2020

Factors Influencing Cloud Computing Adoption by Small Firms in the Payment Card Industry

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Abstract

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MS, Pennsylvania State University, 2009

MS, University of Yaoundé, 1996

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Dissertation Submitted in Partial Fulfillment

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Abstract

Technology acceptance is increasingly gaining attention in research considering the continuous exploits of innovation and various derived advantages. Cloud computing (CC) has shown to be the ideal solution for aligning information technology with business strategies. However, small to medium-sized enterprises (SMEs) in the payment card industry are reluctantly adopting this technology despite the benefits. This correlational study aims at investigating whether security, cost effectiveness, or regulatory compliance influence CC adoption by U.S. SMEs in the payment card sector. The study builds on the technology-organization-environment (TOE) framework and uses a previously validated instrument to assess CC adoption by decision-makers in U.S. SMEs handling payment data. A multiple linear regression analysis of survey data from 140 participants indicated that the model could predict CC acceptance. Cost effectiveness and regulatory compliance significantly predicted the decision to adopt CC with a strong and positive effect. Pearson's coefficients indicated a significant correlation between each independent variable and the outcome variable. Leaders in small payment markets may gain the latest insights on cloud services in their technology decisions. Cloud service providers may be well informed on consumers' demands for the effective delivery of products and services. Implications for positive social change include enhanced cloud security to reduce compliance defects, cybersecurity attacks, and small business failures. This study may increase consumers' confidence and comfort while using their credit or debit cards in various sales outlets, thus boosting business performance and employment with a better quality of life.

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Dedication

I dedicate this dissertation to my loving and supportive husband, Jacob Tambe, and our lovely children, Anne and Jay Tambe. Your love, support, understanding, and patience during this journey were instrumental to the completion of this program. I equally dedicate this work to my late father Papa William Ntantang, my sweet mother Mammie Dora Ntantang, my siblings Apai Hellina, Theodore Ntantang, and Atem Samson—just to name a few. They supported and inspired me throughout my life. I remain grateful to them all for teaching me the value of education at an early age and always staying by me. I also dedicate this dissertation to my other relatives and friends who steadfastly supported and motivated me during this challenging process. Thank you all for the momentum and love.

Acknowledgments

I am giving all the Glory to our Great God for guiding me and providing me with all the resources needed to initiate and complete this project. I am so grateful to Him for making my dream become a reality, and I pray for continuous blessings and inspiration during the years ahead.

My deepest appreciation and gratitude to all my dissertation committee members. Thank you, Dr. Paul Frankenhauser, for your guidance and support in the completion of this study. I extend my gratitude to Dr. Danielle Wright-Babb, Dr. Janet Durgin, and Dr. Aridaman Jain, for all the assistance and guidance during this challenging journey. I remain grateful to you all.

I wish my father Papa William Ntantang were here to share this great moment with me. I thank him and Mom for making me who I am today and for unconditionally loving me and providing all the building blocks in making my life so special. I would like to deeply thank my husband, Jacob Tambe, and our children, Anne and Jay Tambe, for their unconditional love and all the sacrifices and support during this journey.

I would like to thank all my brothers and sisters, nephews and nieces, other relatives, and friends. I commend them for all their support and prayers through this project. Their presence in my life made this process seamless.

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Chapter 1: Introduction to the Study

With rapid innovation and digital business transformation, maintaining a competitive advantage depends on modernizing and superseding the legacy systems with novel technologies. While this necessity expands across businesses, special attention has shifted to small- and medium-sized enterprises (SMEs) in particular. These small enterprises increasingly drive the economy but generally perform poorly with innovation and competition (Ahani, Rahim, & Nilashi, 2017; Senarathna, Wilkin, Warren, Yeoh, & Salzman, 2018). The limited personnel and budget of SMEs place great pressure on decision-makers to focus on core business strategy and seek innovative and cost-effective initiatives to improve profitability, productivity, and agility (Kumra, Choudhury, Nhu, & Nalwa, 2017; Senarathna et al., 2018). SMEs in the payment card industry have an extra burden to protect consumers' sensitive data and comply with the Payment Card Industry Data Security Standard (PCI DSS), and those publicly traded in the United States are compelled to meet the Sarbanes-Oxley Act (Clapper & Richmond, 2016; Yimam & Fernandez, 2016).

Studies have shown that cloud computing (CC) helps organizations cut down on heavy information technology (IT) costs; improve collaboration, productivity, and innovation; enhance security and privacy; and achieve compliance with regulations and standards (Garrison, Wakefield, & Kim, 2015; Kumar, Samalia, & Verma, 2017; Loukis, Kyriakou, Pazalos, & Popa, 2017). However, some small businesses still exhibit concerns, such as loss of control, vendor lock-in, security and privacy, legal compliance, and reliability and availability with this solution (Hassan, Nasir, Khairudin, & Adon,

2017; Kumar et al., 2017; Vasiljeva, Shaikhulina, & Kreslins, 2017). This study focused on evaluating the role of security, regulation compliance, and cost-effectiveness on the decision to adopt CC by decision-makers in small U.S. firms handling cardholder data (CHD).

The sections developed in this chapter include the background of the study, the problem statement, the purpose of the study, the research questions and hypotheses, the theoretical foundation, the conceptual framework, and the nature of the study. Concise definitions of some critical terms are provided, along with assumptions of the study, the scope and delimitations, the limitations, and the significance of the study. This chapter ends with a summary of its main points and a transition to the next chapter.

Background of the Study

The growing cost and rapid evolution of information and communication technologies (ICTs) place privacy and security in the center of information systems. Recent studies have outlined cloud technology benefits such as cost advantage, easy deployment process, more accessibility to the latest ICTs, automatic updates and upgrades, scalability, flexibility, time savings, and improved disaster recovery and back-up capabilities (Kumar et., 2017; Inmor & Suwannahong, 2017; Senarathna et al., 2018). Despite ongoing cloud security and privacy enhancements, the acceptance of this technology remains uncertain for most companies, particularly SMEs (Alruwaili & Gulliver, 2018; Alshamaila, Papagiannidis, & Li, 2013; Lalev, 2017). These concerns are predominantly significant to U.S. SMEs handling CHD as they are mandated to safeguard consumers' sensitive information and validate the requirements imposed by the payment

card industry security standards council (Hemphill & Longstreet, 2016; Oliveira, Thomas, & Espadanal, 2014; Wamba, 2016). Consequently, these firms remain blindsided by their security, privacy, and compliance concerns and often fail to adopt CC to take advantage of its various benefits (Clapper & Richmond, 2016; Phaphoom, Wang, & Abrahamsson, 2015). This study focused on predicting CC adoption by SMEs in the U.S. payment sector from security, regulatory compliance, and cost-effectiveness perspectives.

Predicting organizations' use of novel technologies is gaining popularity among scholars and practitioners in the digital era. Whether the emerging solution is electronic payment (e-payment), electronic commerce (e-commerce), mobile banking, online banking, or CC, the global adoption of technologies remains sluggish (Ahani et al., 2017; Eelu & Nakakawa, 2018; Liébana-Cabanillas & Alonso-Dos-Santos, 2017), resulting in the need to continuously seek updated insights on technologies to increase understanding, applicability, and acceptance. This study holistically approached CC adoption by assessing its technological, organizational, and environmental characteristics by SMEs in the U.S. payment card industry.

Problem Statement

SMEs are essential to the U.S. economy and supply chain. They comprise over 95% of businesses globally, encompassing 99.9% of the U.S. market, and they accounted for 66% of net new jobs created in the United States between 2000 and 2017 (Senarathna et al., 2018; U.S. Small Business Association [SBA], 2018a). Nevertheless, SMEs often exhibit inefficient business performance, struggle with achieving compliance, and are

increasingly targeted by cybercriminals (SBA, 2018a, 2018b; Sophy, 2016; Watad, Washah, & Perez, 2018). About half of all new small firms in the United States survive 5 years or more, with only about one third lasting over 10 years (SBA, 2018b). Such challenges are typically attributed to SMEs' limited human and financial resources, their lack of expertise and innovative technologies, and the reckless behavior of their employees in handling sensitive data (Watad et al., 2018; Williams, 2015). Recent studies support the effectiveness and convenience of CC for small firms and encourage industry-based research because of the variation of cloud adaptiveness across businesses (Candel, Kretschmer, & Strobel, 2016; Carcary, Doherty, Conway, & McLaughlin, 2014; Kumar et al., 2017).

The general management problem is that SMEs in the payment card industry remain hesitant in moving their cardholder data environment (CDE) to a cloud setting, even though the evidence suggests they should focus on strategic business and adopt CC to incur benefits such as scalability, cost reduction, and business continuity (Fan, Chen, Wu, & Fang, 2015; Kumar et al., 2017; Senarathna et al., 2018). Whether CDE is on the cloud or on premises, SMEs in the payment sector are required to protect cardholder data and maintain compliance with the PCI DSS.

The specific management problem is that some SMEs operating in the payment sector in the United States do not fully grasp whether their reluctance to adopt CC is related to security, regulatory compliance, or cost concerns. Small businesses are continuously vulnerable to security and compliance threats, as they seek affordable and secure solutions (Alshamaila et al., 2013; Clapper & Richmond, 2016). About 43% of

SMEs were targeted by cyberattacks in 2015, and only 10% were fully compliant with PCI DSS (Clapper & Richmond, 2016; Sophy, 2016). Few researchers have focused on key determinants of CC acceptance by SMEs in general, and those in the U.S. payment card sector in particular (Kumar et al., 2017; Senarathna et al., 2018; Watad et al., 2018).

Purpose of the Study

The purpose of this quantitative correlational research was to determine to what extent, if any, there is a relationship between three independent variables—(a) security (SE), (b) regulatory compliance (RC), and (c) cost-effectiveness (CE)—and the dependent variable, the decision to adopt CC (DA) by senior executives, IT managers, and business owners in small firms handling payment card data in the United States. The intent was to conduct an online survey of U.S. businesses with fewer than 500 employees that either store, transmit, or process payment data. I employed a nonprobability convenience sampling to recruit participants and performed a multiple linear regression analysis to conclude potential relationships between variables using the Statistical Package for Social Sciences (SPSS).

The findings of this research could provide empirical data on the current state of CC to support SME executives in making decisions on technological solutions suitable for their organizations. Moreover, this study could encourage SMEs in the payment card industry to adopt CC and improve the security of cardholder data. Potential implications for positive social change could relate to increased business performance and an understanding of cloud technology. This study could also present evidence on the significance of security, cost-effectiveness, and regulatory compliance toward cloud

acceptance decisions by SMEs. Furthermore, this research could motivate small businesses in other industries and countries to evaluate their readiness and adopt this emerging technology.

Research Questions and Hypotheses

The main research question that guided this study was RQ: To what extent, if any do security, cost effectiveness, and regulatory compliance influence the decision to adopt CC by senior executives, IT managers, and business owners, in small enterprises handling payment card data in the United States. Multiple linear regression was used to address the main research question, below were the associated hypotheses:

H_0: There is no correlation between security, cost-effectiveness, regulatory compliance, and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

H_a: There is a correlation between security, cost-effectiveness, regulatory compliance, and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

The following secondary research questions and hypotheses were used to assess relationships between the three independent variables and the dependent variable.

RQ1: To what extent, if any, is there a correlation between security and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States?

$H_0$1: There is no correlation between security and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

H_a1: There is a correlation between security and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

RQ2: To what extent, if any, is there a correlation between regulatory compliance and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States?

$H_0$2: There is no correlation between regulatory compliance and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

H_a1: There is a correlation between regulatory compliance and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

RQ3: To what extent, if any, is there a correlation between cost effectiveness and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States?

$H_0$3: There is no correlation between cost-effectiveness and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

H_a3: There is a correlation between cost-effectiveness and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

Theoretical Foundation

Tornatsky and Fleischer's (1990) technology-organization-environment (TOE) theoretical framework was used in this study to support that technological, organizational, and environmental factors could influence technology adoption (see Figure 1). Cloud computing is an innovation, consequently requiring an all-inclusive and comprehensive adoption approach for effective decision making (Hsu & Lin, 2016). Technology adoption theories such as the unified theory of acceptance and use of technology (UTAUT), UTAUT2, the technology acceptance model (TAM), and the theory of planned behavior (TPB) solely relate to a specific aspect of technology acceptance. The TOE framework encompasses the three main perspectives of technological innovation (Hsu & Lin, 2016). TOE is applicable and relevant to this study to depict the influence of security, cost, and compliance constraints on CC acceptance by small U.S. firms in the payment card sector.

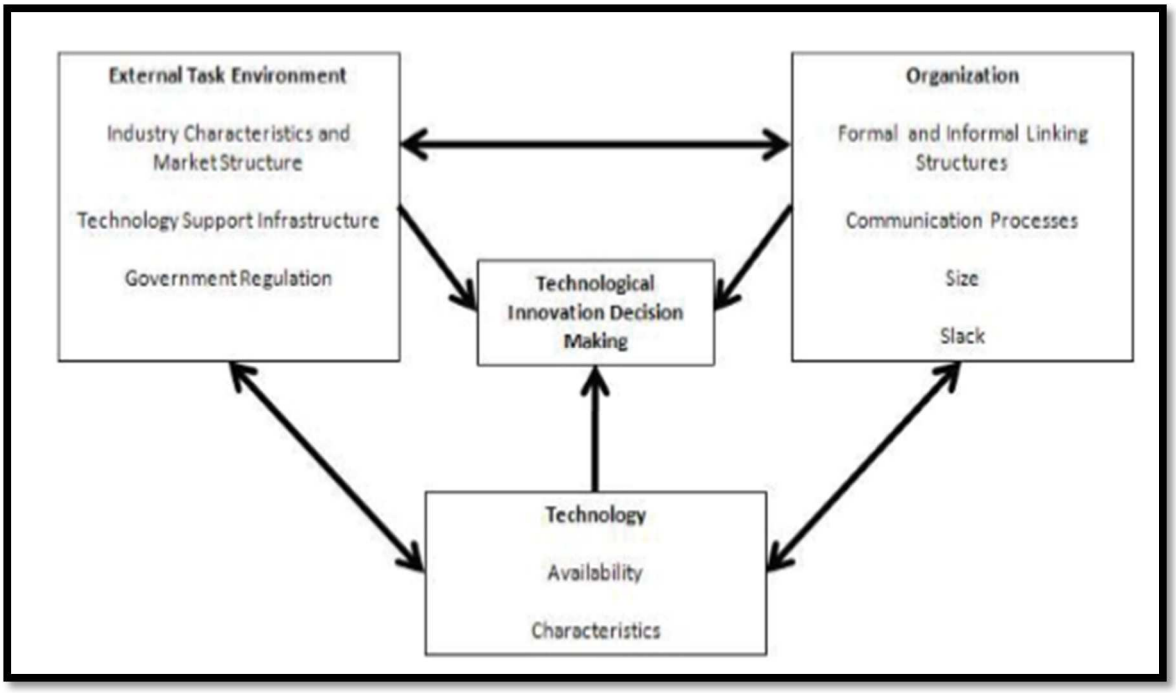

Figure 1. The technology-organization-environment framework. From *The Processes of Technological Innovation* (p. 153), by L. G. Tornatzky and M. Fleischer. Copyright 1990 by Lexington Books. Reprinted with permission from the publisher (see Appendix C).

The organizational perspective of TOE emphasizes that characteristics such as firm size, innovativeness, financial costs, top management support (TMS), and prior technology experience may potentially influence technology adoption (Alshamaila et al., 2013; Hsu & Lin, 2016; Tornatsky & Fleischer, 1990). The technological aspect relates to the significant impact of relative advantage (RA), uncertainty, security and privacy, observability, compatibility, complexity, reliability, availability, and trialability; the environmental context refers to competition and the regulatory environment (Alkhalil, Sahandi, & John, 2017; Hsu & Lin, 2016; Kumar et al., 2017; Tornatsky & Fleischer, 1990). The innovative characteristics of the TOE framework evaluated in this study were (a) SE at the technological level, (b) CE at the organizational context, and (c) RC from the environmental perspective.

Many researchers have used the TOE model in recent years. Alshamaila, Papagiannidis, and Li (2013) investigated the factors influencing CC adoption by SMEs in Northeast England and determined that relative advantage, geo-restriction, uncertainty, compatibility, trialability, size, top management support, prior experience, innovativeness, industry, market scope, external computer support, and supplier efforts significantly influenced CC adoption. Hsu and Lin (2016) determined that a firm's intention toward cloud services was positively shaped by (a) technological factors like relative advantage, observability, and security; (b) environmental features such as competition intensity; and (c) organizational determinants like financial costs and satisfaction with existing information systems.

Alkhalil, Sahandi, and John (2017) explored key factors driving the migration of existing resources to a CC environment by integrating the diffusion of innovations (DOI) and TOE frameworks. The authors determined that, although relative advantage and top management support positively affected an organization's readiness to adopt CC, factors like the internal social network, cloud providers, regulations, information gathering, complexity, risks, and compatibility complicated and negatively impacted this decision. El-Gazzar, Hustad, and Olsen (2016) found that CC inhibitors in Norway were trust, weak service level agreements (SLAs), loss of control over resources, and government intrusion.

This research built on Tornatzky and Fleischer's (1990) TOE framework to evaluate innovation characteristics—SE, RC, and CE—on DA by U.S. small enterprises in the payment card industry. According to Hsu and Lin (2016), perceived security relates

to the positive attitude knowing that CC is risk-free, regulatory environment refers to the support of regulations for secure cloud services, and financial costs are defined as the low cost associated with CC implementation by businesses.

In the context of this study, SE defined the extent to which security concerns may impede CC adoption, and CE referred to the extent to which low cloud-related cost may motivate its acceptance. While RC defined the extent to which regulatory compliance such as PCI DSS may be achieved in a CC environment, as required by the government and industry regulations. The reliability and validity of the adaptation of the TOE model in recent technology acceptance studies made this framework appropriate for this study; it allows relationships between CE, SE, RC, and DA to be captured and evaluated.

Nature of the Study

The correlational research design was chosen for this study to assess the relationships between the independent variables (SE, RC, and CE) and the dependent variable DA. This design approach was consistent with evaluating the existence of a correlation between the dependent variable and independent variables (Frankfort-Nachmias, & Leon-Guerrero, 2018). Researchers widely use quantitative correlation to test hypotheses. In Saudi Arabia, Alkhater, Walters, and Wills (2017) estimated the relationships between privacy, security, trust, quality of service, and technology readiness and cloud acceptance by private sector firms. While Noor (2016) proved that availability, reliability, security, compliance, and privacy hindered CC adoption in universities.

The survey questionnaire research method was used to collect data from a large number of participants who met specific requirements. I used Opala's (2012) survey

instrument, previously tested for validity and reliability, for this study. A pilot study was not necessary. Opala and Rahman (2013) adapted a similar instrument using the TAM model to conduct a factor analysis on the perceptions of 282 CIO/IT managers in U.S. firms toward cloud security, IT compliance, and cost effectiveness. Convenience sampling was used to recruit participants readily accessible with characteristics similar to those in this study. Although nonprobability sampling does not represent the general population of U.S. SMEs in the payment sector, this method was appropriate for the study considering that participants were consistent with the objectives and assumptions of this research, as suggested by Etikan et al. (2016).

Definitions

The following unique terms used throughout this study are critically important for understanding this research.

U.S. Small Business Administration (SBA): A government agency created in 1953 to counsel, assist, and protect the interests of small businesses while preserving a competitive advantage and strengthening the overall U.S. economy (SBA, 2018c).

Office of Advocacy: An independent branch within the federal government that advances small businesses' views and concerns before Congress, the White House, federal courts, federal agencies, and state policymakers (SBA, 2018b).

Small businesses: A small business is An independent business having fewer than 500 employees (SBA, 2018a).

Small and medium-sized enterprises (SMEs) and *small and medium-sized businesses (SMBs)*: Small businesses (Ahani et al., 2017; Attaran & Woods, 2018; Clapper & Richmond, 2016).

Cloud computing (CC): A model capable of delivering "access to a scalable and elastic pool of shareable resources with on-demand provisioning and administration" (Cloud Special Interest Group, 2018, p. 1).

Cloud service provider (CSP): The entity providing cloud services to customers (Alruwaili & Gulliver, 2018).

Cloud service model: How the CSP delivers and controls cloud services to clients. The models include (a) infrastructure as a service (IaaS) in which much access and control over network components, applications, and operating systems is given to the cloud user; (b) platform as a service (PaaS) in which clients' applications are deployed to the cloud infrastructure; and (c) software as a service (SaaS) in which the cloud consumer uses applications owned by the CC providers (Alruwaili & Gulliver, 2018; Gupta & Saini, 2017; Lalev, 2017; Mell & Grance, 2011).

Cloud deployment model: How cloud services are provisioned and controlled in organizations. They can be (a) *public* with the cloud infrastructure hosted by a CSP off-site and available to the general public; (b) *private* and the cloud infrastructure resides within a firm's intranet; (c) *community* and the cloud infrastructure is shared among various companies with common concerns; and (d) *hybrid* and the infrastructure comprises two or more of private, public, or community clouds (Alruwaili & Gulliver, 2018; Gupta & Saini, 2017; Mell & Grance, 2011).

Payment card industry data security standard (PCI DSS): The "global data security standard adopted by the payment card brands for all entities that process, store, or transmit cardholder data and/or sensitive authentication data" (PCI SSC, 2018, p. 9).

Payment card industry security standards council (PCI SSC): "A global forum for the ongoing development, enhancement, storage, dissemination and implementation of security standards for account data protection" (PCI SSC, n.d., p.1).

Self-assessment questionnaire (SAQ): A validation tool that merchants and service providers use to report their PCI DSS self-assessment (PCI SSC, 2018).

Qualified security assessor (QSA): Performs on-site PCI DSS assessments (PCI SSC, 2018).

Report of compliance (ROC): A QSA report of whether proper security standards are in place to protect consumers' credit card data (PCI SSC, 2018).

Attestation of Compliance (AoC): Completed by QSA, this certifies that all relevant PCI demands are met (PCI SSC, 2018).

Merchant: An entity accepting payment cards bearing the logo of the payment brands (PCI SSC, 2018).

Service provider: In PCI DSS, an entity directly providing services that potentially impact the CHD security process on behalf of another entity (PCI SSC, 2018).

Sarbanes-Oxley Act: Federal regulation that establishes standards for publicly traded companies in the United States to protect the general public and shareholders from fraud and accounting errors (Yimam & Fernandez, 2016).

Assumptions

Assumptions were outlined in this study to reveal facts unproven to be true. The primary assumption assumed that CC benefits outweigh its disadvantages, thus the reason for its adoption. SMEs in the payment card industry could increase business performance and overcome their limitations in personnel and budget by adopting CC. CC has proven to be scalable, affordable, flexible, secure, innovative, and agile (Garrison et al., 2015; Kumar et al., 2017).

The second assumption was that security, privacy, and compliance concerns are the main inhibitors to the willingness of small businesses in the payment card sector to adopt cloud services. The growing cloud security enhancements associated with service models—IaaS, SaaS, and PaaS—could contribute to the protection of cardholder data against cybercrimes and increase regulatory compliance. Service models are exposed to different security threats and should be approached differently (Gupta & Saini, 2017; Lalev, 2017).

The third assumption consisted of the belief that senior executives, IT managers, and business owners in SMEs were responsible for technology adoption decisions. Thus, the magnitude of understanding cloud services for efficient IT assessment and decision making. My fourth assumption was that all research participants had access to the internet and were either SurveyMonkey or Walden University panelists. This resource ensured that the web-based questionnaire was fully answered at the respondents' convenience using any mobile device.

My final assumption was that choosing the high priority option, giving survey takers a four-week response window, and posting the survey link on the Walden Participant Pool ensured that I reached the target sample size quickly. The high priority option allows that SurveyMonkey panelists respond to the survey first (SurveyMonkey, 2019b).

Scope and Delimitations

The scope and delimitations of this study were based on aspects of the literature review, the research design, and the theoretical foundation. The scope of this project was to assess CC acceptance by senior executives, IT managers, and business owners in SMEs handling payment card data in the United States based on their perceptions of security, cost effectiveness, and regulatory compliance.

The primary delimitation of this study was related to the use of convenience sampling to recruit readily available online survey participants with the expectation that they could be either senior executives, IT managers, or business owners at U.S. SMEs in the payment card industry. The results of this study cannot be generalized globally, considering that the survey was bound to respondents with these specific characteristics. Moreover, the findings may be biased with the possibility of more than one response per anonymous participant.

The second delimitation was predicated by the linear regression analysis to reveal relationships between predictor variables—SE, CE, and RC—and the outcome construct DA. The TOE model consisted of other variables potentially critical to these small

companies. The research boundaries hereby defined were pivotal in purposively focusing on the research problem.

Limitations

This study had two limitations that could potentially affect its overall efficiency. First, convenience sampling generally has little or no external validity and is often subject to biases as participants are recruited because they are readily accessible (Etikan et al., 2016). To address this limitation, only participants with characteristics similar to the study for analysis were considered.

The second limitation was the focus on CC features of SE, RC, and CE. The TOE framework by Tornatzky and Fleischer's (1990) consists of various variables associated with the technological, organizational, and environmental perspectives. To address this limitation, I adopted a survey instrument that Opala (2012) previously adjusted and used with similar variables.

Significance of the Study

SMBs are essential to the economy in both developed and developing countries. However, they generally face many challenges often related to inadequate human and financial resources, inappropriate technology, and lack of cash flow (Kumar et al., 2017; Watad et al., 2018). With the growing cost of ICTs, CC has proven to help SMBs reduce the procurement and maintenance costs linked to ICTs, maintain profitability and productivity, and improve their cash flow and agility (Kumar et al., 2017). The significance of this study extends beyond the understanding of key factors of CC acceptance by U.S. SMEs. It may contribute to the reduction of a current gap in the

literature and effect social change with credible data to help SMEs become more sustainable. Additionally, cloud providers could improve their products and services.

Significance to Theory

Researchers and professionals increasingly explore potential benefits and challenges of CC by assessing influencing factors of its adoption. Alkhalil et al. (2017) determined that relative advantage, trialability, external social, and top management support positively influenced the migration of SMEs to CC, while size, compatibility, organization readiness, regulation, selection of cloud providers, and information sources negate this intention. Liang, Qi, Wei, and Chen (2017) revealed that technology, cloud provider support, environment stimulus, organizational readiness, and cloud trust were significant determinants of e-government (e-Gov) cloud adoption in China. Opala (2012) argued that security, IT compliance, and cost effectiveness are key determinants of CC by IT leaders in U.S. Fortune 500 or Forbes 100 enterprises.

Despite the stringent security and compliance requirements imposed on small enterprises in the payment card industry, there is a dearth of research on potential factors influencing CC adoption by U.S. SMEs in the payment sector. This study filled a gap in the literature using the TOE model (Tornatsky & Fleischer, 1990) to evaluate determinants of CC adoption based on technological, environmental, and organizational perspectives. Factors pertaining to security, regulatory compliance, and cost effectiveness of CC were evaluated to provide decision-makers with the latest insights on predictive behaviors toward the acceptance of this technology.

Significance to Practice

The valuable but volatile nature of small enterprises in the United States merits ongoing research on effective strategies capable of supporting decision-makers to maintain a competitive advantage in this digital age. Cloud computing has been identified as an effective solution that enables firms to quickly adapt to this changing world by providing scalable, powerful, cost effective, innovative, and on-demand resources (Alruwaili & Gulliver, 2018; Opala, 2012; Senarathna et al., 2018). Nonetheless, information security, privacy, and compliance (ISPC) concerns still flag cloud service adoption, specifically in the financial sector strictly required to protect consumers' information while complying with regulatory standards (Alruwaili & Gulliver, 2018; Gupta & Saini, 2017; Kumra et al., 2017).

Hemphill and Longstreet (2016) argued that most vulnerable areas often compromised by hackers are client computers, servers interacting with data, and communication pipelines between retailers and credit card processors and financial institutions. This creates an urgent need to continuously harden the security of these access points despite the continuous development of new hacking paradigms by criminals.

Alruwaili and Gulliver (2018) stressed the urgency for the payment sector to assess security, privacy, and compliance readiness while considering cloud services by selecting a suitable and secure cloud deployment model, cloud service model, cloud vendor, and SLAs. Ramgovind, Eloff, and Smith (2010) reiterated the need for small

firms to clearly define procedures, security expectations, and policies in cloud SLAs for effective support, service, and return on investment (ROI).

Being in its early infancy, CC adoption still casts doubts with mixed views from people and businesses. This study was intended to enhance the understanding of CC and create more opportunities for cloud consumers, cloud providers, and researchers to build on current enhancements and caveats of this technology to improve its security and privacy abilities, practices, services, and academic studies.

Significance to Social Change

Potential implications for social change extend beyond small U.S. firms in the payment card industry and include substantial knowledge on cloud technology acceptance to reduce compliance and security issues and business failures. This could support sustainable and enhanced business performance for small payment-handling firms and, subsequently, the improvement of local communities with increased employment and social and economic growth.

Summary and Transition

This chapter mainly focused on introducing the research study by outlining the background of the study; developing the problem statement, the nature, significance, and purpose of the study; identifying the research questions and hypotheses; and providing a suitable theoretical framework along with definitions of terms, assumptions, scope, delimitations, and limitations of the study. Chapter 2 situates this research in the context of previous relevant studies by reviewing academic and professional literature related to this study. Peer-reviewed professional and academic publications on SMEs in general

with an emphasis on those in the payment sector, CC adoption, the payment card industry, cost-effectiveness, security, and regulatory compliance are reviewed in the next chapter.

Chapter 2: Literature Review

The review of relevant literature supporting this study is developed in this chapter. The specific problem presented in this project was that some U.S. SMEs in the payment card industry do not fully understand whether security, cost effectiveness, or regulatory compliance are the driving factors of their CC adoption decision. The main purpose of this literature review was to gain an understanding of (a) the current state of CC and small businesses globally, (b) the key determinants of CC acceptance with an emphasis on SMEs, (c) the TOE framework and recent studies that used this model, and (d) the security and compliance requirements imposed on the payment sector.

This chapter includes four sections. I begin with a literature search strategy that presents the process and sources used to locate the resources reviewed, including key search terms and types of literature. The second part is the theoretical foundation that includes an overview of the TOE framework and its usage in recent studies, the research model, and a synopsis of major technology acceptance models. The review of relevant literature on the concepts and key predictors and outcome variables is synthesized in the third section; this includes topics on CC, small businesses, the payment card industry, and other major standards and regulations. Additionally, this portion elaborates on previous studies on CC adoption by small firms and the development of constructs and hypotheses. The chapter ends with a summary and conclusions, including a transition to the next chapter.

Literature Search Strategy

The main focus of this study was helping SMEs in the payment sector improve their understanding of cloud computing's driving factors to make effective decisions on ICTs. Most peer-reviewed articles were found on research sites through the Walden Library. Databases used to search articles were SAGE Research Methods, Google Scholar, ProQuest, Business Source Complete, ABI/INFORM Complete, ACM Library, Business Source Complete/Premier, IEEE Xplore Digital Library, and Computers & Applied Sciences Complete. Peer-reviewed articles published within 5 years with the following keywords were the general focus: *technology acceptance, cloud computing, TOE framework, payment card industry, small and medium-sized firms, PCI DSS, SME,* and *security and compliance*. However, I used a few outdated articles because of their relevance to the theoretical foundation of this study.

I inspected and reviewed 134 books, peer-reviewed or refereed journal articles, and dissertations. Among these sources, six were books, one was a dissertation, 33 were online publications considered valuable for this study, and the remaining were peer-reviewed articles. While 109 sources were published within the past 5 years, seven were seminal, and 18 were deemed important for this study. I verified references missing a digital object identifier through the Crossref.org website.

Theoretical Foundation

Research studies are typically shaped by various competing concepts and theories to organize ideas, facts, observations, and other models into systems of thought or meaning. Grant and Osanloo (2014) differentiated the theoretical framework from the

conceptual framework by asserting that the former derives from generally tested and accepted theories from the literature, while the latter guides researchers in defining and selecting suitable concepts and processes for their research. Ravitch and Carl (2016) asserted that a conceptual framework helps to place a study in perspective among other studies. In contrast, a theoretical framework is used to support studies looking for relationships among variables and to set limits or boundaries to the study. This research mainly sought to identify relationships among constructs, thus the TOE theoretical foundation, the research model, and major frameworks developed in the next sections.

Technology–Organization–Environment Framework

The TOE theoretical framework introduced by Tornatsky and Fleischer (1990) guided this study by supporting that technological, organizational, and environmental factors may influence innovation adoption. Rogers (1962) defined innovation as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (p. 11). Rogers also argued that innovation might be communicated using different channels. Cloud computing is considered an innovation because of its aptitude in leveraging IT and business performance by continually evolving to provide optimal technological solutions at reasonable costs (Alkhalil, et al., 2017; Chen, Chen, & Lee, 2018; Fan et al., 2015; Raut, Priyadarshinee, Gardas, & Jha, 2017). This underscores the suitability of the TOE framework for this study primarily focused on assessing relationships between the innovation characteristics of cost, security, and regulatory compliance and CC acceptance.

In the early age of technology diffusion, researchers fixated on the adoption decision at the individual level (Rogers, 1983; Tornatsky & Klein, 1982). In their meta-analysis of prior studies, Tornatsky and Klein (1982) defined 30 innovation characteristics, shown in Figure 2, and concluded that compatibility, complexity, and relative advantage impacted technology adoption and implementation. The authors described the positive effect of compatibility with existing technologies and relative advantage over current technologies and the negative impact of technological complexity on adoption. Rogers (1962) linked the adoption decision to five innovation characteristics: (a) relative advantage, (b) compatibility, (c) complexity, (d) trialability, and (e) observability. This research mainly assessed CC adoption at the organizational level.

1) Relative advantage	2) Association with major enterprise
3) Clarity of results	4) Compatibility
5) Communicability	6) Complexity
7) Continuing cost	8) Cost
9) Divisibility	10) Ease of operation
11) Flexibility	12) Importance
13) Initial cost	14) Mechanical attraction
15) Observability	16) Payoff
17) Pervasiveness	18) Profitability
19) Radicalness	20) Rate of cost recovery
21) Regularity of reward	22) Reliability
23) Riskiness	24) Specificity of evaluation
25) Saving of discomfort	26) Saving of time
27) Scientific status	28) Social approval
29) Trialability	30) Visibility

Figure 2. Innovation characteristics. From "Innovation characteristics and innovation adoption-implementation: A meta-analysis of finding," by Tornatzky and Klein, 1982, p. 43. Reprinted with permission by the publisher (see Appendix E).

Tornatsky and Fleischer (1990) believed in a more holistic approach for firms because many technologies are "too big and complex to be grasped by a single person's cognitive power—or usually, to be acquired or deployed within the discretionary authority of any single organizational participant" (p. 133). The TOE model represents a robust framework tailored for organizational adoption and implementation of innovation by considering the following three contextual aspects of technology acceptance developed by Tornatsky and Fleischer (1990):

1. The environment context referred to external factors such as industry characteristics and market structure, technology support infrastructure, and government regulation.
2. The organizational belief denoted communication processes, firm size and slack, and formal and informal structures.
3. The technological aspect referred to technologies available to a business and the impact of their characteristics on the adoption process.

Several researchers have concluded that these three contexts interact with each other to influence decisions on technology acceptance (Amron, Ibrahim, & Chuprat, 2017; Chandra & Kumar, 2018; Hanafizadeh & Zare, 2018; Haneem, Kama, Taskin, Pauleen, & Abu Bakar, 2019). Specific factors of these three perspectives will be examined in the context of this study.

TOE Empirical Studies Across Industries and Countries

The TOE framework has been used across the world to study the adoption of various technologies. Researchers have either solely adopted this model, extended it with

additional constructs, or combined it with other popular theoretical models to study the acceptance of innovation. The following two sections summarize recent empirical studies across industries and regions.

TOE empirical studies across industries. Researchers have applied the TOE framework to study the acceptance of innovative technologies across industries. Whether the focus of the research is on healthcare, manufacturing, education, services, technology, retail, financial, or the public sector, innovation adoption differs among industries and relates directly or indirectly to the organizational, technological, and environmental attributes of firms (Amron et al., 2017; Hanafizadeh & Zare, 2018; Oliveira et al., 2014).

Amron, Ibrahim, and Chuprat (2017) determined that CC acceptance in Indonesia was influenced by technology readiness, human readiness, organization support, environment, security, and privacy. Similarly, Alharbi, Atkins, and Stanier (2016) built on TOE, the human, organization, and technology-fit and the information system strategic triangle frameworks to examine business, organizational, technological, environmental, and human factors that may influence the decision to adopt CC in the Saudi healthcare sector.

Oliveira et al. (2014) assessed key factors influencing the adoption of CC in the manufacturing and services sectors in Portugal. Online survey questionnaire data collected from IT leaders in 369 firms were quantitatively analyzed to determine a 40.8% CC adoption in the services sector and 36.1% in manufacturing. Moreover, cost savings impacted relative advantage directly and CC adoption indirectly.

Chandra and Kumar (2018) built on the TOE model to reveal that technology competence, relative advantage, top management support, and consumer readiness significantly influenced an organization's intention to adopt augmented reality technology designed to improve consumers' shopping experience in Singapore, India, and the United States. Hanafizadeh and Zare (2018) determined that perceived complexity, perceived cost, service observability to the client, cultural fit between client and supplier, perceived loss of organizational knowledge, prior outsourcing experience, external pressure, market volatility, and suppliers' power significantly impacted the outsourcing decision of e-banking services in Iran. Hsu and Lin (2016) argued that small and large enterprises were driven by competitiveness but perceived cloud adoption differently. Hsu and Lin (2016) also determined that observability, firm size, and financial cost influenced the financial and service sectors.

TOE empirical studies across countries. Researchers have used the TOE framework to reveal the driving factors of technology acceptance in both developed and developing countries. While attitudes toward innovation in developing countries remain sluggish compared to developed nations, using the TOE model has uncovered key determinants of technology adoption in many countries, including Taiwan, the United Kingdom, and Malaysia (Alshamaila et al., 2013; Chen et al., 2018; Hassan et al., 2017).

Chen, Chen, and Lee (2018) used DOI and TOE to develop best fit of research competing models for cloud services adoption by considering the internal, external, and individual characteristics of DOI and the service compatibility, entrepreneurship, social influence, perceived information security assurance, perceived cost savings, and top

management support variables of TOE. Furthermore, Hsu and Lin (2016) used the TOE model to show that a firm's intention toward CC was positively influenced by (a) technological factors like relative advantage, observability, and security; (b) environmental characteristics such as competition intensity; and (c) organizational determinants such as financial costs and satisfaction with existing information systems. Similarly, Wang, Li, Li, and Zhang (2016) built on the TOE model to reveal that firm size, compatibility, technology competence, and critical mass were significant predictors of the adoption of mobile hotel reservation systems by hotels in Taiwan.

Gutierrez, Boukrami, and Lumsden (2015) built on TOE to identify competitive pressure, complexity, technology readiness, and trading partner pressure as determinants of CC adoption. Similarly, Alshamaila et al. (2013) investigated the factors influencing CC adoption by SMEs in Northeast England. They determined that relative advantage, geo-restriction, uncertainty, compatibility, trialability, size, top management support, prior experience, innovativeness, industry, market scope, external computer support, and supplier efforts significantly impacted CC adoption.

AlSharji, Ahmad, and Abu Bakar (2018) studied key technological, organizational, and environmental constructs influencing the adoption of social media like LinkedIn, Facebook, Instagram, Twitter, YouTube, Google+, Podcast or iTunes, Blogs, Pinterest, and WhatsApp by SMEs. The findings indicated that social media acceptance was not influenced by technological variables of relative advantage, compatibility, trialability, complexity, and observability. However, the organizational factor of top management support, and the environmental features of industry structure,

availability of technology, and regulatory demands significantly impacted the intention to adopt this initiative.

Hassan et al. (2017) determined that Malaysian SMEs were significantly influenced at the environmental context by external pressure, and at the organizational perspective by IT resources. Whereas Ahani, Rahim, and Nilashi (2017) found that the acceptance of social customer relationship management (CRM) by Malaysian' SMEs was highly impacted by compatibility, information capture, IT/IS knowledge of employee, TMS, information sharing, competitive pressure, cost, RA, and customer pressure.

Maduku, Mpinganjira, and Duh (2016) revealed that relative advantage, perceived cost, top management support, employees' IT capability, and customer pressure were important drivers of mobile marketing adoption by South African SMEs. In India, Gangwar, Date, and Ramaswamy (2015) integrated the TOE and TAM models to support the strong influence of RA, compatibility, complexity, organizational readiness, top management commitment, and training and education on CC adoption by Indian manufacturing, information technology, and finance industries. Moreover, competitive pressure and trading partner had a direct effect on the intention to accept CC.

Phaphoom, Wang, and Abrahamsson (2015) adopted the TOE to develop a cloud implementation model suitable for SMEs providing SaaS and mandated by the PCI-DSS and the health insurance portability and accountability (HIPAA). IT implementation actions such as IT infrastructure and service management, and IT governance were found to produce effective outcomes like the simplified IT resource management, enhanced quality of service, and growth.

Based on the applicability contexts of the TOE on technology adoption, this study identified constructs that were critical for small businesses in general, while emphasizing on U.S. firms handling payment data. The reliability and validity of the adaptation of the TOE framework in recent technology acceptance studies made this model suitable for this study, by allowing relationships between CE, SE, RC, and DA to be captured.

The Research Model

The study proposed the conceptual model illustrated by Figure 3 based on the three perspectives of the TOE framework and the review of related literature to evaluate innovation characteristics security (SE), regulatory compliance (RC), and cost-effectiveness (CE) on the decision to adopt CC (DA) by small markets in the payment card industry operating in the United States. The technological perspective of SE, the organizational context of CE, and the environmental aspect of RC were posited to relate with each other to influence SMEs' decision to adopt CC. Chen et al. (2018) claimed that the relationships between these three contextual factors and CC adoption eventually affected organizational performance.

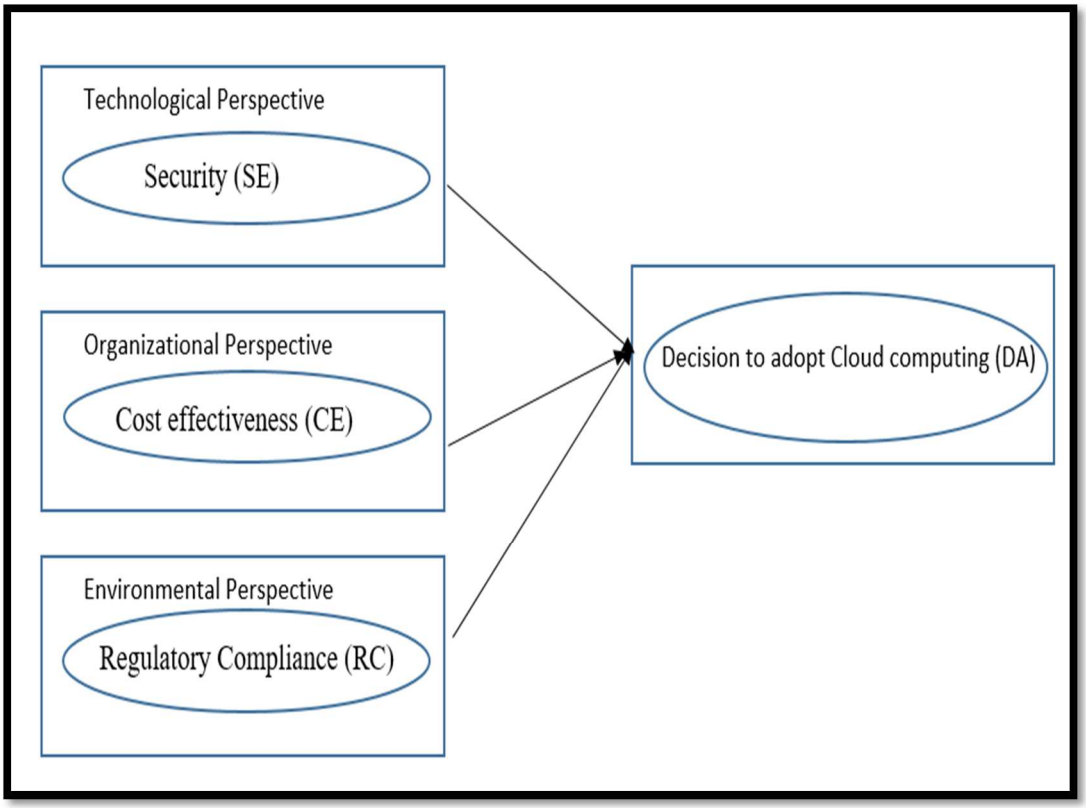

Figure 3. Proposed cloud computing acceptance model. Adapted with permission (see Appendixes B and C) from *The Processes of Technological Innovation* (p. 153), by L. G. Tornatzky and M. Fleischer, 1990, Lexington, MA: Lexington Books, and "An analysis of security, cost-effectiveness, and IT compliance factors influencing cloud adoption by IT managers," by O. J. Opala, 2012, Doctoral dissertation (http://dl.acm.org), p. 26.

While the proposed research model was framed after Tornatzky and Fleischer's (1990) TOE framework printed on Figure 1, Opala (2012) conceptualized a similar representation of the relationships between cloud security, cost-effectiveness, IT compliance, and CC acceptance by adapting the study by Venkatesh, Morris, Davis, and Davis (2003). This study could indicate that Opala's conceptual model may also be viewed through the lenses of the TOE theoretical framework.

Major technology adoption models and theories. Many relational studies have used various technology adoption models and theories to empirically investigate

innovation acceptance at the organizational and individual levels (Rogers, 1962, 2003; Davis, 1985; Venkatesh, Morris, Davis, & Davis, 2003). While TOE was the primary theoretical framework adopted in this study, the following sections outline other popular theories and models used in innovation adoption**.**

The diffusion of innovations. Rogers (1962) proposed the individual, internal, and external characteristics of firm innovativeness through the DOI theory. According to Rogers (1962, 2003), a leader's attitude toward change constitutes the individual element of the diffusion of innovation. Whereas, internal characteristics consist of organizational slack, formalization, interconnectedness, centralization, and complexity, while the system openness represents the external factors.

This theory is widely used with other theoretical frameworks to predict the adoption of innovation (Alkhalil et al., 2017; Chen et al., 2018; Hasheela, Smolander, & Mufeti, 2016). Hasheela, Smolander, and Mufeti (2016) employed this framework to describe the latency between the introduction of CC and its adoption or rejection by the Namibian small businesses. The authors revealed that the hindrances of cloud enterprise resource planning (ERP) adoption by these firms were (a) the lack of knowledge, (b) the negative attitude toward change, (c) the satisfaction with existing system, (d) the incompatibility between current on-premises systems and CC, (e) data security, and (f) internet connectivity issues.

Mohammed, Ibrahim, Nilashi, and Alzurqa (2017) used the DOI and the fit viability model (FVM) to assess the fitness and viability of CC on e-government tasks by 296 IT staff in Yemen's public firms. The results of the quantitative analysis revealed

that relative advantage (RA), compatibility, trialability, and security impacted how CC fits e-government, while complexity did not affect. Furthermore, economic factors and technological readiness were proven to influence the viability of cloud technology.

Technology acceptance model. Davis (1985) introduced TAM to explain user's behavior related to technology acceptance and usage to complete tasks. This model is used in a wide range of studies to justify the relationships between user's technology acceptance and the perceived usefulness (PU) and perceived ease of use (PEOU) (Gangwar et al., 2015; Opala & Rahman, 2013; Tripathi, 2017). TAM is often integrated with DOI to assess main innovation adoption drivers.

In their study of CC influencing factors across the globe, Stieninger, Nedbal, Wetzlinger, Wagner, and Erskine (2018) combined TAM and DOI to reveal the positive impact of compatibility, relative advantage, security and trust, and lower level of complexity. Sharma, Al-Badi, Govindaluri, and Al-Kharusi (2016) expanded the TAM framework to demonstrate the impact of trust, PEOU, PU, job opportunity (JO), and computer self-efficacy on the decision to accept CC in Oman. A quantitative study of data collected from 101 IT leaders revealed that trust, PEOU, computer self-efficacy, JO, and PU were significant predictors of cloud technology acceptance.

Yang and Lin (2015) adopted the TAM and Task-Technology Fit (TTF) theories to assess the factors influencing a user's continuous intention to use cloud storage services (CSS) to store their essential data. The survey data collected from 294 users of online discussion boards such as Mobile01, and social network like Facebook and Google Plus in Taiwan, were statistically analyzed. The results indicated that CSS, unstructured

task, cloud storage self-efficacy, and opinion of reference groups positively influenced PU, which in turn impacted the users' continuance intention to use cloud storage services.

The unified theory of acceptance and use of technology. Venkatesh et al. (2003) developed the UTAUT framework by combining eight theoretical models mainly the social cognitive theory (SCT), TAM, the motivational model (MM), the model of PC utilization (MPCU), the theory of reasoned action (TRA), the theory of planned behavior (TPB), a combined TAM and TPB (C-TAM-TPB), and the innovation diffusion theory (IDT). This framework focuses on an organizational context and identifies the effect of key constructs, performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating condition (FC) on the technology use behavior and behavioral intention, considering the gender, age, experience, and voluntariness moderating factors (Venkatesh et al., 2003).

Based on gaps found in UTAUT, Venkatesh, Thong, and Xu (2012) extended UTAUT to develop UTAUT2 in the aim of improving the model in a consumer context by including the hedonic motivation (HM), price value (PV), and habit (HB) factors to the original model. The UTAUT model is widely used in predicting the acceptance of novel technologies at the firm and user levels (ALotaibi, Ramachandran, Ah-Lian, & Hosseinian, 2016; Bhatiasevi, 2016; Chang, Fu, & Jain, 2016; Madan & Yadav, 2018).

Lain (2015) adopted the UTAUT2 model to determine that EE, SI, trust in e-government, and perceived risk significantly affected the behavioral intention to adopt cloud-based e-invoicing by the Taiwanese government. Mathur and Dhulla (2014) built on the UTAUT2 to uncover that key determinants of CC adoption among chartered

accountants were PE, EE, SI, FC, HM, PV, and HB. Ooi, Lee, Tan, Hew, and Hew (2018) integrated the TOE and UTAUT models to determine that PE, FS, AC positively and significantly influenced innovativeness, whereas innovativeness impacted firm performance positively.

Literature Review

This section consists of a review of recent and relevant academic and professional literature related to this research. The focus of this study was to determine a justified and meaningful gap, identify a relevant problem, and demonstrate how grounded the dissertation is by relying on the TOE theoretical framework described above. Topics related to CC, the payment card industry, small-to-medium-sized firms, and the applicability of CC to small businesses are therefore developed.

Overview of Cloud Computing

Organizations are exploring new opportunities to create business value in this competitive and ever-changing technology landscape. CC has proven to help enterprises conduct business in new ways, by taking advantage of its various and evolving features (Attaran & Woods, 2018; Garrison et al., 2015; Kumar & et al., 2017). This section provides the history of CC, its definition, characteristics, and the deployment and service models.

Origin of cloud computing. The concept of CC is not entirely new, but this technology is globally considered an innovation because of its constant evolvement. Regalado (2011) traced the coinage of CC to 1996 by two individuals; George Favaloro

and Sean O'Sullivan, instead of a decade later, when large firms such as Amazon and Google started using this technology.

Cloud computing may be viewed in various ways. This technology has increasingly evolved from the era of timesharing when firms shared large and expensive computers, through the period when standalone computers were locally networked by the local area network (LAN), and remotely by the wide area network (WAN), to the world wide web (WWW) with the interactions between networks (Daylami, 2015). The cloud metaphor shifted from being a simple remote computing to an Internet-based computing service and a compute cloud or on-demand computing, and now considered as a means to get a task done (Daylami, 2015).

Definition of cloud computing. The definition of CC varies across the globe. The US National Institute of Standards and Technology (NIST) defines CC as "A model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of five essential characteristics, three service models, and four deployment models" (Mell & Grance, 2011, p. 2).

The NIST definition of CC is widely accepted and offers a better understanding of cloud technologies and services globally (Liu et al., 2011). Broadly, the deployment models are the hybrid, community, public, and private clouds, the service models are SaaS, PaaS, and IaaS, and essential characteristics are on-demand self-service, broad

network access, rapid elasticity, resource pooling, and measured service (CSA, 2017; Liu et al., 2011; Mell & Grance, 2011). These characteristics and other valuable information about CC are defined in the NIST CC reference architecture to facilitate its understanding.

The NIST CC reference architecture provides a clear taxonomy of the five main actors involved in CC, including the cloud carrier, cloud consumer, cloud provider, cloud broker, and cloud auditor (Liu et al., 2011). These actors interact with each other within the cloud environment. The cloud consumer is the main stakeholder, whereas the provider offers cloud services to consumers. The auditor performs independent service controls, the broker manages the CC and negotiates consumer and provider relationships, and the carrier handles cloud service connectivity and transport between the provider and the consumer (Liu et al., 2011).

Conversely, the selection of a suitable cloud deployment model, cloud vendor, cloud service models, and SLAs may guide consumers in assessing their cloud readiness (Alruwaili & Gulliver, 2018). Details on the characteristics, service models and deployments models, as referred by the NIST definition, will be discussed in the following sections.

Characteristics of cloud computing. The NIST definition suggests that cloud services exhibit the following five fundamental characteristics (Liu et al., 2011). Resource pooling is the key characteristic referring to the appropriation of resources into a pool by a cloud provider, and their allocation to various consumers. On-demand self-service defines the convenient provisioning of resources by consumers from the pool

without the need for external administration. Broad network access refers to the availability of resources over the network with no need to directly accessing them physically. Rapid elasticity feature enables consumers to either provision for or retract resources from the pool according to their needs. Measured service refers to gaging provisioned resources to ensure accountability with consumers using only the allocated shares.

Despite the universal acceptance of the NIST definition of CC, promoting security in cloud settings is essential. The ISO/IEC 17788 standard determined multitenancy as the sixth essential characteristic of CC and supported its difference from resource pooling and applicability across organizations and business units within an enterprise (CSA, 2017). The multitenant nature of cloud services allows consumers in various groups and locations to share the same pool of resources. This feature may have security implications with data being shared among potential untrusted tenants (CSA, 2017).

In addition to the essential characteristics, recent studies have found some common features of CC. Characteristics such as low cost, advance security, resilience, virtualization, homogeneity, geographical distribution, pay-as-you-go, pay-for-resource, reduced cost, flexibility, increased performance, and subscription have proven to equally attract consumers (Alkhater Walters, & Wills. 2014; Gupta & Saini, 2017; Kumra et al., 2017; Loukis et al., 2017).

Cloud computing service models. The following three main cloud service models prevail (Mell & Grance, 2011):

- PaaS: This model provides the aptitude for consumers to deploy their applications onto a cloud infrastructure with no control over the underlying architecture (Liu et al., 2011; Mell & Grance, 2011). Furthermore, the model offers virtualization, servers, network, and storage (Attaran & Woods, 2018).
- IaaS: This model refers to the capability that consumers can deploy and run software on the provisioned storage, networks, and other cloud resources (Mell & Grance, 2011). Consumers can neither manage nor control the underlying cloud infrastructure, but they have control over storage, operating systems, or the applications deployed (Liu et al., 2011; Mell & Grance, 2011).
- SaaS: This model allows consumers to use the applications owned by the provider on a cloud infrastructure by accessing them from various devices and interfaces (Mell & Grance, 2011).

The level of control over cloud service among the client and the provider generally relates to their responsibility. Typically, SaaS offers less amount of control to customers compared to PaaS, whereas IaaS delegates most control to customers (Alruwaili & Gulliver, 2018; Gupta & Saini, 2017).

Cloud service models are exposed to different security threats (Lalev, 2017). IaaS is the most popular and flexible with less delegation of security activities to the CSP, whereas the provider is mainly responsible for security updates for SaaS and PaaS (Lalev**,** 2017**;** Kumra et al., 2017**).** Therefore, as customers are often attracted to SaaS and PaaS because of reduced responsibility and savings on resources, they lose control of their cardholder data environment **(**"Cloud Special Interest Group PCI", 2018).

Cloud computing deployment models. The four cloud deployment models are described below, according to the NIST CC definition (Mell & Grance, 2011). These models are generally categorized based on the physical location of resources and the ownership and management of the infrastructure (CSA, 2011).

- Public cloud: In this setting, the cloud infrastructure is open for use to the public and generally belongs to a large organization.
- Private cloud: the cloud infrastructure is exclusively provisioned and used by a single enterprise consisting of multiple business units. This type of cloud may be on or off-premise, and locally or externally managed.
- Community cloud: the cloud infrastructure is exclusively provisioned and used by a specific community of consumers belonging to an organization with similar concerns or requirements like security, policy, compliance, and business model.
- Hybrid cloud: this model comprises two or more different deployment models discussed above, to improve redundancy, productivity, and load balancing.

Cloud technologies have shown a mixed impact on organizations across the world. This study focuses on small firms in the U.S. payment card industry.

The Payment Card Industry Overview

Balancing cashless transactions and security remains a challenge for the payment card sector with frauds and data breaches on the rise. Consumers' preferences in using cash are continuously declining, giving place to online and cashless transactions (Fish & Whymark, 2015). Consequently, merchants continuously enhance authentication models such as biometrics with fingerprint and voice recognition to minimize security attacks

and risks (Poole, 2017). While making a case on viable emerging technologies for the financial sector in Saudi Arabia. Alruwaili and Gulliver (2018) argued that CC could help organizations improve payment transactions, manage risks, and streamline business processes. However, being that the U.S. payment sector must protect cardholder data (CHD) and comply with the PCI DSS, it is essential these businesses assess their readiness to security, privacy, and compliance when considering cloud services for their CHD environment (Alruwaili & Gulliver, 2018; Kumra et al., 2017; PCI DSS, 2018).

Definition of the payment card industry (PCI). The Payment Card Industry (PCI) generally refers to firms that either store, process, or transmit cardholder information such as debit, credit, prepaid, ATM, and point of sale (POS) cards (Clapper & Richmond, 2016; Hemphill & Longstreet, 2016; Wamba, 2016; Yimam & Fernandez, 2016). This acronym originated from the creation of the PCI SSC (Council) in 2006 by major credit card brands such as American Express, VISA, JCB, Discover Financial Services, and MasterCard to enforce security standards and protect CHD through the PCI DSS globally (Clapper & Richmond, 2016; PCS SSC, 2018; Yimam & Fernandez, 2016).

PCI DSS compliance requirements. PCI DSS aims at achieving six collective goals and 12 requirements. The PSS DSS goals address vulnerabilities related to payment data security and provide organizations with techniques to manage these weaknesses, whereas the 12 PSS DSS requirements help organizations minimize security breaches associated with payment card data (Hemphill & Longstreet, 2016; PCI SSC, 2018).

Figure 4 provides an overview of the PCI DSS goals and requirements to protect cardholder data, and sensitive authentication data (SAD) displayed or stored in the

payment card are described below according to PCI DSS (2018, p. 5). While these requirements are mainly developed to guide merchants, processors, issuers, acquirers, and services providers.in adopting a minimum set of security requirements for protecting CHD and SAD, they are evaluated yearly by qualified security assessor (QSA) to validate compliance with PCI DSS (Clapper & Richmond, 2016; Hemphill & Longstreet, 2016; PCI SSC, 2018).

According to the PCI SSC (2018), organizations generally perform the following tasks to comply with PCI DSS: (a) determine the scope of cardholder data environment, (b) assess the compliance of their system, (c) report and document the findings by providing a report of compliance (ROC) or a self-assessment questionnaire (SAQ), (d) complete the attestation of compliance (AOC, (e) submit the SAQ, AOC, and a ROC and any other reports to the acquired for merchants, or the payment bank for service providers, and (f) remediate any vulnerabilities from the assessment, and update the report.

Goal#1: “Build and maintain a secure network and systems”
Requirement 1: “Install and maintain a firewall configuration to protect cardholder data.”
Requirement 2: “Do not use vendor-supplied passwords and other security parameters.”
Goal#2: “Protect cardholder data”. The PCI DSS requirements for ensuring that CHD is secure are:
Requirement 3: “Protect stored cardholder data’
Requirement 4: “Encrypt transmission of cardholder data across open, public networks”
Goal#3: “Maintain a vulnerability management program”. Requirements to protect sensitive data
Requirement 5: “Protect all systems against malware and regularly update anti-virus software or programs”
Requirement 6: “Develop and maintain secure systems and applications”
Goal#4: “Implement strong access control measures”. The three requirements below ensure proper authentication, authorization, and physical access to CHD and SAD.
Requirement 7: “Restrict access to cardholder data by business need to know”
Requirement 8: “Identify and authenticate access to system components”
Requirement 9: “Restrict physical access to cardholder data”
Goal#5: “Regularly monitor and test networks”. The PCI DSS requirements to ensure that vulnerabilities are monitored and tested on a regular basis are below.
Requirement 10: “Track and monitor all access to network resources and cardholder data”
Requirement 11: “Regularly test security systems and processes”
Goal#6: “Maintain an information security policy”. To ensure that organization and third parties properly manage their security procedures and policy, the PCI DSS requirement states:
Requirement 12: “Maintain a policy that addresses information security for all personnel”

Figure 4. Overview of Payment Card Industry Data Security Standard goals and requirements. Adapted from “PCI DSS Quick Reference Guide. Understanding the Payment Card Industry Data Security Standard version 3.2.1,” by PCI SSC, 2018, p. 5.

Security and the payment card industry. Despite the enforcement of PCI DSS requirements, data and security breaches still occur. Large-scale data breaches with BJ’s, Heartland Payment Systems, J.P. Morgan, Target Corporation, TJX, Home Depot, and K-Mart have intensified, incurring significant financial losses (Hemphill & Longstreet, 2016; Patty & Andrew, 2015). Card-no-present (CNP) and other fraudulent activities are

on the rise despite security enhancements. Among these improvements are the identification (ID) and verification (V) processes (ID&V), biometrics with voice recognition, facial recognition, fingerprint recognition, online banking ePayments (OBeP), tokenization, password authentication, three-factor authentication, 3-D Secure (3DS) methods machine learning, and EMV (Europay, MasterCard, and Visa) (Froud, 2016; Hemphill & Longstreet, 2016; Poole, 2017).

Pondering whether PCI DSS is enough to protect cardholder data and sensitive authentication data, Wamba (2016) strongly supported that this standard becomes mandatory to every entity handling cardholder data. The PCI DSS is not legally required by the U.S. government, while federal regulations are legally obligated. Conversely, non-compliance fines, and sanctions with the possibility of business closures are possible (Hemphill & Longstreet, 2016; Wamba, 2016).

Major federal regulations and standards. In addition to the PCI DSS, other major regulations and standards are summarized in the following section. These mandates are designed for specific business sectors and requirements (Phaphoom et al. 2015; Yimam & Fernandez, 2016; Shi, Xia, & Zhan, 2010).

- The Healthcare Insurance Portability and Accountability Act (HIPAA) is a federal regulation that ensures the privacy and security of Protected Health Information (PHI) such as patient's medical records, personal, credit, insurance, employment, and any other information capable of exposing individuals' identity.

- The Sarbanes-Oxley Act is a federal regulation that establishes standards for publicly traded companies in the United States to protect the general public and shareholders from frauds and accounting errors.
- The Gramm-Leach-Bliley Act (GLBA) is a federal regulation that requires firms offering financial services and products to maintain a security program capable of preserving consumers' confidentiality and integrity.
- The Federal Information Security and Management Act (FISMA) is a federal government regulation that applies to government agencies and affiliates
- The ISO/IEC 27000 is an IT industry regulation for general security guidelines to all types of organizations.

Overview of Small and Medium-Sized Enterprises

Small businesses are essential to economic growth around the world. Although they are increasingly adopting CC to save time and money, and improve their businesses, many small enterprises are still hesitant toward this technology (Attaran & Woods, 2018; AlSharji, Ahmad, & Abu Bakar, 2018; Senarathna et al., 2018; Watad et al., 2018). The following sections describe SMEs and outline potential security and compliance challenges generally faced.

Definition of SMEs. The definition of SMEs in the literature remains inconsistent across businesses and countries. The size and economic turnover generally categorize these organizations that are commonly described as small businesses (Attaran & Woods, 2018; Maduku, Mpinganjira, & Duh, 2016; Phaphoom et al., 2015; Senarathna et al., 2018). A small business in the United States is defined as an independent company

having fewer than 500 employees (SBA, 2018a). Whereas, firms with less than 250 employees are considered SMEs in other parts of the world (Ayyagari, Beck, & Demirguc-Kunt, 2007; Carcary et al., 2014).

Characteristics of SMEs. SMEs are essential to the global economy, considering their high job creation. SMBs comprise over 95% of businesses with more than 60% of employment in the public sector worldwide (Ayyagari et al., 2007; Ayyagari, Demirgüç-Kunt, & Maksimovic, 2011; Senarathna et al., 2018). Whereas in the United States, they accounted for 66% net new jobs, with 8.4 million new employments created between 2000 and 2017, while larger businesses added 4.4 million net new jobs during the same period (SBA, 2018a, 2018d). Moreover, small firms hired 47.5% of employees in the private sector, encompassing 99.9% of businesses, as depicted by Figure 5 (SBA, 2018a).

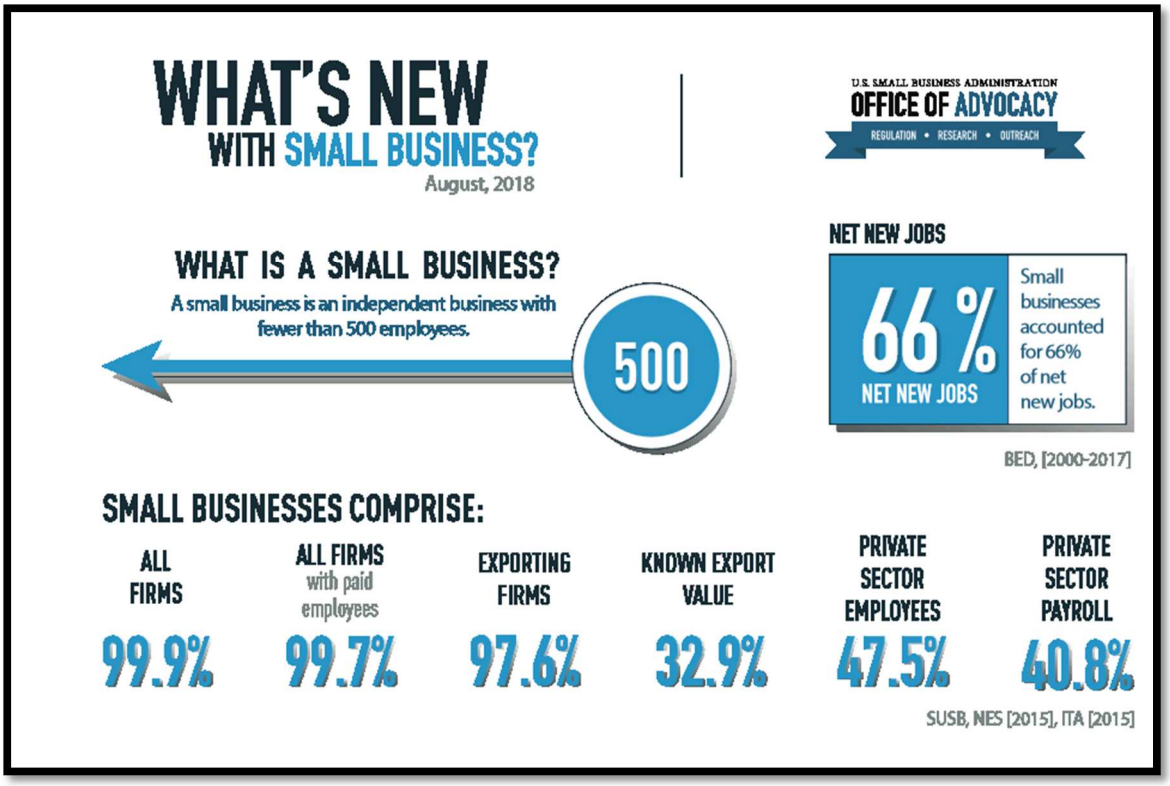

Figure 5. Definition of a small business from "What's New with Small Business?" by the U.S. Small Business Administration, Office of Advocacy, 2018a, p.1. Reprinted with permission by the publisher (see Appendix F).

The survival rate of U.S. small businesses hovers around 50% the first five years, and about 33% after 10 years and more, whereas about 8% of startup SMEs have opened and closed each year since 2010 (SBA, 2018d). A similar survival trend is observed globally (Ayyagari et al., 2007, 2011). Carter and Auken (2006) reviewed the important contribution of small firms in the U.S. economy and determined that the main causes of bankruptcy were the lack of knowledge, inaccessibility to debt, and the economic climate. The authors also found that bankrupt firms were older, in the retail industry, and organized as a partnership. In contrast to larger organizations that are more successful because of advanced skill sets, technologies, capital, processes, and procedures, SMEs

rarely stay and excel in business (Ahani et al., 2017; AlSharji et al., 2018; Senarathna et al., 2018). Thus, the identified low survival rate.

The limited IT budget and personnel generally characterize SMEs. This limitation impedes the security of their data and exposes small businesses to criminal attacks (AlSharji et al., 2018; Priyadarshinee, Raut, Jha, & Kamble, 2017; Senarathna et al., 2018). Symantec reported a dramatic increase in cyberattacks on U.S. small businesses since 2011, with about 43% targeted in 2015 (Sophy, 2016). Whereas, in their study on IT security threats and challenges faced by small firms located in the New-York and New-Jersey metropolitan area, Watad et al. (2018) determined that small businesses barely perceived security tools for their core business competency, due to their lack of knowledge and awareness of required needs and skillsets. Conversely, Kabanda, Tanner, and Kent (2018) argued that top management support, attitudes, and budget influenced South African SMEs' perceptions on cybersecurity.

Small firms generally struggle with achieving regulatory compliance. In their study on small enterprises and their compliance with the PCI DSS, Clapper and Richmond (2016) found that only 10% of SMEs in North Carolina were compliant with PCI DSS. The authors inferred that this standard highly depends on the firm's intention to comply, which is often influenced by awareness, peer behavior, self-efficacy, normative beliefs, the value of complying, and the cost of compliance.

Although SMEs are generally unwilling to adopt innovation, recent studies encourage these enterprises to assess the fitness of CC and other emerging technologies such as CRM, e-commerce, BDA, social media, ERP, and mobile marketing, before

adopting them (Ahani et al., 2017; Attaran & Woods, 2018; Olufemi, 2019; Priyadarshinee et al., 2017).

SMEs and Cloud Computing Adoption

While some organizations tout the perceived advantages of CC, others remain reluctant to embrace this new technology. Small businesses are among those hesitant in adopting this phenomenon as they struggle with technical skillsets and find cloud technology not worth the praises (AlSharji et al., 2018; Attaran & Woods, 2018; Watad et al., 2018). The following sections describe SMEs and their perceived benefits and trials, and ends with a review of recent literature on their CC adoption.

Advantages of cloud computing for small businesses. Recent development in innovative technologies motivates researchers to examine practices and solutions capable of helping small firms improve their business and sustain a competitive advantage. In general, CC provides virtualized environments and on-demand provisioning to distributed systems, with minimal management intervention or interaction of the service provider (Mell & Grance, 2011). Conversely, this setting allows services to be accessed everywhere and anywhere with features such as pay-as-you-go, reduced cost, flexibility, and increased performance (Alkhater et al., 2014; Senarathna et al., 2018).

Similarly, CC defines the way SMEs conduct business. Small businesses may take advantage of this technology by (a) reducing cost associated with capital investment on software and hardware, (b) creating a greater integration of their applications, (c) improving the collaboration of their workplace and improving productivity, (d) increasing the flexibility of hardware and software being accessible anytime and

anywhere, (e) enhancing the reliability of their services delivered from various data centers, (f) improving their competitive advantage with enterprise infrastructures allowing them to compete with more established organizations, (g) and improving the carbon footprint considering the economic and environmental friendly nature of CC (Adane, 2018; Attaran & Woods, 2018; Priyadarshinee et al., 2017; Senarathna et al., 2018). Despite these exploits, some small firms are unwilling to shift their existing systems to a cloud setting.

Challenges of cloud computing for small businesses. Notwithstanding the various benefits of CC for SMEs, numerous obstacles prevent these organizations from fully taking advantage of the technology. According to a 2017 survey by Rightscale (2017), the most challenging hurdles for SMBs that usually prevent them from adopting CC are: (a) insufficient resources and expertise to rapidly implement CC, (b) the lack of implementation time for new initiative considering their limited personnel, (c) management of cost related to maintaining business on the cloud, and (d) security and data control on a shared cloud.

Khan and Al-Yasiri (2016) asserted that other threats to CC adoption were: customer data manipulation, virtual machine (VM) escape, VM hoping, data scavenging, service hijacking, data leakage, denial of service, sniffing or spoofing of virtual networks, insecure MV migration, and malicious VM creation.(Khan & Al-Yasiri, 2016). Whereas, a synopsis of the review of literature on CC adoption by SMEs worldwide found legal compliance, availability and reliability, little control over services, uncertainty, peers

influence, security, and privacy among hindrances (Alsmadi & Prybutok, 2018; Raj, 2018; Senarathna et al., 2018; Vasiljeva et al., 2017).

Cloud computing adoption is perceived differently across businesses and countries. Hwang, Al-Arabiat, and Shin (2016) noted the significance of the acceptance of a technology when its usage is mandatory. Whereas, Candel, Kretschmer, and Strobel (2016) overstated the importance to understand the use of CC within a company to effectively assess potential cloud economic mechanisms. Hwang et al. reiterated management struggles in instilling positive attitudes toward using a mandatory novel system. While Candel et al. echoed the necessity to know the firm's main objective for using cloud services, and encouraged studies on cloud technology based on business sectors considering the variation of cloud adaptiveness across industries. The following section provides a review of recent studies on CC adoption by SMEs at a global perspective.

Cloud Computing Adoption by SMEs Across Countries and Industries

Special interest is placed on CC technologies because of numerous benefits for SMEs. Attaran and Woods (2018) alluded that CC was a viable option for SMBs because of the associated time and cost savings. Studies on the suitability of CC for small businesses are increasingly popular around the world and across industries, as these small firms take advantage of the power of the internet to grow their businesses.

Senarathna et al. (2018) collected online survey data from 149 SMEs about the technological, environmental, and organizational factors significantly impacting their decision to adopt CC. A regression analysis indicated that organizational characteristics

like relative advantage, quality of service, and awareness significantly influenced their decision rather than risk-related factors such as security, privacy, and flexibility.

Alshamaila et al. (2013) conducted a qualitative explorative analysis from semi-structured interview data of 15 SMEs about their attitudes toward their intention to accept CC. The findings revealed that relative advantage, geo-restriction, uncertainty, compatibility, trialability, size, top management support, prior experience, innovativeness, industry, market scope, external computer support, and supplier efforts significantly influenced CC adoption. Whereas, competitive pressure did not play a significant role in this decision.

Phaphoom et al. (2015) recounted the experience of two small businesses providing SaaS, and proposed a cloud implementation framework capable of improving their business goals. The firms, EVE (EVEnt organizer) and HSC (Healthcare Supply Chain provider), were respectively mandated to comply with the PCI-DSS and HIPAA standards. The authors suggested IT implementation actions such as IT infrastructure and service management, and IT governance. They outlined cloud implementation outcomes such as the simplified IT resource management, enhanced quality of service, and supporting growth.

Adane (2018) explored CC adoption strategies of 261 small businesses. The authors determined that an acceptance strategy including goals, a roadmap, and other considerations such as time frame, resources, and business applications could be prominent in helping these small firms meet CC expectations and enhance competitiveness.

Carcary, Doherty, Conway, and McLaughlin (2014) conducted a survey questionnaire of 95 firms with fewer than 250 employees, about the approaches adopted to migrate to CC and the potential benefits. The statistical analysis revealed that current CC practices tailored for large firms should be modified for effectiveness on small organizations, considering their low requirements and business processes.

Vasiljeva, Shaikhulina, and Kreslins (2017) evaluated the familiarity of 86 SMEs with CC and the impact of its adoption on business performance. The authors highlighted the potential and future CC services. The findings indicated that 98% of SMEs were aware of CC, while 88% already used it mostly for storage and backup solutions, web-based email, and online office software. Moreover, Vasiljeva et al. determined that CC promoted cost savings with 42% of participants using public cloud and 49% adopting SaaS, and 50% of respondents assuring to use CC in the next future. However, 42% of firms remained hesitant to accept CC because of reasons like legal compliance, unclear payment model, the integration with IT infrastructure, availability and reliability, little control over services, and sensitive data security and privacy.

The studies summarized in this section outline the positive influence of CC features on its adoption by small businesses globally. However, they could not be generalized since technological skills and expectations may vary, thus the need for studies on CC within industry sectors (Candel et al., 2016). In this prospect, I aimed at determining the predictability of CC adoption by small firms in the U.S. payment sector, based on the security, cost, and compliance factors.

Development of Constructs and Hypotheses

This study was guided by the TOE framework to evaluate innovation characteristics SE, RC, and CE on DA by U.S. small markets in the payment card industry. According to Hsu and Lin (2016), perceived security related to the positive attitude knowing that CC is risk-free, regulatory environment referred to the support of regulations for secure cloud services, and financial obligations defined the low cost associated with CC implementation by businesses. Although SMEs are attracted by the cost savings associated with CC, the uncertainty flagging security and regulation concerns inhibits the willingness of those in the financial sector to adopt this solution (Alruwaili & Gulliver, 2018; Gupta & Saini, 2017; Kumra et al., 2017). While the studied constructs may have various definitions, in the context of this project, I defined them as it follows:

The technological perspective. This context focuses on the technological characteristics capable of influencing the adoption of an innovation (Hsu & Lin, 2016; Tornatsky & Fleischer, 1990). The security construct in the TOE context refers to protecting cardholder information from unauthorized access, breaches, modifications, and deletions (Hemphill & Longstreet, 2016). Security is generally a crucial factor in the adoption of any novel technology (Alruwaili & Gulliver, 2018; Gupta & Saini, 2017; Kumra et al., 2017). Moreover, many studies have found security, privacy, and compliance (ISPC) concerns a typical reason for the lack of interest in CC (Alruwaili & Gulliver, 2018; Gupta & Saini, 2017).

Istikoma, Nurul, Qurat-ul-Ain, and Ibrahim (2015) highlighted the need to align information security to the overall business strategy to effectively handle risks and ensure good corporate governance, improved information security, and validation to compliance mandates. Small businesses handling payment card data must protect consumers' sensitive data and comply with regulations to satisfy their customers, increase sales, and avoid non-compliance fines and sanctions (Awiagah, Kang, & Lim, 2016; Hemphill & Longstreet, 2016). Therefore, mature security measures exert a positive effect on CC adoption (Alruwaili & Gulliver, 2018; Gupta & Saini, 2017; Kumra et al., 2017).

In the context of this study, SE defined the extent at which security concerns may impede CC adoption. Thus, the following hypotheses to support this technological construct:

H1o: There is no correlation between security and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

H1a: There is a correlation between security and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

The environmental perspective. This context addresses constructs associated with the regulatory environment, the external partners, the industry, and the technological support for resources (Tornatsky & Fleischer, 1990). Yimam and Fernandez (2016) defined regulations as "sets of policies that govern the use of sensitive business data" (p. 1). Whereas, Jansen and Grance (2011) referred to compliance as "an organization's

responsibility to operate in agreement with established laws, regulations, standards, and specifications" (p. 15). Security and privacy laws differ in countries, states, and cities, complicating compliance in CC settings (Jansen & Grance, 2011). Thus, the requirement for organizations handling cardholder information to comply with PCI DSS (Clapper & Richmond, 2016; Hemphill & Longstreet, 2016; Yimam & Fernandez, 2016).

While an organization retains the ultimate responsibility for compliance, regulatory enabling conditions generally stimulate the adoption of technologies by providing a practical and reliable environment that facilitates the achievement of standards (Awiagah et al., 2016; Hemphill & Longstreet, 2016). However, Jaatun, Pearson, Gittler, Leenes, and Niezen (2015) highlighted the importance of firms' accountability in a cloud setting by instilling reliability, responsibility, and trust between clients and cloud providers. Jaatun et al. also argued that accountable organizations should a) demonstrate that they are willing and capable of being responsible for their data, b) define policies on data practices, c) keep to their promises, d) monitor data practices, e) correct policy violations, and f) demonstrate compliance.

In the context of this study, the regulatory compliance construct referred to a firm's adherence to regulations and guidelines that are relevant to the business processes, to avoid non-compliance penalties (Hemphill & Longstreet, 2016). Thus, RC defined the extent at which the PCI DSS regulatory compliance instructed to firms in the payment sector may be achieved in a CC environment. Hence, the following hypotheses to support the environmental construct:

H2o: There is no correlation between regulatory compliance and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

H2a: There is a correlation between regulatory compliance and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

The organizational perspective. This context consists of processes, resources, and characteristics such as size related to the organization (Tornatsky & Fleischer, 1990). According to the literature on innovation, cost advantage is a significant factor in adopting new technologies (Ahani et al., 2017; Ilin, Ivetic, & Simic, 2017; Tornatsky & Klein, 1982). Tornatsky & Klein (1982) argued that "The cost of an innovation is assumed to be negatively related to the adoption and implementation of the innovation; the less expensive the innovation, the more likely it will be quickly adopted and implemented" (p. 36).

As a novel technology, CC has proven to decrease IT costs with its pay-as-you-go nature and minimum setup-up, training, management, and operations expenses (Alkhater et al., 2014; Hsu &Lin, 2016; Kumar et al., 2017). Being that monetary resources are a typical concern for small businesses, high-cost IT investments often obstruct their willingness to adopt CC (Ahani et al., 2017; Kumar et al., 2017; Lalev, 2017). Therefore, the cost savings satisfaction with cloud services may motivate small businesses to accept this initiative.

In the context of this study, the cost-effectiveness variable defined the cost benefits associated with the adoption of technology (Hsu &Lin, 2016). Therefore, CE referred to the extent at which low cloud-related costs may motivate its acceptance by SMEs in the U.S. payment industry. Thus, the subsequent hypotheses to support this organizational belief:

H3o: There is no correlation between cost-effectiveness and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

H3a: There is a correlation between cost-effectiveness and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

Summary and Conclusions

From the literature review, it is clear that cloud-native technologies have evolved and matured significantly in recent years. Despite numerous empirical studies on the suitability of CC for businesses, the focus on specific business sectors and localities is limited (Alruwaili & Gulliver, 2018; Candel et al., 2016; Kumar et al., 2017). The review of literature covered many aspects of CC, small firms, the payment card industry, and the TOE framework. The complete review of the resources gathered for my study allowed me to identify the gaps in the understanding and acceptance of CC by small firms in the U.S. payment card sector.

Particular interest was given to CC because of its various advantages in helping organizations leverage their IT and maintain a competitive advantage (Candel et al.,

2016; Kumar et al., 2017; Phaphoom et al., 2015). The exhaustive literature review reiterated the importance of small businesses in the global economy and outlined their struggles due to the limitations and deficiencies in resources, security, expertise, and technology (SBA, 2018a; Senarathna et al., 2018; Watad et al., 2018).

Researchers have considerably elaborated on the reluctance toward CC adoption by assessing the driving factors across businesses and boundaries (Awiagah et al., 2016; Liang et al., 2017; Opala, 2012; Yimam & Fernandez, 2016). The variables of CE, SE, and RC were the focus of this study, due to their importance for small businesses and the payment card sector (Hemphill & Longstreet, 2016; Watad et al., 2018; Yimam & Fernandez, 2016). While Opala (2012) built on the UTAUT model to demonstrate that security, IT compliance, and cost-effectiveness were key factors of CC acceptance by IT leaders in U.S. Fortune 500 or Forbes 100 organizations, this study used the TOE framework to evaluate similar variables to explain the CC reluctance by small U.S. enterprises in the payment card sector.

I will describe the research method used in this study in Chapter 3. That chapter includes the research design and rationale, the methodology, the data analysis plan, the threats to validity, and any potential ethical violations. I will also provide a detailed explanation of each topic including, the research variables, questions, hypotheses, statistical methods, and the relationships between variables with the level of significance.

Chapter 3: Research Method

The purpose of this quantitative correlational research was to determine to what extent, if any, there is a relationship between the three independent variables—SE, RC, and CE—and the dependent variable, DA, the decision to adopt CC by senior executives, IT managers, and business owners in small firms handling payment card data in the United States. This chapter includes the research design along with the research questions and hypotheses, the target population, the research sample, and the sampling methods. Other components of this chapter consist of the recruitment, participation, and data collection procedures, the data analysis plan, threats to validity, ethical considerations, and the instrumentation and operationalization of constructs techniques. This chapter ends with a summary and a transition to the next chapter.

Research Design and Rationale

Research Variables

The focus of this study was to investigate the influence of SE, RC, and CE on the CC adoption decision by leaders of small firms in the payment card sector operating in the United States. I selected the survey instrument by Opala (2012) previously used to assess the impact of security, IT compliance, and cost-effectiveness on CC acceptance decision by IT leaders in U.S. Fortune 500 or Forbes 100 firms for this research. As depicted by the CC adoption survey in Appendix D, the outcome variable was DA (Items 22–25), while the predictors were SE (Items 10–13), CE (Items 14–17), and RC (Items 18–21).

Research Design

I used a quantitative correlational research design in this study to investigate relationships between three independent variables and a dependent variable. Quantitative studies generally assess numerical data with objectivity, whereas qualitative researchers typically focus on exploring and describing a phenomenon of interest for a better understanding (Ravitch & Carl, 2016). This research was intended to neither describe nor explore a phenomenon, hence the inappropriateness of qualitative analysis. Mixed methodology combines both qualitative and quantitative research and is typically suitable for studies requiring both inductive and deductive analysis (Babbie, 2017). This methodology was not appropriate for this study because it would add another layer of complexity to the research by expanding its scope and applicability.

Researchers widely use correlation to test hypotheses. Wagner (2016) argued that correlations show the extent of the relationship between variables. This design approach was appropriate for this study because it addressed the three research questions and hypotheses by evaluating the existence of a correlation between the dependent variable and independent variables (Frankfort-Nachmias & Leon-Guerrero, 2018; Warner, 2013). Moreover, recent studies evaluated correlations between innovation characteristics and CC adoption (Alkhater Walters, & Wills, 2017; Noor, 2016).

Alkhater et al. (2017) estimated the relationships between security, privacy, trust, quality of service, and technology readiness and the cloud acceptance by private sector firms. Similarly, Noor (2016) demonstrated that availability, reliability, compliance, security, and privacy are hindrances of CC in universities. However, studies assessing the

influence of security, regulatory compliance, and cost-effectiveness, on the decision to adopt CC by decision-makers in small firms in the U.S. payment card sector are nonexistent in the literature. The results of this study determined that, while cost effectiveness and regulatory compliance significantly predicted the decision to adopt CC by small U.S. businesses in the payment card industry, all three independent variables correlated individually with the outcome variable.

The role of the researcher in any academic study is important. In contrast to the qualitative researcher being the primary instrument of the study (Ravitch & Carl, 2016), my role in this project was limited to (a) ensuring that the adopted survey instrument was properly configured within the research service, (b) collecting anonymous and relevant data, and (c) statistically analyzing and interpreting the data collected.

Methodology

This quantitative study used a survey questionnaire to gather the perceptions of leaders in small U.S. payment card firms toward CC adoption. This research method allowed me to collect data from a large number of participants who met specific requirements (Frankfort-Nachmias, & Leon-Guerrero, 2018; Warner, 2013). Online surveys are frequently used by researchers to collect valuable data from respondents. Phaphoom, Wang, Samuel, Helmer, and Abrahamsson (2015) collected web-based survey questionnaire data from 352 participants about their professional opinion on CC. The findings of a quantitative analysis of the data collected determined that security, data privacy, and portability or vendor lock-in inhibited the acceptance of this solution.

Opala's (2012) survey instrument, previously tested for validity and reliability, was used for this study. Consequently, a pilot study was not necessary. Opala (2012) adapted Venkatesh et al.'s (2003) instrument to demonstrate that security, IT compliance, and cost effectiveness significantly influenced the decision to adopt CC by IT managers from Fortune 500 or Forbes 100 enterprises in the United States. Recent studies have built on Venkatesh et al.'s survey instrument to validate the relevance of key constructs PE, SI, EE, FC, hedonic motivation, price value, and habit.

Celik (2016) extended the UTAUT framework to describe how anxiety impacted the adoption of online shopping. Whereas, Madan and Yadav (2018) determined that perceived usefulness mobile skillfulness, enjoyment, relationship drivers, and innovativeness were key factors of mobile shopping acceptance.

In the context of this study, the survey instrument by Opala (2012) focused on gathering respondents' answers to close-ended questions on potential influencing factors of CC acceptance by small U.S. payment card markets. A comprehensive discussion on the target population, sampling procedures, instrumentation, and operationalization of constructs is provided in subsequent sections.

Population

The target population for this study consisted of decision-makers older than 18, who either owned or worked for a small business in the payment card industry operating in the United States and were part of either the SurveyMonkey audience or the Walden University Participant Pool. Frankfort-Nachmias and Leon-Guerrero (2018) defined a population as "the total set of individuals, objects, groups, or events in which the

researcher is interested" (p. 438). Qualified participants were expected to meet the following three characteristics: (a) be a senior executive, IT manager, or business owner; (b) work with an independent U.S. firm with fewer than 500 employees; and (c) their firm must either store, transmit, or process cardholder data. Familiarity with CC was not a requirement in this study, but IT security and compliance awareness may help participants in SMEs in understanding payment data protection and validation on the cloud (Alruwaili & Gulliver, 2018; Kumra et al., 2017).

According to the SBA Office of Advocacy (SBA, 2018d), about 30.2 million small businesses existed in the United States in 2015; 19,464 were large businesses. A 2017 survey by Greene and Starvins (2018) indicated that U.S. consumers older than 18 make an average of 70 payments monthly, with 32% debit card transactions, 27% cash purchases, and 23% toward credit cards. Similarly, the 2018 Federal Reserve System outlined a robust increase of 10.1% in the number of total U.S. card payments and 8.4% by value from 2016 to 2017. They found evidence of continuous growth of payment card transactions.

With the high number of small businesses in the United States and the continuous use of payment cards, it was essential to select a suitable population that could improve the generalizability of the findings of this study. However, it was impracticable to survey over 30.2 million small business owners, IT managers, and senior executives in the United States. The cost and time constraints associated with collecting data from members of the target actual population generally contribute to my decision to select small samples (Warner, 2013). Thus, the population for this study was framed from the

SurveyMonkey audience and the Walden University Participant Pool, where participants voluntarily took the online survey based on the three study criteria (SurveyMonkey, 2019c, 2019d; Walden University, 2019).

SurveyMonkey is a professional online platform with over 50 million people worldwide readily available to participate in surveys (SurveyMonkey, 2019d). The Walden University Participant Pool is a bulletin board where Walden researchers connect to participants virtually (Walden University, 2019). SurveyMonkey takers are highly committed volunteers who do not get paid but receive a 50-cent donation to their chosen charity for every answered survey (SurveyMonkey, 2019a, 2019b). Research studies posted on the Walden site are available to the Walden community willing to participate with no incentive (Walden University, 2019). The Walden Participant Pool was considered a contingent plan in case I was unable to collect enough data from SurveyMonkey.

Demographic information, including gender, ethnicity, age, professional title, size of the firm, business type, PCI-DSS compliance obligation, education, and years of experience with CC, were anonymously collected. SurveyMonkey (2019a) keeps respondents' information confidential for statistical purposes. Demographic questions allow researchers to categorize respondents into diverse characteristics (Naidoo & Hoque, 2018). This effort improved the focus of this study on the three main criteria and helped determine the ideal sample for the research.

Sampling and Sampling Procedures

Obtaining the appropriate sample from the target population contributed to the quality of this study, by accurately representing the entities of interest. Conversely, the sampling technique used in selecting a subset of members from a pool may determine how the sample is representative of the actual population (Frankfort-Nachmias & Leon-Guerrero, 2018; Warner, 2013).

Sampling refers to "the process of identifying and selecting the subset of the population for study" (Frankfort-Nachmias & Leon-Guerrero, 2018, p. 439). Whereas, a sample refers to "a subset of case selected from a population" (Frankfort-Nachmias & Leon-Guerrero, 2018, p. 439). The ideal would be to randomly select members of a population by giving them an equal chance to be part of the research sample (Etikan et al., 2016; Warner, 2013). But random sampling procedure can be rigorous and costly, thus the widespread use of nonprobability sampling where participants may have zero chance to be surveyed (Etikan et al., 2016; Warner, 2013). Conversely, I used a sampling from the SurveyMonkey Audience in this study (SurveyMonkey, 2019c). Whereas, I considered the Walden Participant Pool to improve the recruitment rate of volunteer participants.

Over 500,000 members of the SurveyMonkey Audience are readily available at any time to take a survey (SurveyMonkey, 2019c). According to SurveyMonkey (2019c), this group of participants is chosen from a larger population, knowing that not all members have the same chance to be selected. For this study, SurveyMonkey sent web-based survey email links to conveniently available respondents meeting the inclusion

criteria of: (a) being either an adult senior executive, IT manager, or business owner, (b) working for a small U.S. firm, and (c) the firm either store, process, or transmit payment card data. Conversely, the survey link from SurveyMonkey was posted on the Walden Participant Pool to collect data from Walden members.

An accidental or convenience sampling technique was used in this study. This sampling technique "consists of participants who are readily available to the researcher" (Warner, 2013, p. 4). The sample for this study was drawn from the SurveyMonkey voluntary pool and the Walden Participant Pool based on the willingness to participate in the survey and the inclusion characteristics. Hence, the suitability of the nonprobability convenience sampling for this research. Besides, this sampling method is widely used in research (Hassan et al., 2017; Verma, Bhattacharyya, & Kumar, 2018).

Hassan et al. (2017) employed the convenience sampling technique to recruit participants from 132 Malaysian SMEs during workshops, to determine the relationship between CC adoption and perceived benefits (PB), TMS, IT resources (ITR), and EP. Whereas, Verma et al. (2018) investigated managers' attitudes toward the acceptance of big data analytics (BDA) in India, and used this sampling method to collect survey questionnaire data from 150 users of BDA systems such as Hadoop, Netezza, MapReduce, SAP Hana, SQL stream s-Server, Tableau, and Apache Mahout. Similarly, Ratten (2015) recruited university students in the United States and Turkey using the convenience sampling technique to examine factors influencing their intentions to purchase CC. The findings of the statistical analysis revealed that perceived usefulness,

perceived ease of use, performance expectancy, and consumer innovation had similar effects on CC acceptance.

Despite the popularity and convenience of this sampling technique, researchers found it to have little or no external validity, with the propensity of being subjected to biases and outliers (Etikan et al., 2016; Farrokhi & Mahmoudi-Hamidabad, 2012). Nevertheless, conveniently using the online pool from the SurveyMonkey Audience allowed me to select a suitable sample and incur low cost with lesser rigor compared to a random sampling technique (Etikan et al., 2016; SurveyMonkey, 2019c; Warner, 2013). Subsequently, I used the GPower 3.1.9.2 software to estimate the suitable a-priori sample size from the SurveyMonkey Audience pool, through power analysis.

The G*Power software is popularly used in quantitative studies to assess the power analysis and the effect size and to display graphical results of various tests (Fail, Erdfelder, Buchner, & Lang, 2009). Similarly, So (2016) used this tool to reveal the medium to large strength ($f^2 = .297$) of the intervention of WhatsApp application in the learning improvement across two groups of students at a training institute in Hong Kong.

A priori F-distribution test was conducted for this study, using multiple linear regression as the primary statistical method with the fixed model, R2 deviation from zero effects. A priori analysis allows the researcher to compute the appropriate sample size by defining the desired significant level, statistical power, and population effect size to be detected (Fail et al., 2009). For this study, the input parameters used with the GPower software were: (a) F-tests, (b) statistical power (1-β) of 0.95,(c) number of predictors of 3, (d) a medium effect size (f^2) of 0.15, and (e) the level of significance (α) of 0.05.

Based on this power analysis (see Figure 6), a minimum sample size of 119 at 95% confidence interval was deemed suitable for this study. Henceforward, these preliminary results indicated the sample size of 119, while assuming a priori power analysis with $\alpha = 0.05$, $\beta = 0.95$, and $f^2 = 0.15$, and using an F-test linear multiple regression, fixed model, and R^2 deviation from zero (Fail, 2009; "G*Power", 2014). The Cohen's effect $f^2 = 0.15$ was greater than the small effect (0.1), but lower than the medium (0.25) and large effect (0.4), thus a small to medium strength of relationships amongst variables (Cohen, 1988).

The sample size of 119 was consistent with studies by Verma et al. (2018) and Hassan et al. (2017), that used respectively 150 users and 132 SMEs. This sample size was appropriate to answer the research question using Opala's (2012) survey instrument. Thus, indicating that this study consisted of three predictor variables and one outcome variable, with a sample size of 119 determined using GPower 3.1.9.2 software.

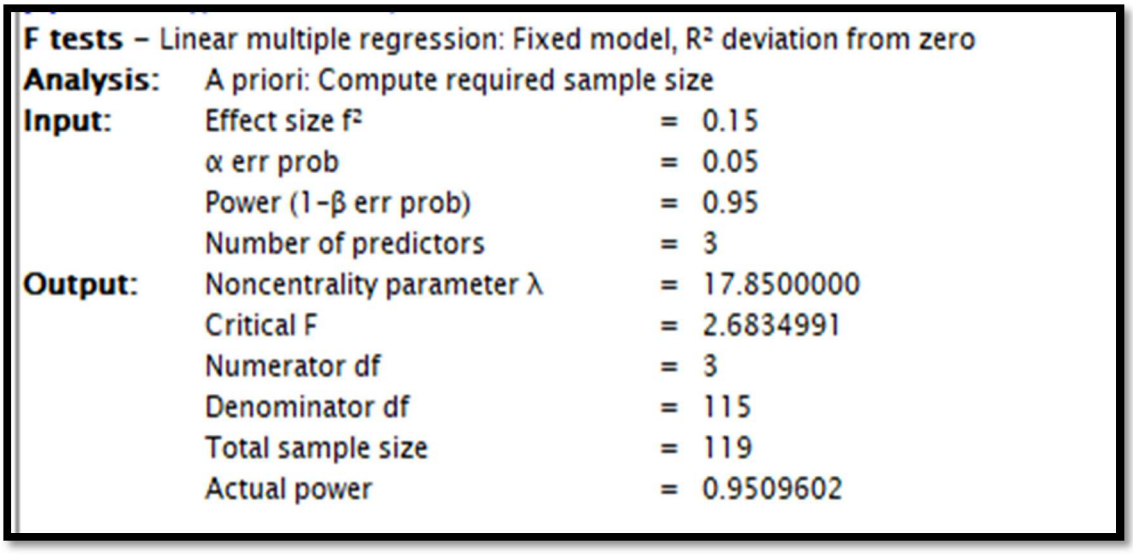

Figure 6. Calculation of sample size using G*Power.

Procedures for Recruitment, Participation, and Data Collection

Opala's (2012) survey instrument was used to collect data related to the influence of security, regulatory compliance, and cost-effectiveness, on the decision by senior executives, IT managers, and business owners in U.S. SMEs in the payment card sector, to adopt CC. This instrument was slightly adjusted to measure the studied constructs, and proper permissions were obtained from the authors of the original and adapted instruments (Opala, 2012; Venkatesh et al., 2003).

The SurveyMonkey professional service and the Walden University Participant Pool were used to target the studied population, and each survey participant was required to complete a consent form before responding to the online survey in accordance with the Walden institutional review board (IRB). Walden participants were directed to the survey on SurveyMonkey to complete the questionnaire. The security statement of the SurveyMonkey site highlights security and privacy measures such as highly secure IT infrastructure, monitoring systems, cameras, encryption, security policies, compliance, and access control, taken to protect and secure customers data (SurveyMonkey, 2018).

The researcher was responsible for setting up the survey on SurveyMonkey. I copied the content of the adapted survey instrument by Opala (2012) and placed in the hosting site. This survey included the following four sections: (a) an informed consent form with the purpose of the survey, (b) the welcome section including the instructions on completing the survey, (c) demographic information, and (d) Opala's (2012) cloud adoption survey (see Appendix D). The survey acceptance criteria specifically targeted

business owners, IT managers, and senior executives in small U.S. payment card firms, with an option to exit if these criteria were not met.

The SurveyMonkey administered the web-based survey by sending an email link to a subset of SurveyMonkey Audience panelists readily available to answer the questionnaire. They had an option to voluntarily participate in a web-based survey and withdraw at any time. This survey was to be made available online for four weeks, to ensure that participants have enough time to answer all questions. Only a fully answered questionnaire was considered for analysis.

The response rate from the online survey may be too low (Burkholder, Cox, & Crawford., 2016; Ravitch & Carl, 2016). To improve this rate, I intended to use the high priority option of the SurveyMonkey survey that allows participants to answer the survey of this study first (SurveyMonkey, 2019c). Subsequently, the web survey link was posted on the Walden Participant Pool to recruit additional participants, with the plan to send reminders periodically to participants.

Upon notification from SurveyMonkey that the survey was complete with enough participation, the results of the survey were subsequently downloaded by the researcher in Microsoft Excel format, and imported into IBM SPSS Statistics version 25 for formatting and statistically analysis on the researcher's personal computer. A copy of the data was later saved securely as required by Walden University, for deletion after about five years.

Instrumentation and Operationalization of Constructs

The main instrument for data collection in this study was a web-based survey adopted from Opala (2012) and administered by SurveyMonkey. Measurements of the survey were equally adopted from Opala's instrument, which was previously adapted from the original survey developed by Venkatesh et al. (2003). Both research instruments were previously tested for validity and reliability, and proper permissions to use them for this study have been granted by their authors (see Appendices A and B).

Research instrument by Venkatesh et al. (2003). Venkatesh et al. (2003) generated a pool of items measuring constructs from TAM, MM, MPCU, TRA, TPB, C-TAM-TPB, and IDT frameworks. They developed a multiple-item survey instrument that is popularly used in research. A preliminary test of this instrument indicated that the internal consistency reliabilities (ICR) were over .70 and explained 69% of the variance. Subsequently, they authors established the validity of the instrument using convergent, discriminant, construct, and face validity with multitrait-multimethod (MMT) analysis and explained 70% of the technology acceptance behavior.

The discriminant validity designed to demonstrate the ability of Venkatesh et al.'s (2003) instrument to differentiate items being measured showed acceptable loading patterns at least .70. The convergent validity indicated that measures were indeed related to the same construct with high inter-correlations. Warner (2013) inferred that construct validity shows evidence of the accuracy of measures based on the operationalization of constructs. Conversely, the MMT analysis of Venkatesh et al.'s instrument showed a 90 percent correlation between variables. Thus, the existence of highly significant

relationships between items. This instrument was consistent with Davis's (1989) TAM study, therefore reliable based on the persistent results during the preliminary and validation tests.

Survey instrument by Opala (2012). The instrument by Opala (2012) consisted of 24 questions scaled across five sections mainly a) demographic information, b) cloud security (CS), c) cost-effectiveness (CE), d) IT compliance (IC), and e) perception of CC adoption (PCA). Eight questions were related to participants' background information in the demographic sections, whereas the remaining parts about respondents' perceptions of constructs had four questions each. The attributes of the variables involved were measured on a five-point semantic differential Likert scales, with values ranging from 1 for Strongly Disagree to 5 for Strongly Agree, as on the original instrument.

Opala (2012) conducted a pilot study of 17 complete surveys to validate the adapted instrument. Considering that the validity of the original instrument by Venkatesh et al. (2003) was not tainted, Opala tested solely the reliability of the adapted instrument. Overall reliability was confirmed at .937 using Cronbach's alpha (α) and exceeding the 0.9. This inferred that the instrument measured what it was supposed to. Consequently, indicating that the same constructs were measured by all variables (Opala, 2012; Warner, 2013).

The survey instrument by Opala (2012) was slightly modified to suit the context of this study. The following four minor adjustments will be made: a) add demographic inquiry on the PCI DSS mandate, b) replace HIPAA with PCI DSS to reflect regulatory compliance instituted to firms handling cardholder data, c) replace the research item

pertaining to the number of users supported by the firm with the number of employees to identify SMEs, and d) add business owners' job title to the demographic section for more granularity on the target population.

Such modifications did not compromise the validity or the reliability of the instrument, and the survey questionnaire clearly covered the studied factors. Conversely, there was no need to re-establish the validity and reliability of the instrument (Warner, 2013). Thus, a pilot study was not required for this study.

In this study, measures on CE, RC, SE, and DA corresponding specifically to Opala's (2012) CE, IC, CS, and PCA followed the same items and format as on the instrument. Hence, CC adoption perceptions of senior executives, IT managers, and business owners in SMEs in the U.S. payment sector, on CE, RC, and SE were measured on a five-point semantic differential Likert scales. Likert scales are popularly used in surveys to measure respondents' attitudes, opinions, and intentions on specific issues, and they outline the magnitude of the difference among participants (Hsu & Lin, 2016; Warner, 2013).

Data Analysis Plan

The survey data were downloaded from the SurveyMonkey.com and statistically analyzed using the IBM SPSS version 25 software, to assess potential relationships between the independent variables and the dependent variable through multiple regressions. Moreover, descriptive statistics of demographic information such as gender, ethnicity, age, title, business type, education, regulation mandate, and experience with CC offered unique characteristics of the data collected.

The data analysis plan primarily consisted of screening the downloaded data for any missing information, outliers, constructs, normality, linearity, homoscedasticity, multicollinearity, independence of errors, normal distribution of error, and undue influence. Allison (1999) argued that the validity of multiple regression analysis depends on testing assumptions such as linearity, independence of errors, homoscedasticity, multicollinearity, undue influence, and normal distribution of error.

The analysis of collected data answered the main research question that guided this study which was: RQ: To what extent, if any do SE, CE, and RC influence DA by senior executives, IT managers, and business owners, in small enterprises handling payment card data in the United States? Frankfort-Nachmias and Leon-Guerrero (2018) claimed that multiple regression allows researchers to assess the effect of two or more independent variables on the dependent variable.

The proposed regression model for this study is: PDA= $\beta 0 + \beta 1 * SE + \beta 2 * RC + \beta 3 * CE + e$, where PDA is the predicted score of CC adoption, $\beta 0$ is the intercept, $\beta 1$, $\beta 2$, and $\beta 3$ are regression coefficients of SE, RC, and CE, and "e" is the error not explained by the regression model. The deriving hypotheses are formulated as follows:

Ho: $\beta 1 = \beta 2 = \beta 3 = 0$. The null hypothesis states that there is no correlation between cloud adoption and security, regulatory compliance, and cost-effectiveness.

Ha: $\beta 1 \neq 0$ and/or $\beta 2 \neq 0$ and/or $\beta 3 \neq 0$. The research hypothesis states that there is a correlation between cloud adoption and security, regulatory compliance, and cost-effectiveness.

The following three secondary research questions and hypotheses were used to assess relationships between the three independent variables and the dependent variable.

RQ1: To what extent, if any, is there a correlation between security and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States?

H1o: There is no correlation between security and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

H1a: There is a correlation between security and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

RQ2: To what extent, if any, is there a correlation between regulatory compliance and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States?

H2o: There is no correlation between regulatory compliance and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

H2a: There is a correlation between regulatory compliance and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

RQ3: To what extent, if any, is there a correlation between cost-effectiveness and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States?

H3o: There is no correlation between cost-effectiveness and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

H3a: There is a correlation between cost-effectiveness and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

I summarized, discussed, and interpreted the results of the linear multiple regression analysis of the continuous Likert-scaled data, and suggested recommendations for future studies. Whereas, the descriptive statistics provided a graphical representation of the categorical demographic data. Multiple linear regression is greatly used in research to evaluate relationships between variables.

Alsmadi and Prybutok (2018) conducted a multiple linear regression analysis to investigate the influence of security and privacy on the adoption of the information sharing and storage behavior (ISSB) by 129 working professionals pursuing an MBA at the University of North Texas. The findings of this analysis revealed that peer influence significantly impacted this behavior. This outcome is contrary to the academic literature asserting that security and privacy were the perceived hindrances of CC services.

Senarathna et al. (2018) performed a multiple linear regression analysis on survey data collected from 149 Australian SMEs to show that firms were likely influenced by

benefiting factors such as relative advantage and quality of service and awareness, rather than risk-prone factors such as security, flexibility, and privacy.

Threats to Validity

As data collected for a research study were quantitatively evaluated, ensuring that these measurements were precise, accurate, valid, and reliable is very important. The validity of research generally relates to the accuracy and truthfulness of the concept being considered, whereas the reliability implies that the same data collected yields the same results each time over repeated intervals (Babbie, 2017; Drost, 2011; Warner, 2013). These considerations can differentiate a poor from a quality research project to ensure that research findings are accepted and trusted (Burkholder et al., 2016; Drost, 2011). Knowing the threats associated with the internal, external, and construct validity in research and strategizing in mitigating them clarified the conclusions and variables of this study.

External Validity

This study focused on three potential CC influencing factors on SMEs in the U.S. payment card sector. Therefore, the deriving findings were specific to the studied population, technology, and features. Hence, the results could not be generalized to other businesses, technologies, factors, and countries. Babbie (2017) referred to external validity as the degree at which the results of a research are confidently generalized to a larger group. Additionally, the author argued that making sure that the researcher is not the experimenter of the study, and carefully defining variables with less specificity will help the external validity.

This project was an online survey-based study administered by a professional hosting firm. Although the survey approach allowed the researcher to get a sense about what is going on from a broad number of people, there is generally a low response rate and inaccuracy of survey data associated with this method (Burkholder et al., 2016; Frankfort-Nachmias, & Leon-Guerrero, 2018; Ravitch & Carl, 2016).

The biggest and most important threat to external validity in this research was the use of a nonprobability sampling procedure to recruit survey participants readily available. Despite the popularity and convenience of this sampling technique, researchers have found it to have little or no external validity, with the propensity of being subjected to biases and outliers (Etikan et al., 2016; Farrokhi & Mahmoudi-Hamidabad, 2012). Participants were not randomly selected from a specific population, consequently, the sample did not represent an actual population (Etikan et al., 2016; Farrokhi et al., 2012; Warner, 2013). To reduce this threat, only data meeting the specific characteristics of our study were selected for analysis, and the results were compared with studies on CC acceptance across industries and regions worldwide.

Another threat to external validity in this study related to the focus on small U.S. firms in the payment card market, with the possibility of having a lower response rate. To minimize this threat, I performed the following tasks: (a) used a trusted survey hosting site with a reliable and diverse database; (b) selected an explicit and short survey instrument; (c) provided relevant information about the study on the survey; (d) sent the survey link to various participants; (e) promised the confidentiality, security, and anonymity of the survey; (f) used targeting survey options; (g) posted the study on the

Walden Participant Pool; and (h) offered my willingness to answer any additional question about the survey. Although the conclusions of this study were not applicable to large firms and SMEs in other industries and countries, the diversity of the online participants indicated its extension to other small films handling cardholder data across the United States.

Internal Validity

This correlational study used a previously validated measurement instrument to accurately quantify the intentions of survey participants about the adoption of CC by their respective organizations. Internal validity refers to the extent at which the results of a research are attributable to variables studied on the research (Babbie, 2017). Shadish, Cook, and Campbell (2002) argued that factors other than independent variables could affect the dependent variables. Whereas, Warner (2013) indicated that nonexperimental studies generally have weak internal validity, being that assessing the correlation between variables does not always imply a causal interference. Conversely, testing, maturation, attrition, regression artifacts, instrumentation, selection, ambiguous temporal precedence, and additive and interactive effects can threaten internal validity (Shadish et al., 2002).

The potential bias associated with survey participants and their responses posited a major threat to the internal validity of this study. Participants may not have provided truthful answers because of their state of mind and other factors such as unwillingness, fatigue, and the misunderstanding of questions. Thus, carefully controlling and specifying the measurement procedure minimizes instrumentation, whereas reducing the additive and interactive effects mitigates all other threats to internal validity (Shadish et al., 2002).

To mitigate this study's threat to internal validity, I performed the following tasks: (a) provided ample information about the study on the survey instructions; (b) used a previously validated instrument with small modifications that did not interfere with measured items; (c) did not request sensitive information on the survey; (d) clearly stated my allegiance to the confidentiality, security, and anonymity of the data collected; and (e) sent email with the link to the survey for completion at the participant convenience, including an option to exit the survey.

Construct Validity

Construct validity typically refers in psychology and education as "the degree at which scores on a measure correspond to the underlying construct that the measure is supposed to assess" (Warner, 2013, p. 938). This study aimed to determine whether factors such as cost-effectiveness, security, and regulatory compliance could influence the decision to adopt CC.

For this purpose, this project was specifically tailored to answer the research questions effectively. Participants responded to the online survey questionnaire with no knowledge of the research questions. Therefore, I anticipated minimal biases with this study. Threats to validity are generally addressed in research by studying the aspects of internal, external, and construct validity. While evaluating whether the features of an online software engineering course could support the learning of the software process, Fernandes, Oliveira, and Figueiredo (2016) performed a correlation analysis to assess relationships among variables. The authors similarly addressed the threats to validity to minimize biases and increase the validity and credibility of the research. This study

focused on assessing correlations between constructs by accurately measuring the influence of SE, RC, and CE on CC adoption within the studied population.

Ethical Procedures

Research often occurs in an uncontrolled and natural environment where it is usually challenging to protect participant's privacy, minimize harm, and respect the experiences of others. Rubin and Rubin (2012) claimed that researchers practice ethical behavior by showing respect, honoring promises, and avoiding pressure and harm to the interviewee. Whereas, Babbie (2017) urged researchers to exercise voluntary participation, anonymity, protection, confidentiality, accurate analysis, and reporting of results, no harm to participants with a minimum degree of deception. Researchers are urged to use pseudonyms to protect participants' confidentiality and anonymity, as they seek for effective ways of securing participants' information by proactively planning and safeguarding the privacy and security of the collected data (Ravitch & Carl, 2016).

Babbie (2017) supported that IRBs review research proposals to make sure that subjects' rights and interests are protected, while professional associations publish a code of ethics to guide researchers. Therefore, it is the responsibility of the researcher to keep the participant safe, respected, and comfortable throughout the research by avoiding ethical issues through mutual consent (Rubin & Rubin, 2012).

Ethical agreements ensure that researchers and participants understand what is proper and improper in scientific research (Babbie, 2017). Understanding ethical issues also instills trust and confidence in participants while helping researchers to fully grasp their rights and responsibilities. I am ethically responsible for: (a) complying with the

requirements mandated by the Walden University's IRB; (b) preserving the confidentiality of participants; (c) providing an informed consent form to participants; and (d) safeguarding the data collected during a period after which data will be shredded, as requested by Walden University.

Although personal and firm information were not collected in this study, an informed consent form was integrated into the survey instructions. Informed consent ensures that the interviewee is comfortable with the interview guidelines by agreeing to participate in the study (Ravitch & Carl, 2016; Rubin & Rubin, 2012). The survey instructions included the research background, any risks and benefits, privacy and confidentiality measures, any potential compensation, and the voluntary nature of the study.

Summary

Sections discussed in the chapter included an introduction, the appropriate research method and approach, the methodology with the population, the sampling and setting, and the instrumentation and materials, the data analysis plan with the research questions and hypotheses, the threats to validity, and the ethical considerations. This chapter demonstrated how the research design aligned with the problem statement, the purpose statement, the research questions, and the research hypotheses.

My specific problem statement consisted of assessing the influence of security, compliance, and costs on the decision of small business leaders in the payment sector to adopt CC. A quantitative correlational design was deemed suitable for this study, considering the need to determine relationships between variables (Frankfort-Nachmias,

& Leon-Guerrero, 2018). Moreover, a web-based survey questionnaire using a convenience sampling method was found to be appropriate, with the intent to collect data from many participants who met specific requirements. Burkholder, Cox, and Crawford (2016) argued that although the survey questionnaire has several benefits, some concerns exist with a potential low response rate and the inaccuracy of survey data.

I subsequently outlined the reliability and validity of the survey instrument by Opala (2012), and used the G*Power software to determine the potential sample size of 119 for this study. Consecutively, I provided the data analysis plan to answer the research question. The threats to internal validity, external validity, and construct validity were described along with the specific strategy to overcome them. In the final section, I elaborated on ethical considerations with an emphasis on IRB requirements.

In the next chapter, the research questions and hypotheses will be addressed by collecting and analyzing empirical data and accurately reporting the findings. I also intend to outline the research instrument, the regression model and analysis, and present tables and figures depicting the results of the study.

Chapter 4: Results

The purpose of this quantitative correlational research was to determine the existence and extent of relationships between SE, RC, and CE and DA, the decision to adopt CC by senior executives, IT managers, and business owners in small firms handling payment card data in the United States.CC has proven to be an efficient and convenient technology for small organizations (Sophy, 2016; Watad et al., 2018). A main research question and three deriving secondary research questions guided this study.

The main research question focused on assessing the existence and extent of relationships between the independent variables—SE, RC, and CE—and the dependent variable, DA. Each secondary research question assessed the correlation between each independent variable and the outcome variable: (a) RQ1 measured the correlation between SE and DA, (b) RQ2 examined the relationship between RC and DA, and (c) RQ3 evaluated the association between CE and DA. To answer each research question, I developed an alternative hypothesis and a null hypothesis. According to Frankfort-Nachmias and Leon-Guerrero (2018), a hypothesis is "a tentative answer to a research problem" (p. 436). A total of eight hypotheses were verified with this empirical study to predict the relationships between (a) SE, RC, CE, and DA to answer RQ; (b) SE and DA to answer RQ1; (c) RC and DA to answer RQ2; and (d) CE and DA to answer RQ3.

Two main sections are involved in this chapter. The first portion is the data collection process that consists of a description of the recruitment process, the response rates, and any discrepancies with the plan presented in Chapter 3. This section also includes a discussion on the data preparation process, a report on baseline descriptive and

demographic statistics of the research sample, and a description of how proportional the research sample is to a larger population. The second section covers the findings of this study, including tables and figures. Similarly, the results of the descriptive statistics and inferential statistics, precisely multiple linear regression and Pearson correlation, are reported. The chapter ends with a summary and a transitional statement to Chapter 5 that covers the research analysis, limitations, implications, recommendations, and conclusion.

Data Collection

I used the SurveyMonkey audience service to collect empirical data necessary to assess the relationship between SE, RC, and CE, and CC acceptance by decision-makers of small U.S. businesses in the payment card sector. With neither the validity nor the reliability of the survey instrument by Opala (2012) being altered, this project did not need a pilot study. I was responsible for setting up the survey on SurveyMonkey Audience and posting the survey link on the Walden Participant Pool to collect the research data. The data collection process was initiated after securing IRB approval (#11-25-19-0646899). I set up the survey on SurveyMonkey based on the instrument in Appendix D and included the informed consent on the first page of the questionnaire.

Survey Instrument Setup

I applied the SurveyMonkey targeting options and qualification logic features to improve the response rate and ensure that the survey met the research criteria. Conversely, I made the following two minor changes to the approved survey instrument for the reasons specified, and IRB did not find these revisions to increase risks to participants:

1. To accommodate the SurveyMonkey targeting options, I modified the ranges on the number of employees in the organization from *less than 500*, *501 employees to less than 1000*, and *1000 employees or more*, to *1-10 employees, 11-50 employees*, *51-200 employees*, and *201-500 employees*.
2. In order to gather additional information on job titles, I added the comment field *Please specify* to the *None of the above* option.

Three research criteria were addressed in the survey setup.

Small U.S. business. I selected the following SurveyMonkey two targeting options to aim at companies with fewer than 500 employees operating in the United States: (a) SurveyMonkey number of employees in company as 1–10, 11–50, 51–200, 201–500; (b) country as United States (USA), SurveyMonkey; and (c) region as all regions.

Firm in the payment card industry. I added a screening question at the beginning of the survey on the company's financial obligation to PCI-DSS. Respondents who chose *No* were automatically disqualified from completing the survey.

Adult senior executive, IT manager, or business owner. I selected below targeting options to reach out to respondents meeting this criterion: (a) list of titles with an option to add comments for missing roles, (b) employment status as employed part-time and employed full-time, (c) age as 18–100+, (d) gender as both, and (e) household income as $0–$200k+.

To best estimate the people qualified for my survey based on the screening question, I opted for a 20–34% qualification rate of respondents (SurveyMonkey, 2019e).

Similarly, to ensure that only participants who consented to the study were qualified to take the survey, I added a disqualifying logic when the *I do not consent* option was selected. Choosing the disqualifying responses automatically ended the survey. I chose the anonymous responses option to exclude respondent's personal information, such as name, e-mail address, customer data, and IP address, from the survey results.

Recruitment Time Frame

Survey collectors gather research data from participants who meet the target options and qualification logic. I targeted 150 complete responses from SurveyMonkey to satisfy the minimum sample size of 119, as described in Chapter 3. Only respondents who consented to the study by selecting *Yes* to the screening question could take the survey. The data collection window was from November 25, 2019, to December 3, 2019. During this period, SurveyMonkey sent the survey link to readily available panelists in their audience who matched the selected targeting options.

Similarly, the study remained available on the Walden Participant Pool. Respondents were asked to consent to the study, freely participate in the survey, review their answers, and submit their final responses. Meanwhile, I periodically monitored the responses on SurveyMonkey and addressed any concerns.

The initial audience collector created on November 25, 2019, received a 91% disqualification rate due to the lack of survey targeting options and rigid qualification logic around the demographic questions related to the inclusion criteria. Participants were automatically disqualified when they selected excluding options associated with the PCI DSS obligation, job title, and the number of employees in the organization.

Consequently, this collector was closed by SurveyMonkey on November 26, 2019, because of the high disqualification rate.

I created a new collector on November 27, 2019, using the number of employees in company and employment status targeting options. Consequently, I introduced the two revisions described in the survey instrument setup and retained only the disqualification logic associated with the screening question on PCI DSS obligation. The collector was closed on November 29, 2019, after reaching the requested 150 complete responses.

I downloaded the sample in Microsoft Excel to my password-protected personal computer and screened for missing and irrelevant data. After finding 11 irrelevant responses, as described in the data preparation section, the collector was relaunched on December 3, 2019. This collector was closed the same day after 11 complete answers.

Survey Recruitment Rates

At the end of the survey window on December 3, 2019, a total of 580 responses were collected. One response from the Walden Participant Pool and 579 responses from the SurveyMonkey audience. I used a histogram to graphically represent the distribution of the recruitment rates with the height of each bar representing the frequency (Wagner, 2016). Figure 7 reflects the daily responses during the survey window. These trends indicated that 97 people responded to the survey on November 25, 2019; 31 on November 26; 141 on November 27; 59 on November 28; 223 on November 29; one on November 30; none on December 1–2, and 28 on December 3.

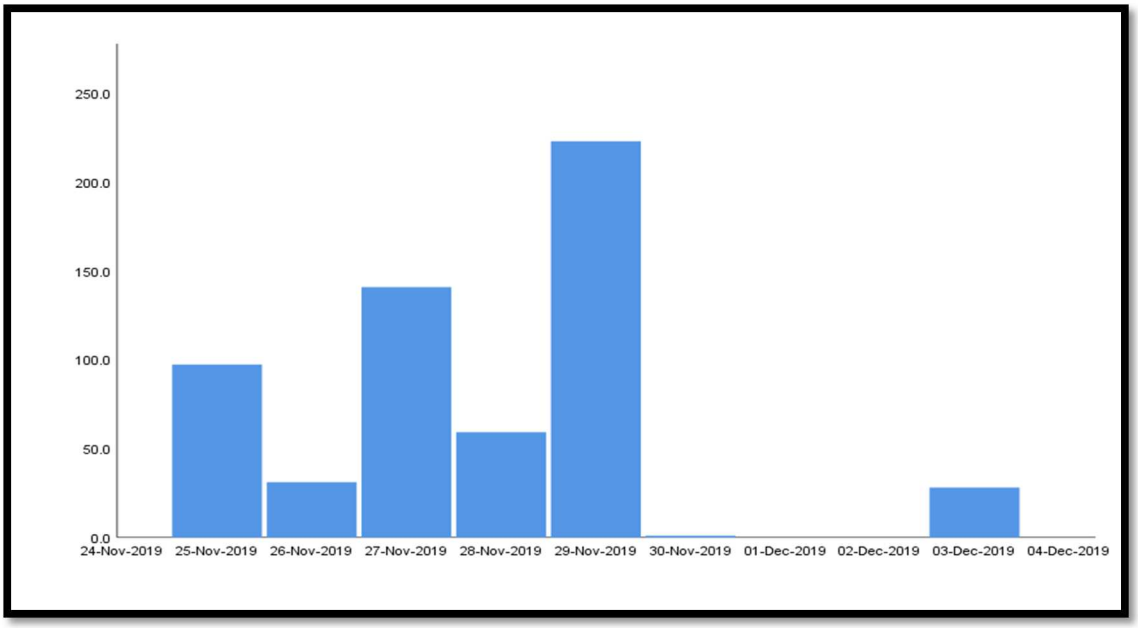

Figure 7. Survey responses by day.

Survey Response Rates

Among the 580 survey responses collected, 169 people finished the whole survey. Thus, an overall 29.13% completion rate. The only participant from the Walden community completed the study through the weblink collector; 168 (29.01%) completed through the audience collector. The daily distribution of the 169 complete survey responses displayed in Figure 8 indicates a total of six complete responses obtained on November 25; three on November 26; 17 on November 27; 21 on November 28; 63 on November 29; none between November 30 and December 2; and 11 on December 3.

At the end of the nine-day survey window, the 169 complete responses exceeded the minimum required sample size of 119 indicated by the power analysis. The low participant day coincided with Thanksgiving Day in the United States. Whereas, the higher responses on November 29 was the day after Thanksgiving. This high response rate may be attributed to the availability of respondents after Thanksgiving, as opposed to

the low rate during the celebrations. The absence of responses in three days was related to the survey collector closure, as described in the recruiting timeframe section.

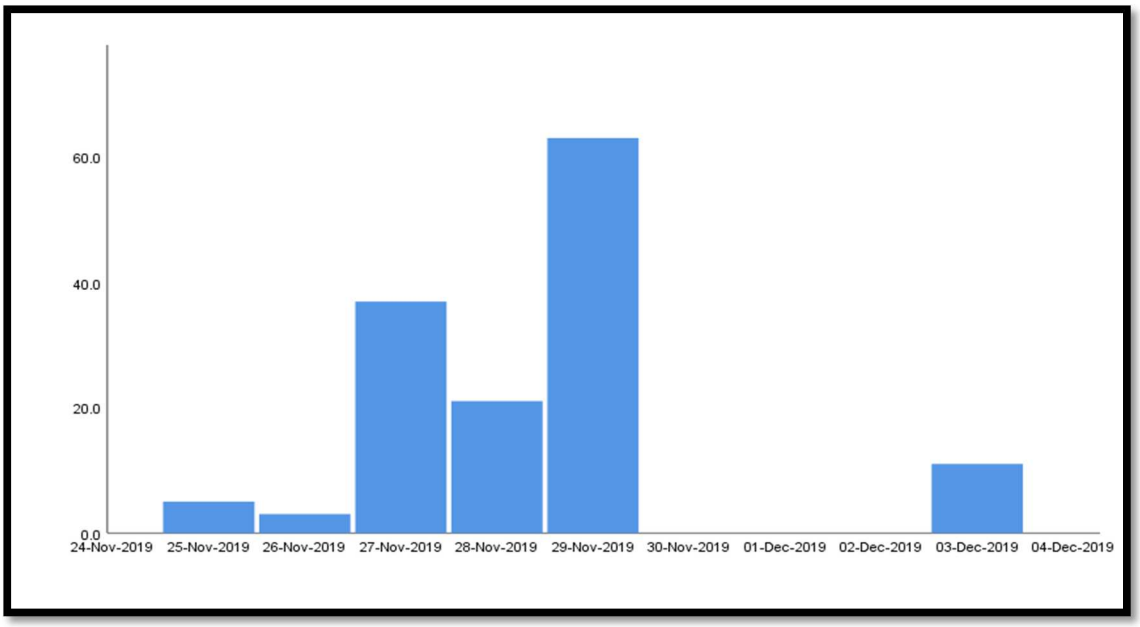

Figure 8. Number of complete survey responses by day.

Discrepancies from Chapter 3

I meticulously followed that data collection procedure outlined in Chapter 3. However, five differences were observed compared to the previous plan. The final survey instrument in Appendix D was modified, as described in the survey instrument setup section. The survey was open for eight days as opposed to four weeks, as previously suggested. The minimum sample size was met during the survey window. I did not select the high priority option of the SurveyMonkey as planned. I chose the targeting options and created survey collectors to improve the qualification rate of respondents and increase the response rate. I did neither send reminders to participants nor email an invitation letter to participants because SurveyMonkey administered the survey to their audience. At the same time, I posted the web link on the Walden Participant Pool. I

approached the survey acceptance criteria differently. I did not set disqualifying options for the three inclusion criteria but did the following to satisfy these requirements: (a) create a screening question on firm financial obligation with PCI DSS to disqualify respondents not in the payment card industry, (b) select the targeting options of employment status and number of employees in company to target only participants working in U.S. small firms, and (c) collect remarks on respondents' job title for more granularity on decision-making roles.

Data Preparation

I filtered the complete responses using SurveyMonkey rules defined on the question summaries page of the analyze responses tab. The survey dataset was then downloaded to my password-protected personal computer in Microsoft Excel format and screened for any missing values. I named blank headings for respondent's comments on demographic items; title, degree, ethnicity, and primary business as *title comments*, *degree comments*, *ethnicity comments*, and *primary business comments,* respectively. I further renamed the items related to research constructs as specified in Appendix H to simplify items' descriptions during analysis.

Eight responses had an empty item, while three had "Abm," "6," and "sever" as comments for the job title. I deleted these 11 responses as I did not consider missing data, and the comments did not represent any relevant job title. Furthermore, I deleted 18 responses with title comments such as *customer service representative*, *librarian*, *public safety*, *analyst*, *office manager*, *marketing*, and *research*. These titles were neither indicative of IT management nor senior executives' roles.

The final research sample of 140 complete responses was securely saved in my personal computer for analysis using the IBM SPSS Statistics Version 25. I later safely kept the dataset on Google Cloud for five years, after which data will be deleted and purged as required by Walden IRB.

Baseline Descriptive Statistics

The three independent variables and the dependent variable had four items each measured on a five-point Likert scales, with values ranging from 1 for *Strongly Disagree* to 5 for *Strongly Agree,* as specified on Appendix D. To facilitate the data reporting and analysis, I coded the questionnaire items as displayed on Appendix H. Conversely, to perform the inferential analysis, I recoded the variables on the IBM SPSS software to a scale unit of measurement with values 1 (Strongly Disagree), 2 (Disagree), 3 (Neither), 4 (Agree), and 5 (Strongly Agree). Interval-ratio variables were required for linear regression analysis (Wagner, 2016).

To describe the statistics of the constructs, I computed the measures of central tendency using the mean scores, and dispersion through the standard deviation for the three predictors (SE, CE, and RC) and the outcome variable (DA). Table 1 reflects that the means of all constructs varied between 14.35 and 15.66, while the standard deviations ranged from 3.10 and 3.34. These results were relatively equal among independent variables, with higher scores for the dependent variable.

Table 1

Means and Standard Deviations for the Study Variables

Variable	*M*	*SD*
DA	15.66	3.34
CE	14.98	3.17
RC	14.76	3.14
SE	14.35	3.10

Note. $N = 140$.

Proportionality to Larger Population

One hundred and sixty-nine complete responses were collected from 580 SurveyMonkey Audience panelists who answered the online survey. Thus, a 29.14% response completion rate was observed. Over 500 thousand members of the SurveyMonkey Audience are readily available at any time to take a survey (SurveyMonkey, 2019c). Hence, I conducted a 0.12% convenience sampling of the SurveyMonkey voluntary pool.

Demographic Statistics

The following frequency distribution of each of the nine demographic questions offered some insights in the sample. The frequency distribution of the screening question on the business obligation toward PCI-DSS was 100%, as all 140 participants considered for this study answered "Yes" before they could proceed with the survey.

This study targeted senior executives, business owners, and IT decision-makers. Table 2 shows that 47.2 % of participants occupied an IT management position; 23.6% in *Other IT Management Position*, and 23.6% in *IT/Security/Operation Manager*. About

19% of participants were business owners, and 10% manually provided their titles ranging from *Chief Financial Officer* to *Sr. Software Developer*. *Chief Security Officer* and *Chief Information Officer* had the lowest frequency with 12% and 6 %, respectively.

Table 2

Frequency of the Respondent's Title (N = 140)

Job title	n	%
IT/security/operation manager	33	23.6
Other IT management position	33	23.6
Business owner	27	19.3
IT security/assurance director	15	10.7
None of the above (please specify)	14	10.0
Chief security officer (CSO)	12	8.6
Chief information officer (CIO)	6	4.3
Total	140	100.0

Note. None of the above: (please specify): administrator, advisor, chief financial officer, content manager, engineering manager, hotel manager, inventory manager, marketing director, project manager, quality, security, sr. software developer.

This study was focused on businesses with fewer than 500 employees operating in the United States and handling cardholder data. Table 3 presents the distribution of participants in four groups. Organizations having between 11 and 50 employees had the highest representation (31.4%), while firms with 201-500 employees had the lowest frequency (15.7%).

Table 3

Frequency of the Organization Size (N = 140)

Organization size	n	%
1–10 employees	32	22.9
11–50 employees	44	31.4
51–200 employees	42	30.0
201–500 employees	22	15.7
Total	140	100.0

Table 4 shows that more males (56.4%) than females (43.6%) completed the survey. Whereas, Table 5 depicts that adults between the age of 28 and 37 accounted for 42.1% of the sample, and people above 58 years were less represented (4.3%).

Table 4

Frequency of Gender (N = 140)

Gender	n	%
Female	61	43.6
Male	79	56.4
Total	140	100.0

Table 5

Frequency of Age (N = 140)

Age range	n	%
28–37	59	42.1
38–57	41	29.3
18–27	34	24.3
58–67 and older	6	4.3
Total	140	100.0

Most participants owned a bachelor's degree (36.4%), as reflected in Table 6. They were Caucasian (54.3%), as shown in Table 7, had two to less than five years' experience with CC (32.1%), as revealed by Table 8, and were affiliated with businesses in education and IT-services (13.6 %) as indicated in Table 9.

Table 6

Frequency of the Level of School (N = 140)

Level of school	n	%
Bachelor degree	51	36.4
Graduate degree	39	27.9
High school diploma	24	17.1
Associate degree	18	12.9
Doctorate degree	7	5.0
Other (please specify)	1	.7
Total	140	100.0

Table 7

Frequency of Ethnicity (N = 140)

Ethnicity	n	%
Caucasian	76	54.3
Asian	27	19.3
Hispanic	19	13.6
Black	14	10.0
Other (please specify)	4	2.9
Total	140	100.0

Table 8

Frequency of Cloud Computing Experience (N = 140)

Cloud computing experience	n	%
Two years to less than 5 years	45	32.1
Less than 2 years	42	30.0
Five years or more	31	22.1
None	22	15.7
Total	140	100.0

Table 9

Frequency of Primary Business (N = 140)

Primary business	n	%
Education	19	13.6
IT services	19	13.6
Government	16	11.4
Healthcare	16	11.4
Professional, technical, and services (non IT)	16	11.4
Financial services/banking	13	9.3
Other (please specify)	10	7.1
Energy/utilities	8	5.7
T–manufacturing	8	5.7
Travel/leisure/hospitality	6	4.3
Construction	4	2.9
Telecommunications	3	2.1
Cloud service providers	2	1.4
Total	140	100.0

Study Results

This research project was guided by the intent to offer the latest cloud technology insights and help U.S. small firms in the payment card sector to understand key factors potentially driving their CC decision. Thus, the purpose of this quantitative correlational study was to assess the existence and extent of relationships between the independent variables; security (SE), regulatory compliance (RC), and cost-effectiveness (CE), and the dependent variable; the decision to adopt CC (DA), by senior executives, IT

managers, and business owners in small firms handling payment card data in the United States small businesses in the payment card industry. The main research question (RQ) and the three secondary questions (R1, R2, and R3) along with their deriving eight hypotheses (Ho, Ha, H1o, H1a, H2o, H2a, H3o, and H3a) were formulated as follows.

RQ: To what extent, if any do SE, CE, and RC influence DA?

Ho: There is no correlation between SE, CE, RC, and the DA.

Ha: There is a correlation between SE, CE, RC, and the DA.

RQ1: To what extent, if any, is there a correlation between SE and DA?

H1o: There is no correlation between SE and DA.

H1a: There is a correlation between SE and DA.

RQ2: To what extent, if any, is there a correlation between RC and DA?

H2o: There is no correlation between RC and DA.

H2a: There is a correlation between RC and DA.

RQ3: To what extent, if any, is there a correlation between CE and DA?

H3o: There is no correlation between CE and DA.

H3a: There is a correlation between CE and DA.

Data collected, as described in the previous section from the SurveyMonkey American Audience were statistically analyzed using the IBM SPSS Statistics Version 25. The researcher started by painting the unique characteristics of the research sample with a descriptive analysis of the demographic data. A preliminary screening followed to test the assumptions for linearity, independence of errors, homoscedasticity, multicollinearity, undue influence, and normal distribution of error linear. Finally,

inferential statistics through multiple linear regression analysis and Pearson correlations were performed to answer the research questions, test the research hypotheses, and draw conclusions from the collected data.

Descriptive Analysis

The research sample is described in this section to determine specific characteristics associated with the demographic information collected. I used the IBM SPSS Statistics Version 25 to compute descriptive statistics such as characteristics of participants and organizations, the standard deviations, frequency, percentage, and the mean of the research variables.

Characteristics of participants. Descriptive statistics covering participants' age, gender, title, level of education, ethnicity, and CC experience are presented in Table 2 and Tables 4, 5, 6, 7, and 8. These results indicated that the majority of respondents were male Caucasians between 28 and 37 years old, had a bachelor's degree and two years to less than five years CC experience, and were business owners (19.3%) or occupied an IT management position; 23.6% *Other IT Management Position,* and 23.6% *IT/Security/Operation Manager*.

Characteristics of Organizations. Information related to the business type and the organization size are displayed in Table 3 and Table 9. All studied firms were obligated to comply with PCI-DSS and had fewer than 500 employees. Table 3 indicated that 31.4% of firms had 11–50 employees, and 30% had 51–200. Whereas, the primary business of most firms was education (13.6%) and IT-services (13.6%) (see Table 9).

Descriptive statistics of the research variables. According to Frankfort-Nachmias and Leon-Guerrero (2018), the measures of central tendency such as the mode, the mean, and the median describe the average or typical case of a distribution, whereas the measures of variability describe the variation or diversity of this distribution. The minimum, maximum, mean (M), variance (V), and standard deviation (SD) scores of the research variables, SE, CE, RC, and DA are presented in Table 10. Each construct had four attributes measured on a five-point Likert scale ranging from 1 for *Strongly Disagree* to 5 for *Strongly Agree.*

The items SE1, SE2, SE3, and SE4 of the SE variable presented in Table 10 had roughly equal scores of the mean, variance, and standard deviation. The values of standard deviation ranged from .993 and 1.063, and the variance hovered between .987 and 1.129. Conversely, the mean scores varied between 3.50 and 3.69, indicating that the average response for SE1, SE2, SE3, and SE4 was between *Neither* and *Agree* on a five-point Likert scale.

The differences among the survey items RC1, RC2, RC3, and RC4 were quite small, as seen in Table 10. The standard deviation hovered between .939 and .958, and the variance ranged from.882 to .925. Whereas, the mean scores varied between 3.59 and 3.78, indicating that the average response to questions RC1, RC2, RC3, and RC4 fell somewhere between *Neither* and *Agree* on a five-point Likert scale.

The upper and lower values of the survey items CE1, CE2, CE3, and CE4 in Table 10 were quite similar. The variance scores ranged between .837 and 1.002, and the standard deviation varied between .915 and 1.001. Conversely, the mean values varied

between 3.66 and 3.80, suggesting that on average, respondents answered *Neither* or *Agree* on a five-point Likert scale to CE1, CE2, CE4, and CE4.

The descriptive statistics among DA1, DA2, DA3, and DA4, displayed in Table 10, showed roughly equal mean, standard deviation, and variance scores. The measures of standard deviation ranged from .941 to .985, while the variance values hovered between .885 and .971. While, the mean scores ranged from 3.86 to 4.01, indicating that the average response for DA1 was *Agree,* and either *Neither* or *Agree* for DA2, DA3, and DA4, on a five-point Likert scale.

Table 10

Descriptive Statistics Among Study's Constructs (N = 140)

Variable	M	SD	V
SE1	3.61	.993	.987
SE2	3.50	1.063	1.129
SE3	3.54	1.055	1.113
SE4	3.69	1.052	1.106
CE1	3.66	1.001	1.002
CE2	3.80	.915	.837
CE3	3.73	.973	.947
CE4	3.79	.958	.918
RC1	3.68	.962	.925
RC2	3.78	.945	.893
RC3	3.59	.959	.919
RC4	3.71	.939	.882
DA1	4.01	.941	.885
DA2	3.88	.985	.971
DA3	3.91	.948	.899
DA4	3.86	.971	.943

Preliminary Data Screening

This screening of the data collected was primarily performed to check the validity of multiple regression analysis and efficiently interpret the regression model. This prerequisite step was critical to detect any missing information and outliers, and test assumptions for linearity, independence of errors, homoscedasticity, multicollinearity, undue influence, and normal distribution of error. Consequently, I performed a linear

regression and requested the collinearity diagnostics with the Durbin-Watson residual, Cook's distance, standardized residuals, scatterplot, and histogram.

Missing data and outliers. I eliminated incomplete and erroneous surveys, as described in the data preparation section. Consequently, the number of valid responses was reduced to 140. The scatterplot of the standardized residuals displayed in Figure 9 was used to inspect missing data and outliers. The scatterplot showed no discernable patterns of the standardized residuals, indicating the absence of missing data and outliers.

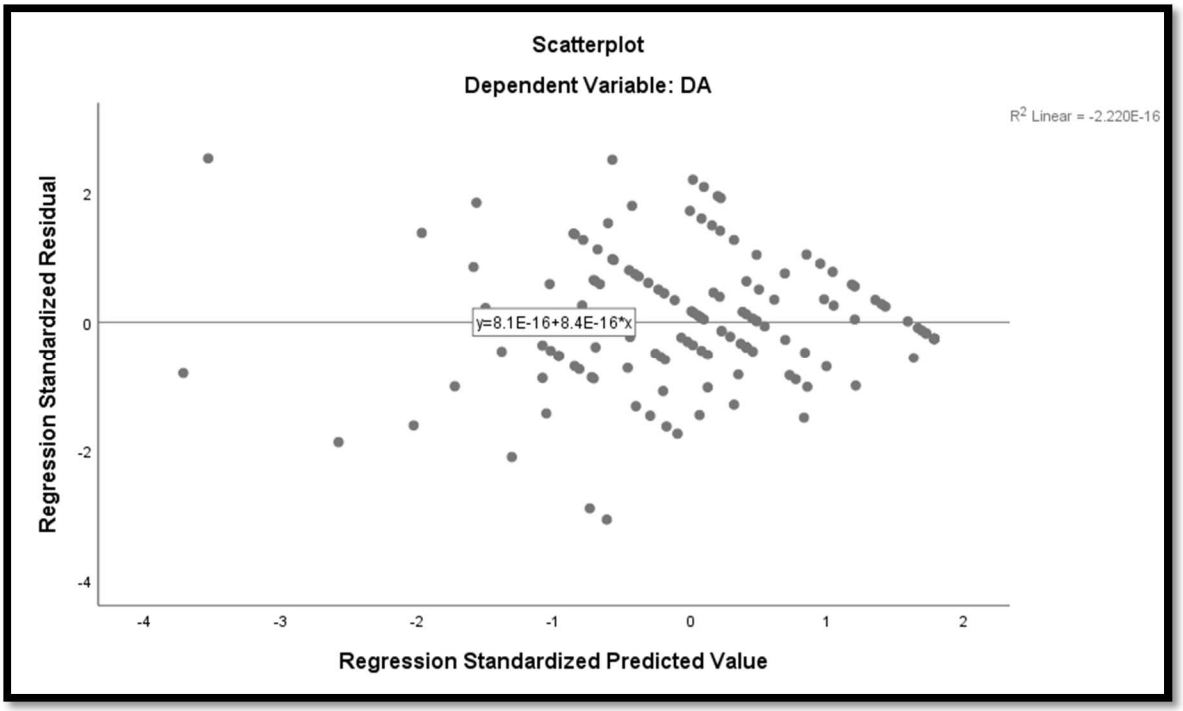

Figure 9. Scatterplot of the standardized residuals.

Assumption of independence of errors. The model summary in Table 11 showed Durbin-Watson statistic of 2.019. This score was between 0 and 4.0, indicating that there was no correlation between the residuals, hence meeting the assumption.

Table 11

Multiple Regression Model Summary (N = 140)

R	R^2	Adjusted R^2	*SE*	Durbin-Watson
.815(a)	.664	.657	1.95390	2.019

Note. (a) predictors: RC, SE, CE, dependent variable: DA.

Assumption of multicollinearity. The VIF (variance inflation factor) statistics in Table 12 were lower than 10 (SE: 2.360, CE: 2.955, and RC: 3.017), reflecting that the assumption of the lack of correlation between independent variables was met.

Table 12

Multiple Regression Coefficients

Variable	B	SE B	β	t	p	VIF
SE	.162	.082	.150	1.969	.051	2.360
CE	.524	.090	.498	5.835	.000	2.955
RC	.247	.092	.233	2.700	.008	3.017

Note. $F(3, 139) = 89.785$, $p < .001$, $R = .815$, Adjusted $R = .657$, and $R^2 = .664$, Durbin-Watson = 2.019. Dependent Variable: DA. N = 140.

Assumption of undue influence. The Cook's distance on the residual statistics ranged from .000 to .314, and lower than 1.0. This assumption was met as there was no undue influence on the model.

Assumption of homoscedasticity. The scatterplot in Figure 9 did not show any grouping of scatter with discernable patterns. Hence, this assumption was met.

Assumption of linearity. The scatterplot in Figure 9 depicted a linear equation. Thus, the assumption of the existence of a linear relationship was met.

Assumption of normal distribution of errors. The pointy histogram in Figure 10 depicted a normal distribution. Moreover, this figure indicated a tendency for a skewed distribution with a peak not at zero, as expected for a symmetrical distribution. The points appearing to lie in diagonal from the bottom left to the top right of the straight line on the Normal Probability Plot (P-P) in Figure 11 provided supportive evidence that this assumption was met with no significant deviation from normality.

Based on the preliminary analysis, there is some evidence to support the assumptions for linearity, independence of errors, homoscedasticity, multicollinearity, undue influence, and normal distribution of error. Meeting these assumptions confirmed the validity of multiple regression analysis for this study.

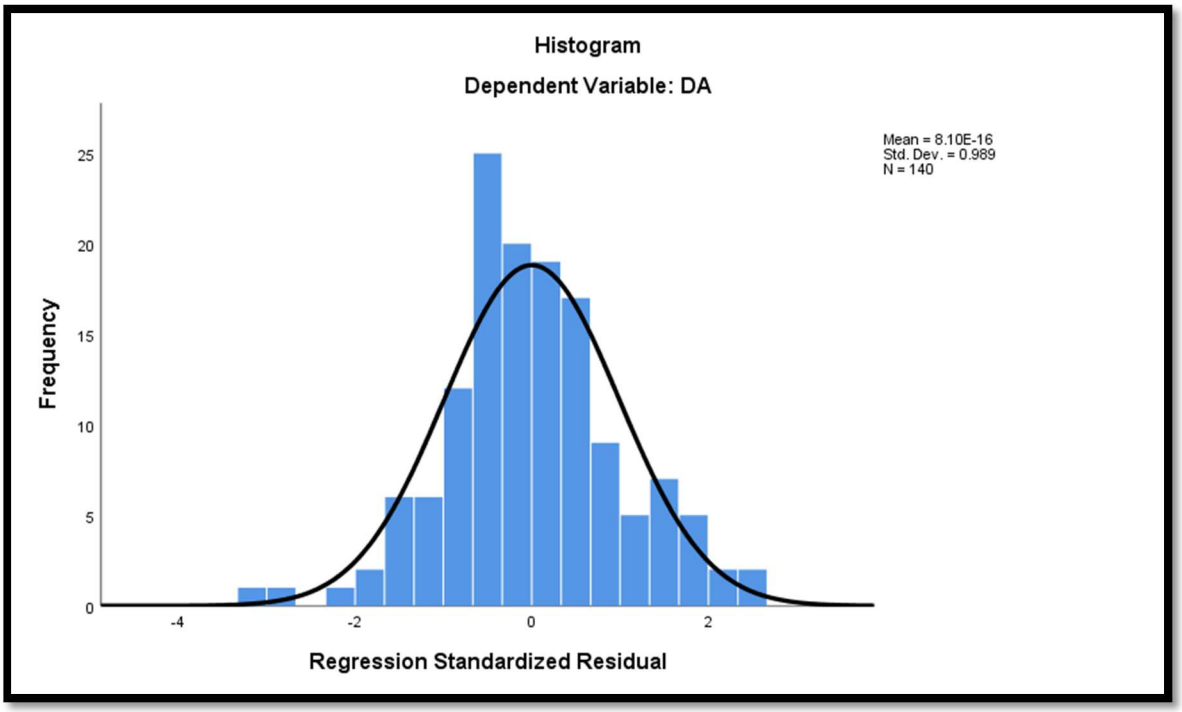

Figure 10. Histogram of the regression standardized correlation.

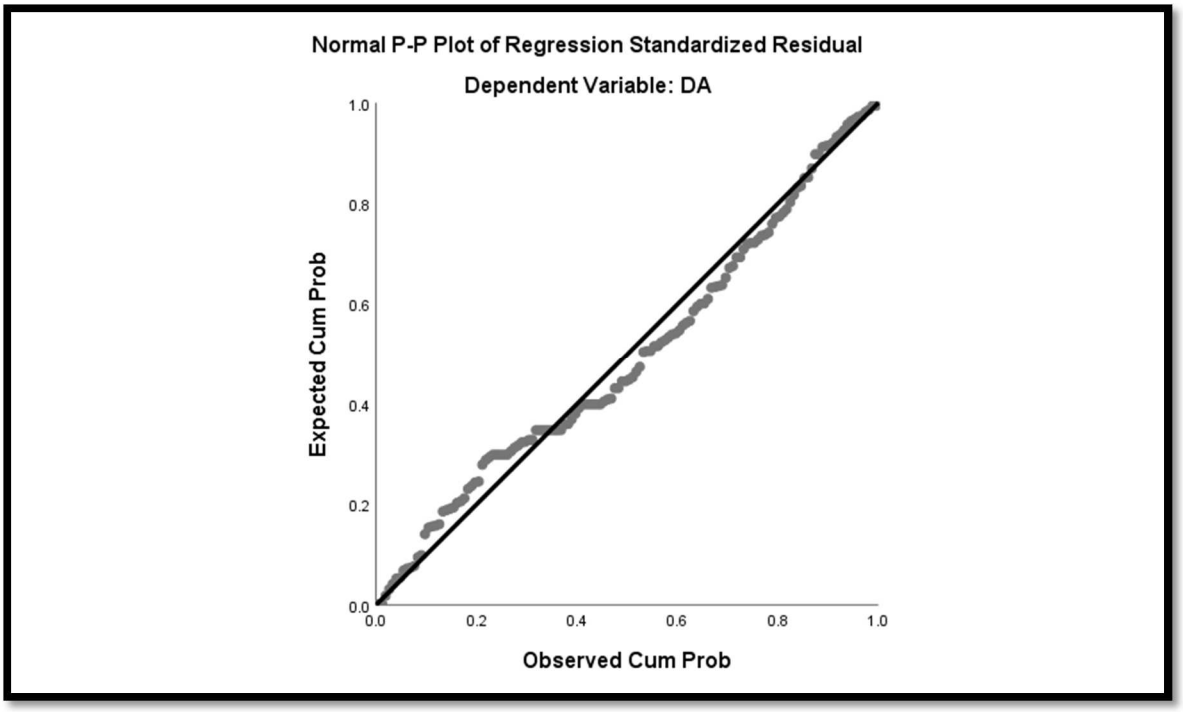

Figure 11. Normal probability plot (P-P) of the regression standardized residual.

Inferential Statistics

A multiple linear regression analysis at 0.05 significance level was conducted to answer the main research question. Multiple regression allows the researcher to determine the extent at which two or more independent variables may impact the outcome of the dependent variable (Frankfort-Nachmias & Leon-Guerrero, 2018). Whereas, a Pearson correlation coefficients test was performed to answer each secondary research question between an independent variable and the dependent variable. Pearson's correlation coefficients provide the strength of the relationship between two variables and are generally easier to understand when two metric variables are used to test for a possible correlation (Frankfort-Nachmias & Leon-Guerrero, 2018; Wagner, 2016). The survey instrument did not have continuous variables. Therefore, I used a five-point Likert

scale, and I assigned a numerical value from 1 to 5 to each response; 1 for *Strongly Disagree,* 2 for *Disagree*, 3 for *Neither*, 4 for Agree*,* and 5 for *Strongly Agree.*

Main research question (RQ). Multiple linear regression analysis at $\alpha = 0.05$ was performed to answer the main research question (RQ) stating; to what extent, if any do SE, CE, and RC influence DA by senior executives, IT managers, and business owners, in small enterprises handling payment card data in the United States

This regression method was suitable for answering RQ because it allowed the researcher to assess the effect of two or more independent variables on the dependent variable (Frankfort-Nachmias & Leon-Guerrero, 2018; Wagner, 2016). The independent variables were SE, CE, and RC, and the dependent variable was DA. The null hypothesis stated that there is no correlation between security, cost-effectiveness, regulatory compliance, and CC adoption. While the research hypothesis stated that there is a non-zero correlation between cloud adoption and security, regulatory compliance, and cost-effectiveness.

The research regression model was: PDA = β0 + β1*SE + β2*RC + β3*CE + e, where PDA was the predicted score of CC adoption, β0 the intercept, β1, β2, and β3 the regression coefficients of SE, RC, and CE, and "e" is the error not explained by the regression model. The results of the multiple regression were as follows:

The regression model was overall statistically significant, $F(3, 139) = 89.785$, $p < .001$, $R = .815$, adjusted $R^2 = .657$, and $R^2 = .664$. This result indicated that 66.4% of the variation of CC adoption could be explained by the linear combination of three independent variables SE, CE, and RC. While all three variables had positive regression

coefficients, cost-effectiveness and regulatory compliance were found to be the primary predictors of CC acceptance by small U.S. businesses in the payment card sector (p <.05). Whereas, SE was not found to predict CC adoption (p > .05) significantly.

The regression coefficients are presented in Table 12. Cost-effectiveness was the biggest contributor in explaining the variation of CC adoption scores (β = .498, t = 5.835, p < .05) compared to regulatory compliance (β = .233, t = 2.700, p <.05). Security was at the border line of statistical significance at α = 0.05. Thus, SE, did not significantly explain the variation of CC adoption (p > .05). The null hypothesis of no correlation between the three predictors and the outcome variable was rejected. Conversely, the alternative hypothesis of the predictive influence of security, cost-effectiveness, and regulatory compliance on CC was supported.

The final regression predictive equation was: P*DA = 1.827 + .162(SE) + .247(RC) + .524(CE)* + e.

Security. Despite a positive slope (.162), SE was not a predictor of CC adaption (p > 0.05). Conversely, security did not explain any significant variation in the decision to adopt CC in the final regression model.

Cost-effectiveness. The positive slope (.524, p < .05) suggested that for any increase of CE, there was an increase of .524 in CC adoption decisions.

Regulatory compliance. The positive slope (.247, p < .05) supported that for any increase of RC, a 24.7% increase in the behavior toward CC adoption was expected.

Secondary research questions. The results of the Pearson correlation test between the four constructs presented in Table 13 were used to answer all three

secondary research questions. Pearson correlations measure the extent at which variables are related (Wagner, 2016). Conversely, testing direct the correlation between each independent variable and the dependent variable allows the researcher to evaluate how changes in one independent variable can affect the dependent variable (Frankfort-Nachmias & Leon-Guerrero, 2018).

Table 13

Pearson Correlation Coefficients Among Study Variables (N = 140)

Variable	SE	CE	RC	DA
SE	1	.714**	.721**	.674**
CE	.714**	1	.785**	.788**
RC	.721**	.785**	1	.732**
DA	.674**	.788**	.732**	1

Note. ** Correlation is significant at the 0.01 level (2-tailed).

The Pearson correlation coefficients (r) in Table 13 showed that each independent variable was a statistically significant predictor of CC ($p < .01$), with a positively moderate to strong effect ranging from .674 to .788. As with the regression analysis, CE had the strongest effect (r = .788) compared to RC (r = .732), and SE (r = .674), which had a moderate effect.

Secondary Research Question 1 (R1): This research question was; to what extent, if any, is there a correlation between security and the decision to adopt CC by senior executives, IT managers, and business owners, in small enterprises handling payment card data in the United States. The null hypothesis stated that there is no correlation between security and the decision to adopt CC by senior executives, IT

managers, and business owners in small enterprises handling payment card data in the United States. The research hypothesis stated that there is a correlation between security and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

Based on the Pearson correlations in Table 13, security was a statistically significant predictor of cloud adoption. Therefore, the null hypothesis stating that there is no correlation between SE and DA could be rejected. The strength of this relationship was moderate and positive with $r = .674$, N = 140, $p < .01$. Although security was not found to contribute to the variation of CC adoption in the regression model, higher CC security could practically translate to a higher adoption rate.

Secondary Research Question 2 (R2). This research question was, to what extent, if any, is there a correlation between regulatory compliance and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States? The null hypothesis stated that there is no correlation between regulatory compliance and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States. The research hypothesis stated that there is a correlation between regulatory compliance and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

Based on Pearson correlations on Table 13, regulatory compliance significantly predicted CC adoption at 0.01 level. The null hypothesis stating that there is no

correlation between RC and DA could be rejected. Conversely, there was a positive and strong correlation between RC and DA ($r = .732$, N = 140, $p < .01$). Thus, higher RC could drive higher adoption rate of CC.

Secondary Research Question 3. The research question (R3) was; to what extent, if any, is there a correlation between cost-effectiveness and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States? The null hypothesis stated that there is no correlation between cost-effectiveness and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States. The research hypothesis stated that there is a correlation between cost-effectiveness and the decision to adopt CC by senior executives, IT managers, and business owners in small enterprises handling payment card data in the United States.

Based on Pearson's correlation in Table 13, cost-effectiveness significantly predicted CC adoption ($p < .01$). The null hypothesis could be rejected that there was no correlation between cost-effectiveness and the decision to adopt CC. Similarly, a strong and positive correlation between CE and DA ($r = .788$, N = 140, $p < .01$) was observed.

Summary

The main question of this study was to determine the existence and extent of relationships between SE, RC, CE, and DA. This chapter covered the data collection process and the results of the quantitative analysis performed.

The data collection section included a discussion on the survey setup, the participants' recruitment process, the response rates, and discrepancies with the plan

presented in chapter 3. This section also included the data preparation process and the baseline descriptive and demographic statistics. The second section outlined the results related to the descriptive characteristics of the demographic information collected, the data screening process, and inferential statistics.

With 169 complete surveys collected, a total sample of 140 responses were considered relevant for this study. The descriptive analysis of demographic data indicated that 54.3% of respondents were Caucasian, 56.4% were males, 42.1% were between 28 and 37 years old, 36.4% owned a bachelor's degree, 32.1% had two years to less than five years CC experience, 19.3% were business owners, 23.6% occupied other IT management positions, and 23.6% were IT/Security/Operation managers. Moreover, 31.4% of firms had 11 - 50 employees, while 30% had 51-200, and 27.2% % of primary businesses were either education or IT-services.

With no significant violation uncovered while testing assumptions, multiple linear regression analysis indicated an overall significant model ($p < 0.001$). Cost-effectiveness and regulatory compliance were found to be the statistically significant predictors of CC adoption in the overall regression model ($p < .001$). Whereas, Pearson's correlation analysis showed that each independent variable had a relatively strong and positive relationship with the outcome variable.

The findings discussed in the second section of this chapter will be analyzed and interpreted in Chapter 5. The limitations of this study, recommendations for future studies, and the potential impact for positive social change will also be elaborated. The chapter will end with a conclusion of this study.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this quantitative correlational research was to assess the influence of SE, RC, and CE on DA CC by senior executives, IT managers, and business owners in small firms handling payment card data in the United States. Cloud computing has proven to be an efficient and convenient technology for small organizations (Sophy, 2016; Watad et al., 2018). The study mainly focused on determining relationships among the independent variables—security, regulatory compliance, cost effectiveness—and the dependent variable, which was the decision to adopt CC and measuring the extent of these relationships.

As presented in Chapter 4, results indicate that each independent variable fairly correlated with the outcome variable positively and strongly: SE ($r = .674$, $p > .001$), CE ($r = .788$, $p < .001$), and RC ($r = .732$, $p < .001$), when only one variable was considered at a time. The multiple regression analysis revealed that only CE and RC were statistically significant predictors of CC $F(3, 139) = 89.785$, $p = .000$, $R = .815$, adjusted $R^2 = .657$, and $R^2 = .664$). In other words, if CE and RC are in the regression model, it is unnecessary to add SE as the third variable. These results also indicated a strong and positive relationship between variables, with 66.4% of the variation of CC adoption likely to be explained by the predictors.

This chapter covers an interpretation of the findings of the quantitative analysis presented in the previous chapter. This chapter also includes a discussion on the limitations of the study, recommendations for future studies, possible implications for positive social change, and a conclusion of this research.

Interpretation of Findings

This study was primarily initiated to detect and assess relationships between three predictors—CE, RC, and SE—and an outcome variable, DA, by conducting a multiple linear regression analysis. This statistical analysis was appropriate in predicting relationships between two or more independent variables and a dependent variable (Frankfort-Nachmias & Leon-Guerrero, 2018; Warner, 2013). No serious violations of the assumptions surrounding multiple regression were found. I used multiple linear regression to answer the main question based on the regression model: PDA = $\beta 0 + \beta 1 *$ SE + $\beta 2 *$ RC + $\beta 3 *$ CE + e. The relationship between each predictor and the outcome variable was assessed through the Pearson correlation analysis.

The descriptive statistics among constructs displayed in Table 10 reveals higher mean scores for questions related to (a) willingness to use CC to host sensitive information ($M = 3.69$), (b) good cost provided by CC ($M = 3.80$), (c) reliability of CC in meeting IT compliance ($M = 3.78$), and (d) willingness to use CC ($M = 4.01$). While these findings underscore the importance of the studied constructs, they corroborate prior studies outlining potential CC adoption factors for small businesses (Adane, 2018; Priyadarshinee et al., 2017; Senarathna et al., 2018; Watad et al., 2018).

Main Research Question

The regression model detected an overall statistically significant regression with CE and RC, primarily predicting the adoption of CC by U.S. small businesses in the payment card industry. This finding validated studies supporting the significant role of cost advantage in CC adoption for small businesses (Adane, 2018; Alkhater et al., 2014;

Senarathna et al., 2018). Similarly, these results underscored the importance of regulatory compliance in technology acceptance by businesses required to achieve standards and regulations (Clapper & Richmond, 2016; Hemphill & Longstreet, 2016; Yimam & Fernandez, 2016).

However, these results differed from Opala's (2012) on U.S. Fortune 500 or Forbes 100 firms using similar constructs. Opala revealed that IT security also predicted CC adoption decisions in a similar regression model. Moreover, SE was statistically significant if it was the only variable in the regression model. This finding suggests the variation of CC adoption across industries as businesses have various technology requirements and expectations (Candel et al., 2016; Kumar et al., 2017).

The regression analysis revealed that over 66% of CC decisions by small businesses in the payment card industry were explained by cost effectiveness and regulatory compliance. Although the decision to adopt CC was statistically related to cost effectiveness and regulatory compliance, the positive regression and Pearson coefficients suggested an optimistic effect of security, regulatory compliance, and cost effectiveness, on CC adoption. Therefore, IT managers, business owners, and senior executives in U.S. SMEs in the payment card industry may be willing to implement CC if they incur better security, higher cost savings, and effective regulatory compliance with PCI-DSS. Cloud computing providers could improve their services and products, and researchers could build on these findings to investigate CC adoption in other business sectors and countries.

Secondary Research Questions

Pearson correlations in Table 13 found positive, and moderate to strong individual relationships between security, regulatory compliance, cost-effectiveness, and CC adoption, respectively. These individual results supported the findings by Opala (2012); security (r = .672, N = 282, p < .001), cost-effectiveness (r = .704, N = 282, p < .001), and IT compliance (r = .756, N = 282, p < .001). However, Opala found IT compliance to have the highest correlation with CC decision. Whereas, this study uncovered that cost-effectiveness exhibited the highest relationship with CC adoption; SE (r = .674, N = 140, p < .001), CE (r = .788, N = 140, p < .001), and RC (r = .732, N = 140, p < .001).

Security. The TOE technological perspective of security was posited to impact innovation adoption at the technological context of the TOE framework (Hsu & Lin, 2016; Tornatsky & Fleischer, 1990). The results of the multiple linear regression determined that security was not a predictor of CC adoption, if CE and RC were already in the regression model. However, the Pearson coefficient displayed a moderate correlation between security and CC adoption decisions. While the regression analysis contradicted previous studies supporting the significant predictive effect of security on CC adoptions (Alruwaili & Gulliver, 2018; Opala, 2012), the moderate and positive correlation between security and CC adoption aligned with most studies in Chapter 2 (Awiagah et al., 2016; Hemphill & Longstreet, 2016). These results substantiated previous studies claiming that security concerns may impede CC adoption (Alruwaili & Gulliver, 2018; Gupta & Saini, 2017; Hsu & Lin, 2016; Kumra et al., 2017).

Cost-effectiveness. The organizational context of cost-effectiveness defined the cost benefits associated with the adoption of technology (Hsu &Lin, 2016; Tornatsky & Fleischer, 1990). Multiple linear regression revealed the statistical significance of this predictor with a positively strong effect on CC adoption by SMEs in the U.S. payment card industry. This outcome implied that low cloud-related costs could motivate its acceptance by small firms in the U.S. payment card industry. Several studies have found cost savings to be a significant predictive variable to technology adoption, including CC (Ahani et al., 2017; Kumar et al., 2017; Opala, 2012).

Regulatory compliance. The TOE environmental context of regulatory compliance referred to the regulatory environment, the external partners, the industry, and the technological support for resources (Tornatsky & Fleischer, 1990). Complying with regulations allows organizations to satisfy customers, increase sales, and avoid non-compliance fines and sanctions (Awiagah et al., 2016; Hemphill & Longstreet, 2016). Regulatory compliance was statistically significant in predicting CC adoption, and its strong and positive correlation with DA underlined its potential influence on the cloud acceptance decision. This finding coincided with previous studies supporting the positive effect of achieving regulatory compliance on CC adoption (Awiagah et al., 2016; Hemphill & Longstreet, 2016; Opala, 2012).

Although the findings of this study indicated that cost-effectiveness and regulatory compliance had a statistically significant relationship with CC adoption, all three independent variables individually correlated with the outcome variable with a positive and relatively strong effect; CE (r = .788), RC (r = .732), and SE (r = .674). The

results presented here suggested that each independent variable may predict at least 67% of the outcome variable. These findings accentuated the need for firms in the payment card industry to assess their security, privacy, and compliance readiness while considering cloud services (Alruwaili & Gulliver, 2018). Hence, allowing them to select a suitable and secure cloud deployment model, cloud service model, cloud vendor, and SLAs.

Limitations of the Study

I observed some limitations during this research in addition to the two previously identified in Chapter 1.

a) Participants were conveniently recruited from the SurveyMonkey Audience. To minimize this limitation, I setup targeting options, a screening question, and disqualification logics to target only participants with characteristics similar to the study.

b) Focusing on the relationships between CE, SE, RC, and DA limited the scope of this study to one independent variable per TOE technological, organizational, and environmental perspective. To address this limitation, I used a previously validated instrument with similar variables (Opala, 2012).

c) Irrelevant comments introduced by participants about their titles. Being that respondents' title was an inclusion criterion, allowing an option for comments introduced unrelated data. This limitation decreased the final sample size. Thus, an opportunity for future studies would be to expand the list of titles and use a job title targeting option.

d) The targeting option for the number of employees in the company may have limited the number of survey responses, as participants may not have updated their

profile on the SurveyMonkey platform. To overcome this challenge, the options on the size of the organization were between 1 and 500 employees. Future studies may gather information from larger organizations for a broader assessment.

e) Time and money constraints limited this study. To minimize this challenge, I stay focused, worked harder, used the SurveyMonkey disqualification logic, and gradually added collectors as needed.

Recommendations

Small businesses are essential to the global economy. They comprised over 95% of businesses globally, encompassed 99.9% of U.S. market, and accounted for 66% of net new jobs created in the United States between 2000 and 2017 (SBA, 2018a; Senarathna et al., 2018). While, CC has proven to be an efficient and convenient solution for SMEs (Candel et al., 2016; Carcary et al., 2014; Kumar et al., 2017), I recommend continuous empirical studies across industries and regions to improve small businesses, and subsequently our communities.

This study was limited to three innovation characteristics of CC adoption by building on the TOE theoretical framework by Tornatsky and Fleischer (1990). According to Tornatsky and Fleischer, technology acceptance may be influenced at the technological, organizational, and environmental levels. While various innovative characteristics exist for each context of the TOE model, this research was limited to one factor per perspective. Thus, the need for further studies on other innovation features like cloud complexity, availability, and privacy, that remain challenging for small businesses (Alsmadi & Prybutok., 2018; Khan & Al-Yasiri, 2016; Rightscale, 2017).

Although cost-effectiveness and regulatory compliance were found to be the primary predictors of CC adoption, security was on the border line at the level of significance ($p >= .05$). I recommend further studies with a larger sample size to measure any variation of these results.

This study was focused on small businesses in the payment card industry typically obligated to comply with the PCI-DSS. Expanding the research to other laws and regulations such as the Sarbanes-Oxley Act, FISMA, GLBA, and HIPAA could provide a comparative representation of the driving factors of cloud adoption according to mandates.

The results of this study indicated that SMEs in the payment card industry were influenced in their cloud decision making by cost-effectiveness and regulatory compliance. I recommend a qualitative analysis with open-ended questions to explore various factors that may influence CC acceptance by decision-makers at small firms in the payment card industry. These questions could offer a better understanding of what people think, feel, and experience instead of judging or evaluating them (Ravitch & Carl, 2016).

Being that participants' title was required in defining decision-makers' roles, future studies may expand the list of job titles. Similarly, a targeting option on job title may be used to target decision-makers and improve the response rate of the survey.

Implications

The waves of revolution across the world are frequently displayed through various channels such as television, social media, and the internet. While the changes

may be positive or negative, meaningful or meaningless, small or weak, corporate or social, positively impacting people's lives and their communities through this study was my most fulfilling goal. The findings of this study extend beyond small businesses in the United States payment card industry. Considering how essential small firms are to the global economy, helping them become more sustainable may improve people and our communities.

This study aimed at examining the impact of cost, security, and compliance on CC adoption by a subset of the SurveyMonkey Audience. Although the findings could not be generalized, the research supported the common belief that decision-makers in small U.S. businesses primarily rely on cost savings and regulatory compliance incurred with CC while exploring this technology. Moreover, security was found to play an important role based on its direct correlation with CC decisions.

Significance to Theory

The TOE theoretical framework developed by Tornatsky and Fleischer (1990) was exploited to assess CC determinants at the technological perspective (SE), organizational context (CE), and the environment level (RC). The findings suggested that cost-effectiveness and regulatory compliance could significantly predict the decision to accept CC with a positive and strong effect. Whereas security directly correlated with CC adoption in a positive manner. These results added to the current body of knowledge on the TOE model with an emphasis on small-to-medium sized companies in the payment card industry and their security, cost-effectiveness, and regulatory intentions toward CC. While these findings underlined the continuous use of the TOE framework, they

supported the applicability of this model on similar constructs previously evaluated with the UTAUT framework introduced by Venkatesh et al. (2003) and Opala (2012).

Significance to Practice

Small businesses are essential to the global economy, and CC was found to be a comprehensive and effective technology for them (SBA, 2018a; Senarathna et al., 2018). Decision-makers and stakeholders may find the results of this study helpful in considering key factors driving the selection of their technologies. Whereas, CC providers may apply these results in improving their services and products. Despite the aforenoted limitations, the findings of this research may be used as a foundation for further studies on technology acceptance across regions and businesses. Moreover, the exhaustive literature review may provide valuable knowledge on various topics, including CC, small businesses, and regulatory compliance.

Significance to Social Change

The findings of this study revealed the significant predicting effect of cost-effectiveness and regulatory compliance on the decision to adopt CC and supported the budget constraints generally sustained by small firms (AlSharji et al., 2018; Priyadarshinee et al., 2017; Senarathna et al., 2018). Potential implications for social change extended beyond small U.S. firms in the payment card industry and included the substantial and novel knowledge on cloud technology acceptance to reduce business failures. The results of this study may potentially contribute to a sustainable and enhanced business performance for small firms handling cardholder data, which could subsequently improve local communities with increased employment and social and

economic growth. Moreover, the outcome of this research may increase consumers' confidence and trust while using their payment cards, with the knowledge that CC may offer a secure, reliable, and compliant environment for sensitive data.

Conclusions

Notwithstanding the outward advantages of CC, businesses remain reluctant to adopt this solution because of various and diverse reasons (Chen et al., 2018; Hsu &Lin, 2016; Kumar et al., 2017). This study was purposely focused on examining the existence and extent of the relationship between the independent variables; security, cost-effectiveness, and regulatory compliance, and the dependent variable; the decision to adopt CC by senior executives, IT managers, and business owners in small firms handling payment card data in the United States. The TOE theoretical framework by Tornatsky and Fleischer (1990) was used to approach the constructs at the technological level with security, organizational level with cost-effectiveness, and the environmental context through regulatory compliance.

A sample size of 140 participants recruited from SurveyMonkey allowed me to perform descriptive and inferential statistics presented in Chapter 4. The descriptive statistics provided characteristics specific to participants and their organizations, and the studied constructs. Most participants were male Caucasians between 28 and 37 years old, had a bachelor's degree with two to four years of CC experience, and either business owners or IT managers. Most firms had between 11 to 200 employees with education and IT-services as the primary business. Measures of central tendency and dispersion of the research constructs revealed a slightly skewed distribution of the attributes.

The findings of the descriptive statistics and multiple linear regression analysis revealed that the regression model was a statistically significant predictor of CC adoption with, 66.4% of the variations in CC adoption attributed to the linear combination of the predictor variables security, cost-effectiveness, and regulatory compliance. In the final regression model, only cost-effectiveness and regulatory compliance could significantly predict the behavioral intent to adopt CC with a positively strong effect. These results corroborated with many studies reviewed in Chapter 2 on the predicting effect of cost-effectiveness and regulatory compliance on technology adoption (Ahani et al., 2017; Kumar et al., 2017; Lalev, 2017; Opala, 2012). However, the findings deflected from the study by Opala (2012) supporting the predictive effect of security on CC decisions in a similar regression model but supported the direct correlation between individual independent variable and the dependent variable (Clapper & Richmond, 2016; Opala, 2012; Vasiljeva et al., 2017).

This research applied the constructs studied by Opala (2012) on small businesses in the U.S. payment card industry using the TOE theoretical model by Tornatsky and Fleischer (1990). Knowing that the reasons for CC reluctance may be specific to each organization, there is a need to continuously seek updated information to increase the understanding, applicability, and acceptance of this technology.

The results of this quantitative study will undoubtedly contribute to the scarce literature on innovation adoption by small businesses in the payment card industry. Conversely, these findings may be used as a) a foundation for future technology acceptance studies, b) a tool for decision-makers in improving their technology adoption

decisions, c) a benchmark for cloud service providers to increase customers' demands and satisfaction with better services and products, d) and a body of knowledge on latest CC insights.

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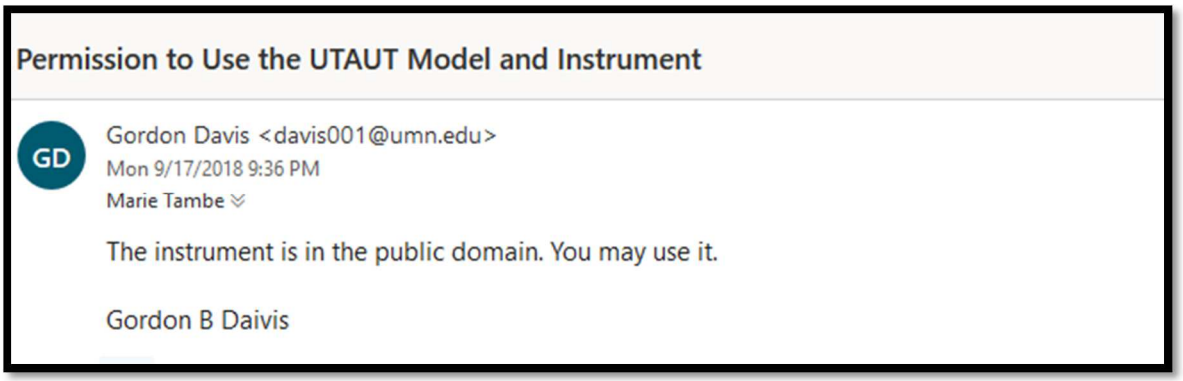
Appendix A: Permission to use the UTAUT Model and Instrument by Venkatesh, Morris, Davis, and Davis (2003)



Permission to Use the UTAUT Model and Instrument

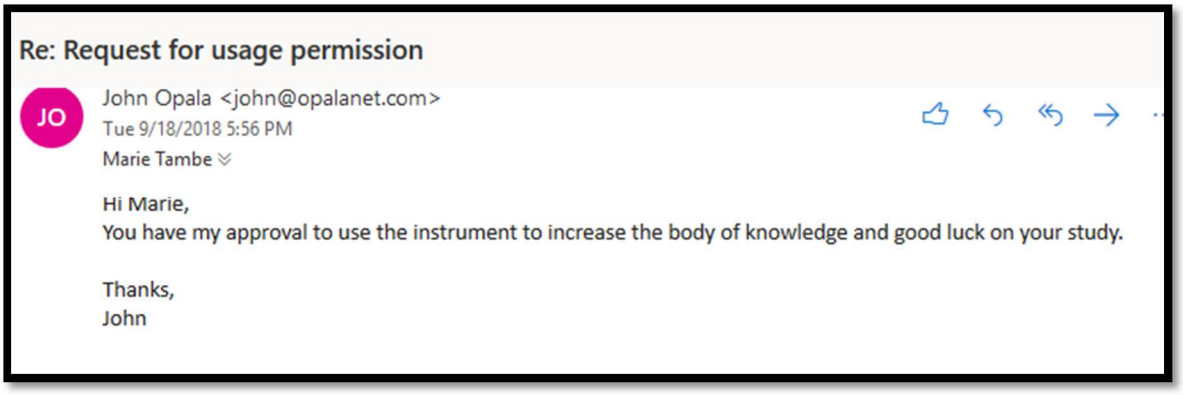
GD

Gordon Davis <davis001@umn.edu>
Mon 9/17/2018 9:36 PM
Marie Tambe

The instrument is in the public domain. You may use it.

Gordon B Daivis

Appendix B: Permission to use the Research Instrument by Opala (2012)



Re: Request for usage permission

JO

John Opala <john@opalanet.com>
Tue 9/18/2018 5:56 PM
Marie Tambe

Hi Marie,
You have my approval to use the instrument to increase the body of knowledge and good luck on your study.

Thanks,
John

Appendix C: Permission to Reprint Image by Tornatzky and Fleischer (1990)

RE: Request permission to reprint image

PZ

Patricia Zline <pzline@rowman.com>
Mon 12/17/2018 12:04 PM
Marie Tambe

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Appendix D: Cloud Computing Adoption Survey

Welcome to the Study.

Thank you for participating to this study, As noted on the informed consent form, this survey is securely stored at SurveyMonkey. The survey should be taken in less than 30 minutes by checking on all that apply. However, you can freely withdraw from the survey by clicking on the Exit button on the right.

SECTION I

Item No	Demographic Information	Value
1	Is your company financially obligated to achieve PCI Compliance?	☐ YES ☐ NO
2	What best describes your title?	☐ IT/Security/Operation Manager ☐ IT Security/Assurance Director ☐ Chief Information Officer (CIO) ☐ Chief Security Officer (CSO) ☐ Other IT Management Position ☐ Business Owner ☐ None of the above (Please Specify) ----------
3	How many employees are in your organization?	☐ 1-10 employees ☐ 11-50 employees ☐ 51-200 employees ☐ 201-500 employees
4	What best describes your gender?	☐ Male ☐ Female
5	How old are you?	☐ 18□27 ☐ 28□37 ☐ 38□57 ☐ 58-67 and older
6	What is your education level?	☐ HS Diploma ☐ Associate Degree ☐ Bachelor's degree ☐ Master's degree ☐ Doctorate Degree ☐ Other (Please Specify) ----------
7	Which response best identifies your ethnicity?	☐ Black ☐ Asian ☐ Caucasian ☐ Hispanic ☐ Other (Please specify) ----------
8	How many years of experience do you have implementing Cloud Computing technologies?	☐ None ☐ Less than 2 years ☐ Two years to less than 5 years ☐ Five years or more
9	What is the primary business or industry of your organization?	☐ Construction ☐ Education ☐ Energy/Utilities ☐ Financial Services/Banking ☐ Government ☐ Health Care ☐ IT–Manufacturing ☐ IT–Services

		☐ Cloud Service Providers ☐ Professional, Technical, and Services (non□IT) ☐ Telecommunications ☐ Travel/Leisure/Hospitality ☐ Other (Please specify) ---------

SECTION II

Please respond to each of the questions numbered 10 through 25 by checking one of the options. A score of one indicates Strongly Disagree, whereas a score of 5 indicates Strongly Agree

Cloud Security (SE)

Item No	Item Description	1 Strongly Disagree	2 Disagree	3 Neither	4 Agree	5 Strongly Agree
10	I feel that Cloud Computing technology is secure	☐	☐	☐	☐	☐
11	I am concerned about security of the technology used in Cloud Computing services such as virtualization, IaaS, SaaS, and PaaS	☐	☐	☐	☐	☐
12	I feel that Cloud Computing technology is more secure than traditional enterprise networks methods	☐	☐	☐	☐	☐
13	I am willing to use Cloud Computing to host sensitive information for my organization	☐	☐	☐	☐	☐

Cost Effectiveness (CE)

Item No	Item Description	1 Strongly Disagree	2 Disagree	3 Neither	4 Agree	5 Strongly Agree
14	The cost of maintenance is lower with cloud computing than with traditional IT methods.	☐	☐	☐	☐	☐
15	Cloud computing provides a good value for their costs	☐	☐	☐	☐	☐
16	I would consider cloud computing to have considerable cost savings over traditional IT methods.	☐	☐	☐	☐	☐
17	The cost of acquiring Cloud Computing is considerably cheaper than traditional computing methods.	☐	☐	☐	☐	☐

Regulatory Compliance (RC)

Item No	Item Description	1 Strongly Disagree	2 Disagree	3 Neither	4 Agree	5 Strongly Agree
18	Cloud Computing technology does/will significantly improve IT compliance	☐	☐	☐	☐	☐
19	Cloud computing is inherently reliable and meets IT compliance requirement.	☐	☐	☐	☐	☐
20	Cloud Computing is reliable than traditional computing methods, and improves IT Sarbanes-Oxley compliance expectations	☐	☐	☐	☐	☐
21	Cloud Computing systems are reliable and increase PCI DSS compliance expectations	☐	☐	☐	☐	☐

Intention to Adopt Cloud Computing (DA)

Item No	Item Description	1 Strongly Disagree	2 Disagree	3 Neither	4 Agree	5 Strongly Agree
22	I am willing to use Cloud Computing technology	☐	☐	☐	☐	☐
23	I feel that my organization's computational needs can be met by Cloud Computing	☐	☐	☐	☐	☐
24	I would feel comfortable recommending Cloud Computing approaches in my organization.	☐	☐	☐	☐	☐
25	I feel that Cloud Computing uses proven technology	☐	☐	☐	☐	☐

Survey Instrument adapted from Opala (2012), and Venkatesh, Morris, Davis, and Davis (2003).

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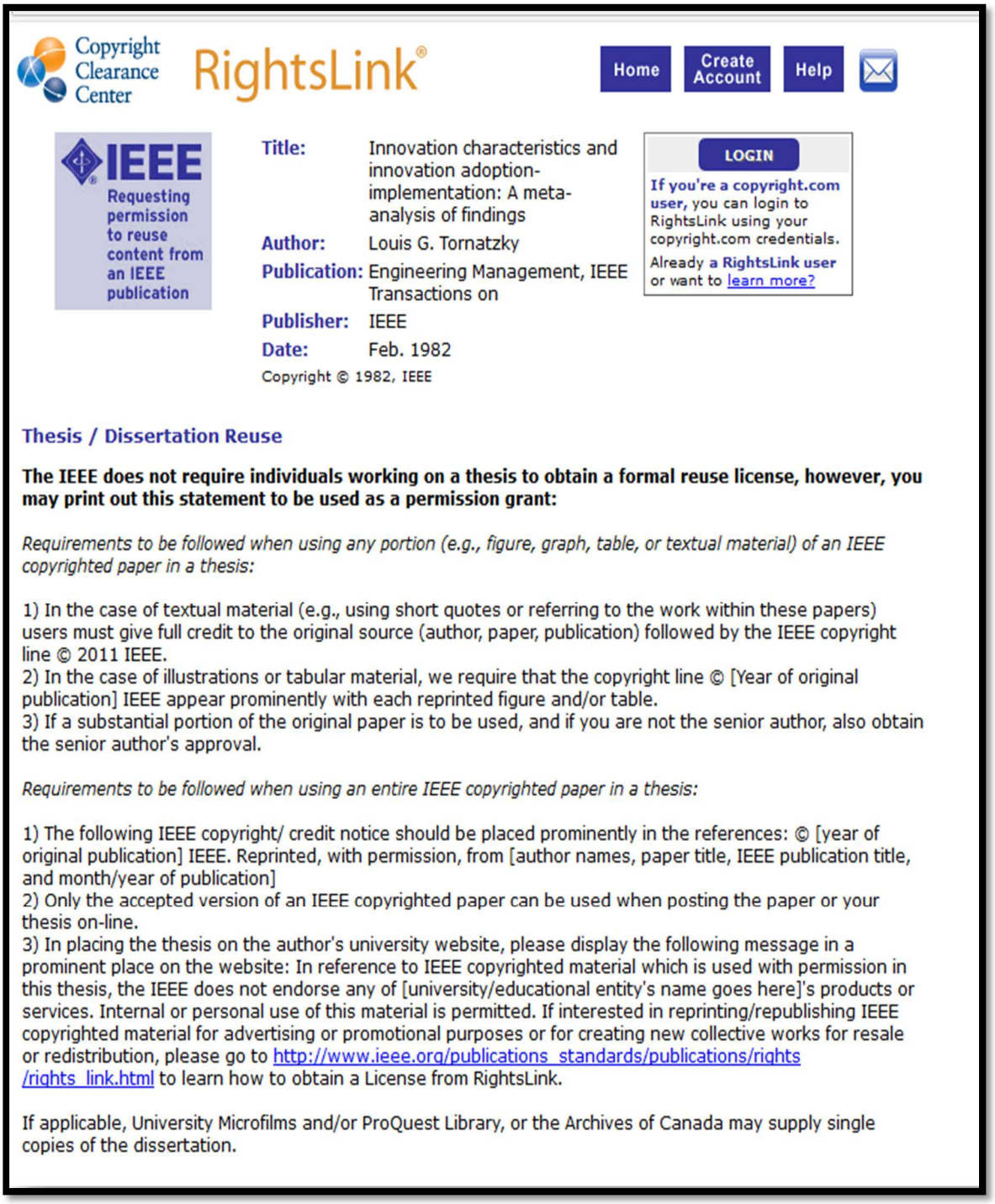

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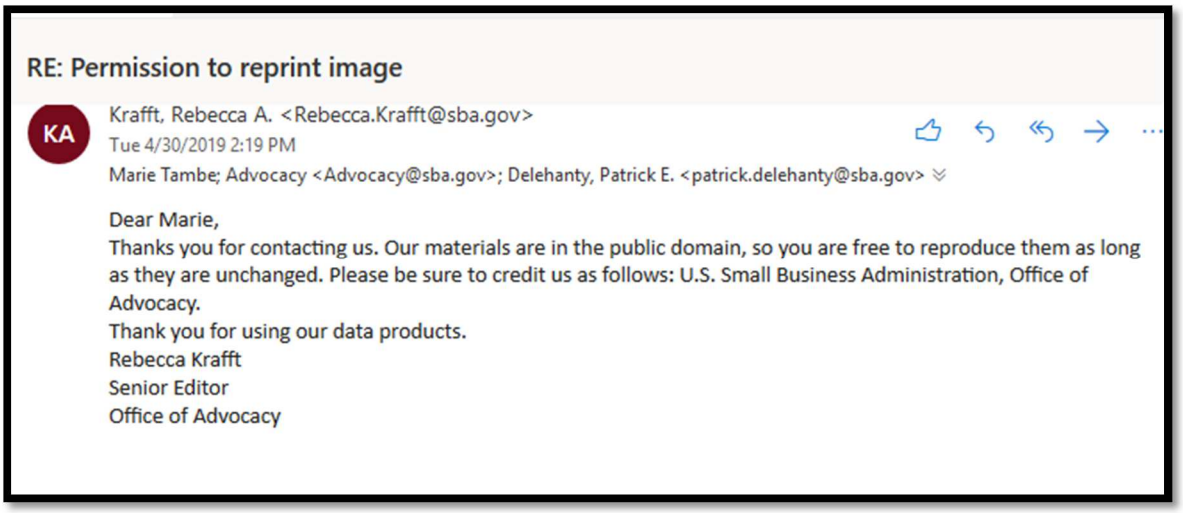

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KA

Krafft, Rebecca A. <Rebecca.Krafft@sba.gov>
Tue 4/30/2019 2:19 PM
Marie Tambe; Advocacy <Advocacy@sba.gov>; Delehanty, Patrick E. <patrick.delehanty@sba.gov>

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Appendix G: Codes of Constructs Items

CLOUD SECURITY (SE)		
Item No	Item Description	Code
10	I feel that Cloud Computing technology is secure	SE1
11	I am concerned about security of the technology used in Cloud Computing services such as virtualization, IaaS, SaaS, and PaaS	SE2
12	I feel that Cloud Computing technology is more secure than traditional enterprise networks methods	SE3
13	I am willing to use Cloud Computing to host sensitive information for my organization	SE4
COST-EFFECTIVENESS (CE)		
14	The cost of maintenance is lower with cloud computing than with traditional IT methods.	CE1
15	Cloud computing provides a good value for their costs	CE2
16	I would consider cloud computing to have considerable cost savings over traditional IT methods.	CE3
17	The cost of acquiring Cloud Computing is considerably cheaper than traditional computing methods.	CE4
REGULATORY COMPLIANCE (RC)		
18	Cloud Computing technology does/will significantly improve IT compliance	RC1
19	Cloud computing is inherently reliable and meets IT compliance requirement.	RC2
20	Cloud Computing is reliable than traditional computing methods, and improves IT Sarbanes-Oxley compliance expectations	RC3
21	Cloud Computing systems are reliable and increase PCI PSS compliance expectations	RC4
INTENTION TO ADOPT CLOUD COMPUTING (DA)		
22	I am willing to use Cloud Computing technology	DA1
23	I feel that my organization's computational needs can be met by Cloud Computing	DA2
24	I would feel comfortable recommending Cloud Computing approaches in my organization.	DA3
25	I feel that Cloud Computing uses proven technology	DA4