IoT devices in 2015 from 2010. Corporate IT leaders of organizations and government agencies receive increasing requests from enterprise departments to service IoT technology (Barkakati et al., 2017). The IoT technology brought benefits to IT practice to support business applications such as IoT network technologies enhancing the cloud computing network, distributed computing network, or hybrid networks. Researchers reported that they collected information from IoT devices for effective IT practices on the concept of convergence, connectivity, computing power, and collecting valuable data from anywhere, at any time, on any network, and any device (Gupta & Gupta, 2016). Hence, corporate IT leaders need to have adequate implementation strategies for IoT technology to make it work and deliver the desired result to realize IoT benefits for business applications. The study's findings provided a preferable set of implementation strategies collected from multiple cases from multiple organizations. Therefore, the study results may help IT leaders fill the gaps in the IT practice of understanding and effectively practicing IoT technology as innovative technology. As a result, organizations and government agencies may implement IoT technology within their organization by proposing a preferable set of IoT technology implementation strategies before integrating it with existing business systems.

Implications for Social Change

The implication for positive social change includes the potential to improve technology impacts on human living environments by providing connectivity among things between home, office, and hospital. Additionally, end-users may advance their balance in living conditions in smart living environments and smart office environments. Mathaba et al. (2017) concluded that end-users would benefit from automation's efficiency and effectiveness in operational processes, from adopting IoT technology to integrating with Web 2.0 technology or Enterprise 2.0 technology. The preferable set of implementation strategies for IoT technology from the study's findings could also benefit organization leaders and corporate IT leaders as targeted audiences of the study, increasing the number of organizations to implement, integrate, adapt, and continuously employ IoT technology. End-users may benefit from IoT products connecting directly to business applications. In the healthcare industry, patients may find their caregivers or medical providers providing the necessary care and making significant medical decisions promptly based on the processed information from collected IoT data of IoT devices. Caregivers or medical providers may prefer to use the processed information from collected IoT data continuously synchronizing from the patients' IoT wearable devices to the clinics or doctor's office IoT platform (Rahmani et al., 2018). Medical IoT middleware applications may provide valuable insights to medical practitioners regarding their current health status to save patients' lives promptly. Finally, an individual may also benefit from the study's findings to have acceptable practices in applying knowledge of IoT technology gained to share personal data with IoT devices connecting directly to back-end network systems. Hence, end-users may live comfortably in smart living environments such as smart homes, offices, or hospitals.

A Review of the Professional and Academic Literature

I conducted this literature review to answer the following research question: What implementation strategies do corporate IT leaders use for IoT technology implementation to realize IoT benefits for their organizations? I selected seven criteria to search for literature on implementation strategies for IoT technology. Those criteria were: (a) implementation strategies for IoT technology, (b) collecting IoT data, (c) filtering unused IoT collected data, (d) implementing IoT technology within the cloud computing environment, (e) implementing IoT technology with legacy network on-premises, (f) IoT benefits across industries including healthcare, and (g) using TOE framework model to implement the IoT technology.

I focused on five areas forming the reviews in literature: (a) conceptual framework, (b) analysis of support security, (c) analysis of contrasting security theories,

(d) analysis of potential themes and phenomena, and (e) relationship of this study to previous research. I explore the three categories of TOE framework with their factors for an organization to successfully implement IoT technology, including technological context with factors of internal infrastructure and external technology; organizational context with factors of organization, staff, and IT leaders; and external environment context with factors of limitations, opportunities, IT industry, and vendor support. For this literature review, I identified how my chosen framework, the TOE framework, was used in IoT research to discuss various strategies for implementing IoT technology. Using the Walden University library, I accessed the databases, including the EBSCOhost Computers and Applied Sciences Complete, IEEE Xplore Digital Library, ScienceDirect, and ProQuest Computing. I also use Google Scholar to search for articles. I identified all 70 articles were valid peer-reviewed papers listed in Ulrich's database using the Ulrich peer-review verification option with the International Standard Serial Number (ISSN) as the verification parameter. The literature review included 77 articles; 70 (or 90%) were peer-reviewed and published within five years of the expected chief academic officer (CAO) approval date in 2022.

For this proposal, I used 174 referenced sources. Ninety-four percent of the sources were published within the last five years, whereas 94% were peer-reviewed. I used 77 sources in the literature review, with 90% of them being peer-reviewed sources and published within the last 5 years. The overall references included two books and no doctoral dissertations.

Application to the Applied IT Problem

I explore how corporate IT leaders used implementation strategies for IoT technology to realize its benefits for their organizations in this pragmatic qualitative study. In this literature review, I explain the TOE model's conceptual framework for this study and analyze the supporting and contrasting security theories. Next, I discuss the potential themes and phenomena by providing a critical analysis and synthesis of the literature. Lastly, I explain the relationship of this study to previous research.

Conceptual Framework

I selected the TOE framework as the base model for the conceptual framework for this study. DePietro et al. (1990) designed the technology-organization-environment (TOE) framework that researchers and organizations could use to research technological innovation decision-making for adoption and implementation at the firm level.

Many researchers and organizations use information security theories or models to research relating to technological innovation. Delone and McLean (2003) proposed the information systems (IS) success model with six interrelated dimensions of information system success to help researchers measure technological innovation's impact on users. Rogers (1995) presented the diffusion of innovation (DOI) theory so that researchers could apply the model for research relating to adopting and utilizing technological innovation with five categories of individual innovativeness. Fontela and Gabus (1974) developed the decision-making trial and evaluation laboratory (DEMATEL) method that researchers could use to address the interrelations and dependency among criteria to assess technological innovation's impact or performance system using the seven steps.

Davis (1989) wrote the technology acceptance model (TAM) that researchers could use to determine the core factors affecting technological innovation acceptance among users. These information security theory/framework models allow researchers and organizations to use in research relating to technological innovation in various target audiences such as user-centric, organization, or enterprise. This study explores the implementation strategies of IoT technology in the organization. Therefore, I selected the TOE framework as the base model for the conceptual framework for this study. In the following sections, I reviewed the TOE framework and other available theory/framework models in literature in the last 5 years.

The TOE Framework

DePietro et al. (1990) designed the context for change, including factors of organization, technology, and environment, to form the TOE framework. The organization context contains the descriptive measures in an organization, such as firm size, managerial structure, or human resources (DePietro et al., 11990, p. 153). The technology context has factors describing the technology internally and externally relevant to the firm (DePietro et al., 1990, p. 153). The environmental context contained factors pertinent to an organization's interfaces, such as industries, competitors, vendors, or government regulators (DePietro et al., 1990, pp. 153-154). Numerous peer-reviewed articles demonstrate how researchers and organizations have applied the TOE framework as the base model theory for designed frameworks to adopt and implement technology innovations.

Researchers and corporate IT leaders have used the TOE framework as a single base theory to adopt and implement technology innovation at the organizational level within industries or a whole country. Ahmadi et al. (2017) designed a framework for adopting innovative, country-wide hospital information systems (HIS) for Malaysia's public hospitals using the TOE framework's three dimensions. De Souza et al. (2017) established the second-order digital divide framework, based on the TOE framework, to explore the adoption of information communication technology (ICT) in small and medium enterprises (SMEs) in Brazil. Martins et al. (2016) also emphasized adopting the diffusion process of cloud computing software as a service (SaaS) by designing a conceptual model for accessing the determinants based on the TOE framework from 265 firms using cloud computing SaaS service. In these cases, the researchers and corporate IT leaders realized the benefits of obtaining sufficient positive factors using the TOE framework's three factors to adopt and implement the technology innovations for organizations in different countries.

Corporate IT leaders and researchers fully adopt the TOE framework as a base conceptual model for designing a framework for IoT technology innovation adoption and implementation at the organization level. Researchers discovered the TOE framework's factors sufficient to establish research models for adopting and implementing technological innovations at the organizational level in all industries and countries, including advanced IT (A-IT), Industrial 4.0, and IoT technology (Bantau & Rayburn, 2016; Lin et al., 2018; Shousong et al., 2018; Tu, 2018). These studies' researchers noted that corporate IT leaders adopt the TOE framework as a base theory to construct the study models to adopt IoT technology innovation for their organizations. I chose the TOE framework for this reason for this research.

The TOE Framework and DOI Theory Combined

Researchers and corporate IT leaders often propose conceptual models based on core theories such as the TOE framework combined with other theories such as the DOI theory or the TAM model. Organizations and researchers realized the benefits of the integration of both the TOE framework and DOI theory to establish research frameworks for technological innovation adoption in enterprises, industrial markets, and local government agencies (Chiu et al., 2017; Martins et al., 2016; Shaltoni, 2017; Tang & Ho, 2018). Integrating DOI theory's five states and TOE framework's three factors provided researchers and corporate IT leaders with an effectiveness and efficiency template to establish the research models for technological innovation adoption at the organization level.

Researchers and corporate IT leaders could also construct research models using the TOE framework with DOI theory for IoT technology innovation adoption at the firm level. Organizations and researchers developed research models as well as study hypotheses by integrating the TOE framework and DOI theory to identify the decisive factors at possible states for IoT technology innovation adoption at organizations, industrial markets, and local government agencies (Chiu et al., 2017; Shaltoni, 2017; Tang & Ho, 2018). These studies emphasized the TOE framework and DOI theory hybrid to identify the positive influencing factors to construct the study structures for IoT technological innovation adoption in enterprises, industries, and local government agencies. In this study, I focused on exploring the factors of implementation strategies of IoT technology rather than studying the interest rate of IoT technology from the organization. Therefore, the TOE framework and DOI theory hybrid would be unnecessary for this study.

A Combination of the TOE Framework with other Security Theories

Organizations and researchers explored the combination of the TOE framework and theories other than the DOI theory. Duan et al. (2017) developed the research model based on the integration of the TOE framework and the DeLone and McLean Model of IS Success (D&M) information system success model to identify critical success factors for IoT technology implementation in food traceability systems in China's organizations. The researchers intended to collect only success factors using the D&M model, constructed the research model using the TOE framework, and implemented the IoT technology innovation in food traceability systems. Hsu and Yeh (2017) used the hybrid of the TOE framework and the decision-making trial and evaluation laboratory (DEMATEL) method to construct a research model for IoT technology innovation adoption in Taiwan's logistics industry. The researchers evaluated the TOE framework's identified factors using the DEMATEL method to collect only influencing factors for adopting IoT technology. Lastly, Ruivo et al. (2016) defined a conceptual model by incorporating the TOE framework and Resource-Based View (RBV) theory to assess the Enterprise Resource Planning (ERP) system for adoption across Iberian manufacturing and services SMEs. The researchers used the identified factors using the TOE framework to explain the ERP system's usage and the RBV theory to explain the ERP value. Thus, researchers and corporate IT leaders select the TOE framework fully or partially combined with other theories to establish new research models to adopt and implement technological innovation at the firm level crossing industries and countries. In this study, I used the TOE framework to explore factors of successful implementation strategies of IoT technology at the organization level without combining it with other information security (IS) theories.

Combining the TOE framework and DOI theory has led researchers and corporate IT leaders to conduct empirical research by integrating the TOE framework and other security theories. Researchers and corporate IT leaders addressed their designed research models based on the TOE framework and other theories such as DEMATEL, D&M, TAM, and Tri-Core Model theory for IoT technology adoption at organizations in industries, SMEs, and countries (De Souza et al., 2017; Duan et al., 2017; Hsu & Yeh, 2017). These studies' researchers reported the TOE framework's flexibility and high standard theoretical level that researchers and corporate IT leaders identified as the factors for IoT technology innovation adoption at the organizational level in industries crossing many countries borders. Hence, I found it was necessary to investigate and analyze the related theories using the TOE framework to discover the relationship and alignment among their factors and elements.

The TOE framework is A Selection for This Study

There are many advantages for researchers and corporate IT leaders selecting the TOE framework directly to reveal the business decision to adopt and implement technological innovation at the firm level. De Souza et al. (2017) established the second-order digital divide concept using the TOE framework as a base model for information communication technologies (ICTs) innovation adoption in 3,231 SMEs. The researchers concluded that the TOE framework focused on technology adoption at the firm level rather than the other user-centric adoption theories such as TAM theory, DOI theory, or tri-core model theory. The TOE framework would provide sufficient influence on all three factors for researchers and corporate IT leaders researching the adoption and implementation strategies for IoT technology in industries and countries (Bantau & Rayburn, 2016; Lin et al., 2018; Shousong et al., 2018). Thus, these studies' researchers reported that organizations used the TOE framework directly or constructed study structures to adopt and implement IoT technology at the firm level. I explored the implementation strategies for IoT technology innovation at the organizational level in this study. Therefore, after this literature review section of the TOE framework in the research, I chose the TOE framework for use as the adequate base security theory for this study structure to explore the implementation strategies for IoT technology innovation. In the next section, there is an in-depth literature review of the TOE framework's evolution through different research methodologies such as qualitative research, quantitative research, and mixed methods research.

Evolution of the TOE Framework

Researchers and corporate IT leaders have selected the TOE framework for almost 3 decades for organizations to adopt and implement technological innovation on their projects. DePietro et al. (1990) wrote the context for change in organizations to adopt and implement technology innovation with three elements of technology, organization, and environment, also known as the TOE framework. The TOE framework was initially designed to lead an organization in adopting innovation and implementing it to benefit the organization and its business environment, including the government systems. It would be necessary to review the evolution of the TOE framework up to the current of this study to unfold its transformed structure, if any, to confirm the conceptual model of this study covering the necessary factors of the three contexts.

Over four million search results are currently showing on bing.com and yahoo.com search engines with the keyword *TOE framework.* Researchers and corporate IT leaders have used the TOE framework's three contexts without adding or eliminating them because each context contains various selection factors. The researchers selected the TOE framework to specify the technology innovation perspectives, explain the factors influencing the adoption of business decisions, and evaluate the organization's decision-making behavior regarding technology innovation (Duan et al., 2017; Thomas et al., 2016; Tu, 2018). Researchers and corporate IT leaders realized benefits from utilizing identified factors of the TOE framework that sufficiently cover the adoption and implementation of technology innovation in their organizations.

Researchers emphasized the combination of the TOE framework and DOI theory in research relating to diffusing innovation in an organization and benefiting from factors of contexts. Government offices and private firms confirmed benefits from the integrated TOE framework and DOI theory to obtain influenced factors and support of top management and leadership (Tang & Ho, 2018), focus factors and explain diffusion (Chiu et al., 2017), and establish research framework (Shaltoni, 2017). In summary, researchers reported that they found a guaranteed rate of achieving sufficient influenced internal and external factors from the TOE framework that they would consider staying possible to its original design. Hence, the DOI theory would be used before or after the TOE framework to analyze diffusion to technology innovation at the organizational level. There would be potential for researchers to observe the evolution of the TOE framework from newer concept models that integrated it with DOI theory.

It would also be necessary to review the combination or integration of the TOE framework and other theories that might evolve its original structure. Researchers and corporate IT leaders selected the TOE framework and combined it with the RBV theory to explain the technology innovation's usage and value (Ruivo et al., 2016). Hsu and Yeh (2017) reported that they integrated the TOE framework with the DEMATEL method to evaluate factors of the contexts and produce results. Duan et al. (2017) decided to combine the TOE framework with the D&M model to focus on influential factors and the success of adoption behavior. Like constructing a research model based on the TOE framework and DOI theory, researchers and corporate IT leaders decided to maintain the significant three contexts of the framework by selecting positively influenced factors and then combining them with other theories to obtain the research solutions. In summary, researchers and corporate IT leaders have used the TOE framework for almost three decades with minimal significant evolution to transform it into an irreversible framework to mark down the TOE framework evolution.

Limitations of the TOE Framework

The TOE framework comprises three elements of a firm's context influencing the process through its adopts and implements technology innovations, including technology, organization, and environment (DePietro et al., 1990). There are three significant limitations of the TOE framework in research, including research methodologies, boundaries, and adopting sophisticated technological innovations. Researchers found the TOE framework's limitations, such as primary unclear constructs and being too generic, needed to combine with the D&M model to conduct mixed methods research (Duan et al., 2017). De Souza et al. (2017) reported that they used the TOE framework and found it was designed for the organization as a starting point instead of using it at the user level. Chiu et al. (2017) discovered that they combined the TOE framework with other theoretical models to understand the adoption and implementation of complicated technological innovations. Thus, researchers and corporate IT leaders not only explored the adoption and implementation of technology innovations with identified influencing factors of the TOE framework but also identified potential weaknesses in research methodologies, boundaries, and complex innovations. I adopted the TOE framework with clearly identified factors of the three contexts to explore the implementation strategies of IoT technology in an organization in this study. In the next section of the literature review, I include an analysis of related security theories for a complete review of the conceptual study framework.

Critical Analysis of Supporting Security Theories

Researchers and corporate IT leaders have used over a hundred information security theories in IS research. Still, only a few of them focus on technology innovation research regarding adoption and implementation. DePietro et al. (1990) developed the TOE framework to address the three contexts in adopting and implementing technology innovation internally and externally in the organization. Although researchers heavily used the TOE framework to research the adoption of technology innovation at the firm level, the TOE framework also focuses on implementing technology innovation in organizations (DePietro et al., 1990, p.197). Fleischer and Roitman (1990) wrote the four perspectives of implementation for technology innovation at the firm level as part of the TOE framework focusing on implementation, including technocentric, sociocentric, conflict/bargaining, and system designs. Researchers successfully explored the possibilities of adopting and implementing innovation using the TOE framework at the firm level (Fleishcer &Roitman, 1990). Bantau and Rayburn (2016) reported using the TOE framework to adopt and implement the A-IT and extend it to increase the broader range of influenced factors for the three contexts. Lin et al. (2018) explored the TOE framework to adopt Industry 4.0 in the Chinese automotive industry. Shousong et al. (2018) and Tu (2018) reported using the TOE framework to adopt the logistics and agriculture products supply chain. Thus, these studies' researchers explored the TOE framework's benefits in applying and extending the influenced factors of adoption and implementation for technology innovation at the organizational level. In summary, the researchers found that they could use the TOE framework to provide a theoretical background and empirical study regarding the implementation of technology innovation. Hence, I explore the IoT technology implementation strategies using the TOE framework's classified factors and guidance in this study.

The DOI Theory

In addition to the TOE framework, researchers also selected other theories to focus on technology innovation adoption in the organization. Rogers (1995) wrote the DOI theory using the five categories of individual innovativeness for the adoption of innovation in the organization as follows:

- The knowledge category included the influences of the relative advantage factor.
- The persuasion category included the influences of the compatibility factor.
- The decision category included the influences of the trialability factor.
- The implementation category included the influences of the observability factor.
- The confirmation category included the influences of the complexity factor.

Researchers applied the five stages of DOI theory to address the distribution of innovation across a system, such as broadband mobile applications adoption by enterprises (Chiu et al., 2017). Shaltoni (2017) reported that the research used the DOI theory as the base model for internet marking adoption in emerging industrial markets. Tang and Ho (2018) used the DOI theory to construct the study structure for IoT adoption in local government agencies in the United States. Thus, these studies' researchers reported that they applied DOI theory, starting with the initial stage and ending with the confirmation stage of individual innovativeness, addressing the distribution of innovation in an organization or a particular social system. Researchers and corporate IT leaders followed the implementation stage in DOI theory after establishing the same research study's adoption stage. I decided not to use the DOI theory for this study because I focus on exploring the factors of successful implementation strategies of IoT technology rather than studying the interest rate of IoT technology from organizations. In this study, I use the TOE framework as the basic model for the study structure to explore the organization's IoT technology implementation strategies. I selected the TOE framework because I do not need to explore the IoT technology adoption process before exploring the same research implementation process.

The IS Success Model

Researchers use other available theories with a focus on organizational impact. Delone and McLean (2003) proposed an updated IS success model from their original D&M theory, including six interrelated dimensions of IS success, such as information quality, system quality, service quality, use (in the same category to use), user satisfaction, and net benefits. Researchers reported IS success in measuring taxonomy using the D&M model, showing the positive impact of the individual in healthcare service evolution towards the IoT technology (Martinez-Caro et al., 2018). Duan et al. (2017) applied the D&M model as the base model for the study structure to explore the positive impacts of food traceability on individuals and enterprises in China. Costa et al. (2016) combined the D&M model with the TAM theory and TOE framework to construct the model validation for Enterprise Resource Planning (ERP) systems adoption and satisfaction. Thus, these studies' researchers measured the IS success based on the organization level's information, system, and service quality. I use the TOE framework as the foundation model for the research model to explore the IoT technology implementation rather than measuring the IS success to find the impact of IoT technology on individuals, enterprises, or society in this study.

The Theory of Planned Behavior (TPB)

Researchers integrated the TAM model and TPB theory with the TOE framework to adopt and implement innovative technology. Ajzen (1991) wrote the TPB theory to determine customer behavioral intention based on attitude, subjective norms, and perceived control. Researchers used the TPB theory to analyze the impact of green initiatives in the hospital environment based on consumer perceptions such as personal values, attitudes, environmental knowledge, and perceived benefits (Gao et al., 2016). Awa et al. (2015) successfully integrated the TAM model, the TPB theory, and the TOE framework to construct the study structure to adopt e-commerce in the organization. Chong et al. (2015) integrated the TPB theory and other security models to analyze end-user personalities and construct radio frequency identification (RFID) predictions as IoT technology adoption in the healthcare industry. Thus, these studies' researchers reported that researchers and corporate IT leaders selected the TPB theory to analyze and predict the customers' or individuals' innovative technology adoption behaviors. I do not integrate the TPB theory with the TOE framework because I am not studying individual behaviors when exploring IoT technology implementation strategies in this study.

Critical Analysis of Contrasting Security Theories

There are two possible contrasting security theories toward the TOE framework in adopting and implementing technology innovation, including the DEMATEL method and the TAM model. Golcuk and Baykasoglu (2016) stated that the DEMATEL method focused on modeling cause-and-effect relationships for individuals or groups toward decision-making and evaluations. Mangla et al. (2018) emphasized that the DEMATEL method contained techniques to evaluate and support decision-making based upon a group of independent experts' opinions. Chang and Chen (2018) reported using the DEMATEL method to analyze social game factors to support decision-making to improve services. Thus, these studies' researchers reported that researchers used the DEMATEL method to evaluate innovation technology factors and support decision-making for individuals or groups. The TAM model is a second model next to the DEMATEL model to study the individual groups adopting innovative technology.

Researchers and corporate IT leaders use the TAM model to study individuals' or groups' prediction rates in adopting innovative technology. Chatterjee and Bolar (2019) reported using the TAM model to identify innovation technology intentions as determinants in predicting innovative technology adoption in individuals or groups. Next, Estriegana et al. (2019) reported using the TAM model to focus on the innovative technology of individuals or groups but omitting other factors such as efficiency, playfulness, and satisfaction. Gu et al. (2019) noted that the TAM model contained critical elements of consumer acceptance of innovative technology but lacked actual guidance to adopt the new technology. Thus, these studies' researchers reported the TAM model's usefulness for adopting innovative technology in individuals or groups without specific guidance.

The DEMATEL Method

The DEMATEL method was developed in the Science and Human Affairs Program of the Battle Memorial Institute of Geneva to address the interrelations and dependency among criteria, find the total influential matrix, and produce the network relations map representing cause or effect groups (Fontela & Gabus, 1974). Farhani et al. (2017) used the DEMATEL method to discover immediate or immediate relations in a system of variables with seven steps:

1. Obtain expert's views and calculate the average of all judgments.
2. Normalize direct-relations matrix Z.
3. The total-relation matrix T.
4. Analyze the results.
5. Find a causal diagram.
6. Produce quantifiable results in Crisp logic to Crisp value.
7. Calculate the influential weights of DEMATEL combined with the analytic network process (ANP).

Hsu and Yeh (2017) reported that they used the DEMATEL method to assess factors affecting the adoption of IoT technology. Farhani et al. (2017) used the DEMATEL method to weight criteria for the assessment of innovation technology by evaluating the environmental impact of building a new urban highway in Iran. Rolita et al. (2018) noted that they used the DEMATEL method to assess safety management system (SMS) performance in Indonesia. Thus, the studies' researchers emphasized that researchers used the DEMATEL method to assess technological innovation's impact or performance at the firm level. I selected the TOE framework as the base model to establish the research model to explore the IoT technology implementation strategies with classified factors of the three contexts in this study. Hence, I would not need to integrate the TOE framework with the DEMATEL method because I do not mainly focus on assessing the impact or performance of the IoT technology.

The TAM Model

Researchers and corporate IT leaders use security theories in their technological innovation research to discover solutions or benefits to individuals, organizations, or society. Davis (1989) wrote the TAM model particularly to model user acceptance of information systems, aiming to explain the determinants of computer acceptance behaviors. The TAM model embraced two factors of perceived usefulness (U) and perceived ease of use (E) toward the factors of behavioral intention to use an actual system use (Davis, 1989). Researchers used the TAM model to determine the core factors affecting the user acceptance of technology innovation, such as elderly users accepting the IoT and smart homes for elderly healthcare in Thailand (Pal et al., 2018). Costa et al. (2016) used the TAM model to assess enterprise resource planning (ERP) system adoption and user satisfaction. Sumak et al. (2017) reported using the TAM model to assess E-business technology adoption and customer acceptance. Thus, these studies' researchers addressed that researchers used the TAM model to assess technological innovation adoption and user acceptance in internal and external environments. In this study, I use the research model based on the TOE framework to explore the IoT technology implementation strategies at the firm level without integrating with the TAM model, as not necessary to assess technology adoption and user acceptance.

Adaptive Structuration Theory (AST)

Researchers used the AST theory to study the role of innovative technologies in organizations for business benefits and improvements. DeSanctis and Poole (1994) wrote the AST theory for studying the role of innovative technologies in the organization change process: (1) the types of structures that are provided by advanced technologies, and (2) the structures that emerge in human action as people interact with these technologies. Benamar et al. (2019) used AST theory as a base model to construct the study security model to study the IoT device's characteristics based on smartwatch consumers' appropriation process. Mueller et al. (2016) integrated AST theory with other security models to construct the study model to study innovative technologies' role in individual and organizational behavior, such as generating the data needed for socio-material theorizing. Bala and Venkatesh (2017) studied the employees' reactions to IT-enabled process innovations in the healthcare system by integrating the AST theory and other security models to focus on individual and organizational aspects of process changes. Thus, these studies' researchers reported that the AST theory would be researchers' first choice for research studies exploring the role of innovative technology and organizational change. This AST theory contrasts with the TOE framework because of its user-centric characteristics. Hence, I do not integrate the TOE framework with the AST theory to construct the research model in this study.

Critical Analysis of Potential Themes and Phenomena

Researchers and corporate IT leaders observed the adoption and implementation of IoT technology activities increasing during the past decade. This section reviewed professional and academic literature on potential themes and phenomena of IoT technology implementation strategies. There were four significant breakdowns: (1) the IoT current trends and benefits, (2) IoT Technology Benefits in Industries, (3) the current issues with IoT technology implementation in security, privacy, scalability, reliability, and reusability, and (4) the three factors of technology, organization, and environment. In the following sections, I present in literature that researchers and corporate IT leaders resolved the encountered issues when implementing IoT technology. As there are increasing IoT technology implementation projects, researchers and corporate IT leaders are aware that there are more enterprise departments looking into obtaining IoT benefits.

The Current Benefits of IoT Technology

Manufacturers added sensor(s) on an IoT device for collecting a specific type of data about or surrounding the object carrying this device. The term internet of things (IoT) technology relates to the network(s) connecting all IoT devices attaching to objects such as the cloud network, mobile network, wireless sensor network, or only the legacy network. Like computer production systems producing personal computers or mobile devices, manufacturers produce IoT devices targeting consumers needing to collect specific objects' data to support business decision-making. Manufacturers produced IoT devices, applications, and the pre-configured network connecting IoT devices before selling and delivering to consumers (Reyna et al., 2018), wearable or attached to parts of the body with the manufacturer's intrinsic settings (Qi et al., 2018), and sophisticated network attaching device like 6loWAN border-router manufactured by Intel and Weptech (Hossain et al., 2018). Thus, these studies' researchers reported that manufacturers had significant roles in setting, configuring, and controlling IoT devices before and after delivery to consumers. From that point of view, it is less IT-focused on implementing IoT technology than current IT infrastructure implementation strategies in organizations. Hence, I focus on exploring IoT technology implementation strategies to generate a set of findings of IoT implementation strategies for corporate IT leaders and researchers to realize IoT benefits for their organizations.

The Internet of Things (IoT) is a network connecting objects or products equipped with devices containing sensors to collect information and then exchange or transmit it in real time via the Internet. According to Merriam-Webster, Incorporated (2019), the definition of the IoT is the network capability that allows information to be sent to and received from objects and devices (such as fixtures and kitchen appliances) using the Internet. The corporate IT departments configure IoT networks with two primary network connections: connections among IoT devices and connections among objects or destination servers. The networks connecting IoT devices are mainly radio frequency identification technology (RFID), infrared sensors, global positioning system, laser scanners, nanonetwork, near-field communication (NFC), body area network (BAN), and personal area network (PAN) (Rahmani et al., 2018). The networks connecting objects and servers in IoT networks are mainly the Internet, mobile network, wireless sensor network, mesh networks, the legacy networks such as local area network (LAN), metropolitan area network (MAN), and wide area network (WAN). There are five popular IoT protocols such as message queue telemetry transport (MQTT), Bluetooth low energy (BLE), WiFi, Cellular, and long-range WAN protocol (LoRaWAN) (Baker et al., 2017). Last, organizations widely use IoT networks in the cloud-based environment, mobile operating systems, smart cities, smart hospitals, or organizations' on-premier environments.

The IoT Current Trends

There are IoT trends across industries, environments, and across the globe. Researchers and organizations explored IoT technology in the healthcare industry by establishing e-Health gateways to connect sensor nodes and cloud computing (Rahmani et al., 2018). Martins et al. (2016) reported that they shared IoT attention among industries and environments. Reyna et al. (2018) applied blockchain technology to identify IoT devices for improving IoT applications uniquely. Thus, these studies' researchers identified and expanded the IoT technology in multiple directions for multiple meaningful applications and purposes.

IoT Technology Benefits in Industries

Higher profit would significantly influence the business decision to adopt and implement technological innovation, especially IoT technology. Castro et al. (2017) reported that businesses had higher profits when they adopted and implemented IoT technology, such as healthcare, logistics, industrial, security, agriculture, and the environment. Henze et al. (2016) reported that organizations gained customers by enforcing personal privacy before uploading data to the cloud. Qi et al. (2018)

emphasized that organizations gained business partners from cost-effective and accurate conventional hub-based systems based on IoT technology. These studies' researchers addressed that organizations reported higher profits from adopting and implementing IoT technology to advance their business alignments and decision-making activities.

IoT and Fast Access to Information

Corporate IT leaders and researchers could use IoT networks and their natural characteristics in automation network activities to enable organizations accessing information quickly. Researchers and organizations reported that staff and end-users increased data demands, especially among medical staff using healthcare IoT applications (Castro et al., 2017). Jiang et al. (2018) found that data volume is increasing with the number of network equipment from the rapid development of IoT technology. Rahmani et al. (2018) reported that automating tasks increased cloud access within IoT-based systems. Thus, these studies' researchers reported that organizations addressed businesses' decision-making benefiting from IoT technology primarily by fast access to information at all layers of the IoT network.

IoT and Advantages in All Industries

Researchers and organizations observed advantages in all industries by adopting and implementing IoT technology. Alkhalil and Ramadan (2017) reported that organizations implementing IoT technology have opportunities for business advancement in all industries, such as increased sensor data collection. Boukerche and Grande (2018) emphasized that there were advancements in management technology for cloud computing resources. Researchers also found advancements in web services to increase accessible information on food security (Abeysiriwardana & Kodituwakku, 2016). Thus, these studies' researchers highlighted that researchers and organizations discovered opportunities for advancements in all industries by adopting and implementing IoT technology.

Current IoT implementation issues in security, privacy, scalability, reliability, and reusability

Researchers and corporate IT leaders have encountered issues when implementing IoT technology in many areas, such as security, privacy, scalability, reliability, and reusability. Talbot et al. (2018) reported IoT technology implementation issues with the IoT environment security system failing to identify rogue IoT devices in the platform. Fu and Xu (2018) described those hackers used transduction attacks to access data privacy within wearable devices equipped with sensors. Yang et al. (2018) emphasized that the IoT data in the marine field would be much more complicated than traditional data information, in which scalability issues lie among the raw and processed data. Sohal et al. (2018) reported reliability issues with the collected data using IoT technology caused by attacks from malicious edge devices in the fog computing environment. Jacobson et al. (2017) noted that stakeholders and developers reported reliability and reusability issues as the nature of the IoT technology, especially in implementation such as failure modes or degraded security levels to maintain mobility communication. Thus, these studies' researchers raised awareness for researchers and corporate IT leaders to focus on IoT issues when implementing IoT technology for business benefits.

IoT implementation issues in security

There are issues in security when researchers and corporate IT leaders implement IoT technology. During the IoT implementation process, researchers observed issues in security such as data integrity and privacy of users were vulnerable to malicious tampering (Boukerche & Grande, 2018); the massive number of objects led to challenges in high-security risks of system management and governance (Alkhalil & Ramadan, 2017); and security issues in the gateway between sensors and cloud storage in term of remote monitoring (Rahmani et al., 2018). Thus, these studies' researchers reported the issues in implementing IoT technology, such as policy, known threats, and healthcare applications.

IoT implementation and security policy

In the IoT implementation process, researchers and corporate IT leaders would address organization security policy to secure information systems, organization facilities, and physical appliances such as doors, locks, storage, or stairways. Researchers and corporate IT leaders reported security access issues from policies and a subset of permission assigned to users or the smart device failing the verification process (Hossain et al., 2018). Next, Qi et al. (2018) addressed security issues by collecting personalized health information from wearable sensing devices when implementing IoT technology. Last, Moosavi et al. (2016) recorded issues with security policy in fog-based architectures among smart gateways. These studies' researchers reported IoT implementation issues with the organization's security policy, affecting the business decision-making on adversaries toward information systems or facilities' mechanisms.

IoT implementation and known threats in security policy

Corporate IT leaders would include known threat lists regarding information systems and physical mechanisms in each organization to keep the business from these known security policy threats in the IoT implementation process. Lee et al. (2017b) reported known security threats to IoT services such as hacking and exploiting, especially while collecting and transmitting IoT data. Zhan et al. (2018) posted issues with file integrity, malicious files, and threats in shared memory when transmitting IoT data. Lee et al. (2018) reported threats to expose IoT sensors or devices, leading to abnormal behavior that caused abnormal operations in IoT-based services. Thus, these studies' researchers reported and suggested that organizations include known security threats when implementing IoT technology.

IoT implementation and security in healthcare

There are significant securities in the healthcare industry. In the United States, healthcare applications must comply with the Health Insurance Portability and Accountability Act (HIPAA) privacy and security rules (Alharbi et al., 2016). Researchers and corporate IT leaders measure and address security protection in healthcare when implementing IoT technology. Moosavi et al. (2016) reported that security in IoT-based healthcare systems would be a significant concern in areas such as smart transport systems or smart healthcare systems. Hossain et al. (2018) addressed the security concerns in IoT-based health prescription and remote healthcare services. Abeysiriwardana and Kodituwakku (2016) emphasized security issues in free universal healthcare systems provided by government administration and services. Thus, these studies' researchers reported that organizations would address and add security in healthcare when implementing IoT technology.

IoT implementation issues in privacy

There are privacy issues in organizations that researchers and corporate IT leaders must address when implementing IoT technology, such as social privacy or data privacy. Lee et al. (2017b) reported that social privacy and data privacy issues occurred when exchanging data in the Internet environment. Researchers also addressed the malicious tampering activities at IoT gateway targeting data integrity and users' privacy (Boukerche & Grande, 2018; Rahmani et al., 2018). Hossain et al. (2018) reported unauthorized access to user privacy within IoT-based distributed systems. Thus, these studies' researchers reported that researchers and organizations addressed the privacy issues in protecting the privacy of employees, customers, and clients when implementing IoT technology.

IoT implementation issues in the healthcare privacy policy

Corporate IT leaders implemented IoT technology's privacy policy and permissions for sensors collecting information while IoT applications access information based on their pre-defined roles. Hossain et al. (2018) reported that the IoT-based systems stored privacy policy and a subset of permissions in the authorization service's policy database. Henze et al. (2016) addressed that organizations interacted with the users to drive individual privacy configuration before transmitting information to the Internet environment. Salman et al. (2018) reported that organizations established privacy policies for IoT devices to trust users' rating of IoT applications. Thus, these studies' researchers reported that a privacy policy would be essential to protect personal information from malicious activities when implementing IoT technology.

IoT implementation issues with known privacy threats

Researchers and organizations have encountered known privacy threats in the IoT-based environment and successfully neutralized and generated known threat lists. Das et al. (2018) reported known privacy threat lists in the IoT environment with solutions that included device access control to prevent malicious IoT devices and user access control from securing user privacy. Yaqoob et al. (2017) addressed that organizations prevented exposure of individuals' information in the IoT-based environment from an unsafe operation, bypassing controls, or malicious code modifications. Zhan et al. (2018) handled malicious files by detecting and removing malicious files. Thus, these studies' researchers reported that researchers and corporate IT leaders generated the known privacy threat lists as one of the primary tasks in implementing IoT technology.

IoT implementation issues in healthcare privacy

Healthcare providers address and resolve issues with privacy rules and federal privacy laws. Parah et al. (2018) reported that medical data and healthcare privacy issues occurred during exchanging IoT data within an IoT-based environment in hospitals via healthcare systems. Martins et al. (2016) addressed healthcare privacy issues when exchanging IoT data among IoT cloud platforms. Reyna et al. (2018) resolved the healthcare privacy issues in e-health IoT applications, such as mobile applications. Thus, these studies' researchers reported issues in healthcare privacy when implementing IoT technology for their organizations.

IoT implementation issues in scalability

There are several issues in scalability when researchers and corporate IT leaders implement IoT technology. Researchers and organizations establish the range of information to be collected, exchanged, or transmitted across organizations and external environments on top of the number of IoT devices and wearable appearance around the facilities. Rahmani et al. (2018) reported issues with scalability within IoT-based systems, such as poor scalability design, which resulted in high implementation and cost. Reyna et al. (2018) addressed the scalability limitations of IoT applications and storage capacity. Zhan et al. (2018) reported the scalability issues in restoring virtual machines' modified files in the cloud IoT-based environment. Thus, these studies' researchers explored scalability issues when researchers and corporate IT leaders reported on processes of implementing IoT technology.

IoT implementation issues in scalability

There are challenges in IoT scalability, including the amount of information collected from IoT devices to be exchanged or transmitted, IoT applications, and IoT devices in organizations internally or externally. Rahmani et al. (2018) reported solutions for scalability issues in IoT-based systems, such as an established smart gateway to support load balancing and efficient scalability. Kobusinska et al. (2018) reported that organizations could use big data technologies to resolve IoT-based systems' scalability issues in managing massive amounts of data. Zhang et al. (2018) addressed a lightweight log-based hybrid storage system along with the hybrid file system (HFS) to resolve the cloud IoT-based systems' scalability issue. Thus, these studies' researchers reported that researchers and corporate IT leaders encountered challenges in scalability when implementing IoT technology for their organizations.

IoT implementation with known issues in scalability

On top of the appearance of objects equipped with IoT devices flooding and occupying organizations, database storage increasing would also raise high-priority challenges for organizations' management teams. Kobusinska et al. (2018) reported known issues with IoT-based systems' scalability in sensors and input devices, such as data confidentiality, verification, or authorization. Zhan et al. (2018) addressed checking file integrity issues and detecting malicious files in cloud IoT-based systems. Reyna et al. (2018) discussed fog computing demanding limited IoT devices at gateways in a cloud IoT-based system. Thus, these studies' researchers reported the known issues in scalability in IoT technology that researchers and corporate IT leaders would need to review when implementing it for their organizations.

IoT implementation issues in healthcare scalability

In the healthcare industry, researchers and corporate IT leaders experience challenges in scalability within medical facilities, healthcare communities, and patients. Researchers and organizations reported scalability issues, including in healthcare relating to health information exchange (HIE) and clouds such as smart e-health gateway, remote healthcare centers, or fog computing in healthcare IoT-based systems (Rahmani et al., 2018); IoT applications in e-health such as wearable devices (Reyna et al., 2018); and issues with processing and managing IoT information in cloud IoT-based healthcare environment (Kobusinska et al., 2018). Thus, these studies' researchers explored scalability issues in healthcare in IoT technology that researchers and organizations would need to resolve.

IoT implementation issues in reliability

There are issues in reliability that impact the reliable results of IoT information collection and IoT data exchanged over the Internet environment when implementing IoT technology for an organization. Sicari et al. (2018) reported resolutions to issues preventing reliable results to the IoT platform, such as assessing the entities composing the heterogeneous IoT system for potential attacks and vulnerabilities. Rathore and Park (2018) posted cloud-based attack detection solutions in the IoT system. Li et al. (2018) reported attacks on nodes evaluation for reliability in mobile devices and edge devices. Thus, these studies' researchers emphasize strategies and solutions to ensure the reliability researchers and corporate IT leaders used and reported from their successful IoT technology implementations.

IoT implementation issues in reliability

There are issues in implementing IoT technology, preventing IoT devices from deploying to distribute meaningful IoT data from IoT applications within an IoT-based environment. Ouaddah et al. (2017) reported issues affecting service continuity reliability. Li et al. (2018) addressed failure in communication and failure recovery communication preventing reliability in IoT-based services. Rathore and Park (2018) reported that cloud-based attacks prevent communication devices and sensors from affecting reliability in a cloud IoT-based environment. Researchers and corporate IT leaders reported reliability issues in IoT-based systems, including data from heterogeneous sources or IoT-based middleware services (Sicari et al., 2018), multipath communications and failure during data transmission (Li et al., 2018), and both offline mode and short-term available IoT resources (Ouaddah et al., 2017). Thus, these studies' researchers reported issues that impacted reliability in IoT-based systems that researchers and organizations reported when implementing IoT technology.

IoT implementation issues in healthcare reliability

Reliability issues in IoT-based healthcare environments must be encountered and resolved for safe healthcare services. Ouaddah et al. (2017) reported reliability issues in an IoT-based healthcare environment, such as attackers gaining control of IoT devices or medical wearable devices or accessing IoT healthcare applications. Rathore and Park (2018) reported that attackers compromised IoT devices connecting to malicious devices for collusion attacks or denial of service attacks. Li et al. (2018) reported that attackers attacked multipath communications in mobile health architectures, causing failed paths. Thus, these studies' researchers reported reliability issues in IoT-based healthcare environments when researchers and corporate IT leaders implemented IoT technology in healthcare systems.

IoT Implementation Issues in Reusability

There are issues in reusability when corporate IT leaders implement IoT technology. Medrano-Gil et al. (2018) reported multiple reusability issues when implementing IoT technology, including IoT services, which must be personalized to each user and activated when necessary to avoid failure and distrust of the IoT solutions. Navale and Bourne (2018) posted data retention issues, notably increasing the cost of IoT data usage on cloud storage. Baker et al. (2017) reported standardization issues with wearable devices or vision-based sensors for activities or health monitoring purposes. Thus, these studies' researchers explored reliability issues when researchers and corporate IT leaders reported implementing the IoT technology for their organizations.

Issues in IoT-based environments affect the reusability of IoT infrastructures and applications. Navale and Bourne (2018) reported reusability issues in implementing IoT technology, such as types of IoT data being processed and supported, caused the implemented IoT-based systems not to be partially or fully reusable. Medrano-Gil et al. (2018) emphasized that synchronization issues and bugs were highly existing among IoT devices and IoT applications. Baker et al. (2017) reported standardization issues among departments implementing IoT technology in an organization or between businesses. In summary, these studies' researchers reported issues with reusability when researchers and corporate IT leaders implemented IoT technology for their organizations.

IoT implementation with known issues in reusability

There are known reliability issues in the implementation of IoT technology. Baker et al. (2017) reported several IoT projects facing difficulties establishing reusability, such as IoT devices out of battery power or out of cellular range of coverage. Alkhalil and Ramadan (2017) reported the reusability issues in implementing provenance data in IoT systems. Qi et al. (2017) addressed issues in reusability, such as establishing accurate smart medical sensors or standardized IoT system architectures. Thus, these studies' researchers reported that researchers and corporate IT leaders resolved known reusability issues when implementing IoT technology for their organizations.

IoT implementation issues in healthcare reusability

There are reusability issues with IoT technology in the healthcare industry. Qi et al. (2017) reported reliability issues in healthcare systems such as personalized healthcare systems with cost-effective issues in heterogeneous connected wearable devices. Alkhalil and Ramadan (2017) addressed interoperability issues independently developed among departments and businesses. Baker et al. (2017) reported that end-users (i.e., patients) with emergency health conditions such as seizing or suffering cardiac issues would cause reusability issues. Thus, these studies' researchers reported that researchers and corporate IT leaders resolved reusability issues in healthcare systems when implementing IoT technology.

The three factors of technology, organization, and environment

Researchers and organizations researched IoT technology adoption and implementation in organizations using the TOE framework to realize the IoT benefits at academic and enterprise levels. DePietro et al. (1990) wrote that the TOE framework is for an organization to adopt and implement technology innovation with three technological, organizational, and environmental factors. The following are some influenced factors that researchers and corporate IT leaders identify adequate, relevant influences for the three TOE factors to support business decision-making in adopting and implementing technological innovation. IoT technology is one of the current ubiquitous contemporary technologies influencing information systems and other technologies.

Researchers and organizations reported in their empirical studies that they selected the TOE framework to assess the influences of the framework's three factors on the innovations (Ahmadi et al., 2017; De Mattos & Laurindo, 2017). Martins et al. (2016) found that the TOE framework employed relevant factors to broaden the innovation contexts. Ruivo et al. (2016) reported that organizations realized the benefits of using the TOE framework in different industries, such as the service or manufacturing industries. Thus, these studies' researchers reported identified influences for all three factors of the TOE framework that researchers and corporate IT leaders used to support business decision-making for adopting and implementing IoT technology in their studies.

Technological context and IoT

There are two main identified influences for the TOE framework's technological factors: the internal infrastructure and the external technologies. The internal infrastructure included not limited to computers, network connection types, or Internet connection. Researchers and organizations reported that internal technology influences significantly impact innovation adoption (Chiu et al., 2017). De Souza et al. (2017) reported that internal technology, including network technology and the Internet, were similar in small and large organizations. Bantau and Rayburn (2016) reported that organizations had existing and new technologies referring to many forms of innovation that manifest with internal support and culture. Thus, these studies' researchers reported that researchers and corporate IT leaders identified, analyzed, and concluded the business decision-making regarding technological factors' internal influences on adopting and implementing IoT technology.

The external technologies with identified influences in an organization would be cloud storage, cloud applications, or cloud infrastructure. The technological factor fulfilled business decision-making in adopting and implementing IoT technology. Bantau and Rayburn (2016) reported that external technology focused on consumers referring to service and support to embrace adoption innovation. De Souza et al. (2017) addressed external technology as the type of external network connections and speed access conditions correlating to innovation. Chiu et al. (2017) reported that external technology as the characteristics and usefulness of innovation toward business partners or competitors. Thus, these studies' researchers reported the technological factors identified external influences as one of the TOE frameworks factors that researchers and organizations successfully adopted and implemented the IoT technology.

Organizational context and IoT

Three identified influences for the organizational factor in the literature supported the business decision-making to adopt and implement the IoT technology, including organization, staff, and corporate IT leaders. Researchers and organizations reported the organizational influences to include scope, size, and resources that organizations encountered as internal issues (Chiu et al., 2017); the quality and availability (De Souza et al., 2017); and internal support to embrace innovation (Bantau & Rayburn, 2016). Thus, these studies' researchers reported the organizational influences of the organizational factor that researchers and corporate IT leaders identified to support the business decision to adopt and implement IoT technology.

The organizational factor's staff influences are related to technological capacities and competencies measuring the organization's adoption and implementation of the IoT technology. Researchers and organizations reported the staff influences included innovative capabilities, technological proficiency, and supportive readiness that the organization provided cost adjustment (Tu, 2018); incorporated product characteristics with innovation (Lin et al., 2018); and top management supports and staff skills availability (Martins et al., 2016). Thus, these studies' researchers reported that the researchers and corporate IT leaders identified staff influences to support the organizational context in adopting and implementing IoT technology.

The corporate IT leaders influenced the organizational context by focusing on the IT team's positive attitudes regarding implementing and using the current technology for innovation. Researchers and organizations reported corporate IT leader influences, including skills and technology capabilities that organization accounted for overall IT personnel (Martins et al., 2016); accounted for individual characteristics (De Mattos & Laurindo, 2017); and readiness to implement the IoT technology (Ahmadi et al., 2017). Thus, these studies' researchers reported corporate IT leaders' influences supporting the organizational factor that researchers and corporate IT leaders explored in studies to adopt and implement the IoT technology.

Environmental context and IoT

The TOE framework's environmental factor would embrace the influences of industrial organizations, vendor supports, limitations, and opportunities. The environmental factor's industrial organization influences would include smart homes, smart offices, or smart cities that organizations needed to list as a requirement for implementing the IoT technology. Researchers and corporate IT leaders reported that smart homes, smart offices, or smart cities' concepts assisted the organization to achieve remote corporate activities, such as telecare in the healthcare industry (De Mattos & Laurindo, 2017). Also, Martins et al. (2016) and Ahmadi et al. (2017) addressed the industrial organizations' influences as coercive or normative formal or informal pressures exerted on sharing information among relevant organizations and multiple stakeholders. Thus, these studies' researchers reported that remote corporate activities were important influences of environmental factors in adopting and implementing IoT technology.

The vendor supports influences of the TOE framework's environmental factor embrace on-site training and consulting. There were skills and technological capacities that organizations sought vendors' support for cost savings purposes, such as reducing IoT technology complexity by adding gateways to on-site training (Ahmadi et al., 2017). Bantau and Rayburn (2016) reported that organizations experienced service environment aspects from vendors and consumers, assisting in reducing unnecessary complexity implementation processes towards realizing innovation success. Tu (2018) reported the harsh environment of vendors and consumers measuring the reliability of IoT technology benefits and performances. In summary, these studies' researchers reported the influences of vendor support that researchers and corporate IT leaders used for the environmental factor to implement IoT technology while reducing complexity and increasing success.

The limitation influences of external environmental factors are market elements, competitors, and regulators that set possible boundaries in implementing IoT technology in an organization. Lin et al. (2018) explored the influences supporting the TOE framework's external environmental factor of the IoT technology implementation. Hsu and Yeh (2017) encountered limitation influences of the TOE framework's external environmental factor as challenges in terms of interests and feasibility for stakeholders' satisfaction. Chiu et al. (2017) reported challenges from stakeholders' points of view and values when exploring the TOE framework's external environment factor. Thus, these studies' researchers reported the limited influences of the external environmental factor. Researchers and corporate IT leaders used one of the TOE framework's three factors to reduce the complexity and increase project success in adopting and implementing IoT technology.

The external environment factor's opportunity influences embrace market elements, competitors, and regulators supporting the implementation of IoT technology in the organization. Martins et al. (2016) explored the external environmental factor to identify the opportunity influences for organizational advantages, such as new opportunities or competitive business improvements. Ahmadi et al. (2017) addressed the environmental factor's opportunity influences as the extended scope and resources of the organization. Chiu et al. (2017) reported using the opportunity influences of external environmental factors to apply relevant knowledge from opportunity influences to create profitable opportunities. Thus, these studies' researchers reported the potential influences of the external environmental factor that researchers and organizations used to identify, extend, and apply toward implementation of IoT technology.

Relationship of this Study to Previous Research

Throughout this literature review session, I go through all reviewed resources addressed the implementation of IoT technology within the studies. However, there was no research study focusing mainly on implementing IoT technology within organizations. De Souza et al. (2017) reported partially focusing on implementation steps of IoT technology, such as plan and pace implementation. De Mattos and Laurindo (2017) addressed implementing IoT technology, such as redesigning jobs, modifying human resources policies, or redesigning the organization's business alignments. Bantau and Rayburn (2016) reported the partial implementation of IoT technology in installation and integration with larger systems. Thus, these studies' researchers reported that they partially focused on implementation of IoT technology tasks in their IoT empirical studies.

Researchers and corporate IT leaders successfully adopted and implemented innovative technologies such as cloud computing, industry 4.0 technologies, and indoor link-node models that IoT technology is part of them. Alharbi et al. (2016) identified the five significant factors influencing Saudi healthcare systems to adopt and implement cloud computing in collaboration with IoT technology, m-Health, and big data to improve healthcare service in Saudi Arabia. Arcidiacono et al. (2019) addressed that they successfully implemented the industry 4.0 technologies, collaborating with cyber-physical systems (CPS), IoT technology, Industrial IoT (IIoT), cloud computing, cognitive computing, and artificial intelligence, using the three identified vital factors to support SME applications. Guo and Pun (2019) reported successfully constructing the link-node models as indoor positioning techniques for indoor location-based IoT applications. The results help implement advanced IoT applications and services. Thus, these studies’ researchers reported that researchers and corporate IT leaders successfully adopted and implemented IoT technology as part of the focused, innovative technologies like cloud computing or industry 4.0. I explore the implementation strategies for IoT technology that researchers and corporate IT leaders implement for business applications in their organizations.

Transition and Summary

In this foundation of the study, there are significant elements such as the study's background, the problem statement, the purpose statement, the nature of the study, the conceptual framework, the research question, the significance of the study, and the review of the professional and academic literature. In the literature review section, there are several literature sources' critical analysis and synthesis. There are significant elements in the literature review section, including reviewed articles relating to the TOE framework, such as the information security theory model for the study, information security theories supporting the study, information security theories contrasting the study, IoT technology in research, and the relationship of the study to previous study and findings. In the IoT technology research section, there are analysis and synthesis sources in the literature regarding IoT implementation issues in security, privacy, reliability, and reusability. Finally, there are reviewed articles in IoT technology research with an applied TOE framework relevant to this study's security theory model.

In this chapter of the study, the foundation of the study, there are twelve sections in total providing concrete elements to support the foundation section and establishing readiness for Chapter 2, the project, and Chapter 3, application to professional practice and implications for change. In Chapter 2, I focus on strategies to conduct the research study, such as the role of the researcher, participants, research method, research design, population and sampling, ethical research, data collection, data organization, and reliability and validity. Finally, in Chapter 3, I focus on presenting findings, applying them to professional practice, implications for social change, and recommendations for action and further study.

Section 2: The Project

In Section 1, I discussed the major components needed to establish the foundation of this study. In Section 2, I present the major components with a restatement of the purpose statement to support the project. I discuss nine components: (a) the purpose statement; (b) my role as a researcher; (c) an overview of the participants; (d) the research methodology and design; (e) the population and sampling; (f) ethical research; (g) the data collection; (h) data analysis technique; and (i) reliability and validity.

Purpose Statement

The purpose of this pragmatic qualitative inquiry study was to explore the implementation strategies that corporate IT leaders use for IoT technology implementation to realize IoT benefits in their organizations. This study's targeted population consisted of six qualified corporate IT leaders from healthcare industry in the United States. The participants would be currently holding IT professional positions such as chief of information officers (CIOs), chief technology officers (CTOs), IT managers, and IT directors experienced in implementing IoT technology in their organizations. The implication for positive social change from the findings of this study included the potential to improve technology impacts on human living environments by providing connectivity among devices between home, office, hospital, and public environment. Citizens might balance better living conditions in both smart living environments and smart office environments that have implemented IoT technology.

Role of the Researcher

The researcher's role was essential in the steps that the researcher must recognize, document, and follow to complete the research safely (Ajjawi, 2016). My role as a researcher involved several activities such as the data collection process, establishing a relationship with the research topic and participants, ensuring adherence to research ethics, and following *Belmont Report* protocols. Lastly, I mitigated bias by viewing the collected data from a personal lens and extinguishing my personal IT experience from any IoT implementation project beforehand.

My role as a pragmatic qualitative inquiry study researcher involved exploring the phenomenon, collecting data, interpreting data, and presenting the study's findings. Tai and Ajjawi (2016) noted that researchers who selected qualitative methodology for their studies-maintained integrity in collecting, interpreting, and concluding the qualitative data to support their research topics. Thus, the qualitative researcher used the collected data to interpret and generate conclusions based on their stances, varying from one qualitative researcher to another. As a researcher for this qualitative research, I focused on honesty, integrity, and loyalty throughout the research processes, from defining the problem statement for my research topic, declaring the purpose statement, constructing the conceptual framework, and reviewing the literature relevant to the research topic. Lastly, I determined the research participants based on their specialties relevant to the research topic. I interviewed them to collect qualitative data, interpret collected data, and present the findings to answer the overarching qualitative research question.

Researchers define the research topic for the qualitative research study based upon the problem statement, purpose statement, and the identified participants according to their relevant specialties to the research topic. Hence, I developed my relationship with the research topic and the research participants in qualitative research studies. Hadi and Closs (2016) noted that the researchers of qualitative research studies investigate the research topics by developing the topic guidelines and content and collecting qualitative data by establishing rapport and trust with research participants. Researchers reported that they must recognize their relationships with the research topic and establish relationships with the participants to explore their studies comprehensively. I had over 20 years of experience in the IT field, certified in system administration in information security by the National Security Agency (NSTISSI 4011 and 4013) in the United States. I had no prior experience in implementing IoT technology for an organization. I did not have a previous relationship with all six research participants. Still, I selected, contacted, and established relationships with the research participants, following the directions and regulations of Walden University's Institutional Review Board (IRB).

It is essential to address the researcher's ethical role and protect participants' rights (United States Department of Health & Human Services, 1979). There were principles and protocols for safeguarding research participants in the *Belmont Report*, including respect for persons, beneficence, justice, informed consent, and risk and benefits assessment, and subject selection (United States Department of Health & Human Services, 1979). I followed the protocols of the *Belmont Report* and remain compliant with the United States National Institutes of Health (NIH) Office of Extramural Research to adequately protect the research participants. I have completed the NIH Web-based training course "Protecting Human Research Participants" and received certificate 2432188.

As a researcher for this study, I established adequate plans to mitigate bias and view data from my lens. First, even though I have experience in IT implementation projects in the past, I have no experience in implementing IoT technology for an organization. Hence, I remained neutral to all implementation strategies the research participants provided me with through the qualitative interview sessions. Second, I notified the research participants that I stayed neutral as a qualitative researcher, collecting their information regarding the research topic, coding the collected data, validating the data for reliability and validity, and presenting the findings based on the collected data. Next, I mitigated bias by establishing a qualitative interview protocol to determine how the interview would be conducted with each participant. The interview protocols include the structure of the interview questions, voluntary and withdrawal information, answering questions about the study process, privacy and confidentiality, and the member checking process for data interpretation accuracy (Appendix B). Lastly, I used my experience as an IT professional for over 20 years to ensure all necessary research activities are correctly planned to eliminate mistakes, such as successfully recording the interview sessions.

Participants

In this pragmatic qualitative inquiry study, I specified the eligibility criteria for the study participants. In addition to the suggested number of participants between two and 25 in qualitative research, Alase (2017) stated that the number of participants should reflect homogeneity within the total collected data. I drew the findings from the collected data of the participants who have met the research participant's inclusion criteria. Carrotte et al. (2016) recommended specifying the inclusion criteria for participant selection to establish focus groups to collect data. Researchers may establish the inclusion criteria to form the focus groups and establish the exclusion criteria to recognize the not eligible participants. In this study, the participants were between the ages of 21 and 64. The participants had experience with IoT technology and the IoT technology implementation based on their responses to the research recruiting criteria forms. The participants had experience defining new corporate positions or redefining the current corporate functions to add new roles with responsibility for the implemented IoT technology. Depending upon the potential participants available, I found the new eligibility participants using the snowball sampling strategies, LinkedIn, and social media networks for the data's homogeneity.

The participants in this study included the corporate IT leaders in healthcare organizations or government agencies in the United States. I followed Walden University’s Office of Research Ethics and Compliance (OREC) policies. I received approval from Walden’s Institutional Review Board (IRB) to comply with 42 CFR Part 93 of the U.S. federal regulations (Walden University, 2019, Compliance Responsibilities section, para. 5). To gain access to participants. I used snowball sampling strategies, LinkedIn, and social media networks to seek IT professionals in the healthcare industry and contact them directly. Then, I contacted the potential participants via email, text messages, or phone calls. Moser and Korstjens (2018) noted that researchers might need to use formal or informal communication methods for a face-to-face interview to reduce problems, such as gaining access to participants, access to the organization's documents, or selection location for interview sessions. Kars et al. (2016) reported that researchers found potential participants by encouraging eligible participants and reducing unnecessary communication between researchers and participants. In summary, researchers contacted participants, accessed the organization's documents, and recommended communication methods between researchers and participants in a face-to-face interview in a pragmatic qualitative inquiry study.

To establish a working relationship with participants, I followed IRB procedures to contact the potential participants directly. I sent the participant consent form, including information such as anonymity description, strategies to protect the confidentiality, and seek written permission from participants (Appendix B). I received IRB approval before contacting the potential participants. I shared the information over the consent forms to gain the participants' trust from anonymity, interview locations, and methods of protecting the interview records. Then, I had opportunities to meet participants in person via qualitative face-to-face interviews during the interview sessions or via Zoom scheduled interview sessions. Alase (2017) noted that research participants would share their stories without worrying about distortion or prosecutions based upon their trust in anonymity and confidentiality. Oltmann (2016) recognized that research participants found themselves comfortable and enjoyable with the researchers. Carrotte et al. (2016) added that the participants preferred to answer the research questions using their own words based on their understanding of the topics. In summary, researchers reported that participants and researchers established a working relationship from consent forms following the U.S. federal regulations and face-to-face interviews at pre-defined locations to protect human rights and confidentiality (Bungay et al., 2016). I followed the interview protocol to establish the working relationship with participants, such as meeting participants at the pre-defined location or via Zoom scheduled interviews or introducing and briefing myself and the study topic. I reminded the voluntary withdrawal, brief on the structure of interview questions and answers, the approximate total time of the interview, and the member checking process to verify the accuracy of data interpretation.

The potential participants agreed to participate in the study based on the study's criteria for selecting participants before signing the consent form. Tai and Ajjawi (2016) noted that the number of participants increased the collected data's homogeneity, leading the researcher to understand and answer the overarching research question. Hence, the researchers collected data from the research participants to draw the study findings. In this study, I communicated with the participants directly to achieve the appropriate number of participants. Ball et al. (2016) reported that researchers collected purposive and snowball sampling based on participants' characteristics and the study's objective. Hence, the healthcare organizations' IT leaders' snowball sampling strategies guaranteed the study findings to answer the overarching research question regarding the implementation strategies for IoT technology.

Research Method and Design

To ensure selecting the appropriate research methodology, I explored each available research method thoroughly to discover the one aligning well with the research topic and the research question. The qualitative methodology empowered the researchers to incorporate both human and social data to interpret and explore a natural setting phenomenon (Franco, 2016). Out of all three research methods (qualitative, quantitative, and mixed methods), Leppink (2017) reported that researchers selected the qualitative research methodology to explore the phenomena using qualitative tools to answer the overarching research. I chose a qualitative method for this study based on the study's problem statement and overarching research question.

I assessed the five qualitative designs to select the appropriate design for this study. The five designs of qualitative methodology were: (a) pragmatic inquiry design, (b) case study design, (c) narrative design, (d) phenomenological design, and (e) ethnography design. The researchers selected the pragmatic qualitative inquiry design to have an in-depth exploration of human experience to address and resolve the problem in a real-world situation based on the research findings (Salkind, 2010). Researchers used the pragmatic inquiry design to investigate and understand multiple entities benefiting from phenomena under human experience in real-world situations (Lohre, 2020; Nipp et al., 2016; Salkind, 2010). I chose the pragmatic inquiry study design for this qualitative study to explore IT leaders' organizations benefitting from IoT technology with successful implementation strategies to understand and draw study findings. As a result, researchers and corporate IT leaders would benefit from the study findings to successfully implement

IoT technology for their organizations. In the following subsections of method and research design, I expanded my chosen method and design for this study.

Method

For this study, I chose a qualitative methodology. Daniel et al. (2017) explained that the qualitative method offered researchers research tools to explore and explain the phenomenon by collecting open-ended responses, analyzing data through multiple processes, and accurately and consistently drawing the study findings. Hence, the researchers reported that they analyzed, identified, and sorted themes involving open codes based on initial codes generated from the open-ended interview questions. In this study, I explored the implementation strategies for IoT technology by analyzing themes and presenting findings based on corporate IT leaders' responses to the qualitative semistructured interview questions.

Qualitative methodology, interviewing in person or via Zoom web conferencing (or similar web conferencing software), advances researchers' ability to observe participants' responses based on their actual behaviors toward the research topic. Shin (2017a) explained that qualitative methodology allowed researchers to collect direct observations of technological innovation's user behavior. Ruggieri et al. (2017) noted that the qualitative method constructed the interview structure using identified themes for the study, analyzing the realism of innovation, and answering the research questions. Lee et al. (2017a) summarized that the researchers used the qualitative method 72% more than the quantitative method to collect in-depth data on participants' cognitions and behaviors. Thus, these studies' researchers reported that researchers used the qualitative methodology to explore individual experiences and behaviors toward phenomena to explain the research topic. Therefore, I selected the qualitative methodology to explore the research topic by investigating the human experience of IT professionals with successfully implemented IoT technology in their healthcare organizations.

The researchers used quantitative methodology to analyze the statistics of collected data from a structured survey based upon the hypotheses to find the relationships between the dependent variable and independence variables. Bolondi et al. (2018) reported using the quantitative methodology to investigate the variables' relationships using the hypotheses and statistical analysis. Tu (2018) noted that quantitative hypotheses led the researchers to investigate the research topic using survey data for data analysis. Murray et al. (2016) decided to use the quantitative method to investigate the impact of technological innovation on assets and the financial system's business value. Thus, these studies' researchers reported that the researchers selected the quantitative methodology to investigate the impact of technological innovation on business by analyzing the hypotheses and variables' relationship. According to the research topic and the overarching research question, I did not need to analyze the hypotheses or variables' relationship.

Researchers and corporate IT leaders used the quantitative methodology to investigate and present the solutions to research topics relevant to success or failure in business and technological innovation impacts. The researchers used the quantitative method to employ a quantitative analysis to evaluate technological innovation's impact on business decision-making and benefits (Colakovic & Hadzialic, 2018; Murray et al., 2016; Tu, 2018). Thus, researchers reported that they chose the quantitative methodology over a qualitative method to evaluate the variables' relationships and investigate the phenomenon to answer the research questions. The quantitative methodology was unsuitable for this study because I did not investigate the relationship among variables based on the study's problem statement.

The researchers selected the mixed methods methodology to focus on evaluating or exploring the study findings obtained from the first part of the study using the qualitative or quantitative methodology. Ferguson et al. (2017) reported using the mixed methods methodology to obtain a cohesive discussion of the research topic by analyzing the quantitative and qualitative methods. Hadi and Closs (2016a) added that the mixed methods methodology would best suit research by evaluating one method's findings using another method or answering different research questions within a study. Store-Valen and Buser (2018) noted that they used a qualitative method in mixed methods methodology to collect data directly from users and used a quantitative method to compare the findings with collected data from the literature. Thus, these studies' researchers reported that researchers used mixed methods methodology to possess the advantage of utilizing one research methodology to complement another for advanced research purposes. While researchers chose mixed methods to advance the research, other researchers used them to integrate multiple views to present the findings. I did not need to examine or compare the qualitative research part's findings based on the study's problem statement and purpose statement. Therefore, I did not select the mixed methods methodology for this study because I did not need to collect quantitative data and investigate the relationship among variables. I selected a qualitative method over quantitative and mixed-methods methodologies because the study research question requires exploring participants' experiences and behaviors in implementation strategies for IoT technology.

Research Design

Researchers choose a research design best suited to the research methodology to address the research topic by answering the research question. Abellan (2016) noted that researchers could choose one of the five traditional qualitative research designs to address the research question, such as ethnography, phenomenology, narrative research, case studies, and grounded theory. Mills (2016) reported choosing the qualitative methodology's grounded theory approach to identify the phenomenon during the study's processes. Turner et al. (2017) used the case study to capture participants' behaviors and multiple case studies to obtain more claims from organizations about the phenomenon. Nipp et al. (2016) reported that researchers selected the pragmatic inquiry study to investigate participants' human experiences to find benefits for treatments and better problem solutions for younger and older patients with cancer. Thus, these studies' researchers reported that researchers successfully achieved the study findings by choosing the appropriate research design for qualitative research. For this study, I used a pragmatic qualitative inquiry study design for this qualitative study. I discussed the following in detail the rest of the research designs for qualitative research, including ethnography, phenomenology, narrative research, and case studies.

The narrative design is about stories of daily life or human experiences with the phenomenon that researchers can describe through participants' responses to address the research topic. Petty (2016) reported that researchers used narrative design employing in-depth interviews to record sensitivity, empathy, and compassionate stories or experiences with the phenomenon from research participants' narrations. Levitt et al. (2016) noted that researchers found the narrative design in qualitative research making stories or experiences with the phenomenon from interview responses as the originations describing the phenomenon. Fusch et al. (2018) added that the researchers used the narrative design in qualitative research to understand the participants' experiences with phenomena through their stories. Thus, these studies' researchers reported that researchers used narrative design for qualitative research to address the research topic through findings from participants' stories and experiences with the phenomenon.

The phenomenological design in qualitative research involves in-depth interviews to identify phenomena via participants' conscious stories and experiences. Cibangu and Hepworth (2016) reported that researchers used phenomenological design in qualitative research to investigate the essence of participants' experiences. Feldon and Tofel-Grehl (2018) noted that the phenomenological design would help researchers present the study findings based on the participants' lived experiences influencing the actual phenomenon. Sjogren et al. (2017) reported that researchers derived four main themes of the phenomenon based on participants' narratives about the research topic. Thus, these studies' researchers reported that researchers used the phenomenological design to obtain lived stories and conscious experiences with the phenomenon from participants' in-depth interviews. In this study, I did not choose the phenomenological design for this study because I did not need to obtain live stories or conscious experiences with the phenomenon.

The researchers used ethnographic design in qualitative research to provide guidelines to collect data from interviews with individuals or focus groups so that researchers can understand the culture to interpret the phenomenon. Charette et al. (2019) reported using ethnography design to collect data from individuals and conducted focus group interviews to describe the phenomenon. Rutberg and Bouikidis (2018) noted that they used ethnography design to investigate and describe the phenomenon that influenced the culture's behaviors. Celikoglu et al. (2017) reported that researchers used ethnography design to participate in research participants' daily life to observe and collect cultural behaviors from participants. Thus, these studies' researchers reported that the researchers used an ethnography design to participate and interview the research participants to collect cultural behaviors influencing the phenomenon. I did not choose the ethnography design because I did not need to collect cultural behaviors influencing the phenomenon.

I selected to use a pragmatic inquiry study design for this qualitative study. The pragmatic qualitative inquiry study design warranted me to collect appropriate data from participants' interviews and promptly achieved data saturation during the qualitative semistructured interview process.

Population and Sampling

I selected six qualified corporate IT leaders from the healthcare industry utilizing IoT technology across their facilities as the population for this qualitative study. This population adequately provided the sampling to help the study address the research topic and answer the research question. To identify the defined population above, I used the snowball sampling strategies, LinkedIn, and social media networks to directly seek IT professionals from the healthcare industry in the United States. Kars et al. (2016) reported that researchers would need to involve organizations' gatekeepers for keen assistance in recruiting research participants from organizations. Maba and Mantra (2018) noted that they recruited the research participants by defining the inclusion criteria and setting the cutoff number. Villa-Torres et al. (2017) added that the research population preferred benefits from the study findings provided their real living experience toward the phenomenon as responses to the research questions. These studies' researchers reported that the researchers recommended defining the study population before recruiting them because the population would determine the beneficial impacts of the study findings. In this study, I identified the IT professionals from healthcare industry in the United States that matched with this study's defined population.

Researchers determine the sample size collected from participants to address the research question(s), especially reaching data saturation in qualitative interviews. Boddy (2016) reported that researchers need to acquire a larger sample size in positivism qualitative research than in in-depth qualitative research. Sim et al. (2018) noted that researchers determined the sample size for qualitative research using the adaptive approach as saturation was better than using a more interpretive model such as the a priori approach. Saunders et al. (2018) reported four models of saturation researchers to use to generate assumptions and their scopes consistent with the research question(s) and the conceptual framework. Thus, these studies' researchers reported that researchers determined the sample size from the research population based on the type of research, a model of saturation, and judgments of saturation. In this study, I used the sample size as six qualified IT professional participants, including CIO, CTO, IT Director, and IT Manager. I began the interview process with a sample size of six participants and continued to interview them until I reached data saturation. The data saturation was appropriate to determine the study's sample size. The data saturation was in one of two forms, such as the repetition of answers responding to research interview questions (Saunders et al., 2018) or no additional available research participants.

Researchers used the snowball sampling method to provide adequate strategies for reaching research participants and collecting snowball samplings in the study. I used the snowball sampling approach to have continuous sample reflections or effectively locating and reaching research participants using LinkedIn or social media networks. Bungay et al. (2016) reported that they employed snowball sampling strategies to identify, define, and recruit potential research participants through social media or network members' recommendations and referrals. Gaus (2017) noted that the snowball sampling strategies allowed more potential research participants to volunteer in the research study by referring to each other. Palinkas et al. (2015) reported that researchers employed snowball sampling strategies to focus on similarities based on the potential participants' recommendations and referrals. Thus, these studies' researchers reported that researchers decided to use the snowball sampling method collecting the snowball samplings from participants' interviews in qualitative research.

In a pragmatic inquiry study approach, researchers determine the number of research participants to collect research sampling. Alase (2017) recommended the number of participants between 2 and 25 in qualitative research. Marshall et al. (2013) reported that qualitative researchers should include no more than 30 interviews in the IS study. Constantinou et al. (2017) reported that the qualitative researchers found themes saturation after the 12th out of 20 interviews using the Comparative Method for Themes Saturation (CoMeTS). These studies' researchers reported that the qualitative study would need 30 interviews from 2 to 30 participants based on the research topic's complications. In this study, along with a sample size of six, I used the CoMeTS method to determine the themes saturation to stop the interviewing process, analyzed the collected data, and used the findings to answer the research question. The ideal number of research participants would be six participants. As a result, I contacted six participants from healthcare industry in the United States to guarantee this study's theme and data saturation.

In this study, I selected a sample size of six participants to collect qualitative semistructured data. I successfully collected the data and achieved a data saturation checkpoint. The alternative methods to determine the number of participants and the sample size in qualitative research depend on the research topic and the number of participants availability. Constantinou et al. (2017) reported that researchers determined the number of participants and sample size differently based on the definitions of focus groups, observation, or text analysis. Gaus (2017) noted that qualitative researchers would prefer to collect sampling from the combination of participants' interviews and document analysis through cultural studies. Bungay et al. (2016) reported that the snowball sampling strategies allowed researchers to reach out to research participants based on recommendations from current participants. Hence, the researchers added the number of participants and increased the sample size to strengthen research validity and reliability. In summary, these studies' researchers reported the alternative methods to determine the number of participants and sample size using snowball sampling strategies, determining the method of collecting research sampling, or combining two or more research sampling methods. I used snowball sampling strategies to reach participants that would significantly contribute to the additional research sampling or new themes. As long as the theme saturation and data saturation were achieved, it was unnecessary to interview more participants. The sample size remained at six participants.

The qualitative researchers determined the data saturation event to stop collecting open-ended responses from participants. Fusch and Ness (2015) noted that data saturation occurred when there was no new information from participants' responses; researchers could use the collected data to answer the research questions. Other scholarly researchers could replicate the same result by following similar procedures in the research (Fusch & Ness, 2015). Bungay et al. (2016) reported that they used the snowball sampling strategies to continuously reflect the collected data to determine the data saturation achievement to analyze and present findings for the study. Constantinou et al. (2017)

reported and recommended the CoMeTS method that researchers could use to compare the themes for saturation threshold and reordered the interviews multiple times to verify themes saturation again. In summary, these studies' researchers reported methods to determine the data saturation that researchers used to determine when to stop collecting sampling from participants and begin analyzing and validating the collected data. In this study, I used the CoMeTS method and snowball sampling strategies to ensure theme saturation and data saturation for all interviews to ensure the validity and reliability of this study.

Researchers and corporate IT leaders establish appropriate criteria for selecting research participants to collect quality responses to the research questions. Martinez-Mesa et al. (2016) noted that researchers could use snowball sampling strategies to establish the criteria for selecting participants with more experience relevant to the research topic. They also noted that the snowball sampling strategies would provide criteria for selecting potential participants based upon the initial selected participants' recommendations. Moser and Korstjens (2018) reported that researchers established criteria to select participants with experiences, perceptions, thoughts, and feelings relevant to the research topic. Alase (2017) reported that researchers select research participants based on their responses, matching the criteria of participating selection and agreeing to sign the consent forms, participate in interviews, and provide the company's quality secondary sources. In summary, these studies' researchers reported that researchers must establish the criteria for selecting research participants, including participants' experiences relevant to the research topic, sign the consent forms, and provide quality secondary sources. In this study, research participants must meet the criteria of participant selection relevant to IoT technology implementation projects, such as project sponsor(s), project leader(s), director of IT department, manager of IT department, and management team members with project buy-in approval abilities. Also, leaders of departments involved in the IoT technology implementation project would potentially participate in the research study to fulfill the desired number of participants. As per the researchers' suggestions, I ensured to receive the signed consent forms from all six participants (Appendix B).

There are different types of interview settings in qualitative research. Moser and Korstjens (2018) noted that researchers applied data collection methods for qualitative research, such as participants in observations, face-to-face in-depth interviews, and focus group discussions. Alase (2017) reported that researchers would need to allow participants to express themselves during the interviews, consent to all devices, and provide detailed settings to the Institutional Review Board (IRB). Palacios-Cena et al. (2016) reported using the semistructured interviews with the questions guide to allow participants to share their experiences after collecting their letters. Thus, these studies' researchers reported that researchers generated the interview settings, provided detailed settings to IRB, collected personal letters from participants, and used semistructured interviews in their qualitative research. In this study, I used the interview protocol in Appendix B to explore the research participants' experiences with IoT technology implementation strategies, including open-ended semistructured interview settings with the questions guide containing two main questions and four to six sub-questions. Lastly, I gathered all interview settings information and provided it to the Walden University IRB. After receiving IRB approval, I contacted the potential research participants directly using snowball sampling strategies via LinkedIn and social media networks. I scheduled the interview sessions and locations (or Zoom interview sessions) and conducted six semistructured qualitative interviews.

Ethical Research

Researchers would do their best to encounter and eliminate ethical issues during a study and establish ethics guidelines as best practices for acceptability from research committees and participants. In this study, I focused on protecting participants' rights in four major time frames: contacting process, at the beginning of each interview session, at the end, and during the member-checking process. Hence, I had more chances to encounter and eliminate any ethical issues in this study. Gooding et al. (2018) reported that they discovered increasing responsiveness from potential participants with clarified ethical guidelines and eliminated ethical issues during the study with selected participants. Rooddehghan et al. (2018) noted that researchers would have clarity of ethics guidelines to support responsiveness from participants and minimize the ethical issues arising during the study. Bartholdson et al. (2018) reported that conditions causing ethical issues would occur during the study. Hence, researchers clarified ethics to reduce the study's ethical issues, such as informing voluntary participants, the ability to withdraw from the study, and space for inter-professional perspectives. Thus, these studies' researchers reported that researchers used established ethics guidelines to withstand the ethical issues during a study to continue involving the research participants.

Researchers encounter and discuss the ethical principles in a study. In this study, I ensured incorporating and following best practices of the ethical principles. I included the Walden IRB approval, voluntary participant, participant consent form, my NIH certification (No. 2432188), and a record of the total time I used to complete this study. Bartholdson et al. (2018) reported that they established the ethical considerations, including approval from the regional ethical review board, informed voluntary participation to participants, and the ability to withdraw from the study without explanations. Crnjanski et al. (2016) noted that the ethical principles in their research included the Ethics Committee of the Subotica Pharmacy's approval of completed certification and the time frame from the start date to ended date as they conducted the study. Romious et al. (2016) reported that they included voluntary participation, participation consent form, coded and sorted handwritten transcripts, and the Ethics Committee's approval in the St. Louis County Metropolitan, Missouri area. Thus, these studies' researchers reported that researchers categorized the ethical principles such as informed consent, voluntary safety, anonymity and confidentiality, and participants' rights.

I followed the IRB protocols and obtained consent from all participants. It was the most important ethical principle in this study. Rooddehghan et al. (2018) reported that they obtained written informed consent from all participants as one of the study's ethical considerations. Bartholdson et al. (2018) noted that they obtained oral informed consent from the children's parents to take part in the study. Crnjanski et al. (2016) noted that the participants returned the signed informed consent forms to the researchers before the semi-unstructured interviews. Researchers obtained informed consent forms from all participants and follow IRB protocols to officially communicate with participants and their organizations (Cmjanski et al., 2016). In this study, I obtained informed consent forms from participants before scheduling the semistructured interview sessions.

I communicated with participants and received their voluntary participation as they took part in the study. I incorporated all best practices regarding voluntary participation in research and informed participants regarding their rights and voluntarily participating in the study. Romious et al. (2016) noted that they sent emails inviting participants to volunteer to participate in the research and recommend other potential participants as per the snowball sample strategies. Bartholdson et al. (2018) reported that they informed the voluntary participation and ability to end participation at any time without all research participants' explanations. Gooding et al. (2018) reported that the participants voluntarily participated in the research and went through the interview sessions. Hence, researchers informed participants regarding their voluntary participation.

As an ethical principle of the research, I focused on protecting the confidentiality and anonymity of research participants. Romious et al. (2016) reported that they used handwritten transcripts for all collected data from interview sessions, coded the data, removed the names of participants, and stored the raw data in a safe place to protect the confidentiality and anonymity of participants. Rooddehghan et al. (2018) noted that the researchers removed individuals' or organizations' names, stored the collected data for five years, and informed participants about their confidentiality and anonymity. Crnjanski et al. (2016) reported that researchers informed the confidentiality and anonymity of all participants. In summary, researchers reported that they encrypted the data storage containing participants' responses to the interview questions, replace or remove participants' names and their organizations for anonymity purposes, and inform participants regarding this ethical principle. I informed participants that their confidentiality would be kept secure with a locked safety box in a safe place. I focused on the ethical principle and reported directly to the study committees and Walden University IRB office.

I informed participants about the procedures for withdrawing from the study. A participant can withdraw from the study at any time without any consequences. Gooding et al. (2018) noted that researchers generated procedures for participants deciding to withdraw from the study, such as after the first trial, after the second interview, or after observing the trial process. Bartholdson et al. (2018) noted that they informed students of the withdrawal procedures without explanations to all participants. Rooddehghan et al. (2018) reported that they included information regarding withdrawing from the study procedures at any stage in the Ethics section. In summary, researchers reported that they established procedures for participants to withdraw safely from the study while maintaining the ethical principle of confidentiality and anonymity for participants. In this study, I informed the participants about procedures for withdrawing from the study in three stages: before the official interview session, during the interview session, and after the interview session. The participants who wanted to withdraw from the study did not need to fill out any withdrawal form at any time. There was no withdrawal participant.

Researchers often offer participants incentives as a courtesy method to voluntarily appreciate their time playing an essential role in the study. In this study, I did not offer an incentive. Still, I shared the study results and included this information within the consent form with the participants as it was the best method to motivate them while I was out of the way. Wasson et al. (2016) reported that they discovered from the literature that most healthcare researchers did not offer participation incentives; instead, the participants preferred benefiting from treatments carried out during the study. Lee et al. (2017a) noted that researchers did not offer incentives for participating in research on artificial intelligence (AI) and robots, while participants showed concerns about the research topics and their responses to the interview questions. Hsu et al. (2017) noted that they quickly received the number of participants when offering incentives for participating in the study. Thus, these studies' researchers reported that researchers possibly offered incentives to their participants to motivate the participants' response rate and courtesy to appreciate the value of their tremendous contribution to the study.

To protect the participants' rights adequately, I followed the practices of protecting the Belmont Report's participation rights (United States Department of Health & Human Services, 1979). As a Walden University doctoral candidate performing research for this dissertation, I took and completed the Walden University online course of the United States National Institutes of Health's Office of Extramural Research to protect human research participants (No. 2432188). I included all forms in the Appendices, including the participant consent form and NIH certification (Appendix C). I maintained the data collected from participants' responses on an encrypted USB drive for five years in a safe place to protect participants' confidentiality. Before collecting data, I also included the final doctoral manuscript with the Walden IRB approval number. To keep individuals' or organizations' names confidential, I replaced them with generic information in each transcript of each interview session, such as participant AA (i.e., the code name for this participant would be participant AA).

Data Collection

Data collection is essential for researchers to interact with raw data relevant to the research topic to answer the research question. Moser and Korstjens (2018) noted that researchers recommended using contemporary technology to collect qualitative data during structured, semistructured, or unstructured interviews. Christou et al. (2019) reported that they employed semistructured interview guides and study instruments to collect and interpret data from participants. Bravington and King (2019) reported using the participant-led diagramming technique to organize a large volume of collected data in qualitative interviews. These researchers used instruments, data collection techniques, and data organization techniques to collect data in the study. In the following section, I presented the process of collecting data, such as instruments, data collection techniques, and data organization techniques.

Instruments

For this qualitative study, I was the main instrument for collecting data for the research. Moser and Korstjens (2018) reported that the researcher conducted a face-to-face interview and collected data from participants through interview sessions. Bartholdson et al. (2018) reported that they designed semistructured interview guides to collect data from participants within a separate room in the hospital environment. Rooddehghan et al. (2018) reported that they were the research's primary instrument of interviewing to collect and process data from participants. Thus, these studies' researchers reported that researchers acted as the main instrument for collecting data from participants for qualitative study interviews. In this study, I was the instrument that mainly interacted with participants, interviewed participants to collect data, and organized collected data before proceeding to the data analysis process.

As the main instrument of the study, the qualitative researchers utilize electronic devices and software programs to collect and process participants' responses. In this study, I used an electronic recorded device, the Sony ICD-PX470 Stereo Digital Voice Recorder (PX470), to record the participants' responses, used the Rev.com service to transcribe the transcripts, and used the NVivo 12 software to organize and analyze the collected data after the interview process. Rooddehghan et al. (2018) reported that they recorded the interviews, transcribed the transcripts verbatim, and took field notes to support the interviews. Bartholdson et al. (2018) reported recording the conversations with participants using audio-recorded devices in a separate room and taking field notes after each interview session. Christou et al. (2019) reported that they used the audio-recorded device with participants' permission, took detailed notes per participants' request, transcribed the recorded interviews verbatim, and used NVivo software to organize and manage the collected data. Thus, these studies' researchers reported that qualitative researchers used electronic devices or software programs to record participants' responses during interview sessions and organized the collected data.

Researchers design interview protocols to collect qualitative interview data to enhance the data's reliability and validity. I used the interview protocol in Appendix B for each official interview session with each participant to collect qualitative data for this study. To conduct the member checking process, after uploading the voice recorded file to Rev.com service for transcribing each interview session, I downloaded the transcript, reviewed, and revised the transcript, and verified with the participant the accuracy of the transcript before uploading the transcript to the NVivo 12 software for data organization. Christou et al. (2019) reported that they enhanced the reliability and validity of collected data with the combination of participants' choice of interview languages and locations, transcribed verbatim the transcription, cross-checked for transcriptions accuracy, ensured themes saturation, and completed a debriefing form. Bartholdson et al. (2018) reported using the semistructured interview guide with open questions to interview participants, analyzed data between sessions, and took field notes after each session. Rooddehghan et al. (2018) reported that they repeatedly listened to recorded interview sessions and reviewed the verbatim transcriptions to ensure the data's accuracy and meaning. Thus, these studies' researchers reported that qualitative researchers enhanced the data collection's reliability and validity by using the member-checking technique, transcript review continuous using the sampling strategies, and follow-up interview sessions. I incorporated those best practices into follow-up interview sessions. For example, I kept myself from data collection bias, used the member-checking technique to ensure the accuracy of data interpretation of the interviews, and continuously reviewed transcripts from each interview session. In this study, as the main instrument of the study role, I kept raw data in an encrypted USB device in a safe place for 5 years as available upon research requests.

Data Collection Technique

In this pragmatic qualitative inquiry study, I collected data using a semistructured interview guide (i.e., the interview protocol in Appendix B). I asked open-ended questions (Appendix A), recorded participants' responses for data collection, and took field notes each session for supporting data collection. Researchers use electronic devices or traditional detailed notes to record participants' responses in qualitative research during the interview, observation, site visit, or video recording (Alase, 2017; Grammes & Acikalin, 2016; Rostami et al., 2018). Alase (2017) reported that researchers needed adequate instruments, including their skills to apprehend all possible responses from participants, such as audio-recorded devices, probing and informing questions, taking notes, reactions or feelings toward the questions, and scheduled follow-up interviews if necessary. Grammes and Acikalin (2016) reported that researchers used a video-recorded device and documented it to collect a large amount of data for their qualitative studies. Rostami et al. (2018) reported that researchers used the digitally recorded device to collect data, transcribed verbatim the transcriptions, and took field notes after each interview to clarify the data. Thus, these studies' researchers reported that researchers effectively and efficiently utilized electronic devices to record participants' live responses and converted them into digital formats, such as transcribing verbatim the transcriptions into text format.

Researchers use an additional data collection method, such as a document reviewing the organization's quality secondary sources, to achieve data triangulation. In this study, I also used the document reviews of the organization's quality secondary sources and data from the qualitative interviews as different sources of data collection for data triangulation methodology purposes. I sought each participant to provide available quality secondary sources of organization. Siegner et al. (2018) noted that researchers used extant documents relevant to the research topics for reviewing as data collection for the triangulation approach on top of other data collection methods, such as qualitative interviews or focus groups. Beheshti et al. (2017) asserted that researchers ensured the study's validity by cross-checking documents on multiple databases for correlation of data collection. Gorichanaz (2016) reported that researchers examined documents using multiple perspectives to understand documents for document analysis. Thus, these studies' researchers explained that researchers adopted a triangular approach to ensure the study's trustworthiness by using several data collection methods and techniques of document analysis.

There are advantages and disadvantages to using face-to-face interview sessions to collect data for research. Alase (2017) reported that researchers collected in-depth data during a face-to-face interview because participants worried free of distortion or prosecution in sharing their stories with trusted interviewers. Shin (2017b) reported that researchers had direct observations when collecting data with participants in the interview room. Lee et al. (2017a) reported that researchers found disadvantages when using face-to-face interview strategies, such as reducing the availability of potential participants, selecting an uncomfortable environment around the interview location, or being afraid of exposing their extreme feelings. Thus, these studies' researchers reported that researchers found more advantages to using face-to-face interview sessions than the number of disadvantages. In this study, the face-to-face interview technique provided in-depth sharing experiences of participants. I also carried out member-checking techniques to confirm participant data interpretation accuracy. Once I received the transcript from Rev.com service for the verbatim transcribed voice recorded file, I reviewed and revised the transcript and verified the revised transcript with the participant for data interpretation accuracy.

In this study, I used the member checking process to verify and clarify data interpretation accuracy with participants. In qualitative studies, researchers often use member checking of the data interpretation with participants after the interview to accurately interpret data interpretation. Alase (2017) reported that researchers would increase the accuracy of data collection when carrying out the member checking process before proceeding to the study's data analysis process because the participants would verify and clarify with researchers to ensure the data interpretation reflects their responses to the interview questions. Bravington and King (2019) reported that researchers need to employ the member checking process for the data interpretation to be accurate with participants' responses. Grammes and Acikalin (2016) reported that researchers would focus on the accurate interpretation of data collection by verifying and clarifying with participants in the member checking process to avoid contrary assumptions. Thus, these studies' researchers reported that researchers employed a member checking process to help them verify the data interpretation accuracy with participants.

Data Organization Techniques

Researchers often use different methods or strategies for keeping track of data, such as snowball sampling strategies with continuous reflective data. In this study, I used an encrypted USB device and a safe box with a lock to keep track of data collection and field notes. I used snowball sampling strategies with continuous data reflection between interview transcripts and participants. Keedle et al. (2018) reported that researchers used the smartphone mobile application to collect qualitative data and keep track of data from anywhere at any time. Rostami et al. (2018) reported using the software QRS N-Vivo version 11.0 to manage the transcripts from collected data before proceeding with the data analysis process. Grammes and Acikalin (2016) reported that they archived the qualitative data, such as interview transcripts and all documents, including the field notes, into a system for tracking them back and forth. Thus, these studies' researchers reported that researchers used different systems to track data, such as research logs, reflective journals, and cataloging systems.

Once the data organization process was completed, I stored all raw data and maintained it in a locked container for 5 years. Alase (2017) reported that researchers must use a protected password system to keep the collected data secure to protect it from outsiders. Keedle et al. (2018) reported that they used the encrypted device to keep the video and audio data in a safe place. Rostami et al. (2018) noted that researchers kept the data collection in secure storage in a locked location. Thus, these studies' researchers reported that researchers used the locked container, kept it in a safe place, and made raw data available upon researchers' requests. In the next component, the data analysis technique, I presented in-depth the data analysis logically and sequentially and addressed all research questions and qualitative software tools.

Data Analysis Technique

In this study, I used the Rev.com software service to transcribe participants' responses, reviewed and revised the transcriptions, and used member checking techniques to verify and clarify with participants. Next, I uploaded the verified transcriptions to NVivo 12 software tool to organize, analyze, and generate the database of codes from the collected data. Then, I generated all the themes from the database of codes. I also used the snowball sampling strategies to continue reflecting on the collected data from participants and the NVivo software tool to discover the theme's saturation threshold and data saturation before deciding to stop the qualitative interview process. Researchers carry out the data analysis as the study's primary process to address all research questions toward the qualitative research topic using the software tools. Bartholdson et al. (2018) reported that researchers analyzed themes containing assigned codes generated from collected data and repeated the process until the themes saturation or no new information stopped the interview process. Alase (2017) reported that researchers used color-coded and categorization methods for analyzing the collected data to discover findings for the study. Christou et al. (2019) reported using the N-Vivo 11 software to organize, manage, and analyze the collected data for no new themes and information to stop the interviewing process. These studies' researchers reported that researchers used the NVivo software analysis to organize data collection, discover themes, present themes saturation, data saturation, and no new information from research participants' collected data.

Researchers often use a sequential and logical process for the data analysis process to guarantee the accuracy of the data analysis process. I used the Rev.com software service and NVivo 12 software tools to analyze the themes' saturation threshold and ensure no new information indicating data saturation to stop the qualitative interview process. Hence, I ensured the data collection would be ably collected again using the same qualitative research process. Christou et al. (2019) reported using both a sequential and a logical process to discover additional themes to carry out accurate data analysis for the study. Rostami et al. (2018) reported using the N-Vivo 11 software to manage and analyze the collected data in two stages, including the inductive thematic and deductive theory-driven analysis data. Bartholdson et al. (2018) reported that they discussed the data analysis based upon the categories containing codes assigned from the text of transcribed audio recordings. Thus, these studies' researchers reported that researchers effectively used the NVivo software for qualitative data analysis using the sequential process and logical process to find themes' saturation and data saturation to ensure the data collection set's reliability and validity.

Researchers often use the NVivo software tool for data analysis in qualitative research. I also used the NVivo software to discover codes from participants' responses generated from Rev.com's verbatim transcript of each interview session. Next, I discovered the themes from all assigned codes. Lastly, I used the NVivo software to organize themes aligned with codes to discover the themes' saturation threshold and determine the data saturation event. Rostami et al. (2018) reported using the NVivo software tool to manage and analyze the study's data. Christou et al. (2019) reported that they imported all transcripts from transcribed interview data into the NVivo software to analyze the data collection for the research findings. Booth et al. (2018) reported that researchers used NVivo or Atlas.Ti software tools to manage and analyze the collected data are one of the study's resources. Thus, these studies' researchers reported that researchers used NVivo or Atlas.Ti software tools for coding, mind-mapping, identifying themes, and determining data saturation.

In this study, I used snowball sampling strategies to continue reflecting the data collection and key themes to the conceptual framework to fill out the complete study gap. Researchers identify the key themes based on codes from the collected data in previous or current qualitative research. Rostami et al. (2018) reported that they used the key themes relevant to previous research's key themes in literature and the existing theories and frameworks. Alase (2017) noted that researchers would focus on key themes to analyze the collected data to explore the phenomenon's participants' life experiences. Christou et al. (2019) reported that they focused on key themes to correlate them to existing key themes in literature and conceptual framework to discuss the findings from the data analysis process. Thus, these studies' researchers reported that researchers identified key themes to address the research questions based on the conceptual framework as the study model to answer the overarching research question and findings for the research topic. In the next component, I address the reliability and validity component to ensure the reliability of the data collection and the internal and external validity of the study.

Reliability and Validity

After analyzing the organized data based on the collected data from interviews, I assessed the study's trustworthiness to ensure the reader relies on the truthful study findings by looking at reliability and validity. Researchers perform the reliability processes using criteria such as dependability and credibility of the study's guidelines, protocols, and findings. I focused on the study's data trustworthiness by reflecting it with validity and reliability criteria in this study. The criteria of validity and reliability include dependability, credibility, transferability, confirmability, and data saturation. Buus and Perron (2020) explained that dependability and credibility would be the reliability checklist criteria to confirm the study findings' trustworthiness. Next, Bartholdson et al. (2018) and Raskind et al. (2019) noted that the indicators of trustworthiness included credibility, confirmability, and dependability. Last, Manspeaker and Hankemeier (2019) reported that researchers would ensure the data's trustworthiness by assessing the study findings for confirmability, transferability, and data saturation. Thus, these studies' researchers reported that researchers would assess validity and reliability for data trustworthiness involving dependability, credibility, transferability, confirmability, and data saturation.

Dependability

In this study, I used a member checking process for each participant for data interpretation accuracy and the determinations of themes' saturation and data saturation for the study findings' dependability. Also, I followed the interview protocols (Appendix B) and delivered the open-ended qualitative questions (Appendix A) to ensure the dependability of the collected data from participants. As the study coding protocols, I used the qualitative software tool Nvivo 12 to code the notes, organizations' quality secondary sources, and participants' responses. Then, I identified themes from assigned codes and used Nvivo software for data analysis. In qualitative research, researchers assess the reliability of the study by addressing the dependability of the findings. Cypress (2017) reported that the study used a member checking process to validate the qualitative study findings with identified themes from participants' responses to carry out a dependability assessment. Manspeaker and Hankemeier (2019) reported that they addressed the qualitative studying findings' trustworthiness by including determinations of themes, categories, and data saturation process. Costantini et al. (2016) reported that they addressed the qualitative study findings' dependability by using the test re-test method with participants. Thus, these studies' researchers reported that researchers used the member checking process, data saturation determinations, and test re-test method to verify with participants for data interpretation dependability. In this study, I did not use the test re-test method with participants since I already completed a member checking process to verify the data interpretation accuracy.

Credibility

I ensured the research's credibility in this study by carefully following the participant recruiting criteria to engage the most suited participants to collect the qualitative data (Appendix C). I used a 60 to 90 minutes duration for each interview session to give participants enough time to share their personal experiences and expertise regarding the interview questions (Appendix B). Also, I used the member checking process to verify data interpretation accuracy with participants and assess thematic areas for the study's reliability (Appendix B). Researchers ensure the creditability of data collection, participants, and study findings to confirm the study's reliability. Ozberk et al. (2019) reported that they assessed the codes and the interview records to make necessary corrections to achieve consistency for the findings' creditability. Raskind et al. (2019) reported that researchers using the member checks method provided a high rate of credibility of the qualitative study findings between the researchers and the participants. Sahota et al. (2018) reported that they confirmed the qualitative findings' reliability by addressing creditability, including consistency of instruments and adjustments from data collection assessments with participants. Thus, these studies' researchers reported that researchers used member checking, participant transcript review, and assessment of codes or thematic areas to verify the study's reliability.

Transferability

Researchers perform validity in qualitative research by addressing the transferability of the study's findings to the readers and future research. In this study, I used the participation recruiting criteria and snowball sampling techniques to recruit participants to ensure the qualitative data's transferability among similar populations or other industries. Also, I conducted interview sessions with the initial sample size of six participants or continued to interview until data saturation. I addressed transferability for the reader and future research to use the study's findings and the conceptual framework. Hence, the study reader would follow these implementation strategies to implement IoT technology successfully. I also discussed future research based on the limitations of the study. Apolzan et al. (2016) reported high reliability of the study findings internally, but no external subscale validation was available, leading to the transferability of the study findings to future research. Raskind et al. (2019) reported that they verified that the high rate of credibility and quality of the study findings would be transferable to readers and future qualitative research. Cypress (2017) reported that the research study carried out the transferability of the quality study findings from purposive sampling strategies' continuous reflecting among participants for high-quality data collection and interpretation. Thus, these studies' researchers reported that researchers used study findings and the conceptual framework to address the reader regarding transferability concerning them and future research.

Confirmability

Researchers address confirmability criteria to enhance the validity of the study findings. In this study, I used the NVivo software tool to code all collected data, organizations' quality secondary sources, and notes taken based on participants' responses to verify the study findings' confirmability. I used triangulation methodology to discover the study's findings based on the codes of collected data, documents, and notes from using NVivo software. Cypress (2017) reported that the researcher would address confirmability by consistently reflecting on research activities during the study, including taking notes, documenting the data collection process, and leading out as the primary research instrument for every activity. Manspeaker and Hankemeier (2019) reported verifying the study findings' confirmability using the qualitative software tool Qualtric to assess the findings with categories and themes. Ozberk et al. (2019) reported that they confirmed with participants for internal confirmability and purposive sampling for the study findings' external confirmability. Thus, these studies' researchers reported that researchers used software to verify the study findings' confirmability criterion.

Data Saturation

In this study, I employed the themes saturation comparison method. I confirmed the data saturation by verifying all themes from each participant for no additional themes and new information to ensure data saturation for this study. In the data saturation verification process, I uploaded all transcripts from interview sessions, organizations' identified documents, and notes taken from interview sessions to the NVivo 12 software to generate codes. Once I had all codes assigned to uploaded data, I identified themes from these codes regarding keywords from my research topic and the overarching research questions. As soon as the new inputs from the interview session's newest transcription provided no new information for the new code, I marked that interview session as the data saturation threshold. For example, at participant FA with interview number 6, I found no new code or theme after inputting the collected data into NVivo 12 software. So, I mark interview number 6 as my data saturation threshold or a possible themes saturation threshold. Once I confirmed the data saturation, I stopped collecting data from interviews, notes, and organizations' documents. In qualitative research, researchers primarily focus on collecting data to address the research topic and ensuring data saturation to conclude the data collection and analysis processes. Manspeaker and Hankemeier (2019) reported that they determined the coding saturation from the recurrent themes or no more additional themes from participants' responses as evidence of coding saturation. Chiou et al. (2019) reported using the member check method with data saturation participants without any additional theme. Bartholdson et al. (2018) reported that researchers analyzed data collection, themes, and categories containing assigned codes generated from collected data and repeated the process until reaching theme saturation. Thus, these studies' researchers reported that researchers used multiple methods to ensure data saturation in qualitative research. For example, theme saturation or no additional available participant could pass the selection's participation criteria.

Transition and Summary

The purpose of this pragmatic qualitative inquiry study is to explore the implementation strategies that corporate IT leaders use for IoT technology implementation to realize IoT benefits for their organizations. In this Section 2, I provided the components assisting in completing the project, including the role of the researcher, participants, and research methodology and design. There were two components in Section 2 that I focused on research participants and ethics, including ethical research and the population and sampling. In the last three components of Section 2, I provided a discussion regarding data collection, data analysis techniques, and the study's reliability and validity.

In the next section, Section 3, there is an overview of the study and a presentation of the findings. I focused on application to professional practice and implications for change. Hence, in Section 3, I included the relevant components such as applications to professional practice, implications for social change, and recommendations for action. In the last three components of Section 3, there were recommendations for further study, reflections, and summary and study conclusions.

Section 3: Application to Professional Practice and Implications for Change

In Section 2, I established the significant components to support the project. In Section 3, there is an overview of the study and a presentation of the findings. I present the findings of the implementation strategies for implementing IoT projects in an organization. In addition, I include the applications to professional practice and the implementations for social change. Last, I discuss the recommendations for action, the recommendations for further study, reflections, and ending with the summary and study conclusions.

Overview of Study

The purpose of this pragmatic qualitative inquiry study was to explore the implementation strategies that corporate IT leaders used for IoT technology implementation to realize IoT benefits in their organizations. This study's population consisted of IT leaders from healthcare organizations in the United States. The participants are currently holding IT professional roles related to IoT technology implementation in healthcare organizations, such as chief operating officer (COOs), president, founder, chief product innovation officer (CPIO), principal program manager, and women in cyber security vice president (WiCyS). All six participants worked for small and medium-sized healthcare enterprises in four states of the United States: California, Florida, North Carolina, and Washington. I followed the study protocols in Appendices A, B, C, and D to collect and analyze interview data and review documents.

There were six major themes discovered: (a) take full advantage of vendor support, (b) use all identified external influencers and influences, (c) align current IoT technology with business needs, (d) use all identified internal project staff skills, (e) use all identified current internal infrastructure, and (f) use all identified external support technologies. After I analyzed the alignments of technological, organizational, and environmental factors of both participants' information and literature on the TOE conceptual framework, the results presented that the literature on the TOE framework supported the meaningfulness of all six themes. Table 1 shows the frequency of TOE framework factors in technology, organization, and environment. The study findings included strategies for implementing IoT technologies in an organization's IoT project, such as IoT technologies alignment with business needs, internal skillful staff and external influencers, and external support technologies.

Table 1

Frequency of TOE Framework Factors in Technology, Organization, and Environment

Context	Participant count	Participant references	Document count	Document references
Technological context	6	315	42	48
Use all identified current internal infrastructure	6	153	21	24
Use all identified external support technologies	6	162	21	24
Organizational context	6	394	37	43
Align current IoT technology with business needs	6	257	21	25
Use all identified internal project staff skills	6	137	16	18
Environmental context	6	272	33	44
Take full advantage of vendor support	6	137	14	20
Use all identified external influencers	6	137	19	24

Note. Factors Frequency of TOE Conceptual Framework; *n* = frequency.

Presentation of the Findings

The research question for this study was: What implementation strategies do corporate IT leaders use for IoT technology implementation to realize IoT benefits for their organization? I employed the semistructured interviews and reviewed the literature to collect data from participants (*n*=6), publicly available technical reference documents (*n*=117), and publicly available reference documents related to factors of the TOE conceptual framework (*n*=36). Participants shared publicly available documents I could locate through search engines and library databases of Walden University library and Google Scholar. I used the three contexts of the TOE conceptual framework as guidance for data analysis to discover the implementation strategies for implementing IoT technology at organizational levels, such as technological, organizational, and environmental. I performed a member-checking procedure (*n*=6). I employed methodological triangulation to align information among collected participant data, available literature resources, and documents related to the TOE conceptual framework to validate this study's collected participants' information.

After I verified the collected interview data with all participants, I uploaded the data to the NVivo software, release 1.6.2 (4831). I used the NVivo software to assign codes, identify themes and subthemes, and categorize the codes into themes and subthemes to generate the database of codes for the study. I used the six themes to present the findings with meaningful information organized within the study database of codes based on the collected data from interviews. Participants AA, BA, CA, DA, EA, and FA were in the healthcare industry and volunteered and consented to participate in the study's qualitative semistructured interviews. The six research participants are from four different states in the United States. I used additional literature resources on top of resources from the literature review in Section 1 to support the validation of findings by aligning participants' provided information, literature resources, and literature resources related to the TOE conceptual framework. Next, I present all six themes as the study findings.

Theme 1: Take Full Advantage of Vendor Support

This theme represents an aspect of the external environment context to support the implementation strategies for IoT technology in an organization. This theme consisted of inputs from all six participants with 137 references to the database of study codes sharing how they successfully use vendors for support. Four subthemes supported this theme: identifying, assessing, and recruiting vendors for support, onsite training, consulting experience, and good technical support. I identified 14 secondary quality resources with 13 references supporting the participants' inputs. Table 2 shows the frequency of participants' inputs for this theme, subthemes, and documents.

Table 2

Frequency of Theme 1: Take Full Advantage of Vendor Support

Major/Sub-theme	Participant count	Participant references	Document count	Document references
Take full advantage of vendor support	6	137	14	13
Identify, assess, and recruit vendors for support	6	55	5	9
On-site training	6	28	4	4
Consultant experience	6	28	4	4
Good technical support	6	26	4	4

Note. Theme 1, Take Full Advantage of Vendor support; *n* = frequency.

Subtheme: Identify, Assess, and Recruit Vendors for Support

This subtheme is relevant to locating, assessing, and hiring the right vendors for the IoT implementation project. Participants responded to the semistructured qualitative interview questions to address this subtheme as one of the four major points the organization could take full advantage of vendor support. The organization could successfully identify, assess, and recruit vendors for help by following the participants' inputs.

Identifying vendors for support

Findings indicate two categorical methods to identify vendors supporting the IoT technology implementation project. First, the project team identified IoT vendors in the market based on the specific needs to implement the IoT technology in an organization. Second, the organization decided to become a partner based on the IoT specialties to fulfill the capabilities and requirements to support the IoT technology in the market. These inputs would assist the project team in having insights to identify IoT vendors for support. All six participants provided guidelines on identifying IoT vendors in the market today (AA, BA, CA, DA, EA, FA). Participants BA, CA, and DA specifically identified vendors for supporting IoT project strategies and suggested that organizations and IoT vendors become partners to execute the IoT implementation project. Bantau and Rayburn (2016) asserted that organizations experienced service environment aspects from vendors and consumers, assisting in reducing unnecessary complexity implementation processes toward realizing innovation success.

All participants noted that identifying vendors to support the IoT implementation project would help the project process by passing through the project obstacles regarding regulatory or technical issues that might be occurred while implementing the IoT project. Participant AA identified vendors for supporting the IoT projects and the IoT technology. Organizations must have specialized consultants in product regulatory and different regulatory environments, align IoT technologies to the business requirements or provide monthly subscription support. Participant AA noted, “We had to have a specialized consultant to help us deal with regulatory and product regulations. We need a consultant to understand the documentation and process required and help us get through the processes.” Participant BA indicated how their organization identified vendors, “We are partnering with the vendors we believe can keep us where we are going and always have a plan B.”

Identifying the vendors to support the IoT project is vital to the organization. In this case, Participant CA provided the vendors and where they came from: "They come from strategic partners like the Department of Psychiatry at UCSF, technology partners like IBM Research and IBM Watson Health, or an outside design shop."

In specific locations where the IoT project team might meet the IoT vendors, Participant DA identified vendors by attending forums or conferences, noting,

> There are lots of IoT forums. I think that is the key path to success in my work. You will meet vendors, learn about them, and make friends with many people who will help you implement. So, join conferences, get to know people, and be part of that community so that you can learn from them the best practices and not make mistakes when you do the deployment.

Participant EA also suggested preparing to identify a partner that might be a replacement for any project team members who might leave the project team,

> Let us say you have someone that has left the project team and is critical. If you have things documented, at least the onboarding process will not be that difficult. You do not lose critical knowledge of what you have been doing.

Participants BA and DA provided information regarding identifying their organizations as successful vendors. Participant BA provided an effective method to become a successful vendor by stating,

> I just gave you a secret. You do not have to do everything. Better to be the best at some than a jack of all trades. We say we can support hundreds of devices through Apple Health Kit or Google Fit. I have fewer devices to support because I am an expert in every single one. I get a few support calls because we are the best of the best.

In addition, Participant DA discussed a method by which the organization could become a successful vendor,

> If you want to become a partner, there are a lot of requirements you have to fulfill like financials, the workforce to do the partner work, talent qualified to do partner work, experience, or qualifications at a different level of partnership. You can be a gold partner or a bronze partner.

Hence, organizations could identify a vendor for supporting the IoT implementation project by using the insights of becoming a successful IoT vendor.

Assessing vendors for support

Participants categorized two vendors organizations could evaluate for specific needs to support the IoT implementation project. First, after identifying certain vendors that might support the organization's IoT implementation project, the project team needed to assess those vendors to screen the ones with the most qualifications and meet the project requirements. All six participants provided information about this step as a necessary process to acquire the best-matched vendors based on the IoT project requirements to implement the IoT technology in the organization successfully (AA, BA, CA, DA, EA, FA). Second, an organization might become a vendor, join the vendor group, or train partners to increase vendor availability to the company customers; hence, these would be insights for an organization to look at when assessing vendors for support. Participants AA, BA, DA, and EA provided information regarding this type of vendor, mostly in expanding the business to fulfill the customer needs to avoid customers turning in different directions to recruit the competition vendors or partners. The project team might select the company’s trained or certified vendors to support the current IoT implementation project. Therefore, the project team could speed up assessing vendors for support and recruiting vendors for the support step.

The participants provided detailed information on assessing vendors supporting the IoT implementation project. Participant AA set the vendor capabilities based on the company's success as a vendor supporting company’s own IoT products. Participant AA also discussed that qualified vendors should have the potential to drive the value proposition of IoT technology to support and promote organizations,

> We explored the value proposition and use the case of our technology to prove it drives adoption and acceptance in the marketplace. We collaborated with the university world or the grant world that the government helps using those funds to incentivize people to try something new. And then understand what value they were getting out of it and what you needed to do to increase the value proposition.

Participant BA assessed the vendors as a critical step, “That is a secret sauce proving your vendor support because of knowing your team, the great support, and mastering devices.” Instead of drawing out the expectations or requirements to assess vendors from Participants AA and BA, Participant CA expressed,

> I rely on much third-party expertise. Our chief product officer has a business, design, and psychology graduate degree. Our chief medical officer was the chief medical officer for almost 20 years at a Fortune 20 company. Our chief psychology officer has expertise in organizational psychology.

In addition, Participant DA assessed vendors for support, “Companies always have a partner that goes out there and does the implementation, always 100% of the time. They will do the design and offer the tools. It is called professional services architecture.” Participant DA viewed vendor support as opening many opportunities for many people. Participant EA recommended using the scoring metrics along with interviewing the vendor,

> I think they would be referenced cases for the partner, understanding whether they have done similar cases in the same industry. It is even better, and you can create the scoring metrics and more expectations. Partners also need to know how to manage the IoT side of things. They need to know how to investigate the hardware or talk about connectivity. You can interview and show your credentials deeply important.

Participants evaluated the vendor capabilities, the vision of IoT technology value proposition, abilities to support high management levels, and professional architecture by using the score metrics, direct interviews, or conducting feasibility strategies to evaluate them.

Recruiting vendors for support

This is the last step when the project team recruits the vendors to support the IoT project. All participants reported vendors they recruited and onboarded to support the project (AA, BA, CA, DA, EA, FA). According to participants’ responses, the organization found vendors in two different approaches. First, the organization acquired qualified vendors that directly reflected the project requirements. Second, the organization onboarded vendors to fully represent the organization to implement areas where the organization cannot reach. After recruiting vendors to support the project successfully, participants also supported information on vendors' quality, such as onsite training, consulting experience, and good technical support.

There are several IoT project requirements that the project team would like the vendors to support to pace the project milestones and progress them promptly. Participant AA stated that the organization would assess vendors with specialties dealing with regulations to keep the project moving forward. Participant BA suggested having a backup plan when recruiting vendors. Organizations would onboard vendors with specific expertise and match the required skillsets for the project. Participant DA added, "We hired some level of skilled individuals for the project. I do not want someone with no skill, knowledge, or excitement about that technology." Participant EA indicated that vendors provided support in either resolving challenges or attaching with the project team from the beginning to the end. Participant EA also mentioned onboarding a new partner to replace a project team member or adding a new project team member,

> If it is a totally new person, you need to address the challenge like onboarding. The timeline will become longer. And then set expectations with the stakeholders because this will bring our project back by this period. Moreover, being upfront with the expectation clearly is significant. Secondly, if you have things documented, at least the onboarding process will not be that difficult. You do not lose critical knowledge of what you have been doing.

Participants onboarded vendors to support the IoT projects with regulations and keep the project progressing forward. The project team also expected vendors to use their expertise to handle sophisticated decision-making, attach along the journey with the project team, add or replace team members to the project team, and bring experience from multiple similar projects in the same industry.

Support for the subtheme, identifying, assessing, and recruiting vendors for support, is found in the literature. Othman et al. (2018) conducted empirical research on identifying good vendors for the industry. They concluded that vendor capabilities vendor capabilities, recommendations for future projects, and around five years or more (Othman et al., 2018). Hence, the participants' inputs regarding identifying vendors for support aligned well with discovered criteria results within the Othman et al. (2018) study. This step in identifying vendors for support is essential before approaching them for support. The next step is assessing vendors for support, and all six participants provided information on how to evaluate and screen to handpick the best-matched vendors for support. Blackwell et al. (2006) reported a method to assess current software vendors noting,

> The project team requires access to resources such as IT publications, management consultants, and competitors within the same industry. The project team is also expected to obtain reference sites from any potential software vendors and to visit those sites so that the software vendors can be viewed in a real-world environment (Blackwell et al., 2006, pp. 3548).

Hence, Othman et al. (2018) and Blackwell et al. (2006) supported participants' inputs regarding strategies for identifying and assessing project vendors. After identifying and assessing the vendors for support, the project team would recruit the vendors to support the IoT implementation project. Tatman and Huss (2020) reported that employers could measure traits of integrity provided by hiring personnel during the hiring process based on five integrity factors: substances, theft, authority, rules and deception, and responsibility. Blackwell et al. (2006) asserted that organizations would seriously assess SMEs to undermine the business seriously. Othman et al. (2018) reported that organizations would identify vendors using criteria recognized by International Standard, proven track record, or locally available records to be considered for future projects. Hence, after identifying and assessing the participants' inputs aligned with the literature to hire vendors for support.

This subtheme also aligns with the conceptual framework, which is TOE. DePietro et al. (1990) stated that the environmental context would be when the organization started to conduct business, including dealing with the government, and seeking support (pp. 153-154). So, organizations would seek vendors or consultants to support the implementation process DePietro et al. (1990) suggested acquiring vendors with preinstallation collaboration between vendor and customer and post-installation support, primarily documenting the system's requirements (pp. 230). Following the TOE conceptual framework as a base model, this subtheme supported the environmental context relating to the organization and the external vendors. The participants' inputs supported this subtheme and aligned with the literature resources on the TOE conceptual framework.

The following subtheme would discuss onsite training as another important subtheme.

Subtheme: Onsite Training

All six participants responded to the onsite training topic as supporting the strategies to take full advantage of vendor support. The first approach is to acquire vendors with skillsets and experience in providing onsite training to carry out the implementation project. This helped build up the foundation for implementing IoT technology, and everyone in the company acknowledges that they would welcome this new technology and use it soon. The second approach is organizations acting as vendors offering onsite training because they are experts in supporting their IoT products. In this strategy, the organization or customer would receive support from the best support teams that own the consequences.

Both approaches ensure that organizations or customers fully utilize vendor support to implement IoT technology products efficiently. Participant AA recommended, “Customer support, the app, or the instructions must be clear and concise. Like online chat and interactive, or at least phone to help people through the implementation, installation, and initial use.” Participant BA reported the effectiveness of using the app, “We say we can support hundreds of devices through Apple Health Kit or Google Fit. I have fewer devices to support because I am an expert in every single one.”

Participant CA recalled that a specific type of vendor provides onsite training: "We have found some experts with many experts who are both clinical psychologists and software development engineers.” As a vendor providing onsite training, Participant DA asserted, “I have trained people who can set it up on AWS, Azure, or Google Cloud. Teach them how to do the project and then let them be because I must pass their skillsets.” Participant EA provided information regarding the company acting as a vendor providing onsite training by stating,

> My company focuses a lot on training partners who are what we consider elite IoT developers or have programs around building IoT partners. We try to drive programs so that our partners are trained in a particular region and globally.

In sum, onsite training vendors must be trained, certified, and experienced in supporting the project team or customers using technologies such as applications, clear and concise instructions, chat online or interactive, and phone helps to interact with trainers and learners.

Support for the subtheme, onsite training, is found in the literature. Abdel-Basset et al. (2019) proposed a smart application supporting customers, sellers, and affiliates to use or sell IoT technology devices. Bocoum et al. (2017) stated that onsite training benefits all staff and reduces the number of staff who did not receive training. Evans et al. (2018) reported that onsite training promoted staff effectiveness and closely rolled out the implementation process to real-world conditions. In sum, these literature resources presented the strategies to use external vendors or software applications to provide onsite training to staff that supported the participants’ strategies to use vendors’ onsite training.

Therefore, the participants' inputs were valid and aligned with the literature resources. This subtheme supports the main theme of taking full advantage of vendor support with specific types of onsite training that those vendors can provide onsite training to the project team, staff, or customers.

This subtheme is also in alignment with TOE. DePietro et al. (1990) asserted that vendors, consultants, or education institutions should provide training to workers on using the system as one out of seven issues that organizations would need to address to adopt and implement the innovation (pp. 198). This subtheme provided what and how a vendor could provide onsite training based on participants' experiences.

The next subtheme presented the consultant's experience that the vendor could effectively and efficiently support the implementation project.

Subtheme: Consultant Experience

This subtheme supports the theme by fully leveraging vendor support using the participants' vendor consultant experience. The project team could inherit the vendor consultant experience to use as strategies to implement the IoT technology for the organization. Consultant experience is the vendor quality to help the project team and organization implement the IoT technology successfully. Participant AA reported that the personal consultant experience could support the project team, "I am acting in a product management role for company C to roll out the core software components required to ensure that the product can be commercialized and go to market." Participant AA also considered that vendor support must acknowledge the obstacles by noting, "The technicians, the installers, and customer support persons faced technical questions about

WiFi, connectivity, password, and security. There was a learning curve for technical support, customer service, and installers to learn those things." In addition, Participant BA revealed the organization's vendor support secret, "Our best devices are the ones I recommended and the ones that I can support, and my team can support. My support goal calls are to go faster. I get a few support calls because we are the best of the best."

Participants CA, DA, EA, and FA provided specific consultant experiences that vendors can provide to support the project team and organizations. Participant CA provided the organizations with vendor support's consultant experience by noting,

> We have a team of three that work for us as outside consultants that work at a way sophisticated level and work intensely with our clinical and product design teams and our chief medical officer, our chief psychologist. Some of our advisors and partners also work with IBM Research.

It is critical to find experienced consultants to promote company profits. Participant DA recognized the vendors with consultant experience, "Hire skilled individuals for the project, someone with skills, knowledge, excitement about the technology, and know-how." Participant DA reported that vendors or experienced consultants could help to implement the IoT project in difficult-to-reach locations, "There are areas you cannot reach that is when you want the partners to be engaged in implementing your brand by reselling yourself." Participant EA recruited vendors with consultant experience, "I think we can use partner solutions that do the translation and aggregation. We are also trying to help our partners to grow their IoT practice to have the right skillsets."

Participants provided information regarding vendors with consultant experience and experienced consultants to support the IoT projects. The data was specific to vendors with IoT consultant experience, ensuring commercialization and going to market. Experienced consultants could assist company support teams in supporting the IoT devices, supporting company-owned products, and having the ability to work at a very sophisticated level and intensely. In addition, experienced consultants could be essential in determining their capabilities and competencies to support the IoT project teams and partner solutions with similar projects.

Support for the subtheme, consultant experience, is found in the literature. Chaudhuri (2017) reported that vendors or experienced consultants would assist and train users to inspect and verify IoT devices. Mui (2019) stated that consultants should be certified or academically prepared with management skills to promote innovation and lead the internal support teams. Nistelrooij and Homan (2019) concluded that experienced consultants could supervise and support the development of local power balances. In sum, these literature resources presented the organizations benefited from vendors' or consultants' experiences to carry out successful training, managing, supervising, or supporting the staff. Hence, the participants' inputs aligned with the literature resources regarding vendors and experienced consultants to benefit the IoT project and the company support teams.

This subtheme is also in alignment with TOE. DePietro et al. (1990) explained the perspectives on implementation innovation using four categories: systems management, bureaucratic process, organizational development, and conflict/bargaining, based on advice from many sources such as vendors with consultant experience proceeding across the project processes (pp. 204-205). The participants' inputs for this subtheme showed that vendors with consultant experience provided advice based on their perspectives on implementation to support the project team in processing the project forward in the right direction.

The next subtheme defines the good technical support qualities that the organization and the IoT project team could recruit vendors with those qualities to keep the project moving forward.

Subtheme: Good Technical Support

This subtheme supports the theme of taking full advantage of vendor support because the organization would benefit from vendors providing good technical support. Vendors with good technical support would be efficient and productive in supporting organizations. There are several areas where good technical support can be recognized, such as technical support in training or implementing the project. Participant AA reported, "We trained customer support and customer service on how to install, deal with FAQs, troubleshoot devices and things, and customer support. The app or the instructions have to be very clear and concise." In addition, Participant BA responded with specific applications, "We say we can support hundreds of devices through Apple Health Kit or Google Fit. We have done a compatibility test and checked it out to ensure the data will flow", and also noted,

> Our best devices are the ones I recommend and the ones that I can support and my team can support. I have fewer devices to support because I am an expert in them.

> My support goal is for calls to go faster. I get a few support calls because we are the best of the best.

Participant CA added,

> We have found some experts with many experts who are both clinical psychologists and software development engineers. I rely on a log of third-party expertise. We bring in, we use everybody in our broad network, including consultants and advisors, to align IoT technology to the business requirements.

In another approach, Participant DA reported the personal experience of providing good technical support vendors, "I have trained people who can set it up on AWS, Azure, or Google Cloud. I will do the job for you and make your company more profitable." Participant DA also recalled there were vendors with good technical support. Participant EA discussed methods to spot vendors with reasonable technical support by noting,

> Critical to understanding the partner's capabilities, not just from the solution side but also the hardware and software side of things, and how they would go around addressing it. It will be better if they have done similar cases in the same industry.

Last, Participant FA stated that the vendor could use a feasibility method to locate the vendor with good technical support. In summary, participants noted that a vendor with good technical support would have specific qualifications to support the IoT project. For example, vendors could train company support teams to deal with FAQs, troubleshoot the IoT devices, develop applications to support the IoT devices, expert supporting IoT devices, and be reliable to promote company profits.

Support for the subtheme, good technical support, is found in literature. Wang et al. (2020) reported that training company personnel use the IoT-based technology promotes company cost-benefit and expects more benefits once fully implementing the IoT-based technologies. Yu et al. (2017) reported that vendors who developed the road freight mobile apps provided good databases and technical support to improve freight transport operations. Li et al. (2020) stated that good technical support would provide significant guidance for the development and utilization of the application. In sum, these literature resources presented that organizations and staff could benefit from vendors with good technical support by providing quality training, supporting the applications, and saving costs. Based on the participants' inputs regarding vendors with good technical support qualities, vendors would have two qualities: developing applications to support IoT devices and training company support teams properly to use the IoT technologies. Hence, the literature resources fully supported the participants' inputs regarding vendors' good technical support qualities.

This subtheme is also in alignment with TOE. DePietro et al. (1990) stated in the socio-centric implementation innovation style that implementation activities would include planning and pacing the implementation process by measuring the effectiveness of the social system's functioning (pp. 207). This subtheme provided detailed information regarding how vendors assist the project team in implementing the project with plan and pace by using their good technical support skills such as building support applications and training the company support teams.

In this theme, the findings addressed the research question with validated participants' inputs with literature resources. The findings fulfilled the implementation strategies that corporate IT leaders could use along with other findings to implement the IoT technology for their organization. Following the TOE conceptual framework as a base model, this theme presented one of the environmental factors that was added as one of the study findings.

The next theme identified and used external influencers as the second main theme of this study.

Theme 2: Use All Identified External Influencers and Influences

This second theme supports the implementation strategies for IoT technology in an organization by using all identified external influencers and influences toward the organization's IoT projects from participants' inputs. Organizations can seek input from newly hired vendors or consultants of the IoT project to participate in identifying and using external influencers and influences. This theme consists of information from all 6 participants with 137 references to the database of study codes sharing how they identify and use external influencers and influences. Four subthemes supported this theme, including identifying and using external influencers and influences, regulations, standards, those from other industries, and vendors. There were 19 identified secondary quality resources with 24 references supporting the participants' inputs. Table 3 shows the frequency of participants' inputs for this theme, subthemes, and documents.

Table 3

Frequency of Theme 2: Use All Identified External Influencers and Influences

Major/Sub-theme	Participant count	Participant references	Document count	Document references
Use all identified external influencers and influences	6	137	19	24
Identify and use external influencers and influences	6	55	5	6
Using identified regulations and standards	6	28	5	6
Using those from other industries	6	28	6	6
Through the vendors	6	26	6	6

Note. Theme 2, Use All Identified External Influencers and Influences; *n* = frequency.

Subtheme: Identify and Use External Influencers and Influences

This subtheme presents strategies that research participants used to identify external influencers and influences and strategies to use them to support the IoT implementation project. During the data analysis process, the information from all six participants formed this subtheme to support the external environment aspect of the TOE conceptual framework. This subtheme has two approaches supporting each other: identifying the external influencers and influences and using the external influencers and influences.

Identifying the external influencers and influences

Based on all six participants' inputs (AA, BA, CA, DA, EA, FA), the IoT project team would be able to identify external influencers and influences in several categories, such as standards, regulations, technology, monetizing, incentivizing, or products. Findings from the interviews show that research participants used the current IoT project objectives to customize the range of categories in identifying external influencers or influences to support the IoT project. Each participant provided different methods to identify the external influencers and influences. Participant AA stated that external influencers establish partnerships between companies, ensure IoT products are commercialized and go to market, and promote the value proposition of the IoT devices. Participant AA also reported the other external influences in terms of the value proposition, such as health conditions changing based on monitoring the heart rate readings using the smart bed. Organizations identified external influences to achieve ROI or other benefits from partnerships to sell more IoT products (AA), such as

> One of the unique things about IoT devices is a bit of a surprise when you realize how many different bodies. You have SEC in it. You got communication stuff that must go through FCC certification. You have gotten the UL or something equivalent to UL to go through from a safety standpoint with consumers. You have child protection laws. And then you have the industry regulations themselves.

Participant BA and Participant CA reported that external influencers were people collaborating with the organizations directly or indirectly to promote benefits and ROIs based on IoT solutions. Those external influencers could be payers, patients, supply chain partners, customers, strategic partners, technology partners, third-party experts, or outside engineer consultancies (BA, CA). Participant BA identified external influences that could be government regulations and assistance programs to promote and encourage healthcare organizations to implement IoT solutions, such as implementing value-based care to receive monetary reimbursement from government Medicare and Medicaid programs.

Participant CA raised the awareness of distributing collected data using external influencers,

> We work with our AI vendors, but we also work heavily with our clinical partners. We partner with the American Heart Association, the Department of Psychiatry and Cardiology, and the Department of Veterans Affairs experts. So, we ensure that the data value chain goes all the way through to a clinical decision.

Participant DA also reported one type of IoT solution that nurses could make decisions to provide medication or manage telehealth services for elderly care patients as the external influences. Participant DA reported that identifying external influencers was a key path to success. Participant EA reported that the organization is concerned about the influences relating to government regulations and standards,

> There needs to be produced when we talk about the implementation side of things. If we adopt this standard, for example, OPC UA, how does that integrate into my company's solution? We want to make it turnkey and as easy as possible. Moreover, we can accelerate the adoption and implementation of all these different standards.

Participant EA asserted that organizations could identify influencers for companies adopting similar IoT devices or payers investing in similar IoT devices in the industry. Participant FA added that the organization identified external influencers as cloud providers hosting cloud-to-cloud communication to stream IoT data from IoT devices.

Using external influencers and influences

Participants reported several methods to use identified external influences and a partnership or cooperation with external influencers. First, participants mentioned that they focused on using external influences that drive benefits and reliable support or services based on the requirements of the IoT implementation project. Second, participants reported how they collaborated with or directed hired external influencers for the IoT projects. Participant AA reported the vital strategy of obtaining a change management component to clarify the IoT value proposition,

> Once you go through the market research and development that use case of value, then turn around to inform the implementation relative to how much this has to cost so that we can price it correctly. I think the biggest part of the implementation strategy, or the commercialization strategy is that I must have a change management component to educate the consumer on the value proposition, not just the feature.

Participant AA and Participant BA reported that organizations needed to work with external influencers using partnership strategies to assume product management roles or drive IoT sales. Participant BA noted that the organization used the identified external influences such as regulations or standards to deploy IoT devices into practice, such as IoT devices with specifications that were cleared or approved by FDA. Participant CA reported that the organization contracted with companies or external influencers in partnership and collaboration,

> We rely on these outside engineer consultancies. Thus, my goal is for my company to be one of the survivors. So, I am going with this because we rely

> heavily on our customers and strategic partners and in excruciating detail. So, we work very heavily with customers we choose very carefully, and we work very heavily with strategic partners we select very carefully. That is how we deal with external environment influencers.

Participant CA also reported that the organization assessed the quality of collected IoT data. Participant DA noted that the organization used telehealth services to collect patient data over a secured network and cloud services to store and process collected IoT data. Participant DA asserted,

> So, cloud services, like AWS, cloud services charge this way; they charge by the number of devices they are monitoring. They charge by the storage, which storage you will use, like S3, ECQ, whatever instance you will use or what kind of storage you will use. And then they also charge for ingress and egress rate. So, like four megabytes per second or something. They are going to charge for the data that leaves and comes in. They have a certain charge for that too.

Participant DA and Participant EA reported that the organization could cooperate with partners to implement the IoT projects, provide support and services to IoT products, and build relationships to grow their practices. Participant EA also reported that the organization used the OPC UA standard to speed up the adoption and implementation processes of IoT solutions. Participant FA reported, "So, I think a feasibility study to start with is helpful. If we have decided which area, we are trying to implement based on that, there are specific IoT vendors in the market today." In sum, participants identified external influences and influencers to support the IoT technology implementation projects with regulations, standards, benefits, ROI, support, and services to carry out the IoT project successfully. The project team also used external influences and cooperated with external influencers to drive benefits, acquire reliable support and services, and comply with current regulations and standards.

Support for the subtheme, identifying and using external influencers and influences, is found in the literature. Enke and Borchers (2019) reported that organizations managed activities of external or internal influencers, such as addressing the company’s objectives, influencing hard-to-reach stakeholders, or activities impacting the organization’s solutions. In addition, Alba and Manana (2017) reported a 3-step methodology based on monitoring methods to decide using identified energy consumers and external influencers. Bocoum et al. (2017) reported that influencers and influences, such as regular supply and supervision monitoring, would effectively maintain the motivation of health workers to deliver services. In sum, these literature resources presented by the researchers reported that organizations identified and used external influencers and influences to promote benefits and solutions to business. Hence, the participants’ inputs aligned with those identified literature resources that organizations needed to cooperate with identified influencers and use identified influences for the organization's IoT project.

This subtheme also aligns with the TOE conceptual framework. DePietro et al. (1990) asserted that the systems design perspective aimed political viability, focusing on innovation capability to promote organization solutions adapting to changing environment (pp. 218-219). Qalati et al. (2021) reported mediating environmental factors and organizational performance. DePietro et al. (1990) noted that taking social, organizational, and technical issues into account to plan and set the pace of implementation (pp. 214). Hence, the participants provided inputs to support this subtheme that also aligned with the environmental context of the TOE conceptual framework. The next subtheme would report the topic of using identified regulations and standards.

Subtheme: Using Identified Regulations and Standards

All six participants' responses regarding regulations and standards were external influences and influencers helping IoT projects focus on complying with the IoT technology, including hardware, software, data, or communication. First, participants reported regulations and standards organizations should use to adapt the IoT technology and comply. Second, participants provided available government accommodations and legal vendors to support and encourage organizations to implement IoT technology.

Organizations used both approaches above to ensure the IoT project would comply with current regulations and standards and acquire all available government accommodations to add IoT technology solutions to support business. Participant AA reported,

> One of the unique things about IoT devices is that it has a bit of a surprise when you realize how many different bodies. You have SEC in it, and you got communication stuff that must go through FCC certification. You have the UL or something equivalent to UL to go through from a safety standpoint with customers. You have child protection laws. And then, you have the industry

> regulations themselves. We had to deal with the Center of Medicare. Moreover, we had to deal with FDA.

In terms of using advantages of regulations and standards, Participant AA and Participant BA reported advantages, such as product acceptance or using the IoT devices in the fields, when implementing IoT solutions in a regulatory environment. The government regulations and standards included FCC certification, UL certification, the seal of approval from other entities, FDA cleared, FDA approved, or in the FDA list (AA, BA). Participant BA reported how the government provided incentives to benefit companies investing in healthcare IoT technology,

> So, on the money side, Medicare is trying to help by incentivizing value-based care by giving reimbursement for the use of IoT devices. There have Medicare components. Medicaid is matching in some states, and some now health plans and payers are building bundles that require value-based care, which means IoT needs to be used in this world to care virtually for someone.

Participant CA and Participant DA reported that IoT and cloud service providers assisted healthcare companies in complying with regulations and standards, including HIPAA-compliant privacy and security on AWS, with monthly or annually fees on services and licenses. Participant EA reported,

> There needs to be produced when we talk about the implementation side of things. If we adopt this standard, for example, OPC UA, how does that integrate into my company's solutions? We want to make it as turnkey, as easy as possible.

> Moreover, we can accelerate the adoption and implementation of all these different standards.

In summary, participants used identified regulations and standards along with available government accommodations and legal vendors to comply with IoT projects and acquire benefits for organizations from using IoT technology solutions. The regulations and standards were mainly government regulations, such as SEC, UL, FCC, FDA, Medicare, Medicaid, HIPAA, certifications, HIPAA security, HII, FISMA, or OPC UA.

Support for the subtheme, use of identified regulations and standards, is found in the literature., Labib et al. (2019) reported that regulations and standards were essential to trustworthiness in IoT in data protection and privacy. Yousif et al. (2021) reported privacy and security concerns regarding IoT applications and solutions, emerging standards, and practices. Nashiruddin and Purnama (2020) noted that the IoT technology was successfully supported by NB-IoT (Narrow Band Internet of Things) technology supported by cellular networks or Long-Term Evolution (LTE) with 3GPP (3rd Generation Partnership Project) Release 13 standard (pp. 1). In sum, researchers from these identified literature resources reported that regulations and standards were essential to enforce the privacy and security of IoT data, IoT solutions, and IoT applications in practice. Hence, these literature resources supported and validated the participants' inputs. This subtheme is also in alignment with TOE. DePietro et al. (1990) asserted that government regulations encouraged innovation in health, safety, and the environment (pp. 174). Malik et al. (2021) reported that government support and standards were factors in the environmental context of the TOE framework supporting blockchain technology (BCT) innovation. DePietro et al. (1990) also reported that the project team must reach out to understand the innovation context, not just change based inside an organization (pp. 175).

The next subtheme presented how participants identified external influencers and influences from other industries.

Subtheme: Using Those from Other Industries

This subtheme presents the identified external influencers and influences that organizations from other industries successfully used to implement similar IoT technology. Participants indicated that both external influences and influencers coming from vendors from other industries that implemented similar IoT technology that guided them to implement the current IoT technology successfully also supported the current IoT implementation project. In addition, the IoT product might have a chance to emerge in other industries. Participant AA reported that the consumers and business partners understood and accepted the IoT technology solutions based on its value proposition over the technological features. Participant BA responded that end-users, customers, decision-makers, or smart environments from industries, including the healthcare industry, could be influencers and influences to inherit IoT solutions for daily life. Participant CA asserted that there were also benefits to collaborating with vendors from different industries,

> We collaborated with IBM, IBM Watson Health, and IBM Research early on, like interacting with three completely different companies. They do not know each other; they do not work together. However, we work with them collaboratively to

> apply their tools, particularly their natural language processing tools, to the narratives gathered from users on our platform and derive clinically rather than information.

Participant DA reported that vendors from different industries provided valuable support to regulate the temperatures range to protect the Covid-19 vaccine transported around the US during the pandemic. Participant EA reported that the IoT ecosystem might be the key point to connecting companies or industries together that might lead to IoT standards in the future. In summary, participants found the external influencers and external influences from vendors joining their team and supporting the current IoT project. Those vendors shared the influencers and influences while working for organizations from other industries that implemented similar IoT technology innovations. These were significant findings to guide and assist the current IoT implementation project. The external influencers could work collaboratively, such as a partner ecosystem, to create market opportunities to have more control and make the changes. The external influences were the information's values, derived clinically rather than information. IoT device providers have their IoT cloud or care for patients remotely at a reasonable cost.

Support for the subtheme, using those from other industries, is found in the literature. Sivathanu (2018) reported that the value of “openness to change” significantly influences the “reason for” and “reason against” adoption of IoT-based wearables in the healthcare industry. Rachinger et al. (2019) noted that digital influences similarities in companies from two different industries, including the value proposition in the value network for business model innovation by digitalization. Last, Tu (2018) reported that benefits, costs, and external pressures were determinants of IoT adoption intention from several firms. In sum, these identified literature resources supported and validated the participants' inputs regarding influencers and influences from different industries.

This subtheme is also in alignment with TOE. DePietro et al. reported that organizations acknowledged the competitive pressures to apply to the designs of innovative solutions as external environmental factors (pp. 218-219). Olushola (2019) reported that government regulatory accommodations came along with enforcing IoT policy compliance to firms. Sandu and Gide (2018) asserted that environmental factors significantly influenced SMEs adopting the implementation of innovation based on competitive pressures with positive impacts. The participants' inputs showed that environmental factors positively impact implementing the company IoT project, such as using identified external influencers and influences.

The next subtheme discussed the external influencers and influences through the vendors.

Subtheme: Through the Vendors

This subtheme supports the theme by presenting that the IoT project team can use external influencers and influences through the vendors currently cooperating with the IoT project team to implement the IoT project. The vendors would provide and discuss with the project team influencers and influences they had positive experiences working with to complete past IoT projects. This subtheme is significantly helping the IoT project team identify other external influencers and influences that were not identified or used on previous themes or subthemes. Participant AA reported,

> All three companies I have been involved with have been business-to-consumer. Thus, we have only really explored it from the consumer standpoint. From a partnership standpoint, it was very important for the partners in company A. It was very important for the company to sell more of their core products, which was their biggest measurement. Company B, we were very much on the software side, so the company's motivation. The partnerships in company B were that they could sell more of their hardware. In company C, it is a combination of selling hardware and recurring revenue as a measure of them. We are being successful.

In addition, Participant BA reported that partnerships and payers demanded IoT solutions from all industries. Participant DA reported that partners and vendors recommended influences such as cloud storage services and their service rates. Participant EA indicated, "My customers are more confident in my partners. So, there is no influencing but direct programs to ensure that my partners are certified or trained in the technology I need." Participants reported that they found external influencers and influences through the vendors currently working with the IoT project team could share with the IoT project team. These external influencers and influences were not identified and used in previous subthemes of this theme.

Support for the subtheme, through the vendors, is found in the literature. Metallo et al. (2018) reported that IoT-oriented organizations could reach out to capture value opportunities and business value in the IoT industry across partnerships using key activities, key resources, and value propositions. Rybnicek and Konigsgruber (2019) asserted that government support, legal restrictions, or the market environment influenced the success of interrelationships within industry-university collaborations. Jimenez-Jimenez et al. (2019) reported that information technology and supply chain collaboration with external agents promoted incremental and radical innovations. In sum, these identified literature resources reported influencers and influences existing across industries. Therefore, vendors had the chance to know influencers and influences when delivering past IoT projects. The IoT project team might find matched influencers and influences based on the vendors' recommended list. Hence, the identified literature resources supported and validated the participants' inputs.

This subtheme is also in alignment with TOE. DePietro et al. (1990) stated one of the views of implementation as organizational development (pp. 205), "Implementation arises to meet individual and group needs and should proceed through a participative process." Iskandar and Ramantoko (2018) reported that environmental factors were influences and influencers proposing as customers or suppliers' pressure, competitor pressure, and government support. Cruz-Jesus et al. (2019) asserted that competitive pressure and CRM adoption positively influenced CRM routinization over evaluation and adoption.

In this theme, the findings addressed a portion of the research question with validated participants' inputs from identified literature resources. The findings fulfilled the implementation strategies that corporate IT leaders could use with other findings to implement the IoT technology for their organization successfully. Following the TOE conceptual framework as a base model, this theme presented the second environmental factor and the study findings' second finding.

The next theme would be aligning current IoT technology with business needs as the third main theme of this study.

Theme 3: Align Current IoT Technology with Business Needs

This third theme supports activities of aligning IoT technology with business needs based on participants' responses to the current IoT project as one of the organizational aspects of the TOE framework. The IoT project team can consolidate the current organization's business needs and align them with the current working IoT technology implementation project to ensure the IoT technology fully supports the organization. This theme consists of information from all 6 participants with 257 references to the database of study codes sharing how they align IoT technology with business needs. Four subthemes supported this theme, including ensuring current IoT technology alignment with business needs, measuring the benefits of IoT technology, project buy-in, and size, scope, and resources. There were 21 identified secondary quality resources with 24 references supporting the participants' inputs. Table 4 shows the frequency of participants' inputs for this theme, subthemes, and documents.

Table 4

Frequency of Theme 3: Align Current IoT Technology with Business Needs

Major/Sub-theme	Participant count	Participant references	Document count	Document references
Align current IoT technology with business needs	6	257	21	24
Ensure current IoT technology alignment with business needs	6	98	6	6
Measure the IoT technology benefits	5	35	5	5
Project buy-in	6	33	7	7
Size, scope, and resources	6	91	6	6

Note. Theme 3, Align current IoT technology with business needs; *n* = frequency.

Subtheme: Ensure Current IoT Technology Alignment with Business Needs

This subtheme presents research participants' strategies to ensure current IoT technology solutions align with business needs to support the IoT implementation project. This subtheme has two approaches. First, the IoT project team identified the technology's possible solutions and current company business needs. Second, the IoT project team ensured the alignment of IoT technology and business needs promoting profits and benefits to the organization.

Each participant provided different methods to identify the possible IoT technology solutions and benefits and align them with current business needs. Participant AA reported that the IoT project team implemented the IoT solutions using scrum-related agile development aligning the project plan with the business plan based on the IoT device's unique features, the software development, and the IoT data. The organizations' business plans were revenue-based and had a customer satisfaction component (AA). Participant BA reported the business needs of the healthcare industry were security compliance requirements on top of the infrastructure of IoT systems, such as PHI protection, HIPAA requirements, and IoT data security. Participants CA reported IoT benefits and organizations must focus on the high level of multidiscipline to implement the IoT technology correctly and provide valuable data for clinical decision making. Participant DA noted that legal and HR were also involved in regulating the internal IoT technology,

> Many companies are hiring IoT experts in legal. That is another place they are making many changes is legal is making a lot of changes, HR policies or company policies. So, HR and legal get involved because now, you are dealing with objects rather than people.

Participant EA reported that organizations must focus on business vision in goals, challenges, and ROI and then align the IoT solutions with this vision to achieve customer satisfaction. In summary, participants reported that the IoT project team needed to align the IoT technology solution with the current identified business needs, such as aligning IoT solutions with business goals or challenges. The project team also needs to identify the IoT technology benefits to implement them correctly to support and promote benefits to the organization.

Support for the subtheme, ensuring current IoT technology alignment with business needs, is found in the literature. Suppatvech et al. (2019) reported that organizations integrated business value propositions of IoT technologies and business elements to carry out IoT-enabled servitized business models from their systematic literature review. Sheel and Nath (2019) asserted that organizations reported blockchain technology with big data and IoT improved supply chain adaptability, alignment, agility, competitive advantage, and firm performance. Parida et al. (2019) reported that organizations used a digitalization-enabling business model innovation to realize sustainability benefits using IoT technologies, intensive data exchange, and predictive analytics. In sum, the researchers reported organizations utilized IoT solutions aligning with business needs, such as IoT-enabled servitized business models, IoT improved firm performance or digitalization-enabling business innovation. These literature resources supported and validated the participants' inputs regarding promoted IoT solutions and benefits based on business goals, challenges, and customer satisfaction.

This subtheme also aligns with the conceptual framework, which includes TOE. DePietro et al. (1990) reported that organizations should be aware of planning to implement innovation and incremental pacing with a detailed planning process to reduce end-users ignoring the system (pp. 220). Schaefer et al. (2021) reported that organizations identified the business challenges based on the increased expectations to have municipalities' digitalization accessibility 24 hours services and the digitalization solutions involving AI adoption to support municipal citizens. -Oliveira et al. (2019) asserted that top management support of the organization would ensure the alignment of the innovation and organization interests as one of the organizational contexts. Hence, the participants' inputs supported this subtheme and aligned with the TOE conceptual framework regarding organizational context.

The following subtheme presents the measure of the IoT technology benefits.

Subtheme: Measure the IoT Technology Benefits

This subtheme supports the theme of alignment of current IoT technology with business needs by reporting IoT technology benefits with several measuring methods. Five out of six participants responded to IoT technology benefits. The IoT project team could use implementation strategies to successfully implement the IoT technology and its future benefits, promoting company profits. There are three approaches that participants focus on methods to measure the IoT technology benefits. First, participants concentrate on benefits among internal functioning departments relating directly or indirectly to implementing IoT technology. Second, legal compliances would also focus on organizations bringing IoT technology solutions onboard. Last, participants find it is essential that internal functioning departments benefit from implementing IoT technology solutions.

All three approaches above ensure organization and IoT project team measure the benefits of current IoT technology implementation. Participant BA reported that the organization measured the success of IoT solutions by monitoring the reduction in the number of hospitalization trips to ER or escalations to management teams in 3, 6, 9, or 12 months, and published a case study. Participant CA reported that the company benefitted from IoT products by assessing customer orders, and massive companies and customers were investing in IoT products. Participant DA reported that organizations recognized the IoT solutions' success by the increasing number of invoices in customers’ work orders, including millions of packaged objects shipping to business partners. Participant EA provided information regarding the ROI benefits,

> Real estate space is also a cost-saving that you can have. Consolidating your warehouse could be another cost. So, we need to think at a broader level about this scenario's total cost of ownership and how that translates to 30% operational efficiency. And the quantifiable measure. And then, when you do the IoT project, you can find the true ownership protocols or the actual ROI.

In sum, participants reported that the IoT project team could measure the IoT benefits by measuring lowering risks, cost savings, the product enables consumers to make choices, and actual ROI over time of IoT operation.

Support for the subtheme, measuring the IoT technology benefits, is found in the literature. Brous et al. (2020) reported that measurements of IoT technology benefits were mostly from successful company operations that used collected IoT data by implementing a data quality framework, implementing data governance, or ensuring IoT capabilities in IT infrastructure. Martinez-Caro et al. (2018) noted that the healthcare service dynamic industry determined IoT benefits to using advanced services for IoT-based healthcare systems and services, such as evaluating the effective use of information and communication technologies based on collected IoT data. Marques et al. (2020) asserted that measurements of IoT benefits included a cost-effective and efficient solution for air quality, monitoring air quality in the vehicle while traveling, and contributing to enhancing living environments in smart cities. In sum, these literature resources presented that organizations measured the success of IoT solutions as advanced IoT applications effectively utilized the IoT data crossing multiple industries. Hence, the identified literature resources supported and validated the participants' inputs regarding measuring IoT technology benefits.

This subtheme is also in alignment with TOE. DePietro et al. (1990) reported that organizational members measured the innovation benefits based on the successful results of intentional or unintentional decisions and actions (pp. 154-155). Putra and Santoso (2020) reported that the organizational contexts had a more decisive influence than other contexts, and organizations measured the innovation benefits using research and development (R&D), technological leadership, and innovation. These literature resources on the TOE conceptual framework reported that organizational contexts had the most decisive influence. Organizations measure the innovation solution benefits based on the success of decision making, and functioning units apply the innovative solutions. Therefore, the identified literature resources on the TOE conceptual framework supported the participants' inputs that organizations measured the innovation solution benefits based on the results of decision makings and their usage within functioning departments.

The next subtheme presented the project buy-in that the IoT project team could support the implementation project.

Subtheme: Project Buy-In

This subtheme supports the theme by presenting the IoT project passing the project buy-in milestone when the project team implements the current IoT technology solution for the organization. The project team could focus on two approaches to address the management buy-in and the customers' or consumers' buy-in. The project team must pass the project buy-in in both approaches to successfully deliver the IoT technology implementation project. Participant AA reported,

> I was putting together that partnership with company A, the go-to-market partnership. That is where we got the management's buy-in. We go through the validation, the investment, and the strategic approach to going to market together and build that whole partnership around the value proposition, which is that we can improve this aspect of people's lives. Moreover, it will improve our customer experience, and we can generate sales based on that.

Participant BA indicated that the IoT manufacturers did not have internal project buy-in but the customers' buy-in to initiate the IoT financial orders, "because we are an IoT-based company, there is no tremendous buy-in inside our company. Still, our customers, typically health-oriented, are dealing with a legacy workflow, and IoT devices are not feeling normal." Participant DA reported the IoT reoccurring investment opportunities that drive sales and support project buy-in from the top management team and stakeholders,

> So, you have capital investment and continually have a reoccurring investment for upkeep. You look for ways how to always reduce that operational budget. You can decrease your capital budget, but that will not go away from continually maintaining it.

Participant EA reported project buy-in in detail,

> In my years of doing this, I have been getting the buy-in from a key stakeholder sponsoring a leadership that is sponsoring the project. It is very critical. Getting

> buy-in, there are two ways. First, it is providing the data that is driving the business outcome. We can identify anomalies and all that stuff. Whatever they are. However, the other aspect is doing this to make business sense. Moreover, if it does not make business sense, then it is pointless in that.

Participants provided information regarding the project buy-in topic to keep the IoT project moving forward, focusing on both management buy-in and customers' or consumers' buy-in. The project team could use strategies to pass the project buy-in, such as better sales generation, better people's lives, cost of IoT efforts, capital investment, reoccurring investment for upkeep, IoT solutions, risk mitigation plan, data driving business outcomes, and stakeholder analysis.

Support for the subtheme, project buy-in, is found in the literature. Illa and Padhi (2018) reported that IoT project buy-in should present multiple factors to top management buy-in, such as stakeholders or executive stakeholders. Multiple factors were considered budget allocated, the team's expertise, effective cross-functional collaboration, right platform, right integration partner, good use cases, equipment readiness, or good ROI as IoT benefits (Illa & Padhi, 2018). Yeole and Kalbande (2018) reported that healthcare IoT project buy-in should engage staff at all levels to gain support and buy-in, especially in developing a process for ongoing monitoring of implementation progress. Beecher (2018) asserted that IoT project buy-in must have a clear strategy mitigating security risks to have the C-suite understanding and passing the security funding for IoT projects.

This subtheme is also in alignment with TOE. DePietro et al. (1990) indicated that formal meetings would offer opportunities for sharing information and ideas among areas in the organization as one of the technological innovation processes (pp. 158). Mohungoo et al. (2020) reported that innovation implementers would keep stakeholders engaging with the innovation implementation for better acceptance and project buy-in to improve innovation usage. Elghdban et al. (2020) asserted that the organization strategized to approve the buy-in to acceptance and use of innovation after competitors successfully adopted the same innovation. In summary, these literature resources on the TOE conceptual framework presented that organizations needed to have formal meetings or project buy-in meetings with innovation implementation projects for better internal and external acceptance, especially competitors' successful implemented innovation solutions. Hence, these identified literature resources supported this subtheme that organizations and the project teams needed to pass the project buy-in process to keep the project moving forward.

The next subtheme reports the size, scope, and resources participants provide as inputs in another organizational context.

Subtheme: Size, Scope, and Resources

This subtheme supports the theme by identifying the size, scope, and resources the IoT project team would need to implement the IoT technology solutions. First, the IoT project team must propose the size, including the timeline to complete the IoT project, possible expenses, available staff, and possible barriers during the project's progress. Second, participants respond with IoT project scope to meet stakeholders' requirements and successful IoT solutions. Last, the IoT project team must consolidate all available resources to implement the project. Participant AA reported that organizations and project teams carried out the IoT projects like other innovative projects, including rolling out to commercialization, having similar hardware or software issues with other innovative technologies, and focusing on the internal value standpoint of IoT solutions. Participant BA reported that the IoT project team used the Agile model for the IoT project to keep everyone collaborating and communicating daily to keep the project moving forward. In another approach, Participant DA reported that the project teams would do a pilot study to cover IoT device connectivity, ensure performance, and then roll out the project to cover architecture and the number of endpoints to manage the IoT solutions onsite or remotely. Participants EA also reported that data security and governance would be the keys to supporting the project buy-in,

> Business case governance, security, life cycle management, insights, and actions are key areas. The other interesting implementation could also be like I talked about data frequency. You also should consider data governance in the sense of where or how long you need to keep the data and how long you should store it. That is also another area that you should think about it.

In summary, participants reported that the IoT project team would use the Agile model for the IoT implementation project, product management strategies, governance security, regulatory compliances, medical device, medical services, GPS devices, data frequency, and possibly pilot programs for production as cost savings.

Support for the subtheme, size, scope, and resources, is found in the literature. Dhanda et al. (2020) reported that researchers discovered both advanced encryption standard (AES) and elliptic curve cryptography (ECC) were suitable security protection for using lightweight cryptographic primitives to protect IoT connectivity and cloud data from different types of attacks. Soosay and Kannusamy (2018) reported that the innovative technology project had the size of 360 partnerships represented the supply chain, the scope of transitioning to Industry 4.0 from currently implemented technologies, and resources as collected data from those firms in the agri-food industry in Australia. Soosay and Kannusamy (2018) also noted that food companies in Australia used the predictive capability based on using the enterprise resource planning (ERP) systems, the IT systems of suppliers, and the manufacturing execution systems (MES) to manage the operations of factories and productions. Li et al. (2020b) reported that the security information transmission algorithms for IoT technology projects reduced calculation errors by 20% and improved security by above 90% by using vegetable pests and disease data for intelligent collection, coding, and transmission. In summary, these literature resources reported that organizations used size, scope, and resources to deliver innovative solutions precisely and successfully for organizations in industries. Therefore, these identified literature resources supported and validated the subtheme of the IoT project team using the size, scope, and resources to implement the IoT solutions.

This subtheme is also in alignment with TOE. DePietro et al. (1990) asserted that slack resources and organization size were the two elements leading to adopting and implementing innovation in an organization, such as resources available to support conditions for innovation or size in terms of numbers of employees, yearly revenues, or amount of budget (pp. 160-163). Clohessy and Acton (2019) reported that top management support, organizational readiness, and large companies were factors in adopting and implementing innovative technologies. Ahmad et al. (2020) asserted that 93 identified determinants influenced the BIS (Business Intelligence Systems) adoption and acceptance in organizations, including organization size, scope, compatibility, and top management support. In sum, these literature resources reported that successful and profitable organizations with readiness in size, scope, and resources were ready to adopt and implement innovative solutions to promote benefits and business opportunities. Hence, these identified literature resources supported this subtheme regarding participants' responses toward the size, scope, and resources when implementing the IoT project.

In this theme, the findings addressed aligning current IoT technology with business needs to answer a portion of the research question with validated participants' inputs from identified literature resources. The findings fulfilled the implementation strategies that corporate IT leaders could use with other findings to implement the IoT technology for their organizations successfully. Following the TOE conceptual framework as a base model, this theme presented the first organizational factor and the third study findings.

The next theme, using all identified internal project staff skills, is presented as the second organizational context and the fourth main theme of this study.

Theme 4: Use All Identified Internal Project Staff Skills

This theme supports the implementation strategies for IoT technology in an organization by using all identified internal project staff skills based on participants' responses. Internal IoT project staff's skills would be the core staffing to carry out the IoT technology solution for the company successfully. This theme consists of information from all 6 participants with 135 references to the database of study codes sharing how they identify and use internal project staff skills. Three subthemes supported this theme, including ensuring internal project staff skills, using identified staff's capabilities and competencies, and using identified staff from other internal functional units. There were 16 identified secondary quality resources with 18 references supporting the participants' inputs. Table 5 shows the frequency of participants' inputs for this theme, subthemes, and documents.

Table 5

Frequency of Theme 4: Use All Identified Internal Project Staff Skills

Major/Sub-theme	Participant count	Participant references	Document count	Document references
Use all identified internal project staff skills	6	135	16	18
Ensure internal project staff skills	6	61	6	6
Use identified staff capabilities and competencies	6	35	6	6
Use identified staff from other internal functional units	6	39	6	6

Note. Theme 4, Use All Identified Internal Project Staff Skills; *n* = frequency.

Subtheme: Ensure Internal Project Staff Skills

This subtheme presents strategies participants used to identify, assess, and ensure internal project staff skills are sufficient to support the IoT implementation project. The information from all six participants formed this subtheme to support the second organization aspect of the TOE conceptual framework. This subtheme has two approaches supporting this theme: staff expertise, abilities to work with others, and experience in security and compliance. Participant AA reported that the IoT project team identified and assessed staff to join the project team with strategies and qualities, including upfront screening with exact skillsets and talent levels for each role, having experience with IoT technology, and understanding the layers of IoT devices. Participant BA reported that the IoT project team recruited project staff with IoT device knowledge, healthcare workflow knowledge, speaking the same language at the same level with users and customers, and IoT solutions' human aspects. Identifying and recruiting the specific internal staff skills for the IoT project, Participant CA reported that the organization directly contracted with outside high-level consultants to have them work closely with the project team and internal management teams as part of the internal project staff. Participant DA reported that the IoT project team assessed internal staff with skill, knowledge, and excitement about the technology and provided these staff training as needed. Participant EA reported a method to ensure internal project staff skills,

> I think you have that project team embarking on doing this area of like identifying the challenges, the ROI, and thinking through the various new and innovative ways to address this with IoT solutions. I think the project team needs to be honest with themself around, like, "Hey, we are only here to be driving the thinking, that strategy, that innovation because we understand our businesses, we understand the challenges. However, we might not be able to understand how we

> implement it." Moreover, that is when I think they should bring in a partner to address implementation.

Participants reported that the IoT project team ensured internal project staff skills by evaluating or reevaluating the team structure and determining exact skillsets and talent levels. The team could do an upfront screening skillset for each role, looking for tinkerers type of staff with IoT experience that have done this before or training during the project for additional training.

Support for the subtheme, ensuring internal project staff skills, is found in the literature., Parra and Guerrero (2020) reported that the IoT project team must consist of staff from different disciplines and multiple areas of the organization, such as products and services. Pasko et al. (2022) asserted that IoT skillsets in a data management context, machine condition monitoring, or support decision-making were suitable for IoT staff to apply IoT in industrial problem-solving. Prasher and Onu (2020) indicated that a teamwork skillset would be necessary to build an IoT team using Jira or similar project management tools. In summary, these literature resources reported that IoT project staff were from the organization's departments, experienced with managed and supported IoT devices, and used project management tools. Hence, these identified literature resources supported the participants' inputs that the IoT project team must identify, assess, and recruit staff from internal functional units.

This subtheme also aligns with the conceptual framework TOE. DePietro et al. (1990) noted, "Teams, committees, and task forces bring together individuals from diverse areas, providing different perspectives on problems and opportunities. Joint problem-solving teams maximize ownership of the innovation among parts of the organization" (pp. 158). Ijab et al. (2019) reported in technological readiness that "Big Data Analytics (BDA) skills for staff members must be enhanced through various BDA awareness training as well as technical big data-oriented training" (pp. 5). Sam and Chatwin (2018) noted that organizational readiness would include staff skills and experience positively impacting innovation readiness (pp. 509). In sum, these literature resources on the TOE framework reported that the IoT project team had internal staff contributing to the project would be part of the organizational factors to share ownership of the IoT solutions with internal departments. Therefore, these identified literature resources supported the participants' inputs regarding organizational factors of utilizing internal staff to join the IoT project team.

The next subtheme would present the using identified staff capabilities and competencies approach.

Subtheme: Use identified staff capabilities and competencies

All six participants responded to this subtheme to support the implementation strategies for the company's IoT project. The first approach is to identify and use the project staff's identified capabilities to carry out the project. This approach helped the project management team ensure sufficient skills to complete and deliver the implementation project on time. The second approach is to identify and use the project staff's competencies to guarantee the project's completeness and future related projects.

Both approaches ensure the IoT project team uses both project staff's capabilities and competencies to support the whole IoT implementation project lifecycle. Participant

AA reported that the internal staff who joined the IoT project team would receive training to support the new technologies with customer service capabilities, technical support in installing the IoT devices, and responsible for FAQs and troubleshooting the devices. Participant BA reported that the project staff must be capable of performing the project, familiar with IoT device functionalities like pushing buttons or activating internal functions onsite or remotely and working with end-users or customers to deploy the IoT devices. Participant CA asserted that the project staff must be multidiscipline to perform the project effectively,

> So, our approach to technology implementation challenges is always multidisciplinary. As our solution, we deliver effective, evidence-based mental well-being and social support services with massive scale and reach. If you are trying to approve the physical health and mental well-being of potentially hundreds and millions of people around the world, you had better get it right. Thus, our approach always involves skilled clinicians, skilled software engineers, social learning experts, regulatory expertise, people who understand clinical workflows, and artificial intelligence tools.

As a vendor providing onsite training company products, Participant DA reported that the IoT project team provided training to the project staff, discovered staff capabilities during the onboarding process, and noted the level of excitement about the technology. Participant EA reported that,

> I think you have that project team embarking on doing this area of like identifying the challenges, the ROI, and thinking through the various new and innovative ways are to address this with IoT solution.

In sum, participants reported that the IoT project team identified and used the staff's capabilities and competencies to realize the completeness of the IoT project. The staff would be skilled clinicians, skilled software engineers, social learning expertise, regulation expertise, understanding of artificial intelligence tools, training customer service, training technical support, having fun with the technology, or understanding clinical workflows.

Support for the subtheme, using identified staff capabilities and competencies, is found in the literature. Afzal et al. (2018) reported that a positive impact project manager would provide the project staff training, enhance competencies, and emotional intelligence using professional courses, workshops, and seminars. Wiedemann and Wiesche (2018) asserted that staff capabilities and competencies were the importance of skills and skills categories to build a successful DevOps team, such as full-stack development, analysis, and functional skills. Bresciani et al. (2018) reported the approach of the organization to innovation, "Multinational enterprises (MNEs) need to develop knowledge management (KM) capabilities combine with information and communication technologies (ICTs) capabilities if they want to obtain greater ambidexterity performance at the project portfolio level." In summary, these literature resources reported that the project managers would provide training to project staff for project knowledge base to use their capabilities and enhance their competencies. Hence, the identified literature resources supported the participants' inputs regarding using the project staff's capabilities and competencies.

This subtheme is also in alignment with TOE. DePietro et al. (1990) asserted that the formalization and centralization focused on rules, procedures, or decision-making processes were helpful during implementation, which included creating liaison roles, creating ad hoc task forces, or establishing a matrix form of management (pp. 156-157). Sun et al. (2020) reported that executives found technological competence provided more influence and confidence toward decision-making to adopt innovation. Schull and Maslan (2018) asserted that IT capabilities, including innovation skills and internal data usage, would be the most technological factors in adopting an innovation. In sum, these literature resources presented reported organizational factors relating to using project staff capabilities and competencies helped implement the innovative solutions. Hence, these identified literature resources supported and validated the participants' inputs for this subtheme.

The next subtheme presented that the IoT project team could use identified staff from other internal functional units.

Subtheme: Use identified staff from other internal functional units

This subtheme supports using identified staff from other internal functional units to assist the IoT project team in completing the IoT implementation project. The project team can identify and use staff from other departments with matched skills as strategies to speed up the company IoT project progress. Participant AA reported that the IoT project team onboarded staff from many departments, including retail, marketing, customer service, and manufacturing. In addition, Participant BA said that IoT project team members must be representatives from other departments to assist with those departments' special skills or authorizations, including nurses or medical assistants. Participant CA reported that the organization organized an in-house engineer team to support the IoT project,

> We have our in-house engineering team who writes our actual code, does our testing, et cetera. However, we bring in and we have found some experts, with many who are both a clinical psychologists and software development engineers. We have a team of three that work for us as outside consultants at a very sophisticated level and work intensely with our clinical and product design teams. Our chief medical officer, chief psychologist, and some of our advisors and partners also work with IBM Research.

Participant DA reported that the IoT project team hired IoT experts of different expertise, including legal, HR, or marketing. In summary, participants provided information to identify and include staff from other internal functional units to assist the IoT project team. The staff departments would be the marketing team, retail, customer service, manufacturing, IoT experts in legal, nurses, medical assistants, in-house engineering team writing codes, clinical psychologist, or software development engineers.

Support for the subtheme, using identified staff from other internal functional units, is found in the literature. Tumbas et al. (2018) reported that the chief digital officer (CDO) managed activities like bridging to link the IT department's staff and other functional units' staff. Goh and Arenas (2020) reported collaboration among IT departments and functional units to realize commonalities or set boundaries to each value. Muninger et al. (2019) reported that the company successfully adopted social media tools by including marketing teams, external stakeholders with digital experts, and cross-functional internal teams to support innovative solutions. In sum, these literature resources reported that there were achievements when combined the innovative solutions with other internal or external cross-functional teams. Hence, these identified literature resources supported the participants' inputs for this subtheme.

This subtheme is also in alignment with TOE. DePietro et al. (1990) asserted that the internal linking mechanisms, such as sharing information and ideas with staff from different areas or joint problem-solving teams in the organization, would impact the success of adopting technological innovation (pp. 157-158). Pateli et al. (2020) noted that organizations that adopted innovative solutions at the organizational level would collaborate with multiple internal functional teams, including functional teams, business units, or entire organizations. Looy (2021) reported that staff from other functional units were more people-minded than IT-minded, providing new opportunities to improve business processes and learn new innovative technologies through seminars or IT training. In sum, these literature resources reported that organizations adopting innovative solutions at the organizational level would collaborate with internal functional teams, business teams, or the entire enterprise. Therefore, these identified literature resources supported and validated the participants' inputs for this subtheme.

In this theme, the findings addressed the topic of using all identified internal project staff skills to answer a portion of the research question with validated participants' inputs from identified literature resources. The findings fulfilled the implementation strategies that corporate IT leaders could use with other findings to implement the IoT technology for their organizations. Following the TOE conceptual framework as a base model, this theme presented the second organizational factor and the study findings' fourth finding.

The next main theme presented the using all identified current internal infrastructure as one of technological context.

Theme 5: Use All Identified Current Internal Infrastructure

This theme supports the implementation strategies for IoT technology projects in an organization using all identified current organizations' internal infrastructure. Using those strategies, the IoT project team can identify all available internal infrastructure to support the IoT project. This theme consists of information from all six participants with 153 references to the database of study codes sharing how they identify and use current available internal infrastructure. I used four subthemes to support this theme, including the use of identified and assessed current internal infrastructure, use of identified adequate network connections and protocols, use of identified adequate peripherals, and use of identified secure internet connections. There were 21 identified secondary quality resources with 24 references supporting the participants' inputs. Table 6 shows the frequency of participants' inputs for this theme, subthemes, and documents.

Table 6

Frequency of Theme 5: Use All Identified Current Internal Infrastructure

Major/Sub-theme	Participant count	Participant references	Document count	Document references
Use all identified current internal infrastructure	6	153	21	24
Use identified and assessed current internal infrastructure	6	41	6	6
Use identified adequate network connections and protocols	6	42	6	6
Used identified adequate peripherals	5	28	6	6
Used identified secure internet connections	6	42	6	6

Note. Theme 5, Use All Identified Current Internal Infrastructure; *n* = frequency.

Subtheme: Use identified and assessed current internal infrastructure

This subtheme presents strategies that research participants reported to identify, assess, and use the organization's current internal infrastructure to support the IoT implementation project. All six participants' information formed this subtheme to support the first technological aspect of the TOE conceptual framework. This subtheme has two approaches: identifying and assessing the internal infrastructure and using it to support the IoT implementation project.

Each participant provided a different method to identify, assess, and use the current internal infrastructure. Participant AA reported that the IoT project teams needed to identify the infrastructure that caused the most significant challenge when implementing the IoT solutions, including the alignment of the IoT device firmware, hardware, and end-user software application. The IoT devices might be out of sync in multiple ways, such as wholly drained batteries, numerous versions of end-user software applications, and various versions of IoT device firmware (AA). Participant BA added information regarding internal infrastructure, including transmitting data among medical devices using Bluetooth, WiFi, or cellular network connections. Participant CA reported that the IoT project team could identify and integrate the IoT inbound data as structured data and outbound data as unstructured data from narratives to quantify the psychiatry narrations as a quantitative science. Participant DA reported that the IoT project teams designed, planned, and determined the locations to deploy the IoT solutions by using the layers of IoT devices, such as API, middle, and application layers, to host applications and backend collected IoT data. Participant EA reported a method to identify internal infrastructure as,

> So, if you use GS, 4G, or GSM, how do you use your touch provisioning to ensure that the devices wake up and connect to the right mobile operators? Where's the endpoint? I think all that considers on the management side of things. And then the peripherals of all the different protocols, I think we can use partner solutions that do the translation and aggregation.

Last, Participant FA also reported that the IoT project team might have an IoT hub and an IoT gateway, and then outsource the cloud infrastructure to service providers, such as Amazon, Google, or Azure. In summary, participants reported that the IoT project team could use the internal infrastructure after identifying and assessing them. The internal infrastructure could be hardware, software, firmware, network connections such as Bluetooth or WiFi, IoT devices, cellular devices, data frequency, inbound data, structured data, peripherals of all different protocols, IoT devices with touch provisioning to wake up and connect to mobiles devices and cloud hubs or gateways.

Support for the subtheme, using identified current internal infrastructure, is found in the literature. Vlasov et al. (2018) reported other infrastructures besides devices of the Internet of Things, such as housing and utility infrastructure (HUI), social infrastructure, public infrastructure, and energy infrastructure. Roman et al. (2019) indicated that the immune system for the IoT uses edge technologies employed with IoT infrastructure and edge computing infrastructure to propose a security architecture. Chen et al. (2019) asserted that a complete lifecycle infrastructure management system for smart cities used dumb devices with attached narrowband IoT (NB-IoT) terminals and global positioning system (GPS) modules to upload collected location and battery information to the cloud servers. In summary, these literature resources reported that organizations identified and used infrastructure to support IoT innovative solutions. Hence, the identified literature resources supported the participants' inputs for this subtheme.

This subtheme also aligns with the conceptual framework, which includes TOE. DePietro et al. (1990) asserted that the internal technological context could impact the innovation process in firms with more innovation or automation (pp. 166). Stjepic et al. (2021) reported that organizations identified the compatibility of the innovation based on adequate technology infrastructure toward the existing systems, tools, software, business processes, or values impacting the innovation adoption project success. Ajimoko (2018) noted, "The study reveals the crucial role of technology/organization alignment and fit, and the importance of small business enterprise (SME) owner/top management support."

and, “Further, the study found that small business enterprises (SBEs) are likely to adopt cloud-based big data analytics (CBBDA) if the technical functionalities and their organizational operations combined and their data management needs were in proper alignment” (pp. 70-75). In summary, these literature resources on the TOE conceptual framework reported that organizations that identified and used internal infrastructure to support the innovative solutions would be one of the technological contexts supporting the organization’s innovation solutions. Hence, the identified literature resources supported and validated the participants’ inputs for this subtheme.

The following subtheme presented the topic of using identified adequate network connections and protocols.

Subtheme: Use identified adequate network connections and protocols

All six participants responded to the network connections and protocols topic to support the strategies for implementing IoT technology in a company. The first approach is to identify and use network connections. Hence, the IoT project team can have adequate network connections to support the IoT technology implementation. The second approach is to identify and use the network protocols. In this strategy, the project team uses adequate network protocols for the IoT technology.

Both approaches ensure the IoT project team has adequate network connections and protocols to fully support the IoT technology implementation project. Participant AA reported, “IoT devices represent a unique solution in that they are all connected, and connectivity comes across. It could be Bluetooth. It can be WiFi. It can be the direct cable.” Participant BA reported that the cellular IoT devices provided advanced communication transmitting the device data directly into patient records, such as blood pressure, scale readings, or glucose level readings. Participant BA added that the infrastructure security would protect the IoT devices at vulnerable locations. In a specific to data flow from IoT devices to clinical decision makings, Participant CA reported,

> I look at the flow of data. Inbound data into our technology platform and separately. The flow of outbound data into other systems, third-party systems like billing systems, dashboards, and maybe executive dashboards for the company. So, I focus on the elements of what data will better inform our solution, our customer, or perhaps better inform population health. I look at its source. Precision and accuracy are a source of truth that I want. I want my offering to rely upon and be based on.

As a vendor providing onsite training company products, Participant DA reported,

> So, you have wireless technology up to the gateway. Then you have basic internet capability that hosts somewhere in the cloud. So, your data is saved, and all the layer analytics happen over the application layer.

Participant EA reported that the IoT project team would be aware of internet connectivity and physical locations of IoT devices. In sum, participants reported that the IoT project team could identify adequate network connections and protocols to support the IoT implementation project, such as Bluetooth, WiFi, direct cables, cellular network or mobile network, or internet connection. The IoT project team could use network connections and protocols to connect IoT devices, flow IoT data inbound or outbound, or generate video analytics by establishing network infrastructures. The network infrastructure could be surveillance, wireless, video analytics, sensors, or internet infrastructure. Last, participants reported that IoT devices like sensors or actuators transmit IoT data through those network connections to the clouds via gateways. The IoT devices use software applications or mobile applications with embedded batteries for self-power to improve signal strength.

Support for the subtheme, using identified adequate network connections and protocols, is found in the literature. Triantafyllou et al. (2018) reported that IoT devices are connected through cellular or satellite connections with several protocols in IoT architecture, such as five layers of IoT architecture: the perception layer, network layer, middleware, application layer, and business layer. Soua et al. (2018) reported that the machine-to-machine and satellite (M2MSAT) networks were used for IoT data collection over satellites with several protocols, such as message queuing telemetry transport (MQTT), the constrained application protocol (CoAP), and IoT protocols. The M2MSAT networks included the satellite network, satellite links, and machine-to-machine network (Soua et al., 2018). Nair et al. (2019) noted that there were technologies and communication networks could be configured to establish interconnections of participating IoT entities. The communication networks included the low power wide area network (LPWAN), wireless telecommunication wide area network or wireless data transport protocol, narrow band IoT (NB-IoT) radio technology, or the long-term cellular evolution (LTE) network (Nair et al., 2019). In summary, these literature resources reported that IoT devices connected, communicated, and transmitted data via several network connections using protocols from the ground to satellites, including cellular and satellite network connections with IoT protocols of MQTT, CoAP, LPWAN, and NB-IoT. Hence, these identified literature resources supported the participants' inputs for this subtheme.

This subtheme is also in alignment with TOE. DePietro et al. (1990) asserted that organizations would make innovative decisions to adopt and implement them when existing technology and available new technology generate major determinants (pp. 153). Schmitt et al. (2019) reported that organizations would decide to adopt the smart contracts when integrated functions of IoT based on identified 13 key determinants, where performance expectancy, technology maturity, and perceived compatibility of the technological context were among those key determinants. Umam et al. (2020) asserted that the stakeholder and community users of the smart regency systems would adopt the wireless smart district systems based on the six TOE system hypotheses. The six TOE hypotheses included perceived performance (PU), organizational readiness (RIO), top management assistance (TMS), security issues (CAS), community pressure (PoCU), and stakeholder pressures (PoS) (Umam et al., 2020, pp. 5). In sum, these literature resources on the TOE conceptual framework reported that organizations decided to adopt and implement the innovative solutions when the internal existing internal technology and other innovative solutions were available to support them. Hence, the identified literature resources supported the participants' inputs for this subtheme.

The next subtheme presented the topic of using identified adequate peripherals.

Subtheme: Use identified adequate peripherals

This subtheme supports the theme by identifying and using adequate peripherals to support the IoT implementation project. The project team can identify, assess, and use adequate peripherals to implement the IoT technology for the company. Participant AA reported,

> You have a unique set of challenges relative to the firmware, the security, and the application, whether a web-based application, a desktop application, or an application running on a mobile device. You have more coordination required. I think there is more coordination overhead on that front.

In addition, Participant BA and Participant CA reported that the organizations identified and used different levels of peripherals to support the IoT solutions, including WiFi devices, Bluetooth devices, cellular devices, digital patient records, outbound data, inbound data, right source of data, and the right point of time to collect the data. Participant DA reported that the IoT project team deployed the IoT devices with PoE features (Power over Ethernet), receiving continuous power via the ethernet cables or solar panels to charge the devices if deployed onsite or out in hard-to-reach areas. Last, Participant EA reported that the IoT project team used partner solutions like cloud services,

> The strategy around that is the last small protocol would be something that we standardize as a technology provider. And then the peripherals of all the different protocols, I think we can use partner solutions that do the translation and aggregation.

Participants reported that the IoT project team could identify adequate peripherals based on IoT products, network connections, and environmental conditions. The IoT project team can also use adequate peripherals to support the IoT technology, such as firmware, web-based applications, desktop applications, mobile applications, medical applications, IoT devices with PoE capabilities, or IoT devices with solar panels.

Support for the subtheme, using identified adequate peripherals, is found in the literature. Salih et al. (2019) reported many types of IoT peripherals embedded within a healthcare environment, including digital devices, data input devices, mobile medication devices, assistive devices, medical peripherals, smart devices, IoT devices, and equipment IoT-ready. Kavithasudha et al. (2018) indicated that the implemented IoT systems and IoT applications to compute the number of entries and exits into facilities consisted of several peripherals, such as peripherals of Raspberry pi3 containing two ultrasonic sensors, IR sensor, gas sensor, fire sensor, a display device, WiFi, capture camera, servo motor, relay driver IC, relay, and lamp. Gerrikagoitia et al. (2019) asserted that digital manufacturing platforms in Industry 4.0 incorporated new technologies, applications, and services with five different perspectives with sensors, peripheral devices, and IoT infrastructure. In sum, these literature resources reported that organizations identified several peripherals supporting the IoT solutions, including well-known regular peripherals, medical peripherals, digital peripherals, and advanced peripherals like peripherals of Raspberry pi3 or application peripherals. Hence, these identified literature resources supported the participants' inputs regarding this subtheme topic.

This subtheme is also in alignment with TOE. DePietro et al. (1990) reported that the internal technological context would have factors in technical complexity, the percent of mechanical material transfer devices, workflow rigidity, and initial machine automaticity (pp. 166). Nazir and Roomi (2020) noted that e-commerce technologies adopted technological devices, such as information and communication technology (ICT) infrastructure devices, hardware devices, network devices, and mobile devices. Shee et al. (2021) asserted that implemented technological solutions in complex smart city operations supported real-time communication. The emerging technologies were smart IoT sensors, RFID tags, GPS connectivity, and video surveillance (Shee et al., 2021, pp. 823). In summary, these literature resources on the TOE conceptual framework reported that the existing peripherals supporting the innovations in organizations were factors of the internal technological context supporting the innovative solutions successfully. Therefore, these identified literature resources supported and validated the participants' inputs for this subtheme.

The next subtheme presented the topic of using identified secure internet connections.

Subtheme: Use identified secure internet connections

This subtheme supports the theme of using identified secure internet connections to support the IoT implementation project. The IoT project team can identify all secure internet connections to use to support the IoT technology during the project implementation. Participant AA reported, "IoT devices represent a unique solution in that they are all connected, and connectivity comes across. It can be Bluetooth. It can be

WiFi. It can be a direct cable." In addition, Participant BA reported that the project team used the wireless protocols for IoT devices connecting to secure internet connections,

> What you have is more of an infrastructure issue with introducing a new device. Moreover, that goes to my security and compliance roots because many of these devices are new. They are communicating over a wireless protocol. You cannot see it.

Participant CA reported that the flow of data for inbound data via local network or outbound data via the internet to the third-party systems, "I look at the flow of data. Inbound data into our technology platform and separately. The flow of outbound data into other systems, third-party systems like billing systems, dashboards, and maybe executive dashboards for the company." In another approach, Participant DA reported that the IoT solutions collected the data and used the IoT applications to transmit data via internet service or wireless service with a monthly fee from service providers such as AT&T. Participant EA said,

> So, if you use GS, 4G, or GSM, how do you use your touch provisioning to ensure that the devices wake up and connect to the right mobile operators? Where is the endpoint?

Last, Participant FA reported,

> It is a big dependency or interdependency with IoT. Because of all of this, what we are talking about IoT is all over the net. Do the IoT vendors need fiber optics cable? Do they need a dedicated pipe because they have X trillions of data streaming into their clouds? So, I think those are unknowns but can be seen or

identified as dependencies that need to be considered from an implementation strategy.

In summary, participants reported how the IoT project team could identify and use secure internet connections. The IoT project team can use secure internet connections to establish secure network connections connecting IoT devices and transmitting IoT data, such as AT&T internet service, fiber optic pipe to stream large data to the clouds, data frequency, MPLS service, GS, 4G, or GSM.

Support for the subtheme, using identified secure internet connections, is found in the literature. Sfar et al. (2018) reported that the security of IoT components and applications would communicate in intelligent network connections capable of sensing, perceiving, recognizing, acting, and reacting, and more autonomously. Ly et al. (2018) asserted that enterprises connected and transferred IoT data through different stages of the current internet connections. The internet connections included the usual internet connection, internet security, poor internet connectivity, excellent internet connectivity, internet authorization, or IoT sensor network increasing internet connectivity effectiveness (Ly et al., 2018). Stergiou et al. (2018) indicated that the primary goal of the interaction and cooperation of cloud computing and IoT technologies is to send and receive data over the internet, including the connections of wireless networks or the integrated future internet. In summary, these literature resources reported that organizations identified, analyzed, and used secure internet connections to transmit IoT data, such as intelligent network connections, different stages of the internet connections, or sending and receiving IoT data from IoT devices to cloud computing. Hence, these identified literature resources supported the participants' inputs for this subtheme.

This subtheme is also in alignment with TOE. DePietro et al. (1990) reported that organizations would identify available technology, such as internet connections, to fulfill the information processing requirements and internal communication to increase adopting units' problem-solving and decision-making capacities (pp. 165). Skafi et al. (2020) asserted that the technological context and other contexts are positively related to adopting cloud computing services. Organizations acquired internet connections such as broadband, wireless, internet-based technology, and internet-connected machines running remotely (Skafi et al., 2020). Njenga et al. (2019) reported that the technological factors influenced the adoption of cloud computing in institutions of higher learning in Kenya, including the factors of internet connections. The internet connections included the high cost of internet bandwidth, stable internet connectivity, reliable internet services, mobile wireless broadband internet, and unreliable internet connectivity (Njenga et al., 2019). In sum, these literature resources on the TOE conceptual framework reported that the secure internet connections and strategies to transmit data securely over the internet were internal technological context, such as WiFi connections, and external technical context, such as internet connections. Hence, these identified literature resources supported and validated the participants' inputs for this subtheme.

In this theme, the findings addressed the topic of using all identified current internal infrastructure to answer a portion of the research question with validated participants' inputs from identified literature resources. The findings fulfilled the implementation strategies that corporate IT leaders could use with other findings to implement the IoT technology for their organizations successfully. Following the TOE conceptual framework as a base model, this theme presented the first technological factor and the study findings' fifth finding.

The next theme presented the topic of using all identified external support technologies.

Theme 6: Use All Identified External Support Technologies

This theme supports the implementation strategies for implementing IoT technology projects in an organization using all identified external support technologies based on participants' inputs. The IoT project team can identify all available external technologies to support the current IoT technology implementation project. This theme consists of information from all six participants with 162 references to the database of study codes sharing how they identify and use external support technologies. I used four subthemes to support this theme, including using all identified and assessed external support technologies, all identified applications, all identified cloud infrastructure, and all identified cloud storage. There were 21 identified secondary quality resources with 24 references supporting the participants' inputs. Table 7 shows the frequency of participants' inputs for this theme, subthemes, and documents.

Table 7

Frequency of Theme 6: Use All Identified External Support Technologies

Major/Sub-theme	Participant count	Participant references	Document count	Document references
Use all identified external support technologies	6	162	21	24
Use all identified and assessed external support technologies	6	53	6	6
Use all identified applications	6	44	6	6
Use all identified cloud infrastructure	6	36	6	6
Use all identified cloud storage	5	29	6	6

Note. Theme 6, Use All Identified External Support Technologies; *n* = frequency.

Subtheme: Use all identified and assessed external support technologies

This subtheme presents research participants' strategies to identify and assess all available external technologies to support the IoT implementation project. During the data analysis process, the information from all six participants formed this subtheme to support one of the technical aspects of the TOE conceptual framework. This subtheme has two approaches: identifying and assessing all available external technologies and using them to support the current IoT implementation project. Participant AA reported, "IoT devices represent a unique solution in that they are all connected, and connectivity comes across. It could be Bluetooth. It can be WiFi. It can be a direct cable." Participant BA reported that healthcare organizations could use consumer data services as a marketplace for storing and securely transferring data into the clinical workflow for use with applications or decision making. Participant CA reported that external support technologies could assist in solving compliance issues and cost savings, such as HIPAA-compliant service globally with trust audits and privacy security from AWS. Participant

DA reported the monthly and annual charged fees from IoT service providers or cloud service providers,

> And then the endpoint, your company, whoever is going to monitor or control it if you have license fees on all your applications, right? You must pay license fees. You are not going to get away with that. That is a yearly charge you will constantly pay. So, it could be AWS or Azure, whichever you purchase the license, and you will have to pay for the licensing.

Participant EA reported that organizations used external support technology to perform IoT devices wake up and connect to suitable mobile operators or find the endpoint locations using GS, 4G, or GSM network connections. In summary, participants reported available external support technologies that the IoT project team can identify and assess to support the current IoT implementation project. The external support technologies would be AWS, Azure, or Google, with certifications or licenses on monthly or annual fees. Security and compliances supported the IoT project, such as HIPAA or AWS HIPAA compliant platforms.

Support for the subtheme, using all identified and assessed external support technologies, is found in the literature. Ardolino et al. (2018) reported that industrial companies or manufacturers identified and used external support digital technologies, such as the internet of things (IoT), cloud computing (CC), and predictive analytics (PA). Specific support technologies were WLAN, IEEE 802 ZigBee, Low Energy Bluetooth, 3G/4G/5G, RFID, NFC, extended network management (IPv6), infrastructure as a service (IaaS), software as a service (SaaS), platform as a service (PaaS), or machine learning

(ML) (Ardolino et al., 2018, pp. 2117). Bublitz et al. (2019) noted that environmental and health research used supportive and innovative technologies, such as artificial intelligence (AI), blockchain, and the internet of things (IoT). The supporting technologies were cloud storage, processing systems, machine learning (ML), data science, blockchain, IoT technologies, mobile health, wearable, and ambient assisted living (Bublitz et al., 2019, pp. 2). Reyna et al. (2018) asserted that there were supportive technologies to identify the key points blockchain technology improved IoT applications by using blockchain nodes on IoT devices. The supporting technologies were cloud computing, blockchain, IoT, IPsec, SSL/TLS, DTLS, and ZeroCash technology (Reyna et al., 2018, pp. 182). In summary, these literature resources reported that organizations effectively used multiple external technologies to support the innovative solutions adopted and implemented for business innovations. Hence, the identified literature resources supported the participants' inputs for this subtheme.

This subtheme also aligns with the conceptual framework, which includes TOE. DePietro et al. (1990) reported, "Firms operating in industries or geographic areas with top-notch, low-cost technology-related training and consulting suppliers have more options and more flexibility in carrying out their innovation strategies (pp. 172). Dube et al. (2020) noted that the information systems and information technology studies employed technology adoption models, including technological context consisting of supportive technologies, such as RFID, web-based business, enterprise resource, biometric systems, cloud computing, IoT, and KM systems. Cruz-Jesus et al. (2019) reported technological contexts in that organizations could use existing external and internal technologies to support the adoption and implementation of innovative solutions. In sum, these literature resources said that organizations identified technical contexts and used current internal and external technologies to support the adoption and implementation of innovative solutions. Hence, these identified literature resources on the TOE conceptual framework supported and validated the participants' inputs for this subtheme.

In the next subtheme, I presented the topic of using all identified applications. This subtheme had 50 references total.

Subtheme: Use all identified applications

All six participants responded to the topic of using all identified applications to support the implementation strategies to implement the IoT project. The first approach is to identify and use the end-user or mobile applications. This approach helped the IoT project team use all those identified applications. The second approach is that the IoT project team can identify and use other available applications, including online, intranet, or web server applications.

Both approaches ensure the IoT project team uses all available identified applications to support the current IoT project. Participant AA reported,

> You have a unique set of challenges relative to the firmware, the security, and the application, whether that's a web-based application, a desktop application, or an app running on a mobile device. You have more coordination required. I think there is more coordination overhead on that front.

Participant BA reported the IoT applications, “We say we can support hundreds of devices through Apple Health Kit or Google Fit. I have fewer devices to support because I am an expert in every single one.” Participant CA reported the benefits of using the software solutions or software-driven services to support the IoT product design and development,

> We spend much time designing in choices because trauma-informed software design, as we are experiencing it, emerges as a practice. Our trust supports high penetration and user adoption rates. Thus, I see the ability to foster an environment that earns trust and in a software solution or software-driven service that enables choice as an essential benefit of my company’s product design and development effort.

As a vendor providing onsite training, Participant DA and Participant EA reported that an IoT application layer hosted the IoT applications and collected data connecting to network connections internally and externally, including intranet network connections and internet services like GS, 4G, or GSM. In sum, participants reported that the IoT project team could use all available identified applications to support the IoT implementation project. Those applications included Apple Health Kit, Google Fit, software solution, software-driven service, GS, 4G, GSM, or touch provisioning application.

Support for the subtheme, using all identified applications, is found in the literature. Varga et al. (2020) reported that 5G mobile technology supported industrial IoT applications. IoT applications were mobile edge cloud, multi-access edge computing

(MEC), blockchain, AI, 5G-enabled IIoT, cyber-physical control applications, cloud-native applications, web applications, or real-world Microsoft HoloLens applications (Varga et al., 2020). Tan et al. (2018) reported, “Radio frequency identification (RFID) is one of the key technologies to implement IoT applications, and most universities use the high frequency (HF) RFID card as the students’ identification devices in China” and “In addition, the quick response (QR) code is another technology to enable IoT” (pp. 1). Ghosh et al. (2020) asserted that the construction industry adopted the IoT and digital technologies solutions, such as smart healthcare facilities, smart transportation and traffic systems, fleet tracking solutions, control of logistics chain, smart cities, energy efficiency, waste management, or smart buildings. In sum, these literature resources reported that organizations identified and used IoT applications that connect to multiple types of network connections, including cellular networks. Hence, these identified literature resources supported the participants’ inputs for this subtheme.

This subtheme is also in alignment with TOE. DePietro et al. (1990) asserted that the technology support infrastructure was developed internally or externally (pp. 171), “The constraints or opportunities that a firm must take into account when developing its technology acquisition strategy depend in no small part on the quality and availability of the external sources from which the firm can draw. “ Schmitt et al. (2019) reported 13 key-determinants for integrating smart contracts and IoT. There were technological IoT applications such as sensor networks, low-power wide-area networks, mobile internet, and cloud computing (Schmitt et al., 2019). Masood and Egger (2020) reported that there were identified applications that supported the industrial augmented reality (IAR) implementation projects based on field experiments, such as quality assurance, industrial applications, stationary applications, or augmented reality (AR) applications. In summary, these literature resources on the TOE conceptual framework reported that applications that supported the innovative solutions were technological contexts and connected to internal or external network connections. Hence, these identified literature resources supported and validated the participants' inputs for this subtheme.

In the next subtheme, I presented the topic of using all identified cloud infrastructures. This subtheme had 42 references in total.

Subtheme: Use all identified cloud infrastructure

In this subtheme, the participants provide information regarding using all identified cloud infrastructures to support this theme. The IoT project team can identify and use all available cloud infrastructure to support the IoT implementation project. Participant AA reported,

> So, suppose I am storing your data in the cloud and giving you access to that data and reports. In that case, I have to pay for that every month that you are a user, and many companies sell their devices and do not have a premium subscription or recurring revenue component to match up with that cost. So, the key measurement is the ongoing revenue and ongoing cost, leading to a profitable company.

Participant CA indicated that cloud infrastructure provided cloud services, especially the HIPAA-Compliant AWS service, privacy security, and trust audits. Participant DA reported that the cloud infrastructure included different components, such as hardware layer, API layer, public network, or private network in-house. Last, Participant FA added,

> All the device providers have their own IoT cloud. So, all the IoT sensors, look at Apple, look at anybody has had even a small, fitness or any devices we are talking about or even security, home security, right? In any of the industries we are talking about, each device provider has its own IoT cloud.

In summary, participants reported that the IoT project team could use all available identified cloud infrastructure to support the current IoT implementation project. The cloud infrastructure includes cloud service, cloud storage, cloud data access, cloud monthly or annual subscription, IoT devices surveil the infrastructure, wireless infrastructure, communication to the security team, AWS HIPAA compliant platform available globally, and cloud solutions.

Support for the subtheme, using all identified cloud infrastructure, is found in the literature. For example, Santos et al. (2018) reported a proposed e-health monitoring architecture that handled and stored patient data via IoT sensors that relied on fog and cloud infrastructures. The cloud infrastructure consists of wireless communication and mobile devices, IoT computational devices for health monitoring, cloud applications, or public or private cloud services (Santos et al., 2018, pp. 7). Sa and Umamakeswari (2018) reported that the cloud infrastructure consisted of communication technologies, sensing devices, or IoT technologies. Tsiouris et al. (2020) asserted that cloud infrastructure had IoT devices, cloud storage, web service, a centralized remote repository for data storage, and advanced processing capabilities. In sum, these literature resources reported that cloud infrastructures supported innovative IoT solutions with components, such as wireless communication, mobile devices, cloud applications, or cloud services. Hence, these identified literature resources supported the participants' inputs.

This subtheme is also in alignment with TOE. DePietro et al. (1990) reported that,

> This illustrates the dominant findings of much research on innovation and the environment. Two aspects of the external environment are key determinants of innovative activity: the competitive characteristics of its industry, and the existence of a relevant technology support infrastructure (DePietro et al., 1990, pp. 167).

Yoo and Kim (2018) asserted that the technological factors had cloud infrastructures, such as hardware, virtualization, distributed computing, and automation technologies. Ahmed (2020) reported that the cloud infrastructure in the technological context included networks, servers, storage, applications, and services. In sum, these literature resources reported that the cloud infrastructures and the technology supporting the infrastructures were technological contexts that organizations used to support innovative solutions. Hence, these identified literature resources supported the participants' inputs for this subtheme.

In the next subtheme, I will present the topic of using all identified cloud storage. This subtheme had 35 references in total.

Subtheme: Use all identified cloud storage

This subtheme supports the theme by identifying and using all available cloud storage. Participants provided information that the IoT project team could identify and use all available cloud storage to support the current IoT project. Participant BA reported,

> An application that lives on your smartphone could store the data and then upload the data to the patient's record when you connect to a wireless modem, say from your cable modem on your TV; that is pretty popular. However, in rural communities, you might have to drive somewhere, and when you finally connect to something, the data will flow from the app, connect, and flow.

Participant CA reported that AWS cloud storage service provided security, privacy, and encryption with HIPAA-compliant. In another approach, Participant DA reported that cloud service providers had different charged rates for different types of cloud storage services,

> They charged by how many IoT devices you will monitor and then ingress and egress, egress rate meaning how many megabytes, how many times are you pinging that server to post the data, right? They will charge you for that. Or how many times are you extracting that data? That is how they charge.

Participant EA reported about data security and governance as well as expirations of the cloud data storage contracts,

> The other interesting implementation could also be like I talked about data frequency. You also should consider data governance in the sense of where or how long you need to keep the data and how long you should store it.

In sum, participants reported that the IoT project team uses all identified cloud storage to support the IoT implementation project. The cloud storage includes AWS storage service, smartphone applications storing data and then uploading data to the cloud storage, IoT cloud storage from providers, data governance to control how to keep the data, store the data, and allow accessing the data, and cloud storage services charging by ingress and egress rate.

Support for the subtheme, using all identified cloud storage, is found in the literature. Xiong et al. (2020) reported that researchers proposed the cloud service, secure and efficient multiauthority access control for IoT cloud storage (SEM-ACSIT), that reduced the storage overhead of the system and guaranteed the security of forwarding security and backward security when accessed user's data. Yang et al. (2020) indicated cloud storage would be part of cloud computing with characteristics. The cloud storage characteristics were encrypted, remote data, data privacy, data usability, data storage in public cloud infrastructure, secure cloud storage system, multi-user cloud storage system, and cloud storage service to store the files (Yang et al., 2020, pp. 40). Xue et al. (2019) reported cloud storage and computation overhead controlling scenarios when multiple users collaborate to access the files on cloud storage, such as public cloud storage, data owners, data consumers, and cloud servers. In summary, these literature resources reported that organizations subscribed to use the cloud infrastructures, including the cloud storage services, so that data could be encrypted for security, maintained privacy, and secure access and storage of IoT data. Hence, these identified literature resources supported the participants' inputs.

This subtheme is also in alignment with TOE. DePietro et al. (1990) reported, "We consider it separately from the rest of the environment in order to focus attention on how features of the technologies themselves can influence both the adoption process and implementation" (pp. 153). Ouseph and do Valle (2021) reported, "Cloud computing is the provision of storage as an on-demand infrastructure supplying machines and other users with common data, applications, and information as a service over the internet." Gui et al. (2020) reported that cloud storage advantages support the IoT innovative solutions, such as cost savings, being environmentally friendly, business performance, and more ability to store more data in cloud storage than in conventional operating systems. In sum, these literature resources on the TOE conceptual framework reported that organizations used cloud storage and its components as part of the cloud infrastructures for storing and accessing IoT data as external and internal technological contexts. Hence, these identified literature resources supported the participants' inputs for this subtheme.'

In this theme, the findings addressed the topic of using all identified external support technologies to answer a portion of the research question with validated participants' inputs from identified literature resources. The findings fulfilled the implementation strategies that corporate IT leaders could use with other findings to implement the IoT technology for their organizations successfully. Following the TOE conceptual framework as a base model, this theme presented the second technological factor and the sixth study findings.

In the next section, I present the applications to professional practice based on the study findings. There are six applications to professional practice.

Applications to Professional Practice

In this study, the findings addressed the problem that many corporate IT leaders lack implementation strategies for IoT technology to realize IoT benefits for their organizations. From six different healthcare organizations, all six participants provided their successful IoT implementation strategies to fully address the study's research question: What strategies do corporate IT leaders use for IoT technology implementation to realize IoT benefits for their organizations?

Organizational Factors and Their Applicability to Professional Practice

In the organizational factors of the study findings, the first finding is "ensure current IoT technology alignment with business needs." Corporate IT leaders and the IoT project teams could use those strategies to get buy-in for IoT implementation projects with the top management team and stakeholders and plan ongoing IoT investments for upkeep or monitoring. Hence, professional practices identified in the study can be used by corporate IT leaders, developers, organization management teams, and manufacturers to plan for IoT solutions to evolve into reoccurring investments in the implementation progress. The IoT solutions would also include the establishment of the IoT ecosystem, which became an asset aligning with business needs after the IoT project team successfully implemented the IoT technology.

Based on the study findings, the IoT project team must communicate and recruit talents internally to carry out the IoT project successfully. Applying this to professional practices, the IoT project team, IT leaders, organization management team, and manufacturers should implement IoT solutions in a full-scale organization wide effort. Managers should ensure that everyone can adapt to the IoT solutions and fully understand the IoT data flow inbound and outbound. As a result, corporate IT leaders, developers, and manufacturers are essential to bringing IoT technology to the enterprise at full scale.

Technological Factors and Their Applicability to Professional Practice

Four factors: internal infrastructure, network connections and protocols, good peripherals, and secure internet connections are critical to implementing into professional practice, because corporate IT leaders, organization management teams, developers, and manufacturers would interact directly with current technologies supporting the IoT technology to employ the IoT solutions. The implication in professional practices is that corporate IT leaders and others are always current on technologies supporting the current and future IoT technologies.

Four factors found to be important for professionals responsible for managing IoT were external support technologies, applications, cloud infrastructure, and cloud storage. In professional practice, corporate IT leaders, developers, organization management teams, and manufacturers relate to the IoT technology world and refine their internal IoT technology solutions aligned with industry business partners. Corporate IT leaders and others should be responsible for implementing IoT technology as a must-have enterprise tool to support everyone's daily life.

Environmental Factors and Their Applicability to Professional Practice

Four environmental factors found to be important in professional practice are external influencers and influences, regulations and standards, influencers and influences from other industries, and influencers and influences from vendors. The IoT project team, developers, organization management team, and manufacturers should work closely to actively monitor anything relating to IoT technology from the outside world, just like other contemporary technologies. In professional practice, corporate IT leaders and others should be proficient in utilizing the IoT technology internally and combining the IoT benefits internally and externally. This implication helped spread the IoT technology and its benefits to all industries.

Recruiting vendors for support with on-site training, consulting experience, and good technical support are best practices. The IoT project team and corporate IT leaders should use vendor channels to support the IoT project because vendors play an essential role in connecting the IoT technology from the outside world directly to the enterprise. Corporate IT leaders, developers, organization management teams, and manufacturers are beginning to adopt IoT technology outside to ensure the IoT solutions are implemented correctly and successfully.

Implications for Social Change

Implications for social change from this study could improve technology impacts to support and promote benefits to the organizations and increase the number of organizations implementing and continuously employing IoT technology. As the IT leaders and organization leaders set a standard for the provision of IoT data value chain safely going through to a clinical decision (Participant CA), the caregivers and medical providers could make near real-time medical decisions and provide necessary care to cure patients based on the IoT collected data via IoT input peripherals. As IT leaders, organization management leaders, and manufacturers from other industries than healthcare adopt the study findings to implement IoT technology, businesses and end-users can benefit from the IoT ecosystem with IoT devices in smart cities, offices, hospitals, or smart homes.

Recommendations for Action

I explored the IoT implementation strategies from six participants from six different healthcare organizations used for their IoT implementation projects. The study findings presented the IoT implementation strategies for the organization's IoT project, including aligning IoT technology with business needs, assessing project staff skills, assessing internal infrastructure, using external support technology, using external influencers and influences, and recruiting vendors for support. There were also 72 references of anomalies. One of the three anomalies with the most references, 55 references out of 72 references, was "IoT project challenges and possible solutions," whereas participants provided challenges and solutions applied explicitly to their IoT implementation projects.

Organizational Factors

As the healthcare industry has adopted IoT technology, healthcare organizations implement IoT technology solutions internally or outsource to promote IoT benefits for businesses. As the number of IoT solutions increases within industries, organizations and corporate IT leaders need to stay vigilant to implement and coordinate IoT solutions with other innovative solutions to promote benefits and profits to businesses and end-users.

As organizations move to implement IoT projects, the project team and corporate IT leaders should recruit internal staff with IoT skillsets to be core staff for the IoT implementation project. Second, the IoT project team should use the project buy-in strategies from these findings to pass the buy-in of the top management team, stakeholders, customers, and consumers and keep the project moving forward as the project plan. Finally, the IoT project team, corporate IT leaders, developers, organization management teams, and manufacturers should plan for ongoing investment in IoT solutions per business needs. Therefore, as a recommendation for actions, organizations and IT leaders might establish internal training for employees and contractors regarding IoT solutions, IoT applications, and how to apply IoT technology to corporate daily tasks to improve everyday office life. As a result, top management teams would pass the IoT project buy-in faster, more employees with matched IoT skillsets join the IoT project team, and ongoing investments in IoT solutions are acceptable and essential to promote benefits and profits to the business.

Technological Factors

The corporate IT leaders and developers would benefit from the technological factor's findings, including the IoT internal infrastructure, network security and protocols, secure internet connections, IoT peripherals, and external support technologies and applications. A recommendation for the IoT project team is to establish secure network connections and internet connections to ensure the secure flow of IoT data inbound or outbound to use the IoT collected data for solutions in IoT decision-making. Another recommendation is for the IoT project team to recognize and utilize the external support technologies, applications, and cloud infrastructure to establish long-term relationships and communication with the external IoT technology world to promote the organizations' benefits, opportunities, and profits.

After establishing the IoT project plan, recruiting staff, and passing the project buy-in process, the IoT project team and corporate IT leaders select the IoT materials internally and externally for the project. A recommendation to the IoT project team and IT leaders is to establish network connections, IoT protocols, and secure internet connections to employ IoT solutions to support IoT decision-making purposes. Last, the IoT project team, IT leaders, developers, organization management teams, and manufacturers should adjust the internal IoT implementation strategies to align with their business partners' current IoT solutions.

Environmental Factors

A recommendation for corporate IT leaders, organization management teams, developers, and manufacturers is to recruit vendors to support the IoT implementation project, adapt current regulations and standards, and use external influencers and influences to emerge the existing external IoT technology solutions, regulations, and standards with the internal implementing IoT solutions. These strategies would help the IoT project team increase the IoT benefits and profits for the organization.

This study focused on the healthcare industry and IT leaders implementing the IoT technology project in the US. Organizations and IT leaders from different industries and countries, as well as other possible audiences, could adopt the study findings and refine the IoT implementation strategies to carry out the IoT implementation projects successfully. Organizations, IT leaders, and professionals who embrace the study findings to implement the IoT technology solutions would share with other professionals within the loops or present the successful results at IoT forums or conferences. Internally, enterprises, organizations, and IT leaders should schedule regular training courses for all employees and contractors to introduce the IoT technology and current IoT solutions applied within facilities.

Dissemination of the findings of this study will include publication in a peer-reviewed journal. Each research participant will receive a copy of this study as a courtesy of the research. In addition, registering the study with public conferences or forums as a recently completed research will be an effective method to disseminate the findings to the IT and healthcare industries. Finally, the study can be introduced to universities to have the potential to share the findings with faculties and students.

Recommendations for Further Research

The limitations indicated in Section 1 remained the same toward the end of the study. Therefore, there are three possible recommendations for further research. First, participants reported that IoT technology is still far from government regulations and standards; hence, the findings would have room to fine-tune in future studies. Second, participants provided responses based on clinical resources, environments, and medical team members; hence, the study findings based on the medical data would not be transferable to other industries such as agriculture, transportation, or construction. Therefore, future studies focusing on implementing IoT technology could use similar settings as this study with a different set of semistructured qualitative interview questions, target groups, or conceptual frameworks or theories. Lastly, these study findings are based on participants’ experiences located in the US. Hence, future IoT implementation studies might include participants from other available markets such as European or Asia.

In another recommendation for further study, there were excerpts that participants were repeatedly concerned about the IoT data flow in both inbound and outbound. There were limitations in collecting qualitative inputs regarding IoT data flow because the study focused on the overall IoT implementation strategies. The study's data collection process did not allow the opportunity to drill in-depth into the strategy of the whole process of IoT data flow inside and outside of the enterprise. The IoT processed data tremendously contributes to the IoT decision-making processes to benefit organizations. Therefore, future studies focusing on IoT data and data flow processes sharpened the IoT data and increased its worthiness.

Last, the IoT value proposition is essential that participants emphasize as one of the most successful focuses when implementing the IoT technology. Future studies could include this IoT value proposition topic as partial or complete research to add more IoT value propositions to the world.

Reflections

I came to Walden University and prepared for the educational journey as a Doctor of Information Technology. I have learned several skills to become a scholar researcher, such as the qualitative research process, research design, interviewing participants, analyzing qualitative data, writing the final doctoral report, and many more. I carried on these unique skillsets to conduct more scholarly research in the future.

In this study, I employed a pragmatic qualitative inquiry to explore six participants' successful IoT implementation strategies to promote IoT benefits for their organization. I applied skills in identifying and assessing conceptual frameworks to select the TOE framework as the base model to support this pragmatic qualitative inquiry study. I read several peer-reviewed articles, chose the ones that supported the literature review section of Section 1, and used them as references to support claims or ideas across the final report writing.

Walden University provided an effective virtual classroom setup along with the blackboard discussion. I had the chance to interact with my colleagues and instructors more than four times weekly. In addition, I communicated with my colleagues and chair to receive their suggestions and feedback via emails, weekly scheduled calls, and blackboard discussions. Then, I could incorporate the suggestions and feedback to improve my study paper in many ways, such as using the Walden Library, Walden writing center, and Walden Office of Institutional Review Board. As a result, I understood and carried out successfully each step of the research study.

I used semistructured qualitative interviews to interview six participants from six organizations. During this data collection process, I recruited six participants from six healthcare organizations, from project managers to chief executive officers to founder positions. My greatest takeaway from conducting this study was that I had the privilege to interview directly with the top-notch leadership spearheading contributing IoT solutions to the world.

I had no preconceived biases on the research topic or participants when I wrote the problem statement in Section 1 of this study. I did not work or hold professional positions like all six participants, nor did IoT implementation projects. After I wrote Section 1 and Section 2, I did not know what or how participants would respond to the semi-qualitative research questions and the study findings. When I wrote Section 3 to report the final study, I was delighted with the study results. The corporate IT leaders could adapt and evolve the study findings to successfully implement the IoT technologies in all three contexts of technology, organization, and environment.

Summary and Study Conclusions

There are challenges during the IoT implementation phase that organizations must carry out a formal IoT implementation project to mitigate failures and realize IoT benefits for business; this defines the problem statement of this study. The study findings are based on 1,079 references from all six participants' responses resulting in 3 factors that corporate IT leaders, organization management teams, developers, and manufacturers can use to implement the IoT technology solutions successfully. The six research participants are from six healthcare organizations. The IoT implementation project team can refine the implementation strategies with the study findings in all three factors: organization, technology, and environment.

Organizational factors include the project staff and staff from other internal functional units, ensuring staff skills, staff capabilities and competencies, scope, and resources, measuring IoT technology benefits, project buy-in, and ensuring IoT technology alignment with business needs. Technological factors include internal infrastructure, adequate network connections and protocols, good peripherals, secure internet connections, external support technologies, applications, cloud infrastructure, and cloud storage. Environmental factors include external influencers and influences, regulations and standards, vendor support with on-site training, consulting experience, and good technical support. The results of a successful IoT implementation project generate the IoT ecosystem from the IoT solutions that corporate IT leaders and organization management teams can promote IoT benefits and profits for their organizations.

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Appendix A: Qualitative Open-Ended Questions

The open-ended interview questions are as follows:

1. How would you describe your experience and role with the IoT technology projects?
2. What implementation strategies do you use for IoT technology projects?
3. How do you measure the IoT benefits for your organization? How do you justify the measurements are sufficient to measure the benefits?
4. What happened when you encounter challenges during the IoT technology implementation project? How did you deal with them?
5. What strategies do you apply to redesign jobs and adjust human resource policies when aligning selected IoT technologies to the business requirements?
6. How do you assess and conclude that the project's staff having adequate technological capabilities and competencies to pursue the IoT technology implementation project?
7. How do you assess the external environment influencers in implementing IoT technology, such as limitations, opportunities, industrial organizations, and vendor support?
8. What additional information regarding implementation strategies for IoT technology would you like to provide besides your previous answers?

Appendix B: Interview Protocol

I will present this interview protocol to each research participant at the beginning of the interview session.

Basic Interview Information

Organization name: (organization name)

Participant name: (participant name)

Location: (full address information)

Date: (yyyymmdd)

Time: hh:mm:ss

Interview Introduction

Thank you very much for participating in this research and attending this interview session.

My name is Khanhhung Hoang Pham. I am a doctoral candidate for the Doctor of Information Technology (DIT) program at Walden University, Minnesota, United States.

My background in the IT industry has been starting over twenty-four years since 1996, including multiple IT positions from Help Desk administrator to Systems Analyst covering hardware, software, and corporate network infrastructures.

Interview Purpose

The purpose of this study is to explore the implementation strategies that corporate IT leaders and related teams use for IoT technology implementation to realize IoT benefits in their organizations. Literature reviews have been showing several reports that corporate IT leaders lack implementation strategies of IoT technology, leading to failing implementing IoT devices to integrate IoT systems with existing business resources. Therefore, this study focuses on exploring the successful implementation strategies of IoT technology that corporate IT leaders and related teams applied to their organizations. The study findings will propose a preferable set of implementation strategies of IoT technology before integrating it with existing business systems.

Purpose of Research Participation

The inputs of your responses and other participants will support these research findings to answer the research question and address the research topic, such as your responses to the interview questions and shared sources, if any. The qualitative collected data will support my study to partially fulfillment my degree of Doctor of Information Technology at Walden University, Minnesota, United States.

Risks and Benefits of Participation

Participating in this interview would not pose a risk to your safety or wellbeing. The benefits of this study will be a set of implementation strategies of IoT technology in the organization from multiple experienced corporate IT leaders from organizations. The benefits for participants of this research may result in increased satisfaction, a better environment at work, and receive a copy of the study findings.

The Right to Privacy

I am adhering to Walden University's ethical research standards and your right to privacy. You can withdraw from the research, including this interview, without any consequences. You are free to refuse to answer any questions during the interview session. May I continue the interview session? (yes) (no)

I am requesting your permission to start the audio recording of this interview and document this entire interview using notes taken. I will use your participant ID (provided participant ID number) and ask you to confirm your permission to record and documenting the interview session. Do you agree to start the recording of the interview now? (yes) (n0)

Interview Recording

I am a researcher, Pham, conducting this qualitative interview session. This Zoom (or similar web conferencing software) interview session has a participant ID (provide ID).

Today's date is mm/dd/yyyy, and the current time is hh:mm.

Would you please confirm that I have provided you the purpose of this research, the purpose of your participation, and your risks and benefits? (yes) (no)

Would you approve the audio-recording and taking notes during this interview? (yes) (no)

Confidentiality of the Interview

This interview is entirely voluntary. You may stop the interview or withdraw from the research at any time without any reason or consequences. You can refuse to answer any question during the interview, and we will move on to the next question(s).

I will keep your shared information strictly confidential, including not disclosing to your employer or others.

I will request that you use pseudonyms for individuals and organizations, not allowing others to identify the individuals or organizations in your responses to the interview questions. If names or details are accidentally mentioning during the interview, I will remove or replace them with your suggested synonyms from the transcript and the study report. Also, I request that you will not share or discuss your participation in this research until the study is finished.

I will use all the shared information for this study only. During the data organization process, I will merge your shared data with other participants' shared data and shared quality secondary sources for data analysis purposes as an anonymized report in a doctoral study. When the study is finished, the doctoral study may be published electronically.

I will use the password protection method, encrypt all research data, and store the records on my computer with the Institutional Review Board (IRB), and the doctoral research committee members have access rights to them. I will safely destroy the research records after five years, starting from the doctoral study's publication date.

Interview Checkpoint

Do you have any questions for me? (yes) (no)

Do you want to stop the interview and withdraw from the research? (yes) (no)

If no, we proceed to start the interview now.

Interview Startpoint

This interview is a semistructured interview with a set of questions about your experience as an IT leader with experience in the IoT technology implementation project. I appreciate your time and honest answers to the interview questions. Please include as much as detailed information as possible to cover all the information relating to each question. I may ask follow-up questions on parts of your responses to discover more relating information from your point of view.

Interview Questions

How would you describe your experience and role with the IoT technology projects?

What implementation strategies do you use for IoT technology projects?

How do you measure the IoT benefits for your organization? How do you justify the measurements are sufficient to measure the benefits?

What happened when you encounter challenges during the IoT technology implementation project? How did you deal with them?

What strategies do you apply to redesign jobs and adjust human resource policies when aligning selected IoT technologies to the business requirements?

How do you assess and conclude that the project's staff having adequate technological capabilities and competencies to pursue the IoT technology implementation project?

How do you assess the external environment influencers in implementing IoT technology, such as limitations, opportunities, industrial organizations, and vendor support?

What additional information regarding implementation strategies for IoT technology would you like to provide besides your previous answers?

Follow-up for Member Checking

Thank you very much for your time. Now, I would like to schedule a follow-up interview to ensure I interpret your shared information accurately. The follow-up interview session will have a duration of 30 minutes. I will send you a copy of the interpretation via your email before the scheduled follow-up interview session for your review. Would you like to schedule the next follow-up interview session now?

Interview Conclusion

Thank you very much for your time and shared information in the interview session today. I will see you again in our scheduled follow-up interview session date and time.

Appendix C: National Institute of Health (NIH) Certificate

Certificate of Completion

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

Date of completion: 07/15/2017.

Certification Number: 2432188.