ANA G. MÉNDEZ UNIVERSITY

GURABO CAMPUS

DIVISON OF BUSINESS, TOURISM AND ENTREPRENEURSHIP

FACTORS AFFECTING BLOCKCHAIN TECHNOLOGY ACCEPTANCE IN MOBILE FINANCIAL TRANSACTIONS AND SERVICES

by

Carlos L. Ramón-Rodríguez

Dissertation Thesis

Presented in Partial Fulfillment of the Requirements for the

Doctoral Degree in Business Administration

Gurabo, Puerto Rico

May, 2021

ANA G. MÉNDEZ UNIVERSITY

GURABO CAMPUS

DIVISON OF BUSINESS, TOURISM AND ENTREPRENEURSHIP

CERTIFICATION OF APPROVAL OF DISSERTATION PROPOSAL

The dissertation proposal for Carlos Ramón-Rodríguez's research study was reviewed and approved by the members of the Dissertation Committee. The Doctoral Academic Requirements Compliance form, signed by the committee members, was submitted to the Register's Office and the Graduate Studies & Research Center at the Ana G. Méndez University, Gurabo Campus.

DISSERTATION COMMITTEE MEMBERS

Dr. Isabel Rivera Ruiz
Ana G. Méndez University
Dissertation Committee Director

Dr. Luis Mario Cardona
University of Puerto Rico
Dissertation Committee Member

Dr. Carlos F. Rosa Vazquez
Ana G. Méndez University
Dissertation Committee Member

FACTORS AFFECTING BLOCKCHAIN TECHNOLOGY ACCEPTANCE IN MOBILE FINANCIAL TRANSACTIONS AND SERVICES

by

Carlos L. Ramón-Rodríguez

Dr. Isabel Rivera Ruíz

ABSTRACT

The new digital era has an influence on the acceptance of mobile financial applications available to financial institutions' customers. The arrival of new technologies offers advantages and additional interconnection among products, processes, and services. This also brings unsolicited opportunities for cybercriminals to commit fraud, which results in losses to financial institutions and weakening the trust of consumers. Presently, some financial institutions are using blockchain technology to conduct financial transactions. The empirical research study validated the perceived performance and facilitating conditions of the UTAUT model (Venkatesh et al., 2003). Extended factors of the consumer security perception and trust in financial institutions support the acceptance of the use of blockchain technology to conduct financial transactions and services. The researcher conducted a survey study using the snowball sampling method of financial institution consumers. The research contributes to the gap in literature, by providing an empirical study on the perception of privacy, security, trust, government support, and acceptance factors on the use of blockchain technologies in financial institutions and as practical implications by presenting a better

understanding on user behavioral intention and willingness to adopt to new technologies.

Key words: Blockchain acceptance, financial institutions, UTAUT, trust, government support

DEDICATION

I want to dedicate this research work to my family for the support they have given me throughout my doctoral studies. My wife Liz, my son Leonel, and my daughter Karla are the main reasons I continued working hard to accomplish this goal. Nothing is impossible when you are determined and have the support of your loved ones. When you have the support of your family, there is no hurricane, earthquakes, and pandemic that will stop you! To my parents (Don Raúl and Doña Lourdes) and my in-laws (Don Miguel and Doña Iris) who are always there helping us feed, raise, and take care of our kids when needed. Thanks for your unconditional love and encouragement!

ACKNOWLEDGEMENTS

I would like to acknowledge everyone who played a role in my academic accomplishments, especially my dissertation committee, Dr. Isabel Rivera Ruiz, Dr. Carlos F Rosa Vazquez, and Dr. Luis Mario Cardona. Thanks for all the advice given during my research study. Dr. Isabel Rivera, who was instrumental in my developmental stages as a researcher, Thank you! To my fellow doctoral students who shared their work experiences and spent long hours with me studying, made this experience a memorable one. I wish to all of you the best!

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDIXES

CHAPTER I: INTRODUCTION

The business infrastructure has become more digitalized (Khrais, 2017) with an increase interconnection among products, processes, and services (Bharadwaj et al., 2013). The new trends and recent events of the worldwide pandemic declaration by the World Health Organization in March 2020 (CDC, 2020) of COVID-19, have distressed financial institutions in how they normally operate. Shelter-in-place orders and fear of exposure to COVID-19 virus have leads businesses to expand their digital offerings and consumers have to rely increasingly on mobile and online channels to conduct day-to-day activities (Lei & Tran, 2020).

Some empirical studies layout the economic consequences and the drop on consumers' spending during the COVID-19 crisis in different countries: Denmark (Andersen et al., 2020), China (Chen et al., 2020), and United States (Baker et al., 2020). There are many challenges in how consumers work and live. One of the greatest challenges is in the financial institution' sector. The financial institutions have been partnering with digital money servicing providers and other Fintech companies to continue servicing their customers by including digital banking opportunities (Zaheer, 2020). This allows customers to access financial services from their banks via the Internet or mobile applications without having to be physically present at the financial institution. Besides, provides additional opportunities for the market growth and implementation of new technologies.

The 2019 Global State of Mobile report from Comscore (2019) revealed the total minutes spent online in the U.S. grew 43% from June 2017 to June 2019. The mobile applications dominating that usage with a high 77%, whereas desktop computer usage

has decreased markedly from 34% to 23%, during the same period. There are over 57 million of mobile banking users in the U.S. and 86% of U.S. Banks offer a bill payment option via mobile banking (Szmigiera, 2019). Mobile banking involves using a mobile device to carry out financial transactions. As per the market growth for smart devices, in 2018, the total mobile app revenue amounted to over 365 billion U.S dollars (Clement, 2019). In 2023, mobile apps are projected to generate more than 935 billion U.S. dollars in revenues via paid downloads and in-app advertising (Clement, 2019).

The Puerto Rico mobile phone internet user penetration for 2017, was 68% of the population having access to the internet through mobile devices (Statista, 2018). That percentage will increase to 78% by year 2020. To be competitive advantageous, industries marked by fast changes in technology functionality, not just in announcing new products (first-mover advantage); but also ensuring the availability of new products on a global basis to capture the fast-mover advantage (Bharadwaj et al., 2013).

Financial institutions are using blockchain technology to conduct their financial transactions, processes, and provide services to their customers (IBM, 2016). Thus, blockchain can be used in various online financial services, such as management of digital assets like online payment processing, virtual wallets, global money remittance, enabling smart contracts, and automating banking ledgers (Kamboj & Yang, 2018). Those potential benefits of blockchain are offset with several key challenges. The first challenge is that the technology is complicated. Even the basics are difficult to understand, both conceptually and technically, and this is a barrier to effective decision making and the ongoing implementation and use of the technology (Swan, 2017).

Presently, there are existing mobile-based platforms to conduct financial transactions. At the same time, some of these mobile-based platforms facilitating financial transactions will bring unsolicited opportunities for cyber criminals to commit fraud, which results in losses to financial institutions weakening the trust of consumers (Awiagah et al., 2016). In a digital world, data protection and privacy are the most enormous issues which customers, companies, and policymakers also take seriously into consideration due to the recent increase of security breaches and surveillance in reported incidents (Duy et al., 2018).

During the lockdown period, due to COVID-19, the number of cashless transactions has been increasing and the fraudulent transactions are also increasing rapidly (Dutta & Kumar, 2020). For these reasons, some consumers are reluctant to provide their personal information when requested online. The trust between the clients and companies is imperative for the success of the business relationship between the vendor (financial institution) and consumer. While Bitcoin (cryptocurrency) has garnered attention for facilitating criminal activity, including money laundering, terrorism financing, digital ransomware, weapon trafficking, and tax evasion; it is Bitcoin's underlying protocol, the blockchain, that represents an innovation (Ducas & Wilner, 2017). Blockchain is capable of transforming financial services and challenging existing security, financial, and public regulations and policies (Ducas & Wilner, 2017). Blockchain technology offers the security aspects, accessibility, and benefits that consumers need in mobile transactions and services (Duy et al., 2020). The government support also plays an important role in accepting new technologies by creating laws and regulations ensuring its acceptance and providing guidelines to its use.

Problem Background/ Antecedents

The internet fraud and scams have increased rapidly over the last five years. From 2015 through 2019, the Internet Crime Complaint Center (IC3) received over 1.7M complaints, reporting a loss of $10.2 billion, being the highest $3.5 billion in 2019 (IC3, 2019). According to the web application attacks observed in June 2019, the Caribbean territory suffering the largest number of attacks was Puerto Rico. For seven days, Puerto Rico suffered a total of 300,420 web application attacks (Navarro, 2020). This was confirmed by Jimenez (2019) on his research study. The individuals over 39 years and older, the 67.5% of these participants responded affirmative as having a negative experience with identity theft and cyber finance fraud. The importance of the system's credibility affects the peoples' attitudes after seeing the numerous reports of internet fraud, credit and debit card theft, hacking, and virus attacks (Awiagah et al., 2016). Furthermore, the trust in financial institutions and attitude towards intention to use a new technology shows the importance of security and privacy in e-commerce use.

Bitcoin's underlying protocol, the blockchain, represents an innovation capable of transforming financial services and challenging existing security, financial, and public safety regulation and policies (Ducas & Wilner, 2017). Blockchain technology can streamline online exchanges and reduce corruption, mistakes, fraud, and tax evasion. This is possible because blockchain technology is at its least the most reliable online tracking system yet developed (Swan, 2017). A survey conducted by the Economist Intelligence Unit of IBM Institute for Business Value in 2016 revealed that 15% of majors Banks worldwide are using Blockchain technology by 2017. This percentage was expected to increase to 66% for 2020 by the ability of these institutions to influence and set the

business standards by which others operate. Now, with the exposed technology carried in blockchain is more than a cryptocurrency exchange between P2P (peer to peer), as Nakamoto's (2008) Bitcoin does.

Financial products and services drive the world's development and reduce poverty (Lichtfous et al., 2019). However, more than 1.7 billion individuals globally currently lack the most basic financial services and therefore cannot adequately invest in their health, education, and entrepreneurship. Recent progress has been driven by a new generation of financial services accessed via mobile phones and the internet. Decentralized digital currencies—empowered by their underlying blockchain technology—have caused quite a stir in the tech and financial community, and its potential for empowering financial inclusion is being tested globally. (Lichtfous et al., 2019)

Purpose of the Study

The purpose of this research was to identify the underlying factors affecting the intention to use blockchain technology to conduct mobile financial transactions and services. Using the unified theory of acceptance and use of technology UTAUT of Venkatesh et. al. (2003) model, it was measured the consumer behavioral intention to use blockchain technology in mobile financial transactions and services. As independent variables, the performance expectancy, effort expectancy, social influence, facilitating conditions, and government support were presented. These variables measured the intention of the use of blockchain technology in customers of financial institutions that use mobile applications to conduct their financial transactions and services. Likewise,

extended factors on perceived risk, perceived security, and perceived privacy measured the trust consumer have in their financial institutions. Furthermore, the intention to use blockchain technology to conduct mobile financial transactions and services. The participants of this study were customers of financial institutions of PR and EU.

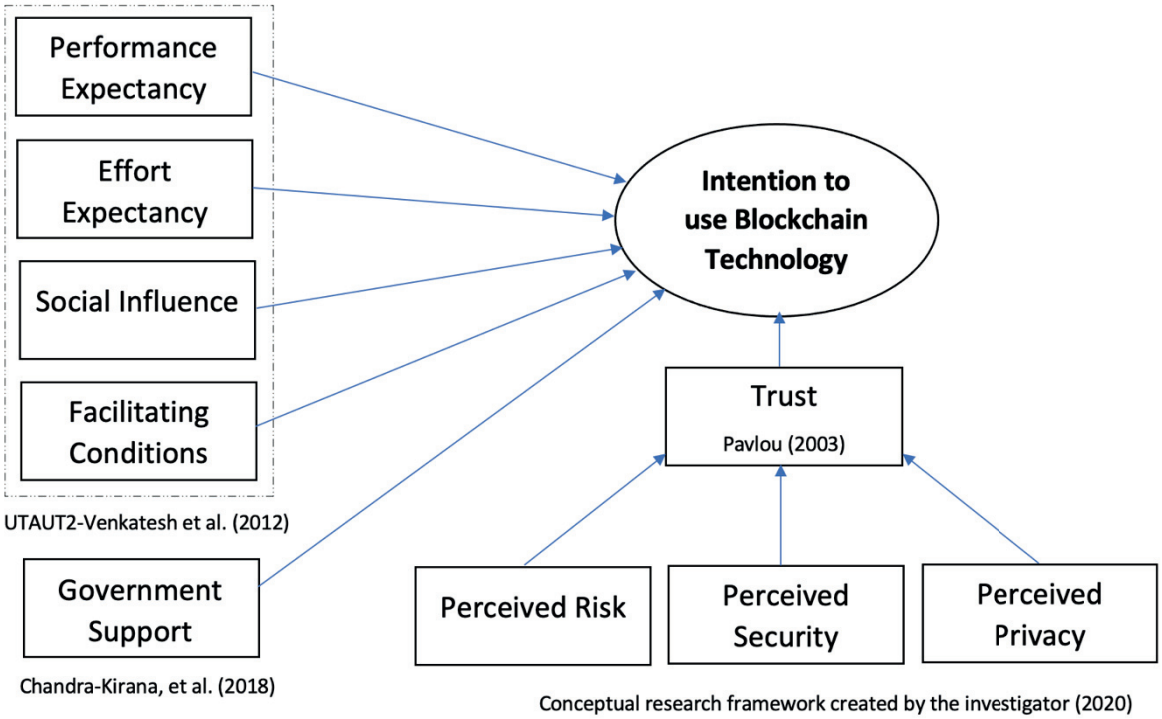
Research Objective

To achieve the purpose of this research, three objectives were presented. First, it was identified the factors that influence the intention to adopt blockchain technology to conduct mobile financial transactions and receive services. Second, the efficiency of the proposed framework for blockchain technology acceptance was measured. Third, it was determined which of the analyzed variables had the most influence on the blockchain technology use and acceptance when conducting mobile financial transactions and receive services.

Conceptual Research Framework

Figure 1 shows the conceptual research framework based on literature review with constructs portraying general technology acceptance variables and consumer's characteristics of performance expectancy, effort expectancy, social influence, facilitating conditions, government support, and trust. These exogenous (independent) variables measured the factors affecting the endogenous (dependent) variable of intention to use blockchain technology in mobile financial transactions and services. Furthermore, the proposed conceptual framework measured the perceived risk, perceived security and perceive privacy as indicated in the literature with trust as an endogenous variable and exogenous variable to the behavioral intention to use.

Figure 1. Proposed Framework UTAUT2, Government Support and Trust



Justification

The researcher did not find much literature related to this disruptive technology and the factors that influence the acceptance of use. At the time of this study, the researcher had found an empirical research study on the use of blockchain technology on banking institutions Malaysia (Yusof et al., 2018) using the UTAUT model of Venkatesh et al. (2003) and Abu et al. (2015). Yusof et al. (2018), limited their study on the four main constructs of UTAUT Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC) in the banking institutions of Malaysia using the viewpoint perspective of the employees and not the consumers. Accordingly, Salem and Ali (2019) proposed a conceptual model using the four main constructs of the UTAUT with two extended constructs of Perceived Risk (PR) and Trust. Furthermore, in a research study performed on Italian firms by Caldarelli et al. (2020),

the UTUT model was utilized to learn about the people's intention to adopt blockchain technology. The proposed model for this research was based on the user's perspective and included the UTAUT model with additional constructs supported by literature on government support and trust. In the proposed model, trust was influenced by the perceived risk, perceived security, and perceived privacy.

At the time of this research, no empirical research was found validating the proposed model. This research validated the UTAUT model of Venkatesh et al. (2003) in the context of the adoption of blockchain technologies to conduct mobile financial transactions and services in Puerto Rico and United States. The conceptual model included additional constructs extending the UTAUT model. The results of this research contributed to the gap in literature with an empirical study on the adoption of new technologies to conduct mobile financial transactions and services.

Research Question and Hypothesis

This empirical research pursued to respond to the following question using the proposed conceptual model and hypothesis:

RQ: How consumers' behavior affects the intention to adopt blockchain technology on mobile financial transactions and services?

H_1: Performance expectancy will positively affect the intention to use blockchain technology to conduct mobile financial transactions and services.

H_2: Effort expectancy will positively affect the intention to adopt blockchain technology to conduct mobile financial transactions and services.

H_3: Social Influence will positively affect the intention to adopt blockchain technology in mobile financial transactions and services.

H_4: Facilitating conditions will positively affect the intention to adopt blockchain technology to conduct mobile financial transactions and services.

H_5: Government support on blockchain technology will positively affect the intention to use new technology to conduct financial transactions and services.

H_6: Perceived Trust in financial institutions will positively affect the intention to adopt blockchain technology in mobile financial transactions and services.

H_7: Perceived Risk affects negatively the perceived trust in financial institutions.

H_8: Perceived security affects positively the perceived trust in financial institutions.

H_9: Perceived privacy affects negatively perceived trust in vendors' financial institutions.

Definitions

The literature review provided various definitions on the constructs and variables for the UTAUT and extended factors that influence the intention to use new technology. Definitions for intention of use, performance expectancy, effort expectancy, social

influence, facilitating conditions, government support, trust, perceived risk, perceived security and perceived privacy is presented in this section adapted to online transactions. Also, the concept of blockchain technology is explained.

Behavioral intention of adoption. This refers to the intention of effective use by the consumer of a future product or service (adapted from Venkatesh et al., 2003). It is referred to as an individual's decision to exhibit a particular behavior in the future (Engotoit et al., 2016).

Performance expectation. Engotoit et al. (2016) defined performance expectation as the degree to which someone believes that using a particular technology will help enhance his or her job performance. Also, Venkatesh et. al. (2003) referred to performance expectation as how much people realize that a system such as the internet or mobile technology is useful in carrying out their tasks in day-to-day work.

Effort expectation. It is the degree of ease associated with the use of a system (Lee et al., 2018). This explains the degree of ease associated with the use of the system. It originates from three constructs of existing models: perceived ease-of-use (TAM/TAM2), complexity (MPCU) and ease of use (IDT) (Venkatesh et al., 2003).

Social influence. This is defined as the degree of influence that opinions of others can have on the adoption of a given system. Social influence as a direct determinant of the intention of use is represented as a subjective standard TRA, TAM2, TPB/DTPB and C-TAM-TPB; social factors in MPCU and image in IDT (Venkatesh et al., 2003). It is the extent to which users perceives that the important others such as family and friends believe that he or she should use m-commerce (Marinkovic & Kalinic, 2017).

Facilitating Conditions. It is defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system" (Venkatesh et al., 2003; Tarhini et al., 2016).

Government Support. It is the degree to which of government support or parties authorized to regulate and protect internet banking transactions (Chandra-Kirana, 2018). Furthermore, the explicit acceptance of the technology in legislations, recognizing it as valid and fitting for specific use cases (Riviere, 2018)

Trust. It is defined as the belief that the other party will behave in a socially responsible manner, and, by so doing, will fulfill the trusting party's expectations without taking advantage of its vulnerabilities (Pavlou, 2003).

Perceived Risk. Trust in a Web-retailer can be expected to take steps to reduce environmental uncertainty and related risk involved in interacting with it (Pavlou, 2003).

Perceived Privacy. Reflects the ability of an individual to control the method in which personal information is collected and used in transactions (Morosan, 2013).

Clarke (1999) defined privacy as the individual's right to be alone. Clarke considered several dimensions like the privacy of an individual's body, behavior, communications, and personal data. The way financial institutions manage consumer personal data will affect the perception of privacy. On traditional online transactions, customers are reluctant to enter their personal information when the sites ask for it, because they are concerned about the interception and misuse of information sent over the internet and how their data is used (Roca et al., 2009).

For financial institutions, the perception of privacy depends on the trust and reputation that customers have with their institutions. In general, reputation may be considered as the result of the organizations' relational history with the context in which it functions (Casaló et al, 2007). In the case of the adoption of new technologies, such as blockchain for financial transactions, the perceived privacy will be the same as the traditional electronic transaction using the website of the financial institution.

Perceived Security. Represents the extent to which individuals subjectively believe that technology is secure (Morosan, 2013).

Perceived information security. It is defined as the subjective probability with which consumers believe that their personal information will not be viewed, stored or manipulated during transit or storage by inappropriate parties, in a manner consistent with their confident expectations (Chelleppa, and Pavlou, 2002). In an online transaction such as financial transactions through the internet, consumers must accept the use of some identifiable information with the institutions as they will do on a traditional financial transaction. Consumer trust in electronic transactions is defined as the subjective probability with which consumers believe that a particular transaction will occur in a manner consistent with their confident expectations.

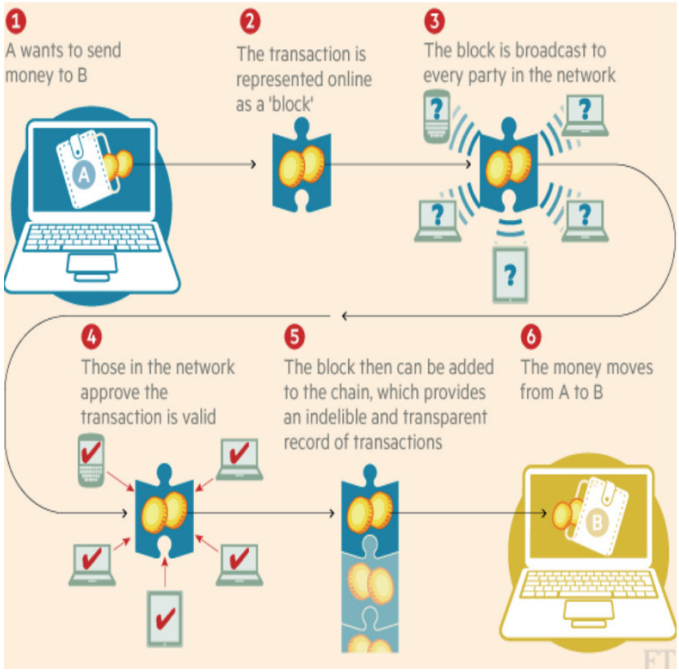
The blockchain technology security is based on key cryptography and the website of financial institutions have a mechanism of encryption, protection, verification, and authentication. The perceived information security and trust in electronic transaction in financial institutions web site should be affected by the trust of the consumer in their financial institution.

Blockchain Technology for Financial Institutions

For financial institutions, the use of blockchain technologies goes beyond bitcoin or other virtual currencies. Blockchain applications in financial institutions touch important fields such as domain registration, crowdfunding, prediction markets, stocks, annuities, pensions, and others (Peters & Panayi, 2015). Some of the benefits that blockchain provides are the SHA-256 hash algorithms (security), reduction in time cycle on transactions, and information related to the digital time stamp, which records the temporal existence of a particular blockchain ledger item at a given instance in time. In other words, blockchain technology enhances the necessary security on a timeless effort and provides the accountability of when and where the transaction took place.

A blockchain is essentially a distributed database of records, or public ledger of all transactions or digital events, that have been executed and shared among participating parties (Crosby et al., 2016). The participants in the system will verify the public ledger and accept the transaction to be valid and untampered. The information entered in the block cannot be deleted. These blocks are linked to each other in a proper linear, chronological order with every block containing the hash of the previous block. Each block will be accepted in the blockchain if it contains the answer to a specific mathematical problem or "proof of work". The proof of work is one of the reasons why financial institutions are taking serious consideration in the use of blockchain technology to conduct their financial transactions. Leading banks like JP-Morgan, State Street, UBS, Royal Bank of Scotland, Credit Suisse, BBVA, and Commonwealth Bank of Australia have joined this initiative (Crosby et al., 2016). Figure 2 shows an example of how the financial transaction is conducted using blockchain technology.

Figure 2. Financial Transaction Using Blockchain Technology (Crosby et al., 2016)



One of the applications widely used within blockchain technology is the smart contracts (automatically execution of the contract between participating parties) which it was created back in 1994 by Nick Szabo. Thus, Szabo came alive with the addition of the blockchain technology benefits and the wide range of applications such as governance, autonomous banks, keyless access, crowdfunding, financial derivatives trading, and settlement; all by using Smart Contracts (Crosby et al., 2016).

Categorization of Blockchain Technology

First, we must understand there are various categorization of blockchain. For financial institutions purposes, the focus will be whether an authorization is required for network nodes which act as verifiers. Accordingly, access to the blockchain data itself is public or private (Peters & Panayi, 2015). In the public blockchain, anyone can read and submit transactions to the blockchain. Meanwhile, in the private blockchain, the permission is restricted to users within an organization or group. Another categorization

of blockchain is permission-less blockchain and permissioned blockchain. In the permission-less blockchains, looking for a monetary reward and without prior authorization, anyone can participate in the verification process if the user contributes with computational power (e.g., Bitcoin). In the permissioned blockchain, there will be a consortium or central authority that verifies the preselected nodes. Permissioned blockchain is intended to be purpose-built and can thus be created to maintain compatibility with existing applications (financial or otherwise) (Peters & Panayi, 2015).

Regulation for Financial Institutions

In the United States, financial institutions follow the anti-money laundering laws and regulations established by the US Congress and government entities such as FinCEN (United States Department of Treasury- Financial Crimes Enforcement Network). FinCEN, safeguard the financial system from illicit use and combat money laundering; and promote national security (FinCEN, 2013). The arrival of new technologies carries opportunities for criminals and Bitcoin is not excluded from it. As presented in the hearing of the US Senate Homeland Security and Government Affairs Committee (2013), Liberty Reserve (a digital currency exchanger) used its centralized virtual currency as part of an alleged $6 billion money laundering operation purportedly used by criminal organizations engaged in credit card fraud, identity theft, investment fraud, computer hacking, narcotics trafficking, and child pornography.

In the United States, regulatory agencies treat the virtual currency (Bitcoin) as property, regulates the transmission of virtual currency as same as currency (Swan, 2015). This includes US government agencies such as FinCEN, banking regulators, SEC, CFTC, and DOJ. In 2011, FinCEN published a final rule amending definitions and other

regulations in relating to money services businesses (MSB) and the application of FinCEN's regulations to persons administering, exchanging, or using virtual currencies (FinCEN, 2013). The Internal Revenue Service (IRS), in the IRS Notice 2014-21 recognized the virtual currency as property and any gain or loss on sale is treated like a sale or exchange of securities. If held as investment property, the gain or loss on sale is capital in nature (IRS Notice 2014-21).

Virtual currency is a medium of exchange that operates like a currency in some environments but does not have all the attributes of real currency. It can be addressed as "convertible" virtual currency. In other words, this type of virtual currency either has a corresponding value in real currency or acts as a substitute for real currency.

The Uniform Regulation of Virtual-Currency Businesses Act (URVCBA), completed by the Uniform Law Commission in 2017, provides a statutory framework for the regulation of companies engaging in "virtual-currency business activity" (Hughes, 2017). According to the law, a virtual-currency business activity means, exchanging, transferring, or storing virtual currency; holding electronic precious metals or certificates of electronic precious metals; or exchanging digital". The URVCBA's unique three-tiered structure that clarifies whether an individual or company engaging in virtual currency business activity is (1) exempt from the act; (2) must register; or (3) must obtain a license.

Some of the questioned components of the arrival of blockchain technology is the effort expectation and performance expectation, one of the UTAUT behavioral constructs. Because many of the ideas and concepts behind Bitcoin and blockchain technology are new and technically intricate, one complaint has been that perhaps

cryptocurrencies are too complicated for mainstream adoption (Swan, 2015). Regular consumers do not need to know how a transmission control protocol and the internet protocol (TCP/IP) works to send an email, and new technology applications pass into public use without much further consideration of the technical details as long as appropriate (usefulness), usable, trustable applications are developed. This perceived issue is solved by many financial industries creating a web interface or platform to conduct their financial transactions. As an example, Venture capital-backed by Ripple Labs is using blockchain technology to reinvent the banking ecosystem and allow traditional financial institutions to conduct their own business more efficiently (Swan, 2015). The Ripple's payment network lets banks transfer funds and foreign exchange transactions without a third party, as is now required.

The IBM report (2016) named "*Leading the pack in blockchain banking",* claims that information, innovation, and interaction frictions can be minimized by the use of blockchain technology in financial industries. The three frictions that blockchain can most reduce are the invisible threats, the inaccessible marketplaces and the imperfect information.

Limitations

As a limitation of this research, it only measured the consumers of financial institutions and their behavioral intention to use a new technology. Further research studies should include other private institutions or government entities.

Importance of the Study

This research contributes to the literature by providing an empirical study on the perception of the behavioral intent to adopt new technologies for mobile financial

transactions and services. The study presents as practical implications a better understanding of the perception which consumers have on their trust in their vendors (financial institutions) and the willingness to adopt new technologies. Vendors will be able to rely on the results of this study as a tool in their decision support systems by adapting new trends of technologies to conduct their mobile financial transactions and services.

Summary

In Chapter one, the problem, justification and importance of this research study was established. A conceptual framework model was presented following the UTAUT model of Venkatesh et al. (2003) with additional extended factors of government support and trust validating the presented hypothesis. Furthermore, the definition of the constructs and blockchain in the financial system was introduced. To address the research objectives and question, the next section will re-establish the problem, examines the theorical background, and provide empirical evidence to support the proposed research framework and hypothesis.

CHAPTER II: LITERATURE REVIEW

This chapter provide the theorical background, research framework with the established hypothesis, and empirical evidence supporting all constructs and variables. To facilitate the understanding of the concepts, empirical support of the constructs and variables was presented.

Re-statement of the Problem

The blockchain technology provides a decentralized transaction ledger functionality that could be used to register, confirm, and transfer all manner of contracts and property (Swan, 2015). The financial institutions are using blockchain technology to conduct financial transactions such as escrow transactions, bonded contracts, multiparty signature transactions, mutual funds, pensions, annuities, among others. The financial industries are becoming aware of new trends in doing business with their clients using blockchain technology. A Deloitte survey conducted in 2019 to 1,306 senior executives in over a dozen of countries at companies with $500 million or more (US respondents) and at companies with $100 million or more (outside the US) in annual revenue revealed that 53% believe blockchain technology has become a critical priority for their organizations in 2019, a 10-point increase over the last year before (Deloitte, 2019). Using blockchain technology will reduce the cost of doing business and convey the security benefits of public-key cryptography, which cannot be ignored by financial institutions.

The consumers need to trust their financial institutions by biding into contracts and conducting financial transactions with them. Consumers are reluctant to provide their personal identifiable information (PII) when is requested online concerned about the

interception and misuse of information sent over the internet and how their PII will be used (Roca et al., 2009). The trust between the clients and companies is imperative for the success of the business relationship between the financial institution and consumer. Also, government support is considered to be one of the influential key factors in the adoption of various technologies (Eliewaha et al., 2017).

The Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT)

The technology acceptance model (TAM) of Davis (1989) and Gefen et al. (2003) preceded the unified theory of acceptance and use of technology (UTAUT) of Venkatesh et al. (2003). This model was developed based on the study of eight models: theory of reasoned action (TRA), technology acceptance model (TAM), motivation model, theory of planned behavior (TPB), TAM and TPB, model of PC utilization, innovation diffusion theory, and social cognitive theory (Yusof et al., 2018). UTAUT has been widely accepted in new technology acceptance research becoming the most used and applied model by many educational institutions and researchers (Yusof et al., 2018).

Through the UTUAT model, it was demonstrated how performance expectancy, effort expectancy; and risk perception influenced the behavioral intention to adopt mobile banking (Sarfaraz, 2017). The studies performed with UTAUT remedied the limitations in explaining acceptance and use of technology lacking in the eight individual models. In the same manner, the acceptance of new technologies, as blockchain does, revolutionize the trust on individual's data in the online world (Duy et al., 2018). Furthermore, the online trust through (1) a belief that the vendor has nothing to gain by cheating, (2) a

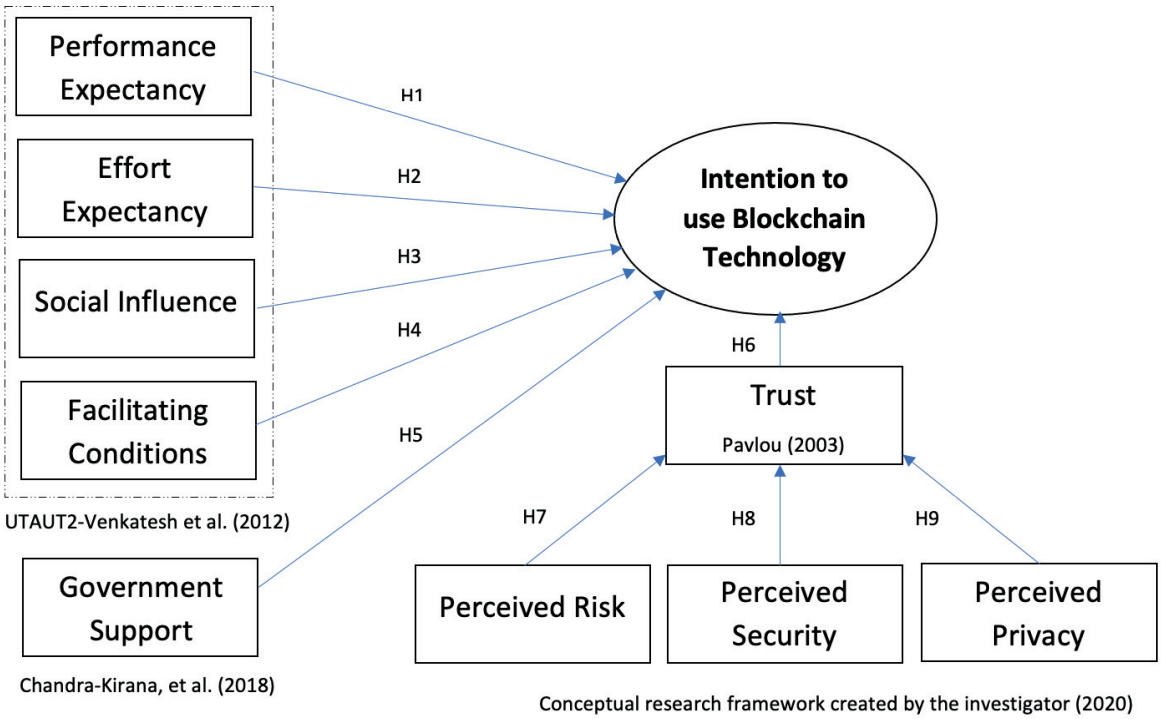
belief that there are safety mechanisms built into the Web site, and (3) by having a typical interface, (4) on that is, moreover, easy to use (Gefen, 2000).

UTAUT of Venkatesh et al. (2003) has been lately used to understand customers' behavior intentions in the acceptance of new technologies in online services. Therefore, the UTAUT developed by Venkatesh et. al. (2003) was chosen as a theorical base for this study. The variables and constructs are adapted in the proposed UTAUT framework model for the acceptance of the use of blockchain technology to conduct mobile financial transactions and services.

Research Framework

Figure 3 shows the adapted UTAUT model of Venkatesh et. al. (2003) with the proposed hypotheses. The independent (exogenous) variables; H1-performance expectancy, H2-effort expectancy, H3-social influence, and H4-facilitating conditions affecting positively the intention to use blockchain technology to conduct mobile financial transactions and services. Another independent construct is the H5-government support, considered to be one of the influential key factors in the adoption of various technologies (Eliewaha et al., 2017) affecting positively the intention to use blockchain technology as an endogenous variable. The extended independent construct H6-trust in financial institutions is expected to positively affect the intention to use the blockchain technology. Trust is a dependent variable to H7-perceived risk, H8-perceived security, and H9-perceived privacy. Moreover, Trust serves as an independent variable to the intention to use the blockchain technology as represented in the research framework.

Figure 3. Proposed Framework with Hypotheses



Empirical Evidence

The UTAUT has been empirically tested and claimed to have greater explanatory power in predicting behavioral intention toward innovative technologies than the preceding technology adoption models (Venkatesh et. al., 2003).

Performance Expectancy and Effort Expectancy

Several studies have presented how performance expectancy and effort expectancy are key factors of the UTAUT that are widely held to influence technology use intention in a variety of technology domains and use context (Maduku, 2017). Likewise, the intention of adoption of mobile payment was investigated by De Sena et al. (2016) in Brasil and by Slade et. al. (2015) in the United Kingdom.

The performance expectancy and effort expectancy strongly influence the behavioral intention to use m-banking in retail bank consumers in South Africa (Maduku, 2017), and in Pakistan (Farah et al., 2018; Raza et al., 2019). Moreover, the performance expectancy and effort expectancy are influenced to the intention to adopt m-banking with real estate salespersons in Taiwan (Shih & Chen., 2013), and as strong predictors among the millennial generation (Tan & Lau, 2016). The performance expectancy and effort expectancy are significantly influence by the behavioral intention to adopt mobile commerce among Pakistani consumers (Sair & Danish, 2018) and to adopt mobile banking in Thailand (Bhatiasevi, 2016).

The performance expectancy is an important factor influencing the behavioral intention to use mobile-based communication technologies for agricultural market information dissemination in Uganda (Engotoit et al., 2016), the intention to use cryptocurrencies in Spain (Arias-Oliva et al., 2019), and the intended use of e-commerce by electronic and non-electronic buyers in Colombia (Sánchez-Torres et al., 2017). The effort expectancy helped to explain tablet computer users' intention to purchase mobile applications (Lee et al., 2018).

In a research study performed on Italian firms by Caldarelli et al. (2020), performance expectation has a significant positive effect on people's intention to adopt blockchain technology (coefficient 0.397 $p < 0.001$). This result suggests that every increase in the expectation about blockchain performance in firms could improve the people intention to abide by this technology.

Social Influence

Social influence is a significant predictor of students' intention to use mobile learning systems (Mubuke et al., 2018) and the use mobile social network applications (Lin & Lu, 2015). In Colombia, social influence is significant in the intended use of e-commerce by electronic and non-electronic buyers (Sánchez-Torres et al., 2017). Likewise, social influence explains tablet computer users' intention to purchase mobile applications (Lee et al., 2018). In southeast Asia, several studies revealed that social influence have a significance on the behavioral consumer's intention to use mobile bank applications in Indonesia (Arahita, & Hatammimi, 2015), Thailand (Bhatiasevi, 2016), and India (Kumar et al., 2017).

Facilitating Conditions

Facilitating conditions significantly influence the intention to use cryptocurrencies in Spain (Arias-Oliva et al., 2019) and predicting the behavioral intentions to adopt mobile wallet solutions in India (Madan & Yadav, 2016). Similarly, facilitating conditions is an influential determinant in mobile banking adoption in Bangladesh (Ahmed et al., 2017).

As per the actual usage behavior to use internet banking in Lebanon, facilitating conditions was found to be determinant in the usage behavior (Tarhini et al., 2016). Furthermore, facilitating conditions significantly influence the use mobile applications for shopping in India (Tak & Panwar, 2017).

Government Support

In addition to e-commerce and e-banking adoption, the UTAUT has been used to study the customer behavior and the factors that motivate citizens to adopt the e-

government public services (Al-Mansoori et. al. 2018). Dečman (2015) in Slovenia used the UTAUT model to understand the government-to-government employees' perspective in technology acceptance. Similarly, Kumar et. al. (2018) investigated the factors that influence direct and indirect adoption of e-government services in India.

Government support has a direct influence on the intention to adopt mobile government in Tanzania (Eliewaha et al., 2017) and the intention of internet banking in Yogyakarta (Chandra-Kirana, 2018). Fridgen et al. (2018) provides a framework for the use of blockchain technology in public sectors in Germany where the government support and legal regulations play an important role in the evaluation framework. Government support has the greatest direct impact on the intention to use e-commerce adoption in small and medium enterprises in Ghana (Awiagah et al., 2016).

Being a disruptive technology with many under-covered and unpredictable chances as well as issues, blockchain technology still faces legal regulation's acceptance or policy normalization. Legal regulation is most concerning challenge of bringing blockchain into many domains (Duy et al., 2018). Blockchain, is the most fastest growing skill with more than 6000% growth over a year, which is sought by not only new growing companies but also traditional ones desiring to catch up with this technology. The government support for blockchain technology has been seen worldwide, including the United States.

In the United States, twenty-eight states have introduced legislation relating to blockchain in 2019 and twenty-seven bills and resolutions have been enacted or adopted (Morton, 2019). The US State of Vermont took the lead in blockchain legislation by adopting a bill, signed into effect by Governor P. Shumlin on June 2, 2016, recognizing

blockchain data as valid in the court system (Riviere, 2018). In the same manner, the US State of Arizona- House bill 2417 introduced in Feb 2017- Art 5A establishes that "a signature that is secured through blockchain technology is considered to be in an electronic form and to be an electronic signature", making signatures admissible under Arizona state laws. Also, recognizes blockchain contracts as admissible records, and as smart contracts may not be denied legal effect, validity, or enforceability (Riviere, 2018).

In Puerto Rico, as usually occurs in most of the Central and South America's countries, there is not an existing regulation that controls the crypto-assets sector (Cripto Inversion, 2020). In the other hand, the new PR incentive code has special dispositions that classify the cryptocurrencies as "other active" allowing foreign investors that are residents of PR to exclude their income. As per Puerto Rico House of Representative resolution RC 829 approved on March 13, 2018, the government of Puerto Rico ordered an investigation and evaluation on blockchain technology with the possibility to be implemented in the government of Puerto Rico and other related purposes of this new technology. Moreover, De Jesús (2019) reported than even the lack of regulation on cryptocurrencies and blockchain technologies in Puerto Rico, the Puerto Rico Office of Financial Institutions Commissioner (OCIF) approved the opening of the first Crypto bank San Juan Mercantile Bank & Trust.

The reconnaissance on blockchain technologies by governments is not only in the United States and Puerto Rico. According to the Bermudian Premier and Minister of Finance, David Burt, blockchain-based companies contribute to the economic development of the country and hence can't be neglected. The Bermudian Government is

working hard to develop the blockchain system. To support the same, they have already signed a MOU with Shyft network and the Binance Group (NextBigWhat, 2018). In India, the Blockchain Summit India 2019, was the first edition of the Vision Blockchain 2030 initiative. The summit inaugurated with welcome messages by Shri Suresh Prabhu (Hon. Minister of Commerce and Industry, Government of India) and has been supported by the Department of Science &Technology, the government of India, and state government of Uttar Pradesh. (Cashaa, 2019). Likewise, Kumar Gaurav, founder and CEO of Cashaa, the keynote speaker referring to blockchain technology stated: "India redesigning a system of trust for the survival of the human race".

Trust, Perceived Risk, Perceived Privacy, and Perceived Security

Regulation and innovation are not necessarily opposed (Werbach, 2018). Werbach stated (2018) that regulators can foster the adoption of new technologies by removing barriers to competition, highlighting public-policy objectives, and promoting consumer trust. Blockchain technology can play a pivotal role when it comes to boosting financial inclusion toward the unbanked and underbanked (Deloitte, 2019). KNC (2019) has defined blockchain as the machine for building trust. The real promise of blockchain technology is its clear and trustworthy value proposition, which fits the social and cultural practices of the unbanked and the underbanked (Deloitte, 2019). Furthermore, data integrity, the strong point of blockchain, is the reason why its use extends also to other domains and applications. Therefore, it has the full potential of revolutionizing data privacy, trust, security, and the relationship with individual information on the Internet (Duy et al.,2018).

Sánchez et. al. (2018) and Makanyeza & Mutambayashata (2018) used the UTAUT model adding the Trust and government support in the acceptance of E-banking in Colombia and plastic money in Zimbabwe, respectively. Trust positively affects the intention to use mobile banking in management students in India (Kumar et al., 2017). Trust is found to be a significant driver of customer satisfaction on mobile commerce on a mobile network in the Republic of Serbia (Marinkovic & Kalinic, 2017) and have a positive impact on the use of financial websites in Colombia (Sánchez et al., 2018).

As a general rule, the organization firm risk assessment required for anti-money laundering (AMLs) regulations, established in different countries: require customer due diligence and ongoing monitoring obligations (Dewey, 2020). These regulations apply to "relevant persons": credit institutions, financial institutions, and trust or company service providers amongst others. Generally speaking, providers and services related to unregulated cryptocurrencies are not presently subject to AMLs and their activities do not require to be authorized (Dewey, 2020) The perceived risk for customers knowing the financial institutions are regulated and need to comply with AML regulations, provide a sense of security and lower the perceived risk when receiving services with financial institutions.

Trust and perceived risk are shown to be direct antecedents of the intention to use a new technology service (Lee & Song, 2013). Correspondingly, to be a direct and indirect antecedent of intention to conduct transactions through e-commerce (Pavlou, 2003). The perceived risk plays a significant role predicting the intention to use mobile banking services in Jordan (Sarfaraz, 2017). Perceived risk and trust in system play an

important role in the behavior intention to use remote mobile payments in the United Kingdom (Slade et al., 2015).

Perceived security and perceived privacy have important implications in the trust in an organization, having trust influences the purchases of air travel ancillary services online (Morosan, 2013). In online purchases context, the concepts of privacy and security are two major antecedents of Trust (Casaló et al., 2007). Trust was clearly and positively influenced by the perceived privacy and perceived security when conducting a financial transaction on a web site (Casaló et al., 2007). For online transactions, Kamboj and Yang (2018) established the major advantages of blockchain technology through its encrypted database as a manner of protecting data integrity; tamper-proofing storage; for prevention of fraud and data theft; for disaster recovery; to be transparent and incorruptible, and to protect critical infrastructure. Adaptability of blockchain for reforming data protection, privacy and security can be considered as an important motivation to research and develop new technologies (Duy et al., 2018).

Summary

Literature review relating the research topic on technology acceptance studies was presented in this chapter along with the definitions of the constructs and concepts related to blockchain technology in financial institutions. The research model presented relationships between constructs of performance expectancy, effort expectancy, social influence, facilitating conditions, government support and trust to behavioral intentions to adopt blockchain technology to conduct financial mobile transactions and services. The

methodology concerning the research design from the hypothesis is discussed in the next chapter.

CHAPTER III: RESEARCH METHODOLOGY

In the first chapter of this research the problem background, statement problem, the purpose of the study, the research objective, conceptual research framework, justification, research questions, limitations, and hypothesis were presented. The second chapter presented the re-statement of the problem, theorical background, research framework, empirical evidence, and definitions. This chapter introduces the methodology for the study presenting the base of a quantitative research, the population to study, sample and instrument design, the data collection procedure, the data analysis, potential benefits, and academic and practical implications of the study.

Research Design

The research model presented in this study takes a quantitative approach with survey research methodology. This research originated results from a representative sample to the population under study to understand the factors that influenced the behavioral intentions of financial institutions' consumers to adopt a new technology to conduct their financial mobile transactions and services. A non-experimental causal correlational design will be utilized for this research. This type of design described the relationships between two or more categories or variables at a given moment (Hernández & Mendoza, 2018).

Population

The profile of the participants in this study were individuals from 18 to 65 years old which conduct mobile financial transactions and services. The participation was voluntary, and it was a non-probabilistic sample. The investigator sent an invitation

(Appendix B-1; Appendix B-2) using the snowball effect via e-mail, social media Face Book, LinkedIn, and WhatsApp of family, colleagues, and friends. A link to the informative sheet (Appendix C-1; Appendix C-2) and electronic questionnaire was included in the invitation on users of mobile devices using the platform Survey Monkey. Likewise, it provided information as the voluntary and anonymous participation in the survey; risk and benefits of participation; the privacy and confidentiality protection; the estimated time of survey completion; and the investigator's disposition to answer any questions.

Sample Design

To determine a minimum sample size and predicting a nonnormal data, PLS-SEM technique is recommended (Hair et al., 2017). Accordingly with table 1.7 of the book, a sample size recommendation in PLS-SEM for statistical power of 80%, on a model having 9 independent relations with a 5% significance and a minimum predictive power $R^2 = 0.10$, the minimum sample is 150. For a predictive power of $R^2 = 0.25$ the minimum sample should be 56. Another commonly used sample determination for PLS-SEM is the item-to response ratio 1:10 (Hair et al., 2017). Since we have 9 relations in our design and 3 items per relation (9x3 =27), the minimum ideal sample was 270.

The survey questionnaire was presented in English and Spanish language using the snowball effect until its reached 278 valid questionnaires of citizens of Puerto Rico and continental United States that uses mobile platforms to conduct financial transactions and services.

Instrument Design

To facilitate responses, the use of multiple items per variable was followed and the Licker-type scale were used ranging from 1 (strongly disagree) to 7 (strongly agree). The questionnaire contained a biographical section with descriptive data and a multi-item questionnaire of three items per construct as presented in Appendix D-1 and Appendix D-2. The questionnaire was adapted to measure the UTAUT's constructs of Venkatesh et al. (2003), government support (Sánchez et al., 2018; Chandra-Kirana et al., 2018) and trust (Pavlou, 2003) in mobile transactions and use of blockchain technology. The key variables are performance expectancy, effort expectancy, social influence, facilitating conditions, government support and trust which is preceded by perceived risk, perceived security and perceived privacy.

Instrument Validity

Hair et al. (2016) defined validity as the extent to which a construct measures what is supposed to measure. The instrument validity is referred as the level which an instrument truly measures the intended variables (Hernández & Mendoza, 2018). To determine the instrument validity developed in this investigation, the literature review method and an expert panel was utilized. The validation panel was comprised of academics and technology experts. An information sheet and a validation template for the official questionnaire was sent to seventeen validation panel experts for their assessment. Thirteen out seventeen panel experts responded to the validation template. The panel indicated if each item was considered to be essential, useful but not essential or not necessary. Subsequently, the Lawshe (1975) formula $CRV = \frac{n_{e-\frac{N}{2}}}{\frac{N}{2}}$, was used to

validate the content validity ratio (CVR). The n_e is the expert numbers which considers an item as essential, and N is the total expert number. The minimum CVR per item for 13 panel experts is 0.54 (Lawshe, 1975; Appendix E). All items in the questionnaire presented to the panel experts obtained the minimum of .54 or above (Appendix F) validating all premises of the questionnaire.

Process to Obtain Authorization

The approval of the office of the Institutional Review Board was requested on February 5, 2021. This request was accompanied by all the documents and protocols required by the Board. The staff in charge of the IRB office assessed the necessity and relevance of the investigation, confirming that the confidentiality of the participants is being guaranteed.

On February 25, 2021 the documents were approved by the Universidad Ana G Méndez Institutional Revision Board (IRB) under protocol number 03-174-21(Appendix A) with an expiration date of February 24, 2022.

Instrument Reliability

A pilot test was conducted by submitting an invitation using the snowball effect via e-mail and WhatsApp of family, colleagues, and friends. A link to the informative sheet and electronic questionnaire was included in the invitation on users of mobile devices using the platform Survey Monkey. During the pilot test a representative sample of 30 valid questionnaires were obtained. The voluntary participation facilitated the researcher to learn any weakness of the questionnaire to achieve the objective of the research.

The validation of the data was made by testing the reliability of the studied instrument using Cronbach's alpha. The Cronbach's alpha indicator was utilized to assess the initial reliability scales, considering the minimum value of .70 and the high correlations large Cronbach alpha indicates that the measures are reliable (Hair et al., 2016). On Chapter VI, results of the reliability test are presented.

Data Collection Procedure

Once we validated and completed the reliability test to the instrument, the investigator sent an invitation (Appendix B1; Appendix B2) to participate in the research study using the snowball effect via e-mail, social media Face Book, LinkedIn, and WhatsApp of a different group of family, colleagues, and friends. A link to the informative sheet (Appendix C1; Appendix C2) and electronic questionnaire (Appendix D-1; Appendix D-2) was included in the invitation on users of mobile devices using the platform Survey Monkey. Likewise, it was provided the information as the voluntary and anonymous participation in the survey; risk and benefits of participation; the privacy and confidentiality protection; the estimated time of survey completion (approximately 10 minutes); and the investigator's contact information and disposition to answer any questions.

Protection of Privacy and Confidentiality

All information related to the participants' identity was kept private and confidential and protected at all times. Under no circumstances the participant information will be shared with third parties. The data collected electronically through Survey Monkey will be kept in an encrypted thumb drive on a private, secure and locked

place at the residence of the principal investigator for a period of five (5) years. At the end of this period, the collected data will be deleted/destroyed, and no copies of the data will be retained. A special software program DBAN will be utilized to wipe the thumb drive.

Data Analysis

A multivariate factor analysis was implemented with PLS and test the research model by using structural equation modeling (SEM) techniques. Smart-PLS v 3.3.2 was utilized to analyze the results. The analysis of data ascends from the survey to test the proposed model. SEM allows to answer a set of consistent research questions in a single, systematic, and comprehensive analysis (Hair et al., 2017).

First, a measurement model analysis was conducted by measuring the reliability, and the convergent and discriminant validity analysis. Based on this analysis, the removal of items was decided at this point. Likewise, a factorial analysis was conducted. Subsequently, the analysis of the structural model (explanatory model) for the intention to use blockchain technologies to conduct financial transactions was utilized to calculate the R2, Q2, path coefficients, and their estimated degree of significance.

Potential Risks and Benefits

During the investigation, no high concern risks were contemplated other than the difficulty to obtain a representative sample of completed questionnaires. The use of the snowball effect facilitated this process. Likewise, the risk that this research had for the participants was minimal, since participants chose to participate voluntarily and were allowed to finish answering the questionnaire at any time, if they felt tired when

completing the questionnaire. As a possible benefit, the participants were able to gain a broader and deeper understanding of the services that blockchain technology offers.

By validating the UTAUT, the factors of performance expectancy, effort expectancy, social influence, facilitating conditions, government support and trust as a precursor of the Intended use and acceptance of blockchain technology to conduct mobile financial transactions and services were studied. Likewise, the perceived risk, perceived privacy and security's correlation to the Trust in mobile transactions and services by using the Blockchain technology was analyzed.

Academic Implications

The research contributes to fill the gap in literature by providing an empirical study on the perception of the behavioral intent to adopt new technologies for mobile financial transactions and services. At the time of this research, the researcher did not find any other research on Blockchain technology acceptance in Puerto Rico form the user's perspective.

Practical Implications

The results of this study presents as practical implications a better understanding of the behavioral intention of consumers to conduct mobile financial transactions and measured the trust in their vendors and the willingness to adapt to new technologies. Vendors and the financial industry are able to rely on the results of this study as a tool in their decision support systems by adopting new trends of technologies to conduct their

mobile financial transactions and services. The result of this study will be share with financial institutions through their bank association meetings and/or conferences.

Summary

The third chapter introduced the methodology for the study presenting the base of quantitative research by providing the research design, population to study, sample and instrument design. Furthermore, the instrument validity, the process to obtain authorization and instrument reliability was presented. To conclude the chapter data collection procedure, the data analysis, potential benefits and risks, and the academic and practical implications of the study were presented.

CHAPTER IV

DATA ANALYSIS AND RESULTS

In this chapter, the analysis and discussion of the results obtained during the research study will be discussed. A quantitative analysis was used to collect the research data. Primarily, a descriptive analysis of the data is presented. The data collected was classified by gender, educational and income level, area of residence, and how knowledgeable participants are in blockchain technologies. Subsequently, the reliability of the instrument was determined by using Cronbach's alpha results to measure the internal consistency.

Additionally, the results of the factor analysis are presented, which was carried out to describe each component and measure the total variance explained by each variable. Likewise, the results of Kolmogorov-Smirnov normality test are given to identify whether or not the data obtained had a normal distribution. This test was essential to select the relevant statistical tests in this investigation. Similarly, the discriminant validity, collinearity test, coefficient of determination R^2, and predictive relevance Q^2 were obtained. Finally, the statistical test carried out in this study was Partial Least Squares-Structural Equation Modeling (PLS-SEM) provided in the statistical program SmartPLS version 3.3.2. The PLS Algorithm, PLS Bootstrapping, PLS Blindfolding techniques were conducted to support or not the hypotheses presented by the researcher.

Data collection and Reliability Test of the Instrument

The instrument utilized to collect the data was a questionnaire with 37 premises (see Appendix D-1; Appendix D-2). The questionnaire was developed by the researcher in Spanish and English language, validated by the literature, and a panel of 13 experts (Appendix F). Likewise, on February 25, 2021 the documents were approved by the Universidad Ana G Méndez Institutional Revision Board (IRB) under protocol number 03-174-21(Appendix A) with an expiration date of February 24, 2022. The minimum sample needed for this research study was 270. For the Pilot, the researcher sent an invitation using the snowball effect via e-mail and social media WhatsApp to a group of family, colleagues, and friends. From February 25, 2021 until February 28, 2021, the collection period started using the Survey Monkey Platform. For the Pilot, the researcher obtained 34 questionnaires and discarded 4 for incompleteness, for a total of 30 valid responses.

Cronbach's Alpha

The Cronbach's alpha coefficient was used as a reliability test for the instrument by using the Statistical Package for Social Sciences (SPSS) Version 27. The Cronbach's alpha coefficient is an indicator measuring the internal consistency of the instrument using the average correlation of the items. This coefficient is normally used to determine the reliability of scales of multiples items (Hernandez-Sampieri et al., 2014). The Cronbach's alpha coefficient values fluctuates between 0 and 1. The closer the value approaches 1.0, the greater the internal consistency of the premises that design the instrument (Hernandez-Sampieri et al., 2014). As presented in Table 1, the number of

analyzed cases for the Pilot were 30, the number of items 30, and the obtained value Cronbach's alpha was 0.900 confirming the reliability of the instrument and Pilot test.

Table 1

Pilot reliability test

Cronbach's Alpha	N of Items
.900	30

For the research study, the collection period started on March 1, 2021 until March 30, 2021. The researcher sent an invitation using the snowball effect via e-mail, social media Face Book, LinkedIn, and WhatsApp to a different group of family, colleagues, and friends. A link to the informative sheet and electronic questionnaire was included in the invitation on users of mobile devices using the platform Survey Monkey. The data collection obtained a sample of 334 participants. Out of 334 participants, the researcher eliminated 36 with missing data and 20 that answered not as to conducting financial transactions using mobile devices. The official sample used for this research was a total of 278 (n= 278).

For the research study a reliability test of the instrument was performed on the data collected for the 278 valid questionnaires. As presented in Table 2, the number of items were 30 and the obtained value Cronbach's alpha was 0.907 and the Cronbach's alpha based on standardized items was 0.915 confirming the reliability of the research study.

Table 2

Research Study Reliability Test

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.907	.915	30

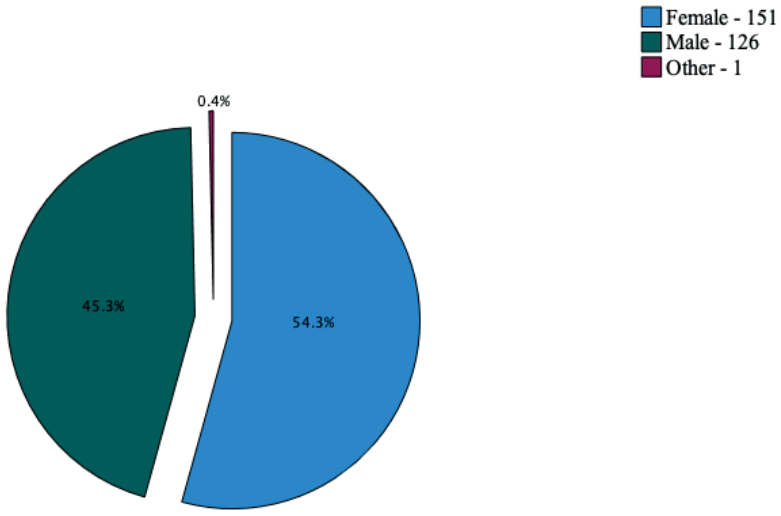
Descriptive Analysis

The collected data from the instrument was based by the research model constructs on user acceptance of blockchain technology to conduct mobile financial transactions and demographic data of the participants. As for the demographic data it was classified by gender, educational, income level, area of residence, and how knowledgeable participants are in blockchain technologies.

Gender

For the total sample of 278 participants, Figure 4 shows the gender demographic which 151 participants are categorized as female gender, representing 54.3%. Likewise, 126 categorized as male gender representing a 45.3%, and one categorized as other representing 0.4%.

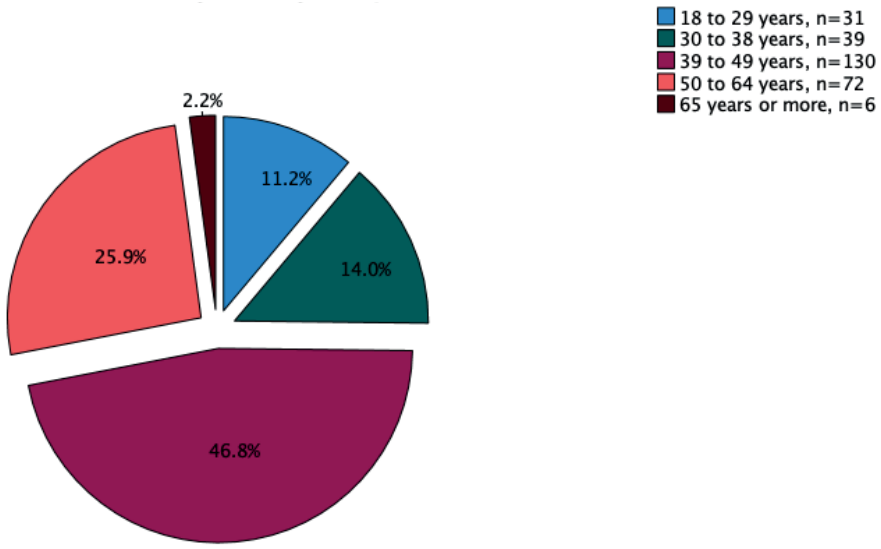
Figure 4. Gender Sample Distribution



Age range

The age range of the participants was divided in five categories: 18 to 29 years, 30 to 38 years, 39 to 49 years, 50 to 64 years, and 65 years or more. As shown in Figure 5, out of the total of 278 participants; the age range 39 to 49 years had the highest percentage of participation with 46.8% (n=130), followed by the age ranges 50 to 64 years with 25.9% (n=72), 30 to 38 years with 14.0% (n=39), 18 to 29 with 11.2% (n=31), and 65 years or more with 2.2% (n=6).

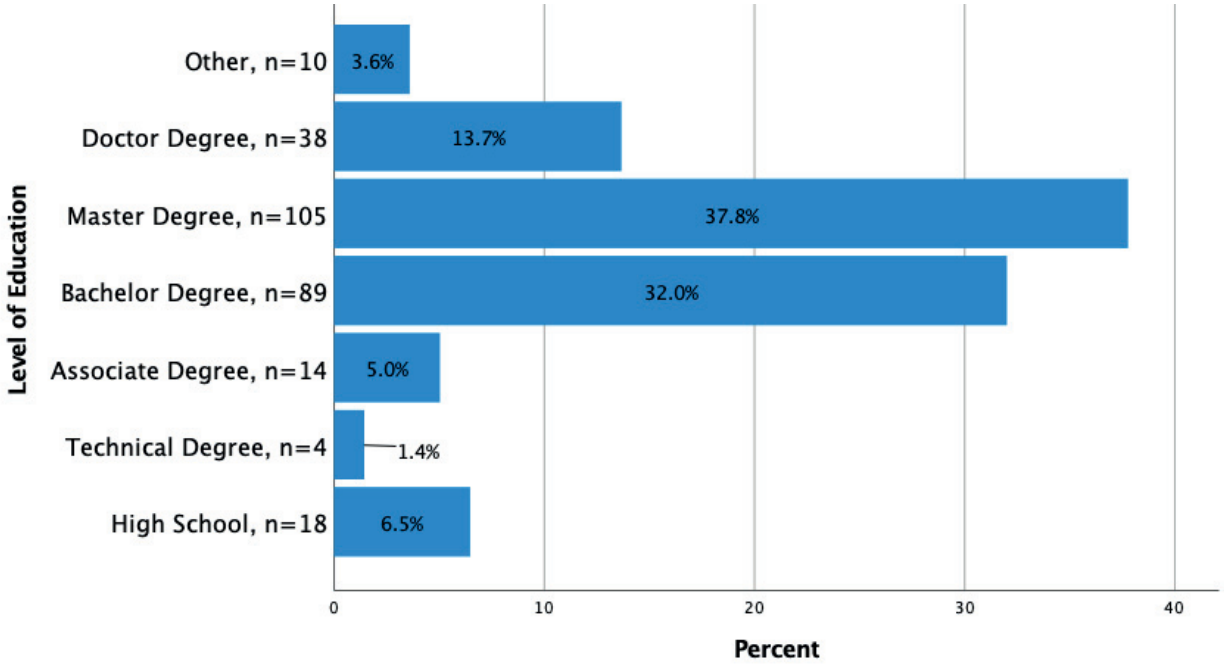
Figure 5. Age Sample Distribution



Level of education

The level of education of the participants was divided in seven categories: high school, technical degree, associate degree, bachelor's degree, master's degree, doctor degree, and other. As shown in Figure 6, out of the total of 278 participants; the level of education master's degree was the highest percentage with 37.8% (n=105), followed by bachelor's degree with 32.0% (n=89), doctor degree with 13.7% (n=38), high school with 6.5% (n=18), associate degree with 5.0% (n=14), and technical degree with 1.4% (n=4). As a note, the category Other in level of education obtained 3.6% (n=10). This was represented by 6 having a Juris Doctor/PhD, 2 having some college and professional training, one law school, and one postmaster degree.

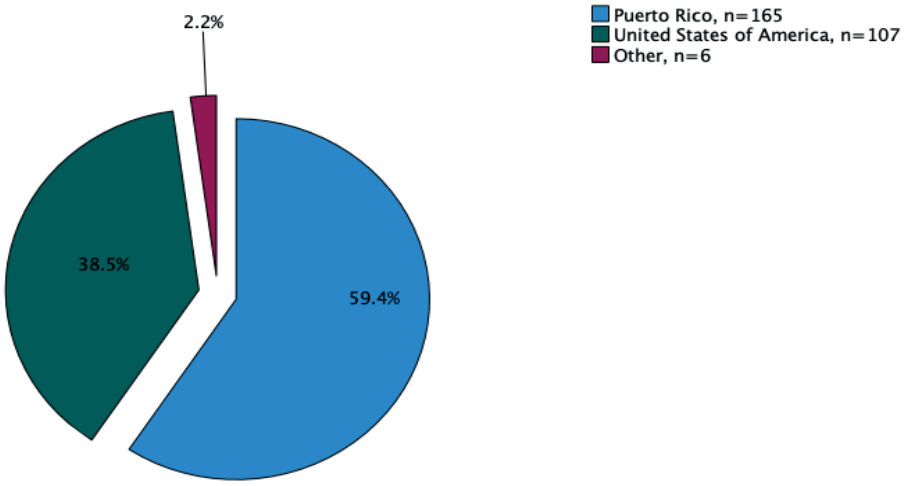
Figure 6. Level of Education Sample Distribution



Place of residence

The place of residence of the participants was divided in three areas: Puerto Rico, United States of America, and Other. As shown in Figure 7, Puerto Rico was the participant's place of residence with the highest percentage of participation with 59.4% (n=165) and followed by United States of America with 38.5% (n=107). As a note, the category Other obtained a 2.2% (n=6). This was represented by individuals residing in Canada, Spain, Samoa, United Kingdom, Dubai, and US Virgin Islands.

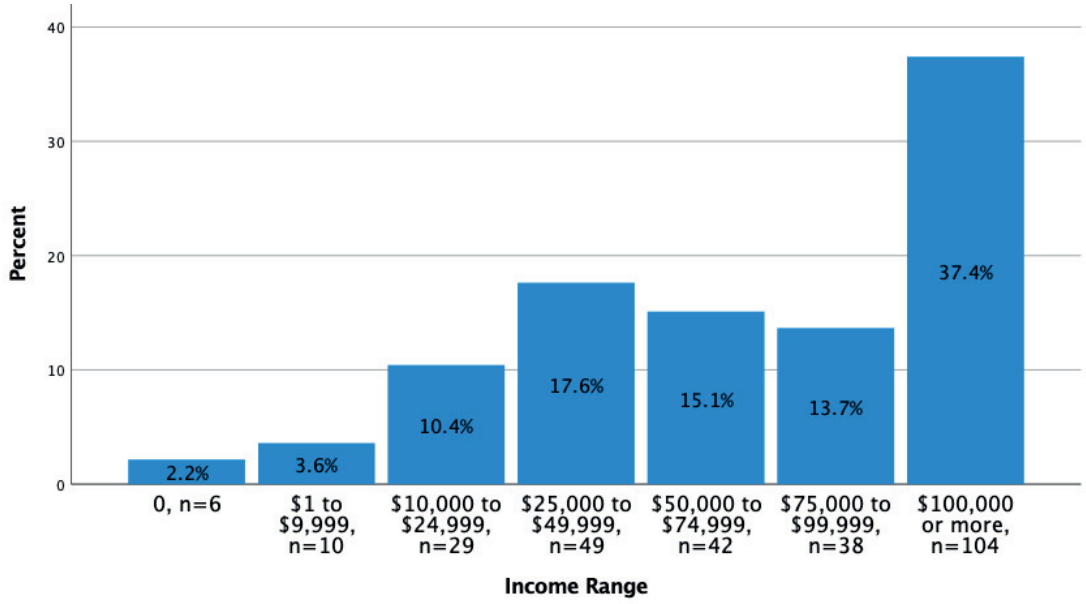
Figure 7. Place of Residence Sample Distribution



Income level

The income level of the participants was divided in seven categories: $0, $1 to $9,999, $10,000 to $24,999, $25,000 to $49,999, $50,000 to $74,999, $75,000 to $99,999, and $100,000 or more. As shown in Figure 8, out of the total of 278 participants; the income range $100,000 or more was the highest percentage with 37.4% (n=104), followed by income ranges $25,000 to $49,999 with 17.6% (n=49), $50,000 to $74,999 with 15.1% (n=42), $75,000 to $99,999 with 13.7% (n=38), $10,000 to $24,999 with 10.4% (n=29), $1 to $9,999 with 3.6% (n=10), and finally $0 with 2.2% (n=6).

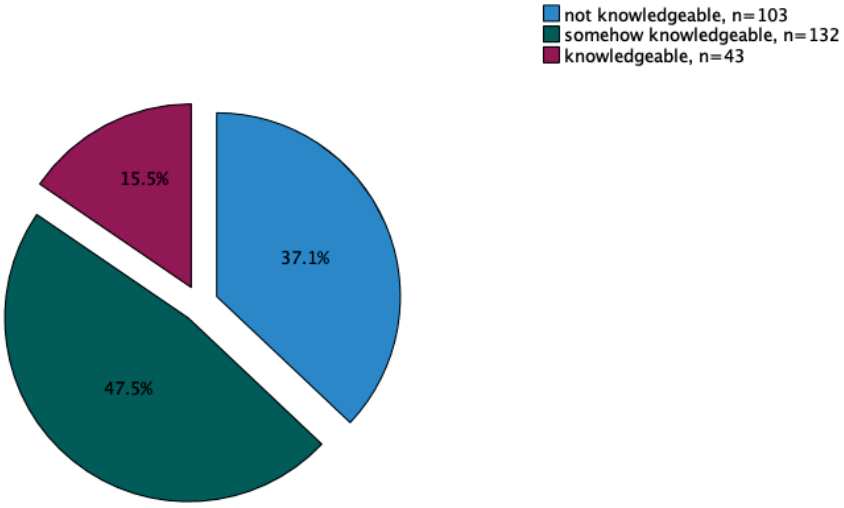
Figure 8. Income Range Sample Distribution



Blockchain knowledge

The blockchain knowledge of the participants was divided in three categories: not knowledgeable, somehow knowledgeable, and knowledgeable. As shown in Figure 9, out of the total of 278 participants; the somehow knowledgeable was the highest percentages with 47.5% (n=132), followed by not knowledgeable with 37.0% (n=103), and knowledgeable with 15.5% (n=43). As a note the blockchain knowledge categories, somehow knowledgeable and knowledgeable, added for 63.3% or 175 of the participants.

Figure 9. Blockchain Knowledge Sample Distribution



Factor Analysis

The factor analysis is a statistical analysis used to identify the underlying dimensions of a measure (Brown, 2015). In order to do a factor analysis, the data need to be measured for suitability by conducting the sample adequacy test Kaiser-Meyer-Olkin (KMO) and Bartlett sphericity test. SPSS version 27 was utilized to run these tests. For the KMO test, it is recommended a value over 0.5 close to 1.0 and significance value of the Bartlett sphericity test less than 0.05 (Brown, 2015). Table 3 shows the values obtained in the KMO and Bartlett test for the research model to be 0.874 and 0.000, respectively. By obtaining these results, its viable to run the factor analysis.

Table 3

Data Suitability Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.874**
Bartlett's Test of Sphericity	Approx. Chi-Square	**5205.047**
	df	**435**
	Sig.	**.000**

When performing the factor analysis, the communalities are evaluated, which represent the proportion of variance that can be explained by the factorial model obtained. Table 4 shows the results of the communalities. As a note, the initial column has a value of 1.00 for each of the variables. This means that each variable is explained 100% by the common factors. Furthermore, the table shows the extraction values which need to reach a value over 0.50 to be acceptable. The results show the extraction values are between 0.567 and 0.836 making all items acceptable.

Table 4

Communalities Factorial Matrix

	Initial	Extraction
PE1 It appears that conducting mobile financial transactions and/or services with enclosed blockchain technology applications is very useful.	1.000	.734
PE2 It appears that conducting mobile financial transactions and/or services with enclosed blockchain technology applications gives me the advantages over traditional forms.	1.000	.781
PE3 It appears that conducting mobile financial transactions and/or services with enclosed blockchain technology applications does not take longer to perform than traditional forms (physically go to the financial institution).	1.000	.636
EE1 It appears that conducting mobile financial transactions and/or services with enclosed blockchain technology applications, the interaction with the mobile application should be clear and understandable.	1.000	.736
EE2 It appears that conducting mobile financial transactions and/or services with enclosed blockchain technology applications, it would be easy for me to become proficient at using it.	1.000	.757

	Initial	Extraction
EE3 It appears that conducting mobile financial transactions and/or services with enclosed blockchain technology applications, is easy to learn operating the mobile application.	1.000	.743
SI1 Family and friends influence my decision to conduct mobile financial transactions and services that contains new technologies (ex. enclosed blockchain technology applications).	1.000	.763
SI2 Media (TV, radio, social media, online news) influence my decision to conduct mobile financial transactions and services with enclosed blockchain technology applications.	1.000	.700
SI3 I would be inclined to use mobile applications to conduct financial transactions and services with enclosed blockchain technology applications if used by people from my social circle.	1.000	.687
FC1 I have the necessary resources to use new technologies (ex. access to Apps libraries- Apple Store, Google store) which provide applications to conduct mobile financial transactions and services.	1.000	.686
FC2 I have the necessary knowledge to use new technologies (ex. with enclosed blockchain technology applications) to conduct mobile financial transactions and services.	1.000	.738
FC3 I can get help if have difficulties using new technologies (ex. with enclosed blockchain technology applications) to conduct mobile financial transactions and services.	1.000	.567
GS1 I think the government has policies that promote new technologies (ex. blockchain technology) to conduct mobile financial transactions and services.	1.000	.768
GS2 I think the government is promoting the development of blockchain technologies.	1.000	.836

	Initial	Extraction
GS3 I think the government has a favorable legislation to use blockchain technology to conduct financial transactions and services.	1.000	.791
PR1 Conducting a financial transaction using a new technology (ex. blockchain technology) will cause a possible loss on my performance.	1.000	.720
PR2 Conducting a financial transaction using a new technology (ex. blockchain technology) will cause a possible loss financially.	1.000	.651
PR3 Conducting a financial transaction using a new technology (ex. blockchain technology) will cause a possible loss in time.	1.000	.673
PP1 Conducting a financial transaction using a new technology (ex. blockchain technology) will cause a possible loss on my personal privacy.	1.000	.776
PP2 Conducting a financial transaction using a new technology (ex. blockchain technology) will make me personally uncomfortable.	1.000	.694
PP3 Conducting a financial transaction using a new technology (ex. blockchain technology) will make me have privacy concerns.	1.000	.794
PS1 I believe blockchain technology is a secure system on mobile applications to transmit sensitive information.	1.000	.670
PS2 I will feel secure providing personal information via mobile devices with enclosed blockchain technology applications.	1.000	.728
PS3 I am indifferent that other people could use the information I provide over enclosed blockchain technology applications.	1.000	.738

TF1 The organization that allows me to conduct financial transactions and services using enclosed blockchain technology applications are generally trustworthy.	1.000	.806
TF2 The organization that allows me to conduct financial transactions and services using enclosed blockchain technology applications give me the impression that they keep their promises. and commitments.	1.000	.770
TF3 The organization that allows me to conduct financial transactions and services using enclosed blockchain technology applications have my best interest in mind.	1.000	.705
BI1 I will recommend to others to use new technologies (ex. blockchain technologies) to conduct mobile financial transactions and/or services.	1.000	.701
BI2 Probably, I would use new technologies (ex. blockchain technologies) to conduct mobile financial transactions and/or services.	1.000	.777
BI3 I intend to continue to use new technologies (ex. blockchain technologies) to conduct mobile financial transactions and/or services.	1.000	.746

Table 5 shows the eigenvalues of the variance matrix and the percentages that each one represents. The eigenvalues express the amount of the total variance that is explained by each factor. It is common to extract the factors with eigenvalues greater than 1. In the factor analysis, 8 factors were found, of which the first factor explains the 31.15% of the total variance, followed by the second factor with 10.84%, third with 8.059%, fourth with 5.72%, fifth with 5.54%, six with 4.33%, seven with 3.79%, and eight with 3.49% for a total variance of 72.92%.

Table 5

Total Variance Explained

Item	**Initial Eigenvalues**			**Extraction Sums of Squared Loadings**		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	**9.345**	**31.150**	**31.150**	**9.345**	**31.150**	**31.150**
2	**3.251**	**10.836**	**41.986**	**3.251**	**10.836**	**41.986**
3	**2.418**	**8.059**	**50.045**	**2.418**	**8.059**	**50.045**
4	**1.716**	**5.718**	**55.763**	**1.716**	**5.718**	**55.763**
5	**1.663**	**5.544**	**61.307**	**1.663**	**5.544**	**61.307**
6	**1.298**	**4.327**	**65.634**	**1.298**	**4.327**	**65.634**
7	**1.137**	**3.789**	**69.423**	**1.137**	**3.789**	**69.423**
8	**1.048**	**3.492**	**72.915**	**1.048**	**3.492**	**72.915**
9	.902	3.008	75.923			
10	.738	2.460	78.383			
11	.672	2.240	80.624			
12	.560	1.867	82.491			
13	.538	1.793	84.284			
14	.502	1.673	85.956			
15	.490	1.634	87.591			
16	.422	1.406	88.997			
17	.387	1.288	90.285			

18	.335	1.118	91.403			
19	.326	1.086	92.489			
20	.300	1.001	93.490			
21	.287	.955	94.445			
22	.245	.818	95.263			
23	.232	.772	96.035			
24	.224	.747	96.782			
25	.204	.681	97.463			
26	.200	.667	98.130			
27	.162	.539	98.670			
28	.151	.530	99.173			
29	.131	.438	99.611			
30	.117	.389	100.00			

A Varimax orthogonal rotation was performed to interpretate the data. The Varimax method minimizes the number of variables with high loads by a factor, thus improving the interpretation of the factors (Thompson, 2004). As a general rule, factor loads with values greater than or equal to 0.5 are considered significant (Hair et al., 2006). Table 6 shows 30 significant factorial loads with values that fluctuated between 0.517 to 0.895.

Table 6

Rotated Component Matrix

Items	1	2	3	4	5	6	7	8
Performance Expectancy 1	.222	.256	.250	.036	.323	***.659***	.103	.081
Performance Expectancy 2	.218	.262	.199	.067	.207	***.749***	.097	.094
Performance Expectancy 3	.115	.022	.001	.100	.189	***.743***	.138	.071
Effort Expectancy 1	.170	-.029	.260	.082	***.753***	.173	.065	-.173
Effort Expectancy 2	.167	.118	.331	.141	***.717***	.243	.114	.013
Effort Expectancy 3	.172	.114	.341	.060	***.706***	.276	.023	.075
Social Influence 1	.049	-.066	-.085	.129	.074	.083	***.844***	-.083
Social Influence 2	.130	.026	.101	.188	-.090	.130	***.778***	.081
Social Influence 3	.105	-.006	.130	-.013	.161	.055	***.787***	.099
Facilitating Conditions 1	.127	-.092	***.757***	-.016	.279	.056	.073	-.044

Facilitating Conditions 2	.127	.156	***.784***	.022	.236	.121	.018	.110
Facilitating Conditions 3	.109	.198	***.634***	.151	.278	.087	.038	.072
Government Support 1	.133	.035	.074	***.848***	.056	.046	.134	.024
Government Support 2	.135	-.001	.004	***.895***	.035	.081	.093	.023
Government Support 3	.114	-.043	.062	***.857***	.114	.051	.064	.135

Perceived Risk 1	.094	***.734***	.143	.008	-.058	.220	.012	-.318
Perceived Risk 2	.107	***.775***	.073	.083	-.020	.159	.019	-.028
Perceived Risk 3	.108	***.700***	.261	.055	-.079	.264	-.007	-.157
Perceived Privacy 1	.137	***.788***	-.077	-.081	.147	-.135	-.015	.290
Perceived Privacy 2	.266	***.757***	.093	-.098	.102	.116	-.061	.066
Perceived Privacy 3	.192	***.754***	-.042	.011	.189	-.073	-.027	.381
Perceived Security 1	***.526***	.349	.273	.107	.230	.019	.111	.346
Perceived Security 2	***.517***	.321	.310	.117	.125	.030	.077	.474
Perceived Security 3	.106	-.010	.050	.147	-.146	.196	.067	***.799***

Trust in Financial Inst 1	***.852***	.055	.091	.114	.201	.107	.062	.007
Trust in Financial Inst 2	***.843***	.098	.023	.147	.146	.044	.062	.003
Trust in Financial Inst 3	***.757***	.166	-.090	.121	.138	.085	.100	.213
Behavioral Intention Use 1	***.589***	.296	.373	.133	-.086	.306	.092	.024
Behavioral Intention Use 2	***.641***	.278	.437	-.005	.014	.295	.099	-.033
Behavioral Intention Use 3	***.637***	.280	.422	.058	-.031	.264	.082	-.047

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.[a]

Rotation converged in 12 iterations.

Data Normality Test

The statistical analysis of the data can be performed using parametric or non-parametric test. For a data that contains a normal distribution, a parametric test is warranted. Otherwise, if the data does not have a normal distribution, a non-parametric test is applied. In order to determine the normality of the data, SPSS provided the Kolmogorov-Smirnov test and Shapiro-Wilk (Hair et al., 2017). The Shapiro-Wilk test is normally applied when the observations obtained are less than 50. Since this research

study had over 50 observations (n=278), the Kolmogorov-Smirnov (K-S) test was utilized.

The null hypothesis H_0 of the K-S test assumes that the data have a normal distribution. If the p value is less than 0.05, this hypothesis is rejected and therefore the distribution is not normal. Table 7 show that items obtained a p value of 0.000 which indicates the rejection of the null hypothesis. The data of this research study are not normally distributed and therefore the applicable test for data analysis is non-parametric.

Table 7

Normality Test

	Kolmogorov-Smirnov[a]		
Items	Statistic	Df	Sig
PE1 It appears that conducting mobile financial transactions and/or services with enclosed blockchain technology applications is very useful.	.255	278	.000
PE2 It appears that conducting mobile financial transactions and/or services with enclosed blockchain technology applications gives me the advantages over traditional forms.	.233	278	.000
PE3 It appears that conducting mobile financial transactions and/or services with enclosed blockchain technology applications does not take longer to perform than traditional forms (physically go to the financial institution).	.288	278	.000
EE1 It appears that conducting mobile financial transactions and/or services with enclosed blockchain technology applications, the interaction with the mobile application should be clear and understandable.	.221	278	.000

Items	Kolmogorov-Smirnov[a] Statistic	Df	Sig
EE2 It appears that conducting mobile financial transactions and/or services with enclosed blockchain technology applications, it would be easy for me to become proficient at using it.	.229	278	.000
EE3 It appears that conducting mobile financial transactions and/or services with enclosed blockchain technology applications, is easy to learn operating the mobile application.	.192	278	.000
SI1 Family and friends influence my decision to conduct mobile financial transactions and services that contains new technologies (ex. enclosed blockchain technology applications).	.233	278	.000
SI2 Media (TV, radio, social media, online news) influence my decision to conduct mobile financial transactions and services with enclosed blockchain technology applications.	.228	278	.000
SI3 I would be inclined to use mobile applications to conduct financial transactions and services with enclosed blockchain technology applications if used by people from my social circle.	.225	278	.000
FC1 I have the necessary resources to use new technologies (ex. access to Apps libraries- Apple Store, Google store) which provide applications to conduct mobile financial transactions and services.	.280	278	.000
FC2 I have the necessary knowledge to use new technologies (ex. with enclosed blockchain technology applications) to conduct mobile financial transactions and services.	.213	278	.000
FC3 I can get help if have difficulties using new technologies (ex. with enclosed blockchain technology applications) to conduct mobile financial transactions and services.	.210	278	.000

Items	Kolmogorov-Smirnov[a] Statistic	Df	Sig
GS1 I think the government has policies that promote new technologies (ex. blockchain technology) to conduct mobile financial transactions and services.	.170	278	.000
GS2 I think the government is promoting the development of blockchain technologies.	.204	278	.000
GS3 I think the government has a favorable legislation to use blockchain technology to conduct financial transactions and services.	.243	278	.000
PR1 Conducting a financial transaction using a new technology (ex. blockchain technology) will cause a possible loss on my performance.	.198	278	.000
PR2 Conducting a financial transaction using a new technology (ex. blockchain technology) will cause a possible loss financially.	.173	278	.000
PR3 Conducting a financial transaction using a new technology (ex. blockchain technology) will cause a possible loss in time.	.204	278	.000
PP1 Conducting a financial transaction using a new technology (ex. blockchain technology) will cause a possible loss on my personal privacy.	.137	278	.000
PP2 Conducting a financial transaction using a new technology (ex. blockchain technology) will make me personally uncomfortable.	.190	278	.000
PP3 Conducting a financial transaction using a new technology (ex. blockchain technology) will make me have privacy concerns.	.143	278	.000
PS1 I believe blockchain technology is a secure system on mobile applications to transmit sensitive information.	.195	278	.000

Items	Kolmogorov-Smirnov[a] Statistic	Df	Sig
PS2 I will feel secure providing personal information via mobile devices with enclosed blockchain technology applications.	.208	278	.000
PS3 I am indifferent that other people could use the information I provide over enclosed blockchain technology applications.	.171	278	.000
TF1 The organization that allows me to conduct financial transactions and services using enclosed blockchain technology applications are generally trustworthy.	.221	278	.000
TF2 The organization that allows me to conduct financial transactions and services using enclosed blockchain technology applications give me the impression that they keep their promises. and commitments.	.196	278	.000
TF3 The organization that allows me to conduct financial transactions and services using enclosed blockchain technology applications have my best interest in mind.	.173	278	.000
BI1 I will recommend to others to use new technologies (ex. blockchain technologies) to conduct mobile financial transactions and/or services.	.200	278	.000
BI2 Probably, I would use new technologies (ex. blockchain technologies) to conduct mobile financial transactions and/or services.	.222	278	.000
BI3 I intend to continue to use new technologies (ex. blockchain technologies) to conduct mobile financial transactions and/or services.	.219	278	.000

Lilliefors Significance Correction

Partial Least Squares – Structural Equation Modeling (PLS-SEM)

To validate the proposed research model proposed in Chapter 1, the Partial Least Squares-Structural Equation Modeling (PLS-SEM) provided in the statistical program SmartPLS version 3.3.2 was utilized. The path model was created by running the PLS Algorithm to estimate all the relationships from the measurement model analysis. The PLS algorithm allowed obtaining the indicator loads, composite reliability, convergent and discriminant validity and the explanatory power of the latent variables of the R^2 based model. Examination of PLS-SEM estimates enables to evaluate the reliability and validity of the constructs measures specifically when using multi-items to measure a construct (Hair et al., 2017).

The Cronbach's alpha coefficient was obtained for each of the items of the questionnaire as per the constructs studied. The Table 8 reveals the results for each of the constructs of the investigation model for the Cronbach's alpha, composite reliability, and the convergent validity measures of the average variance extracted (AVE). The results of the 10 analyzed constructs fluctuated between: 0.72 and 0.92 for the Cronbach's alpha; 0.84 and 0.95 for the composite reliability; and the convergent validity at the construct level between an AVE 0.65 and 0.89. The AVE value over 0.50 indicates that, on average, the construct explains more than half of the variance of its indicators. The results obtained for all constructs are mostly between the acceptable parameters: Cronbach's alpha- above 0.708 and 1, for composite reliability between 0.70 and 0.90, and the AVE above 0.50. Only the Perceived Security item PS3 obtained a low 0.483 Cronbach's alpha coefficient. After following Exhibit 4.4 Outer Loading Relevance Testing (Hair et al., 2017), deletion of item PS3 was recommended by having a positive impact of the

Cronbach's alpha, composite reliability, and AVE. As shown in Table 8, by deleting item PS3, the Perceived Security construct increase the Cronbach's alpha, composite reliability, and AVE from 0.72 to 0.87, 0.84 to 0.94, and 0.65 to 0.89, respectively. As a note, the composite reliability values above 0.90 (and definitely above 0.95) are no recommended because they indicate that all the indicator variables are measuring the same phenomenon (Hair et al., 2017). This may be occurred if semantically redundant items are used. Since none of our results had a value above 0.95 and the composite reliability tends to overestimate the internal consistency reliability, it is reasonable to use a value between the conservative measure of Cronbach's alpha and the upper bound of compositive reliability (Hair et al., 2017).

Table 8

Cronbach's alpha, Compositive Reliability and AVE

Construct	Items	Cronbach's alpha	Composite Reliability	AVE
Performance Expectancy	PE1, PE2, PE3	0.81	0.89	0.73
Effort Expectancy	EE1, EE2, EE3	0.86	0.91	0.78
Social Influence	SI1, SI2, SI3	0.76	0.86	0.67
Facilitating Conditions	FC1, FC2, FC3	0.79	0.88	0.71
Government Support	GS1, GS2, GS3	0.87	0.92	0.80
Perceived Risk	PR1, PR2, PR3	0.82	0.89	0.74
Perceived Privacy	PP1, PP2, PP3	0.86	0.92	0.78
Perceived Security	PS1, PS2, PS3* **PS1, PS2**	0.72 **0.87**	0.84 **0.94**	0.65 **0.89**

Construct	Items	Cronbach's alpha	Composite Reliability	AVE
Trust Financial Institutions	TF1, TF2, TF3	0.89	0.93	0.81
Behavioral Intention to Use	BI1, BI2, BI3	0.92	0.95	0.86

Source: Results obtained from Smart-PLS version 3.3.2.
Note: PS3- Perceived Security item PS3 obtained a low 0.483 Cronbach's alpha coefficient.*

Discriminant Validity

The discriminant validity is the extent to which a construct is truly distinct from other constructs by empirical standards (Hair et al., 2017). By determining a discriminant validity will indicates that a construct is unique capturing the phenomena not represented by other constructs. The heterotrait-monotrait ratio (HTMT) (Henseler et al., 2015) approach was utilized using Smart-PLS version 3.3.2. The HTMT approach is an estimate of what the true correlation between two constructs would be (Hair et al., 2017). Table 9 demonstrated that discriminant validity was established by using 0.85 as relevant threshold level.

Table 9

HTMT Values for Discriminant Validity

Contruct	Behavioral Intention Use	Effort Expectancy	Facilitating Conditions	Government Support	Perceived Privacy	Perceived Risk	Perceived Security	Performance Expectancy	Social Influence	Trust Financial Institutions
Behavioral Intention Use										
Effort Expectancy	0.49									
Facilitating Conditions	0.53	0.68								
Government Support	0.25	0.26	0.19							
Perceived Privacy	0.46	0.22	0.26	0.06						
Perceived Risk	0.52	0.24	0.33	0.08	0.72					
Perceived Security	0.67	0.46	0.51	0.3	0.59	0.44				
Performance Expectancy	0.59	0.63	0.55	0.26	0.34	0.48	0.5			
Social Influence	0.27	0.25	0.22	0.32	0.07	0.07	0.26	0.36		
Trust Financial Institutions	0.65	0.39	0.37	0.33	0.38	0.3	0.67	0.47	0.28	

Collinearity Test

For reflective models, the latent construct behaves as a single predictor of each of the indicators, which are dependent constructs. Therefore, in a reflective measurement model, multicollinearity is not a problem. Regardless of whether the model is reflective or formative, SmartPLS calculates the variance inflation factor (VIF) for the outer model (Hair et al., 2017). Even though, the research model studied is a reflective model, a VIF collinearity test was conducted. As represented in Table 10, each predictor (Item) construct's tolerance (VIF) value was higher than 0.20 and lower than 5 (Hair et al., 2017).

Table 10

Collinearity Test (VIF)

Items	Outer VIF
BI1 I will recommend to others to use new technologies (ex. blockchain technologies) to conduct mobile financial transactions and/or services.	2.69
BI2 Probably, I would use new technologies (ex. blockchain technologies) to conduct mobile financial transactions and/or services.	4.61
BI3 I intend to continue to use new technologies (ex. blockchain technologies) to conduct mobile financial transactions and/or services.	4.00
EE1 It appears that conducting mobile financial transactions and/or services with enclosed blockchain technology applications, the interaction with the mobile application should be clear and understandable.	1.73
EE2 It appears that conducting mobile financial transactions and/or services with enclosed blockchain technology applications, it would be easy for me to become proficient at using it.	2.94
EE3 It appears that conducting mobile financial transactions and/or services with enclosed blockchain technology applications, is easy to learn operating the mobile application.	2.79
FC1 I have the necessary resources to use new technologies (ex. access to Apps libraries- Apple Store, Google store) which provide applications to conduct mobile financial transactions and services.	1.60
FC2 I have the necessary knowledge to use new technologies (ex. with enclosed blockchain technology applications) to conduct mobile financial transactions and services.	1.87
FC3 I can get help if have difficulties using new technologies (ex. with enclosed blockchain technology applications) to conduct mobile financial transactions and services.	1.66
GS1 I think the government has policies that promote new technologies (ex. blockchain technology) to conduct mobile financial transactions and services.	2.19
GS2 I think the government is promoting the development of blockchain technologies.	2.71

Items	Outer VIF
GS3 I think the government has a favorable legislation to use blockchain technology to conduct financial transactions and services.	2.31
PE1 It appears that conducting mobile financial transactions and/or services with enclosed blockchain technology applications is very useful.	2.63
PE2 It appears that conducting mobile financial transactions and/or services with enclosed blockchain technology applications gives me the advantages over traditional forms.	2.70
PE3 It appears that conducting mobile financial transactions and/or services with enclosed blockchain technology applications does not take longer to perform than traditional forms (physically go to the financial institution).	1.37
PP1 Conducting a financial transaction using a new technology (ex. blockchain technology) will cause a possible loss on my personal privacy.	2.49
PP2 Conducting a financial transaction using a new technology (ex. blockchain technology) will make me personally uncomfortable.	1.89
PP3 Conducting a financial transaction using a new technology (ex. blockchain technology) will make me have privacy concerns.	2.59
PR1 Conducting a financial transaction using a new technology (ex. blockchain technology) will cause a possible loss on my performance.	1.87
PR2 Conducting a financial transaction using a new technology (ex. blockchain technology) will cause a possible loss financially.	1.78
PR3 Conducting a financial transaction using a new technology (ex. blockchain technology) will cause a possible loss in time.	1.91
PS1 I believe blockchain technology is a secure system on mobile applications to transmit sensitive information.	2.46
PS2 I will feel secure providing personal information via mobile devices with enclosed blockchain technology applications.	2.46
SI1 Family and friends influence my decision to conduct mobile financial transactions and services that contains new technologies (ex. enclosed blockchain technology applications).	1.67

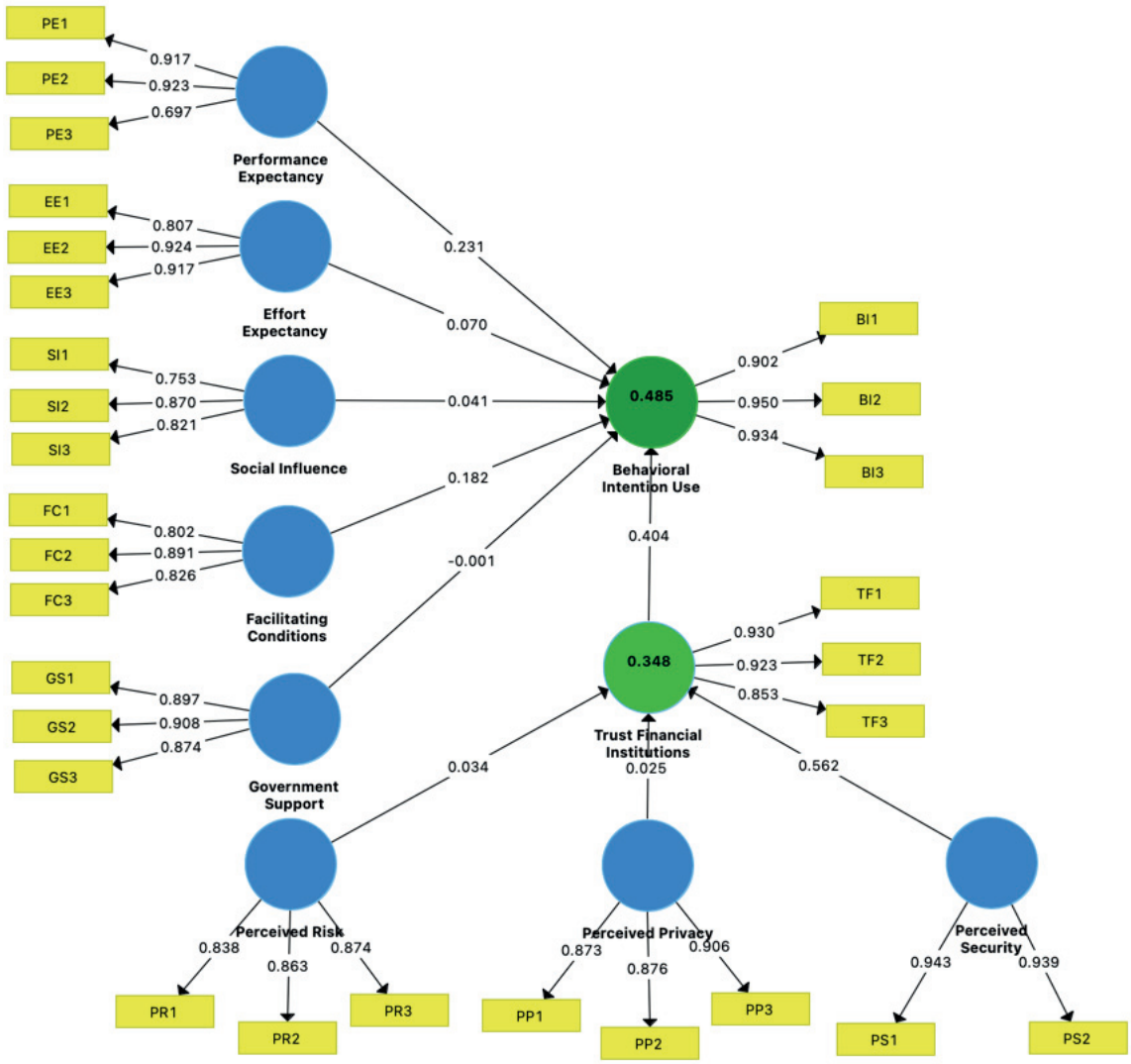
Items	Outer VIF
SI2 Media (TV, radio, social media, online news) influence my decision to conduct mobile financial transactions and services with enclosed blockchain technology applications.	1.57
SI3 I would be inclined to use mobile applications to conduct financial transactions and services with enclosed blockchain technology applications if used by people from my social circle.	1.47
TF1 The organization that allows me to conduct financial transactions and services using enclosed blockchain technology applications are generally trustworthy.	3.77
TF2 The organization that allows me to conduct financial transactions and services using enclosed blockchain technology applications give me the impression that they keep their promises and commitments.	3.72
TF3 The organization that allows me to conduct financial transactions and services using enclosed blockchain technology applications have my best interest in mind.	1.89

Path Model and R^2

The Figure 10 shows the path model obtained from the PLS Algorithm run. The left side and bottom blue color circles represent the research exogenous (independent) constructs with reflective arrows showing the outer loadings Cronbach's alpha going towards the indicators (yellow box rectangles) of the constructs. The middle green circles with the coefficients of determination R^2 in the center, represent the endogenous (dependent) constructs of the model. As a note, the construct Trust in Financial Institutions serves as exogenous and endogenous construct for this model. The values of the arrows going from the exogenous constructs to the exogenous constructs represent the path coefficient (β values), which indicates the relations between the constructs.

The coefficient of determination R^2 obtained for dependent constructs Behavioral Intention to Use and Trust in Financial Institutions were 0.485 and 0.348, respectively. This value is a measure of the model's predictive power and is calculated as the squared correlation between a specific endogenous (dependent) construct's actual and predictive values (Hair et al., 2017). The R^2 values ranges from 0 to 1, with higher levels indicating a better predictive accuracy. In consumer behavior studies R^2 values over 0.20 are considered high (Hair et al., 2017).

Figure 10. PLS Algorithm Results (Path Analysis) and R^2



Predictive Relevance- Q^2 Value

The blindfolding procedure is a resampling technique that systematically deletes and predicts every data point of the indicators in the reflective measurement model of endogenous (dependents) constructs (Hair et al., 2017). In other words, is a measure of the model's predictive power of the data not used in the estimation of model parameters. As shown in Table 11 result Q^2 values over 0.00, Behavioral Intention Use $Q^2 = 0.41$ and Trust Financial Institutions $Q^2 = 0.27$, reflects that the exogenous constructs have a predictive relevance for the endogenous construct for the studied model.

Table 11

Predictive Relevance Q^2 Value

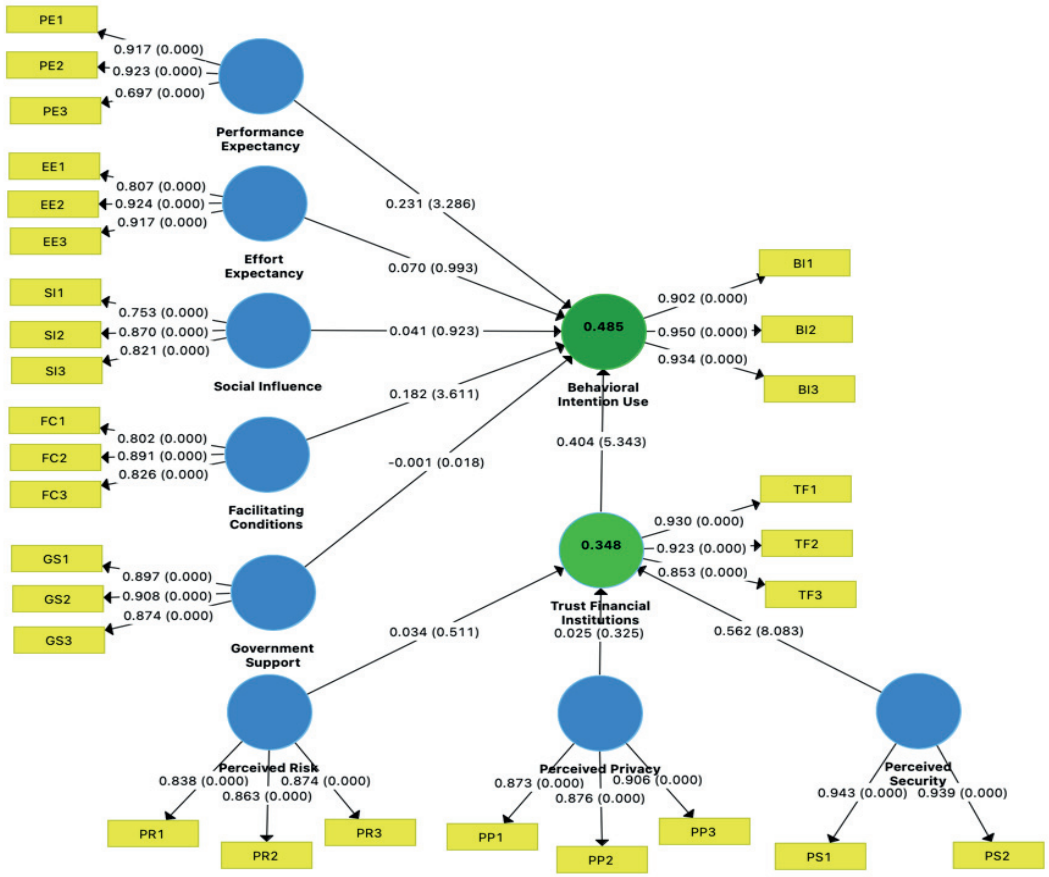
Constructs	SSO	SSE	Q^2 (=1-SSE/SSO)
Behavioral Intention Use	834	494.81	0.41
Effort Expectancy	834	834	
Facilitating Conditions	834	834	
Government Support	834	834	
Perceived Privacy	834	834	
Perceived Risk	834	834	
Perceived Security	556	556	
Performance Expectancy	834	834	
Social Influence	834	834	
Trust Financial Institutions	834	606.55	0.27

PLS-SEM Bootstrapping Technique

SmartPLS Bootstrapping technique was utilized to support or not support the hypothesis proposed in the research model. Bootstrapping allows to assess the significance of the path coefficients. For the research analysis the minimum number of bootstrap samples implemented was 5,000. The critical values for a two-tailed test are 1.96 with a significance level of 0.05%. Likewise, the p value should be less 0.05 to have the significance level or 0.05% (Hair et al., 2017).

The results obtained from the Bootstrapping are represented in Figure 11 and the summary of the Bootstrapping analysis represented in Table 12.

Figure 11. PLS Bootstrapping β Path Coefficient and t Value



The Figure 11 shows the path model obtained from the PLS Bootstrapping analysis. The left side and bottom blue color circles represent the research exogenous (independents) constructs with reflective arrows showing the outer loadings Cronbach's alpha and p values in parenthesis going towards the indicators (yellow box rectangles) of the constructs. The middle green circles with the coefficients of determination R^2 in the center, represent the endogenous (dependents) constructs of the model. As a note, the construct Trust in Financial Institutions serves as dependent and independent construct for this model. The values of the arrows going from the independent constructs to the dependent constructs represent the path coefficient (β values) and the T values in parenthesis, which indicates the relations between the constructs.

Table 12

Summary of Structural Model Results (Bootstrapping)

Hypothesis	Path	β value	T value	P value	Results
H_1	PE → BIU	0.231	3.286	0.001	Supported
H_2	EE → BIU	0.070	0.993	0.321	Not Supported
H_3	SI → BIU	0.041	0.923	0.356	Not Supported
H_4	FC → BIU	0.182	3.611	0.000	Supported
H_5	GS → BIU	-0.001	0.018	0.985	Not Supported
H_6	TFI → BIU	0.404	5.343	0.000	Supported

Hypothesis	Path	β value	T value	P value	Results
H_7	PR → TFI	0.034	0.511	0.609	Not Supported
H_8	PS → TFI	0.562	8.083	0.000	Supported
H_9	PP → TFI	0.025	0.325	0.745	Not Supported

Source: Results from PLS-SEM

Note: PE- Performance Expectancy, EE- Effort Expectancy, SI- Social Influence, FC- Facilitating Conditions, GS- Government Support, TFI- Trust in Financial Institutions, PR- Perceived Risk, PP- Perceived Privacy, PS- Perceived Security, BIU- Behavioral Intention Use

Research Question and Hypothesis Results

The main objective of this research study was to identify the factors that influence the intention to adopt blockchain technology to conduct mobile financial transactions and receive services. The hypothesis of the research study was created based on the research question and literature review. After the data recollection and a full statistical analysis using SPPS and SmartPLS tools, the results obtained are summarized in Table 12.

H_1: Performance expectancy will positively affect the intention to use blockchain technology to conduct mobile financial transactions and services.

The critical values for a two-tailed test are 1.96 with a significance level of 0.05%. Likewise, the p value should be less 0.05 to have the significance level or 0.05% (Hair et al., 2017). In other words, t values over 1.96 and p values of 0.05% or less are considered to support the established hypothesis.

As per PLS Bootstrapping technique, performance expectancy obtained t= 3.286 and p value 0.001. This result affirmed the existence of significant evidence to support the hypothesis raised in the research study. Likewise, the path coefficient β PE = 0.231 was attained. Table 12 shows the details of the relationships and the β, t, and p values obtained for Hypothesis 1. Correspondingly, Figure 11 shows the path coefficient β and t values in the structural model.

H_2: Effort expectancy will positively affect the intention to adopt blockchain technology to conduct mobile financial transactions and services.

The critical values for a two-tailed test are 1.96 with a significance level of 0.05%. Likewise, the p value should be less 0.05 to have the significance level or 0.05% (Hair et al., 2017). In other words, t values over 1.96 and p values of 0.05% or less are considered to support the established hypothesis.

As per PLS Bootstrapping technique, effort expectancy obtained t= 0.993 and p value 0.321. This result affirmed no existence of significant evidence, not supporting the hypothesis raised in the research study. Likewise, the path coefficient β PE = 0.070 was attained. Table 12 shows the details of the relationships and the β, t, and p values obtained for Hypothesis 2. Correspondingly, Figure 11 shows the path coefficient β and t values in the structural model.

H_3: Social Influence will positively affect the intention to adopt blockchain technology in mobile financial transactions and services.

The critical values for a two-tailed test are 1.96 with a significance level of 0.05%. Likewise, the p value should be less 0.05 to have the significance level or 0.05%

(Hair et al., 2017). In other words, t values over 1.96 and p values of 0.05% or less are considered to support the established hypothesis.

As per PLS Bootstrapping technique, social influence obtained t= 0.923 and p value 0.356. This result affirmed no existence of significant evidence, not supporting the hypothesis raised in the research study. Likewise, the path coefficient β PE = 0.041 was attained. Table 12 shows the details of the relationships and the β, t, and p values obtained for Hypothesis 3. Correspondingly, Figure 11 shows the path coefficient β and t values in the structural model.

H_4: Facilitating conditions will positively affect the intention to adopt blockchain technology to conduct mobile financial transactions and services.

The critical values for a two-tailed test are 1.96 with a significance level of 0.05%. Likewise, the p value should be less 0.05 to have the significance level or 0.05% (Hair et al., 2017). In other words, t values over 1.96 and p values of 0.05% or less are considered to support the established hypothesis.

As per PLS Bootstrapping technique, facilitating conditions obtained t= 3.611 and p value 0.000. This result affirmed the existence of significant evidence to support the hypothesis raised in the research study. Likewise, the path coefficient β PE = 0.182 was attained. Table 12 shows the details of the relationships and the β, t, and p values obtained for Hypothesis 4. Correspondingly, Figure 11 shows the path coefficient β and t values in the structural model.

H_5: Government support on blockchain technology will positively affect the intention to use new technology to conduct financial transactions and services.

The critical values for a two-tailed test are 1.96 with a significance level of 0.05%. Likewise, the p value should be less 0.05 to have the significance level or 0.05% (Hair et al., 2017). In other words, t values over 1.96 and p values of 0.05% or less are considered to support the established hypothesis.

As per PLS Bootstrapping technique, government support obtained t= 0.018 and p value 0.985. This result affirmed no existence of significant evidence, not supporting the hypothesis raised in the research study. Likewise, the path coefficient β PE = -0.001 was attained. Table 12 shows the details of the relationships and the β, t, and p values obtained for Hypothesis 5. Correspondingly, Figure 11 shows the path coefficient β and t values in the structural model.

H_6: Perceived Trust in financial institutions will positively affect the intention to adopt blockchain technology in mobile financial transactions and services.

The critical values for a two-tailed test are 1.96 with a significance level of 0.05%. Likewise, the p value should be less 0.05 to have the significance level or 0.05% (Hair et al., 2017). In other words, t values over 1.96 and p values of 0.05% or less are considered to support the established hypothesis.

As per PLS Bootstrapping technique, perceived trust obtained t= 5.343 and p value 0.000. This result affirmed the existence of significant evidence to support the hypothesis raised in the research study. Likewise, the path coefficient β PE = 0.404 was attained. Table 12 shows the details of the relationships and the β, t, and p values obtained for Hypothesis 6. Correspondingly, Figure 11 shows the path coefficient β and t values in the structural model.

H_7: Perceived Risk affects negatively the perceived trust in financial institutions.

The critical values for a two-tailed test are 1.96 with a significance level of 0.05%. Likewise, the p value should be less 0.05 to have the significance level or 0.05% (Hair et al., 2017). In other words, t values over 1.96 and p values of 0.05% or less are considered to support the established hypothesis.

As per PLS Bootstrapping technique, perceived risk obtained t= 0.511 and p value 0.609. This result affirmed no existence of significant evidence, not supporting the hypothesis raised in the research study. Likewise, the path coefficient β PE = 0.034 was attained. Table 12 shows the details of the relationships and the β, t, and p values obtained for Hypothesis 7. Correspondingly, Figure 11 shows the path coefficient β and t values in the structural model.

H_8: Perceived security affects positively the perceived trust in financial institutions.

The critical values for a two-tailed test are 1.96 with a significance level of 0.05%. Likewise, the p value should be less 0.05 to have the significance level or 0.05% (Hair et al., 2017). In other words, t values over 1.96 and p values of 0.05% or less are considered to support the established hypothesis.

As per PLS Bootstrapping technique, perceived security obtained t= 8.083 and p value 0.000. This result affirmed the existence of significant evidence to support the hypothesis raised in the research study. Likewise, the path coefficient β PE = 0.562 was attained. Table 12 shows the details of the relationships and the β, t, and p values

obtained for Hypothesis 8. Correspondingly, Figure 11 shows the path coefficient β and t values in the structural model.

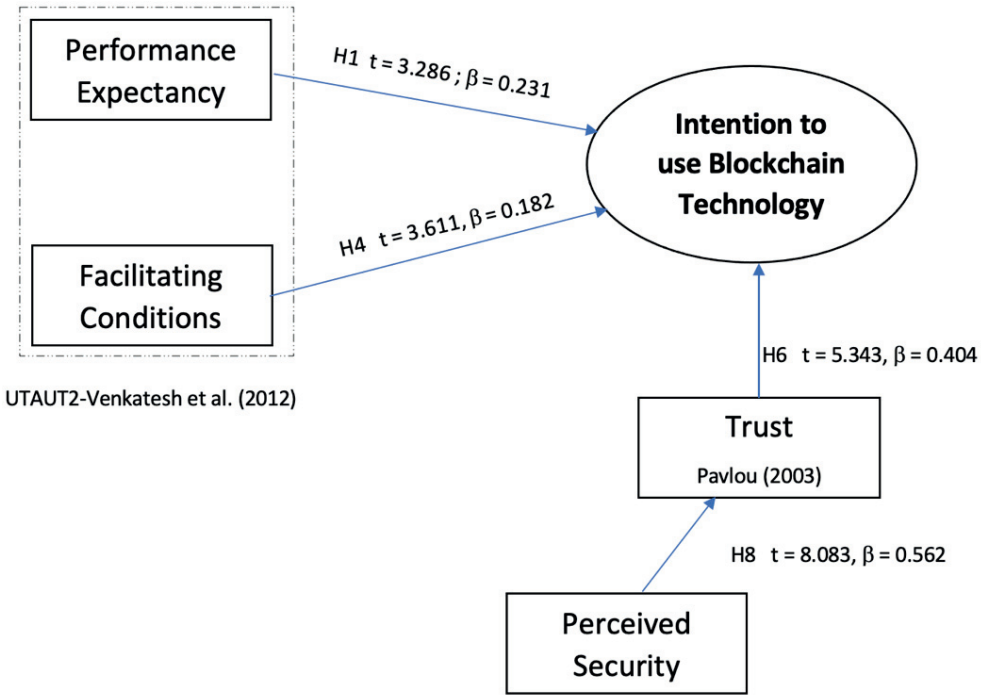
H_9: Perceived privacy affects negatively perceived trust in vendors' financial institutions.

The critical values for a two-tailed test are 1.96 with a significance level of 0.05%. Likewise, the p value should be less 0.05 to have the significance level or 0.05% (Hair et al., 2017). In other words, t values over 1.96 and p values of 0.05% or less are considered to support the established hypothesis.

As per PLS Bootstrapping technique, perceived privacy obtained t= 0.325 and p value 0.745. This result affirmed no existence of significant evidence, not supporting the hypothesis raised in the research study. Likewise, the path coefficient β PE = 0.025 was attained. Table 12 shows the details of the relationships and the β, t, and p values obtained for Hypothesis 9. Correspondingly, Figure 11 shows the path coefficient β and t values in the structural model.

The results are explained in the next chapter 5. Figure 12 represent the final validated model of this investigation with the t and βvalues.

Figure 12. Validated Research Model



Validated research model created by the investigator (2021)

Summary

On this chapter, the analysis and results obtained during the investigation was presented. To start the discussion, a descriptive analysis of the participants was given. The number of voluntary participants was 278 (n=278) individuals that conduct mobile financial transactions and services. Out these participants, 54.3% were female gender, 45.3% male, and 0.4% responded other. For the age ranges 39 to 49 and 50 to 64 totaled 72.6% (n=202) of the participants and for level of education, a 92.8% (n=258) have at least a bachelor's degree or more. The area of residence Puerto Rico had 59.4% (n=165) of the participants and 38.5% (n=107) for the United States of America. For the income level 66.2% of the participants have an income over $50,000 or more, having a 37.4%

(n=104) in the $100,000 or more income range. Finally, the 62.9% (n=175) are somehow knowledgeable and knowledgeable on blockchain technologies.

Furthermore, a factor analysis was conducted using SPSS version 27. Likewise, the internal consistency of the instrument and reliability test (Cronbach's alpha) for the Pilot test and the research study was conducted. A solid Cronbach's alpha 0.90 (Pilot) and 0.907 (research Study) was found for the reliability test. Consequently, a high sample adequacy test Kaiser-Meyer-Olkin (0.874) and a Bartlett sphericity test significance of 0.00 was obtained before conducting the factor analysis. A communalities factorial matrix revealed the extraction values to be acceptable (over 0.50) for all items in the range of 0.576 and 0.836. Therefore, the factor analysis revealed 8 factors which explains the total variance of 72.92%. Lastly, the normality test was conducted using the Kolmogorov-Smirnov test which revealed that the research study is not normally distributed (p value 0.000), and the null hypothesis was rejected. The applicable test for the data analysis is a non-parametric.

The Partial Least Squares-Structural Equation Modeling (PLS-SEM) was conducted using the SmartPLS version 3.3.2 statistical tool program. PLS Algorithm allowed obtaining the indicator loads, composite reliability, convergent and discriminant validity and the explanatory power of the latent variables of the R^2 based model. The composite reliability provides a high level of internal consistency with values between 0.86 and 0.95. Likewise, the convergent validity (AVE) with values between 0.67 and 0.89 demonstrate that the constructs explain more than half of the variance of its indicators. The discriminant validity was demonstrated by HTMT with value under the

0.85 threshold and the collinearity test for reflective models using the variance inflation factor (VIF) with values higher than 0.20 and lower than 5.

For the Path model, the coefficient of determination R^2 (model predictive value) obtained for dependent constructs Behavioral Intention to Use and Trust in Financial Institutions were 0.485 and 0.348, respectively. A blindfolding procedure was conducted in SmartPLS to obtain a predictive relevance Q^2 value (values over 0.00), which is the predictive value of the data not used in the estimation of model parameters. Results revealed the behavioral intention to use and trust in financial institutions with Q^2 values of 0.41 and 0.27, respectively.

The bootstrapping technique to obtain the results to support or not support the proposed structural model hypothesis was utilized. As a result, the factors that affects the intention to use blockchain technology to conduct mobile financial transactions and services are Performance Expectancy (PE) T= 3.286 and p value 0.001, the Facilitating Conditions (FC) T= 3.61 and p value 0.000, and Trust to Financial Institutions (TFI) T= 5.343 and p value 0.000. Likewise, the highest path coefficient β TFI = 0.404 followed by β PE = 0.231, and β FC =0.182. The factors Effort Expectancy (EE), Social Influence (SI), and Government Support (GS) did not have a significant influence in the behavioral intention to use blockchain technology.

Next chapter will provide the conclusions, results discussion, practical and academic contributions, limitations, and future research.

CHAPTER V

CONCLUSIONS

This chapter presents the research findings based on the results obtained in Chapter IV. The practical and academic implications of the study are discussed, Finally, the research limitations, conclusions and future research are presented.

Results discussion

The total of participants of this research study was 278 (n=278) individuals. Initially, a descriptive analysis was produced by using the statistical tool Statistical Package for Social Sciences (SPSS) Version 27 which resulted in a well-educated sample having a strong 92.8% (n=258) of the participants with at least a bachelor's degree. Similar to this, the income level for the participants was high with a 66.2% (n=184) with income levels over $50,000. Most of the participants resides in Puerto Rico (59.4%, n=165) compared with the continental United States of America (38.5%, n=107). To better know the profile of the participants, one of the most important descriptive data results obtained was their knowledge level on blockchain technologies. The 62.9% (n=175) of the participants are somehow knowledgeable or knowledgeable while 37.1% (n=103) describe themselves as not knowledgeable.

The research model was evaluated using statistical tool Smart PLS version 3.3.2 for Partial Least Squares-Structural Equation Modeling (PLS-SEM) by using the PLS Algorithm, PLS Bootstrapping and PLS Blindfolding techniques. The objective was to develop the predictive model of the user intentions and factors that influence the user acceptance of blockchain technologies to conduct mobile financial transactions and

services. The research instrument demonstrated an adequate internal consistency through Cronbach's alpha coefficient $\alpha = 0.907$ and composite reliability values between 0.86 and 0.95. Likewise, the instrument had a good convergent validity with values between 0.67 to 0.89, an acceptable discriminant validity with values under the 0.85 threshold, and the collinearity test for reflective models using the variance inflation factor (VIF) with values higher than 0.20 and lower than the maximum allowed of 5. All these analysis results demonstrated that the instrument (questionnaire) utilized for this research investigation is adequate to measure the proposed model.

As presented in Figure 11, the factors identified in the research that affects the intention to use blockchain technology to conduct mobile financial transactions and services are Performance Expectancy (PE) T= 3.286 and p value 0.001, the Facilitating Conditions (FC) T= 3.61 and p value 0.000, and Trust to Financial Institutions (TFI) T= 5.343 and p value 0.000. Likewise, the highest path coefficient β TFI = 0.404 followed by β PE = 0.231, and β FC =0.182. All these factors have a significant influence in the Behavioral Intention to Use (BIU) blockchain technologies to conduct their mobile financial transactions and services. Similarly, Perceived Security (PS) T= 8.08, p value 0.000, and $\beta = 0.562$ has a significant influence in the Trust in Financial Institutions (TFI). The factors Effort Expectancy (EE), Social Influence (SI), and Government Support (GS) did not have a significant influence in the behavioral intention to use blockchain technology. Likewise, the factors Perceived Risk (PR) and Perceive Privacy (PP) did not have a significant influence over TFI.

The model predictive value obtained for the Behavioral Intention to Use blockchain technology is $R^2 = 0.485$ and $R^2 = 0.348$ for Trust in Financial Institutions.

This means that our model predicts the 48.5% of the BIU and 34.8% for the TFI. Values of 20% are considered high in disciplines of consumer behavior (Hair et al., 2017). Likewise, the predictive relevance obtained a $Q^2 = 0.41$ for BIU and $Q^2 = 0.27$ for TFI. The predictive relevance is important since measure the relevance of the data not used in the estimation the model parameters. Following, the results are discussed for each hypothesis proposed in this investigation.

H_1: Performance expectancy will positively affect the intention to use blockchain technology to conduct mobile financial transactions and services.

Performance expectation is defined as the degree to which someone believes that using a particular technology will help enhance his or her job performance (Engotoit et al., 2016). Similarly, Venkatesh et. al. (2003) referred to performance expectation as how much people realize that a system such as the internet or mobile technology is useful in carrying out their tasks in day-to-day work. For this research study, the performance expectancy construct was measured in the usefulness, advantages, and time to perform mobile financial transactions and/or services with enclosed blockchain technology applications.

As per PLS Bootstrapping technique, performance expectancy obtained t= 3.286 and p value 0.001. This result affirmed the existence of significant evidence to support the hypothesis raised in the research study. Likewise, the path coefficient β PE = 0.231 was attained. Table 12 shows the details of the relationships and the β, t, and p values

obtained for Hypothesis 1. Correspondingly, Figure 11 shows the path coefficient β and t values in the structural model.

Performance expectancy has been determined as a key factor influencing the behavioral intention to use a new technology (Engotoit et al., 2016; Arias-Oliva et al., 2019; Sanchez-Torres et al., 2017). More specifically, in a research study performed on Italian firms, performance expectancy resulted in a significant positive effect on people intention to adopt blockchain technology (Caldarelli et al., 2020). The results obtained in this investigation reveals that mobile users perceived that if blockchain technologies perform well, they will accept and use blockchain technologies to conduct mobile financial transactions and services.

H_2: Effort expectancy will positively affect the intention to adopt blockchain technology to conduct mobile financial transactions and services.

Effort expectancy is the degree of ease associated with the use of a system (Lee et al., 2018). This explains the degree of ease associated with the use of the system. It originates from three constructs of existing models: perceived ease-of-use (TAM/TAM2), complexity (MPCU) and ease of use (IDT) (Venkatesh et al., 2003). For this research study, the effort expectancy construct was measured in how clear, easy to learn and to become proficient in using enclosed blockchain technology applications.

As per PLS Bootstrapping technique, effort expectancy obtained t= 0.993 and p value 0.321. This result affirmed no existence of significant evidence, not supporting the hypothesis raised in the research study. Likewise, the path coefficient β PE = 0.070 was

attained. Table 12 shows the details of the relationships and the β, t, and p values obtained for Hypothesis 2. Correspondingly, Figure 11 shows the path coefficient β and t values in the structural model.

This result does not represent an atypical problem since there are studies that have found a significant effect and others have not. Previous research validated the construct effort efficiency by having a positive effect accepting the new technology are Sarfaraz (2017), Farah et al. (2018), and Raza et al. (2019) In the other hand, other research studies revealed that effort expectancy did not play a significant factor in the acceptance of a new technologies (Ahmed et al., 2017). As a possible explanation is that it is usual that financial institutions provide to their customers, applications that are easy to understand and to conduct transactions. Likewise, the participants of this research study are highly educated with over 92% of them having a bachelor's degree or more.

H_3: Social Influence will positively affect the intention to adopt blockchain technology in mobile financial transactions and services.

Social influence is defined as the degree of influence that opinions of others can have on the adoption of a given system. Social influence as a direct determinant of the intention of use is represented as a subjective standard TRA, TAM2, TPB/DTPB and C-TAM-TPB; social factors in MPCU and image in IDT (Venkatesh et al., 2003). It is the extent to which users perceives that the important others such as family and friends believe that he or she should use m-commerce (Marinkovic & Kalinic, 2017). For this research study, the social influence construct was measured by how family, media, and

people from the participant's social circle influence in the decision to conduct mobile financial transactions and services with enclosed blockchain technology applications.

As per PLS Bootstrapping technique, social influence obtained t= 0.923 and p value 0.356. This result affirmed no existence of significant evidence, not supporting the hypothesis raised in the research study. Likewise, the path coefficient β PE = 0.041 was attained. Table 12 shows the details of the relationships and the β, t, and p values obtained for Hypothesis 3. Correspondingly, Figure 11 shows the path coefficient β and t values in the structural model.

This result does not represent an atypical problem since there are studies that have found a significant effect and others have not. Previous research validated the construct social influence by having a positive effect accepting the new technology are Sanchez-Torres et al. (2017), Kumar et al. (2017), and Mukumbe et al. (2018). In the other hand, other research studies revealed that social influence did not play a significant factor in the acceptance of a new technologies (Sarfaraz, 2017; Arias et al., 2019; Navarro, 2019; Cruz, 2020). As a possible explanation, educated individuals are able to make their own determination. The 62.9% (n=175) of the participants are somehow knowledgeable or knowledgeable in blockchain technologies.

H_4: Facilitating conditions will positively affect the intention to adopt blockchain technology to conduct mobile financial transactions and services.

Facilitating conditions is defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system" (Venkatesh et al., 2003; Tarhini et al., 2016). For this research study, the facilitating conditions construct was measured by having the resources, knowledge and the ability to how get help to conduct mobile financial transactions and services with enclosed blockchain technology applications.

As per PLS Bootstrapping technique, facilitating conditions obtained t= 3.611 and p value 0.000. This result affirmed the existence of significant evidence to support the hypothesis raised in the research study. Likewise, the path coefficient β PE = 0.182 was attained. Table 12 shows the details of the relationships and the β, t, and p values obtained for Hypothesis 4. Correspondingly, Figure 11 shows the path coefficient β and t values in the structural model.

In regard to facilitating conditions previous studies confirmed similar results as this research study in which facilitating conditions is an influential factor to behavioral intentions to adopt new technologies (Madan & Yadav, 2016; Ahmed et al., 2017; Tak & Panwar, 2017; Navarro, 2019). The results obtained in this investigation reveals that if the mobile users have the resources and know how to get help if needed, they will accept and use blockchain technologies to conduct mobile financial transactions and services.

H_5: Government support on blockchain technology will positively affect the intention to use new technology to conduct financial transactions and services.

Government support is the degree to which of government or parties authorized to regulate and protect internet banking transactions (Chandra-Kirana, 2018). Furthermore, the explicit acceptance of the technology in legislations, recognizing it as valid and fitting for specific use cases (Riviere, 2018). For this research study, the government support construct was measured by the user's perception on the government having policies, favorable legislation and promoting the development of blockchain technologies to conduct financial transactions and services.

As per PLS Bootstrapping technique, government support obtained t= 0.018 and p value 0.985. This result affirmed no existence of significant evidence, not supporting the hypothesis raised in the research study. Likewise, the path coefficient β PE = -0.001 was attained. Table 12 shows the details of the relationships and the β, t, and p values obtained for Hypothesis 5. Correspondingly, Figure 11 shows the path coefficient β and t values in the structural model.

This result does not represent an atypical problem since there are studies that have found a significant effect and others have not. Previous research studies revealed that government support (Sanchez-Torres et al., 2018) did not play a significant factor in the acceptance of a new technologies. This result was unexpected by due to other investigations results (Chandra-Kirana, 2018; Riviere, 2018) which represents that new technologies needed to be regulated. As a possible reason and previously mentioned, financial institutions are highly regulated, and consumers may understand there is no need for additional laws and regulations. Another possibility is the believe that Bitcoin, the genesis for blockchain technology, is a decentralized cryptocurrency. Since Bitcoin is not a fiat currency, no government nor entity owns the Bitcoin.

H_6: Perceived Trust in financial institutions will positively affect the intention to adopt blockchain technology in mobile financial transactions and services.

Trust is defined as the belief that the other party will behave in a socially responsible manner, and, by so doing, will fulfill the trusting party's expectations without taking advantage of its vulnerabilities (Pavlou, 2003). For this research study, the perceived trust construct was measured by the user's perception that the organizations are trustworthy, keep their promises and commitments, and have my best interest in mind.

As per PLS Bootstrapping technique, perceived trust obtained t= 5.343 and p value 0.000. This result affirmed the existence of significant evidence to support the hypothesis raised in the research study. Likewise, the path coefficient β PE = 0.404 was attained. Table 12 shows the details of the relationships and the β, t, and p values obtained for Hypothesis 6. Correspondingly, Figure 11 shows the path coefficient β and t values in the structural model.

Trust is justified by the literature as a precursor on the intention to use new technologies (Casalo et al., 2007; Morosan, 2013; Kamboj & Yang, 2018; Navarro, 2019). Similarly, Werbach (2018) establish that regulation and innovation are not necessarily opposed. The consumer trust is promoted by how regulators foster the adoption of new technologies. The United States and Puerto Rico financial institutions are regulated by FinCEN, IRS, SEC, amongst others. Specifically in Puerto Rico, the Puerto Rico Office of Financial Institutions Commissioner (OCIF) which follows the Bank Secrecy Act (US) and know your costumer (KYC) rules of FinCEN, approved the

opening of the first Crypto bank in PR the San Juan Mercantile Bank & Trust (De Jesus, 2019). Additionally, blockchain have been defined as a machine for building trust (KNC, 2019). The result of this study demonstrated that consumers believe in the new technologies offered by their financial institutions.

H_7: Perceived Risk affects negatively the perceived trust in financial institutions.

Trust in a Web-retailer can be expected to take steps to reduce environmental uncertainty and related risk involved in interacting with it (Pavlou, 2003). For this research study, the perceived risk construct was measured by the user's perception that conducting a financial transaction using a new technology (blockchain technology) will cause a possible loss on their performance, financially, and in time.

As per PLS Bootstrapping technique, perceived risk obtained t= 0.511 and p value 0.609. This result affirmed no existence of significant evidence, not supporting the hypothesis raised in the research study. Likewise, the path coefficient β PE = 0.034 was attained. Table 12 shows the details of the relationships and the β, t, and p values obtained for Hypothesis 7. Correspondingly, Figure 11 shows the path coefficient β and t values in the structural model.

This result does not represent an atypical problem since there are studies that have found a significant effect and others have not. In some studies, trust and perceived risk are shown to be direct antecedents of the intention to use a new technology service (Lee & Song, 2013). Correspondingly, to be a direct and indirect antecedent of intention to conduct transactions through e-commerce (Pavlou, 2003). The perceived risk plays a

significant role predicting the intention to use mobile banking services in Jordan (Sarfaraz, 2017). Perceived risk and trust in system play an important role in the behavior intention to use remote mobile payments in the United Kingdom (Slade et al., 2015). In the other hand, research studies revealed that perceived risk (Cruz, 2020) did not play a significant factor in the acceptance of a new technologies. As possible explanation is that financial institutions are regulated and need to comply with anti-money laundering regulations which provide a sense of security and lower the perceived risk when receiving services with financial institutions.

H_8: Perceived security affects positively the perceived trust in financial institutions.

Perceived security represents the extent to which individuals subjectively believe that a technology is secure (Morosan, 2013). For this research study, the perceived security construct was measured by the user's perception that blockchain technology is a secure system and make them feel secure when providing personal information on mobile devices.

As per PLS Bootstrapping technique, perceived security obtained t= 8.083 and p value 0.000. This result affirmed the existence of significant evidence to support the hypothesis raised in the research study. Likewise, the path coefficient β PE = 0.562 was attained. Table 12 shows the details of the relationships and the β, t, and p values obtained for Hypothesis 8. Correspondingly, Figure 11 shows the path coefficient β and t values in the structural model.

Perceived security has an important implication in the trust in an organization, having trust influences the purchases of air travel ancillary services online (Morosan, 2013). In online purchases context, the concept of security is a major antecedent of Trust (Casaló et al., 2007). Trust was clearly and positively influenced by the perceived privacy and perceived security when conducting a financial transaction on a web site (Casaló et al., 2007). Adaptability of blockchain for reforming data protection, privacy and security can be considered as an important motivation to research and develop new technologies (Duy et al., 2018). The results obtained if this research study represents that consumers believe in the blockchain technology security, enhancing their trust in their financial institutions.

H_9: Perceived privacy affects negatively perceived trust in vendors' financial institutions.

Perceived privacy reflects the ability of an individual to control the method in which personal information is collected and used in transactions (Morosan, 2013). The way financial institutions manage consumer personal data will affect the perception of privacy. For financial institutions, the perception of privacy depends on the trust and reputation that customers have with their institutions. In general, reputation may be considered as the result of the organizations' relational history with the context in which it functions (Casaló et al, 2007). For this research study, the perceived security construct was measured by the user's perception that blockchain technology will cause possible loss on their personal privacy, make them personally uncomfortable and to have privacy concerns.

As per PLS Bootstrapping technique, perceived privacy obtained t= 0.325 and p value 0.745. This result affirmed no existence of significant evidence, not supporting the hypothesis raised in the research study. Likewise, the path coefficient β PE = 0.025 was attained. Table 12 shows the details of the relationships and the β, t, and p values obtained for Hypothesis 9. Correspondingly, Figure 11 shows the path coefficient β and t values in the structural model.

This result does not represent an atypical problem since there are studies that have found a significant effect and others have not. There are some studies for online purchases, the concepts of privacy and security are two major antecedents of Trust (Casaló et al., 2007). Trust was clearly and positively influenced by the perceived privacy and perceived security when conducting a financial transaction on a web site (Casaló et al., 2007). In the other hand, previous research studies revealed that perceived privacy (Sanchez-Torres et al., 2018) did not play a significant factor in Trust. As a result for this study, consumers doesn't have privacy concerns or do not make them uncomfortable.

Academic and Practical Implications

The findings of this research are found beneficial and solid base to assist researchers and practitioners who wish to explore the adoption of blockchain technology as this technology is still in its early stage. The primary contribution of this research is the development and validation of a representative model for acceptance of blockchain technologies to conduct mobile financial transactions and services. The researcher did not find any research in Puerto Rico on the user's perspective for the acceptance of this new technology.

This investigation is one of the first ones to include Trust as antecedent of the use of blockchain technology. The $R^2 = 0.485$ for the behavioral intention to use the blockchain technology explains the 48.5% of the variance as a predictive power. Likewise, the $R^2 = 0.348$ for the trust on financial institutions explains the 34.8% of the variance as a predictive value. These results represent a starting point towards the understanding, comprehension and search for improvements that help the process of adoption of this new technology.

Performance expectancy and facilitating conditions were validated as precursor for the behavioral intention to use a new technology as presented in the UTAUT model of Venkatesh et al. (2003). The constructs allow the researcher to distinguish the precursors of trust between perceived privacy, perceived risk, and perceived security. While underlining the importance of consumer's trust in financial institutions, this research clearly points to the influence of perceived security in building trust. Other studies have found comparable results (Chelleppa & Pavlou, 2002). On the other hand, similar to other studies the perceived privacy (Sanchez-Torres et al., 2018) and perceived risk (Arias et al., 2019), did not have an influence on the intention to accept the technology.

As a practical implication, financial institutions should focus on the trust and performance as the most critical adoption factors. Marketing efforts must undertake to ensure that the usefulness and performance of the technology will bring to the customer an easier service and utility compare with traditional financial transactions. In these days of global pandemic where there is uncertainty of mandatory lockdowns and health concerns, having the opportunity to conduct mobile financial transactions and services, using a secure system, provides the usefulness and security they need.

Individuals no longer have to physically go to a financial institution to obtain services and handle secure transactions.

The data security and immutable characteristics that blockchain technology will provide trust to the customer in their institution. Likewise, those financial institutions that bring blockchain technology first will have the competitive advantage compare with those that does not implement the technology. To be competitive advantageous, industries marked by fast changes in technology functionality, not just in announcing new products (first-mover advantage); but also ensuring the availability of new products on a global basis to capture the fast-mover advantage (Bharadwaj et al., 2013).

Facilitating conditions is an important factor of influence the acceptance of blockchain technologies. As a new technology, the intention to use the technology will depend on the underlying conditions under which potential customers can operate the mobile application. The technological resources and the compatibility of the user's technology should be taken into consideration when presenting a new technology. The ease of use of the platform to conduct a financial transaction or request a service will prevent a frustration to their user.

As a recommendation, when implementing a new technology, it is important to provide a clear definition and the benefits of implementation to the consumer. The demographics of this study (Figure 9) revealed that 37.1% (n=103) of the participants did not knew anything about blockchain technology.

Limitations and Future Research

This research study identifies the factors that influence the intention to use blockchain technologies in mobile financial transactions and services. As a limitation, the point of view of the user's perspective was the base. Other future research may investigate the perspective of the employees of the financial institutions to have a different point of view and better understanding of the acceptance of this technology. Likewise, other institutions can be included in future research which may include government entities (e-government transactions and services), educational entities (distance education and accreditation), insurance companies (smart contracts), and other private sector industries which conduct transactions and/or provide services to their customers.

Furthermore, a similar research study can be replicated for finance accounting (auditing sector). Recent financial articles proposed that blockchain technologies can be used as a triple entry accounting method (Mukherjel, 2019). The perspective for professional auditors and regulators of the acceptance of blockchain technology uses for triple entry accounting, should be studied.

Another limitation was the length time to complete the questionnaire. Taking approximately 10 minutes, persuade some individuals of participating. It was found that some questionnaires have missing data and left incomplete with only 3-4 questions of finishing the questionnaire. Out of 334 participants, the researcher eliminated 36 with missing data and additional 20 that answered not as to performing financial transactions using mobile devices. The official sample used for this research was a total of 278 (n= 278).

Summary

This investigation collected a sample of 278 individuals that conduct mobile financial transactions and services in Puerto Rico and United States. The factors that influence the intention to use blockchain technology are performance expectancy, facilitating conditions, and trust which was influenced by perceive security. The research study validated Venkatesh et al. (2003) UTAUT model and the construct of trust in financial institutions.

REFERENCES

Abu, F., Jabar, J., & Yunus, A. R. (2015). Modified of UTAUT theory in adoption of technology for Malaysia small medium enterprises (SMEs) in food industry. *Australian Journal of Basic and Applied Sciences, 9*(4), 104-109. http://eprints.utem.edu.my/id/eprint/14873/1/Modified%20of%20UTAUT%20Theory%20in%20Adoption%20of%20Technology%20for%20Malaysia%20Small%20Medium.pdf

Ahmed, Z., Kader, A. Rashid, M., & Nurunnabi, M. (2017). User perception of mobile banking adoption: An integrated TTF-UTAUT model. *Journal of Internet Banking and Commerce, 22*(3), 2-19. http://dspace.iiuc.ac.bd:8080/xmlui/handle/88203/1534?show=full

Al-Mansoori, K., Sarabdeen, J. & Tchantchane, A. (2018). Investigating emirati citizens' adoption of e-government services in Abu Dhabi using modified UTAUT model. *Information Technology & People, 31*(2), 455-481. https://doi.org/10.1108/ITP-12-2016-0290

Andersen, A., Hansen, E., Johannesen, N., & Sheridan, A. (2020). Consumer responses to the COVID-19 crisis: Evidence from bank account transaction data. *SSEN*. http://dx.doi.org 10.2139/ssrn.3609814

Arahita, C., & Hatammimi, J. (2015). Factors affecting the intention to reuse mobile banking service. *International Journal of Research in Business and Social Science, 4* (4), 15-22. https://doi.org/10.20525/ijrbs.v4i4.15

Arias-Oliva, M., Pelegrin-Borondo, J., & Matías-Clavero, G. (2019). Variables influencing cryptocurrency use: A technology acceptance model in Spain. *Frontiers in Psychology, 10* (475), 1-13. doi: 10.3389/fpsyg.2019.00475

Awiagah, R., Kang, J., & Lim, J.I. (2016). Factors affecting e-commerce adoption among SMEs in Ghana. *Information Development*, *32*(4), 815-836. doi:10.1177/0266666915571427

Baker, S., Farrokhnia, R., Meyer, S., Pagel, M., & Yannelis, C. (2020). How does household spending respond to an epidemic? Consumption during the 2020 COVID-19 pandemic. *The Review of Asset Pricing Studies*, *10* (4), 834-862. https://doi.org/10.1093/rapstu/raaa009

Bharadwaj, A., El Sawy, O., Pavlou, P., & Venkatraman, N. (2013). Digital business strategy: Toward a next generation of insights. *MIS Quarterly, 37*(2), 471-482. http://www.jstor.org/stable/43825919

Bhatiasevi, V. (2016). An extended UTAUT model to explain the adoption of mobile banking, *Information Development, 32*(4), 799–814. doi: 10.1177/0266666915570764

Brown, T. A. (2015). Confirmatory factor analysis for applied research. *Guilford Publications*.

Caldarelli, A., Ferri, L., Ginesti, G., & Spano, R. (2020). Understanding blockchain in adoption in italian Firms. In R. Agrifoglio, R. Lamboglia, D. Mancini, & F. Ricciardi (Ed.), *Digital Business Transformation: Organizing, Managing and*

Controling in the Information Age, (pp.121-136). https://doi.org/10.1007/978-3-030-47355-6

Casaló, L., Flavián, C., and Guinalíu, M. (2007). The role of security, privacy, usability and reputation in the development of online banking. *Online Information Review, 31*(5): 583-603. doi: 10.1108/14684520710832315

Cashaa: Blockchain Summit Concludes at IIM Lucknow, Support Received From Government to Make India Blockchain Capital. (2019, Feb 24). *PR Newswire Europe Including UK Disclose.* https://biblioteca.uprrp.edu:2091/wire-feeds/cashaa-blockchain-summit-concludes-at-iim-lucknow/docview/2185196912/se-2?accountid=44825

CDC. (2020). *New ICD-10-CM code for the 2019 Novel Coronavirus (COVID-19), April 1, 2020*. https://www.cdc.gov/nchs/icd/icd10cm.htm

Chandra-Kirana, K. (2018). Subjective norms, self efficacy and government support to intention to use internet banking (in islamic perspective), *Journal of Internet Banking and Commerce, 23* (1), 1-9. https://tinyurl.com/y2pwcbjv

Chen, H., and Qian, W., and Wen, Q. (2020). The impact of the COVID-19 pandemic on consumption: Learning from high frequency transaction Data. http://dx.doi.org/10.2139/ssrn.3568574

Chelleppa, R. K., & Pavlou, P. A. (2002). Perceived information security, financial liability and consumer trust in electronic commerce transactions. *Logistics Information Management,* 15(5), 358-368. doi:10.1108/09576050210447046

Clarke, R. (1999). Internet privacy concerns confirm the case for intervention. *Communications of the ACM*, *42*(2): 60-67. https://doi.org/10.1145/293411.293475

Clement, J. (2019b). *Worldwide mobile app revenues in 2014 to 2023*. Statista. https://www.statista.com/statistics/269025/worldwide-mobile-app-revenue-forecast/

Clement, J. (2019a). *Mobile app usage – Statistics and facts*. Statista. https://www.statista.com/ topics/1002/mobile-app-usage/

Comscore. (2019). *Global state of mobile. Comscore MMX Multi-Platform, Worldwide Rollup* . https://tinyurl.com/y2v3y2tw

Cripto Inversion. (2020). *Criptomonedas en Puerto Rico*.https://www.criptoinversion.org/ puerto-rico/

Crosby, M., Nachiappan, Pattanayak, P., Verma, S., and Kalynaraman, V. (2016). Blockchain technology: Beyond bitcoin. *Applied Innovation Review, 2*, 6-19. http://scet.berkeley.edu/wp-content/uploads/AIR-2016-Blockchain.pdf

Cruz-Pabón, O. (2020). *Cloud storage: El efecto moderador de la confianza y los factores demográficos en su adopción.* [Doctoral Dissertation, Universidad del Turabo].

Davis, F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13(3), 319-339.* DOI: 10.2307/249008

Dečman, M. (2015). Understanding Technology Acceptance of Government Information System from Employees' Perspective. *International Journal of Electronic Government Research, 11*(4), 69-88. doi:10.4018/IJEGR.2015100104

De Jesús, A. (2019, Apr. 3). Ausente de regulación, Puerto Rico ya cuenta con un criptobanco. *Noticel*,TelecomCorporation.https://www.noticel.com/economia/hack/top-stories/20190405/ausente-de-regulacion-puerto-rico-ya-cuenta-con-un-criptobanco/

Deloitte (2019). *Deloitte's 2019 Global Blockchain Survey: Blockchain gets Down to Business*. https://www2.deloitte.com/content/dam/Deloitte/se/Documents/risk/DI_2019-global-blockchain-survey.pdf

De Sena, R., Moriguchi, S., & Andrade, D. (2016). Intention of adoption of mobile payment: An analysis in the light of the Unified Theory of Acceptance and Use of Technology. UTAUT). *Innovation & Management Review, 13*, 221-230. http://dx.doi.org/10.1016/ j.rai.2016.06.003

Dewey, J. (2020). *Blockchain and Cryptocurrency regulation 2020* (2nd Ed.). Global Legal Insights. https://www.lw.com/thoughtLeadership/gli-blockchain-cryptocurrency-2020-UK

Ducas, E., & Wilner, A. (2017). The security and financial implications of blockchain technologies: regulating emerging technologies in Canada. International Journal, *72*(4), 538-562. doi:10.1177/0020702017741909

Dutta, S., and Kumar, S. (2020). Detection of fraud transactions using recurrent neural network during COVID-19. *Preprints*. doi:10 20944/preprints202006 0368 v1

Duy, P.T., Thu D.T.., Pham, V.H. (2018). A survey on Blockchain-based applications for reforming data protection, privacy and security. *Cryptography and Security*, *DOI:* arxiv-2009.00530

Eliewaha, H., Chong, Y., & Wye, C. (2017). The influence of government support and awareness on rural farmers' intention to adopt mobile government services in Tanzania. *Journal of Systems and Information Technology, 19* (1/2), 42-64. https://doi.org/10.1108/ JSIT-01-2017-0005

Engotoit, B., Mayoka, G., & Bukoma, M. (2016). Influence of performance expectancy on commercial farmers' intention to use mobile-based communication technologies for agricultural market information dissemination in Uganda. *Journal of Systems and Information Technology, 18* (4), 346-363. doi:10.1108/JSIT-06-2016-0037

Farah, M., Junaid, M., and Khan, A. (2018). Mobile-banking adoption: empirical evidence from the banking sector in Pakistan, *7*, 1386-1413. https://doi.org/10.1108/IJBM-10-2017-0215

FinCEN (2013). Application of FinCEN's regulations to persons administering, exchanging, or using virtual currencies, *Department of Treasury Financial Crime Enforcement Network,* FIN-2013-G001. https://www.fincen.gov/sites/default/files/shared/FIN-2013-G001.pdf

Fridgen, G., Guggenmos, F., Lockl, J., Rieger, A., Schweizer, A., & Urbach, N. (2018). Developing an evaluation framework for blockchain in the public sector: The example of the german asylum process. *Reports of the European Society for Socially Embedded Technologies, 2* (13). https://dl.eusset.eu/handle/20.500.12015/3157

Gefen, D. (2000). E-commerce: the role of familiarity and trust. *The International Journal of Management Science,* 28(6), 725-737. doi:10.1016/S0305-0483(00)00021-9

Gefen, D., Karahanna, E., & Straub, D. (2003). Trust and TAM in Online Shopping: an integrated model. *MIS Quarterly,* 27(1): 51-90. https://doi.org/10.2307/30036519

Hair, J., Celsi, M., Money, A., Samouel, P., & Page, M. (2016). *Essentials of Business Research Methods* (3rd. ed.). Routledge Taylor and Francis Group.

Hair, J. F., Black, B., Babin, B., Anderson, R., & Tatham, R. (2006). *Multivariate Data Analysis* (6th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Hair, J. F., Hult, G. T., Ringle, C. M., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM) 2e*. Sage Publications.

Hearing of the Senate Homeland Security and Governmental Affairs Committee Subject: Beyond silk road: Potential risks, threats, and promises of Virtual Currencies. (2013, November20). https://link.gale.com/apps/doc/A349727834/AONE?u=uprpiedras&sid=AONE&xid=6f0e9e02

Henseler, J., Ringle, C., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science, 43(1), 115-135.* doi: 10.1007/s11747-014-0403-8

Hernández, R., & Mendoza, C. (2018). *Metodología de la investigación: Las rutas cuantitativa, culitativa y mixta.* McGraw-Hill Interamericana de España.

Hernández-Sampieri, R., Fenández, C., & Batista, L. (2014). *Metodología de la investigación.* Mc Graw Hill. Mexico, 4.

Hinojosa, J., Meléndez, E., & Serevino, K. (2019). *Population decline and school closure in Puerto Rico*. https://centropr.hunter.cuny.edu/research/data-center/research-briefs/population-decline-and-school-closure-puerto-rico

Hughes, S. (2017). *Cryptocurrency regulations and enforcement in the U.S. Western State Law Review*. https://www.scotthugheslaw.com/documents/CRYPTOCURRENCY-REGULATIONS-AND-ENFORCEMENT-IN-THE-US-2.pdf

IBM. (2016). *Leading the pack in blockchain banking: Trailblazers set the pace.* https://www.ibm.com/downloads/cas/PA8V4RMX

IC3. (2019). *Internet crime report*. Federal Bureau of Investigation. https://pdf.ic3.gov/2019_IC3Report.pdf

Internal Revenue Services. (2014). *IRS notice 2014-21*. https://www.irs.gov/pub/irs-drop/n-14-21.pdf

Jimenez-Robles, J. (2019). *Estudio comparativo generacional sobre la intención hacia la seguridad cibernética del usuario doméstico.* (Publication No. 13895350) [Doctoral Dissertation, Universidad del Turabo]. Proquest Dissertation and Theses Global.

Kamboj, D., & Yang, T. (2018) An exploratory analysis of blockchain: Applications, security, and related issues. *International Conference of Scientific Computing*. https://csce.ucmss.com/cr/books/2018/LFS/CSREA2018/CSC3593.pdf

Khrais, L. (2017) Framework for measuring the convenience of advanced technology on user

perceptions of internet banking systems. *Journal of Internet Banking and Commerce*, *22* (3), 1-19. https://www.researchgate.net/publication/323168221_Framework_for_measuring_the_convenience_of_advanced_technology_on_user_perceptions_of_Internet_banking_systems

KNC. (2019). The meaning of the blockchain. *The Economist*. https://www.economist.com/open-future/2019/01/08/the-meaning-of-the-blockchain

Kumar, V., Lall, A., & Mane, T. (2017). Extending the TAM model: Intention of management students to use mobile Banking evidence from India. *Global Business Review, 18*(1), 238-249. doi:10.1177/0972150916666991

Kumar, R., Sachan, A., & Mukherjee, A. (2018). Direct vs indirect e-government adoption: An exploratory study. *Digital Policy, Regulation and Governance,* 20(2), 149-162. https://doi.org/10.1108/DPRG-07-2017-0040

Lawshe, C.H. (1975). A quantitative approach to content validity. *Personnel Psychology,* 28(4), 563-575. http://caepnet.org/~/media/Files/caep/knowledge-center/lawshe-content-validity.pdf

Lee, S., Park, E., Cho, M., & Jin, B. (2018). Factors affecting tablet computer users' intention to purchase mobile applications. *Social Behavior and Personality, 46*(1), 25-38. https://dx.doi.org/10.2224/sbp.6525

Lee & Song, 2013. Effects of trust and perceived risk on user acceptance of a new technology service. *Social Behavior and Personality, 41*(4), 587- 598. http://dx.doi.org/10.2224/
sbp.2013.41.4.587

Lei, Y., and Tran, T. (2020). *How the COVID-19 pandemic may reshape the digital payment landscape, Federal Reserve Bank Kansas City.* https://www.kansascityfed.org/en/publications/research/rwp/psrb/articles/2020/covid19-pandemic-may-reshape-digital-payments-landscape

Lichtfous, M., Yadav, V., & Fratino, V. (2019). Can blockchain accelerate financial

inclusion globally? *Inside Magazine, 19*, 1-8. https://www2.deloitte.com/content/dam/Deloitte/lu/Documents/technology/lu-blockchain-accelerate-financial-inclusion.pdf (Lichtfous sustituye a Deloitte, 2019a)

Lin, K., & Lu, H. (2015). Predicting mobile social network acceptance based on mobile value and social influence. *Internet Research, 25* (1), 107-130. doi:10.1108/IntR-01-2014-0018

Madan, K., & Yadav, R. (2016). Behavioural intention to adopt mobile wallet: A developing country perspective, *Journal of Indian Business, 8*(3), 227-244. doi:10.1108/JIBR-10-2015-0112

Maduku, D. (2017). Customer acceptance of mobile banking services: A use experience as moderator. *Social Behavior and Personality, 45*(6), 893-900. https://doi.org/10.2224/sbp.5871

Makanyeza, C. & Mutambayashata, S. (2018). Consumers' acceptance and use of plastic money in Harare, Zimbabwe. *International Journal of Bank Marketing, 36*(2), 379-392. https://doi.org/10.1108/ IJBM-03-2017-0044

Marinkovic, V., & Kalinic, Z. (2017). Antecedents of customer satisfaction in mobile commerce: Exploring the moderating effect of customization. *Online Information Review, 41*(2), 138-154. doi:10.1108/OIR-11-2015-0364

Morosan, C. (2013). Toward an integrated model of adoption of mobile phones for purchasing ancillary services in air travel. I*nternational Journal of Contemorary Hospitality Management, 26*(2), 246-271. doi:10.1108/IJCHM-11-2012-0221

Morton, H. (2019). *Blockchain 2019 legislation*. National Conference of State Legislature. https://www.ncsl.org/research/financial-services-and-commerce/blockchain-2019-legislation.aspx

Mubuke, F., Mayoka, G., Masaba, K., Ogenmungu, C., & Naguajja, S. (2018). Social influence: Testing the predictive power of its dimensions in explaining the intention to use mobile

learning systems in universities empirical evidence from Ugandan Universities. *I-Manager's Journal of education Technology, 15* (3), 53-61. https://eric.ed.gov/?id=EJ1206609

Muherjel, P. (2019). Accounting, auditing and Blockchain. The common thread that binds the 3 is triple entry accounting. *Finextra.* https://www.finextra.com/blogposting/18183/ accounting-auditing-and-blockchain-the-common-thread-that-binds-the-3-is-triple-entry-accounting

Nakamoto, S (2008). *Bitcoin: A peer-to-peer electronic cash system*. https://bitcoin.org/bitcoin.pdf

Navarro, J. (2020). *The Caribbean: Web application attacks 2019 by country.*

https://www.statista.com/statistics/1058898/internet-application-attacks-caribbean-countries/

Navarro-Navarro, J. (2019). *Factores que influyen en la intención de adopción de la tecnología m-wallet en Puerto Rico.* (Publication No. 13895384) [Doctoral Dissertation, Universidad del Turabo]. Proquest Dissertation and Theses Global.

NextBigWhat. (2018). *Bermuda government to make changes in banking act to support blockchain-based companies.* HT Digital Streams Limited, https://login.librarylogin.uagm.edu/login?url=https://www.proquest.com/docview/2088540809?accountid=28867

Pavlou, P. (2003). Consumer Acceptance of Electronic Commerce: Integrating Trust and Risk with the Technology Acceptance Model. *International Journal of Electronic Commerce, 7*(3), 69–103. http://www.jstor.org/stable/27751067

Peters, G., and Panayi, E. (2015). *Understanding Modern banking ledgers through blockchain technologies: future of transaction processing and smart contracts on the internet of money*. Department of Statistical Science, University College London. http://dx.doi.org/10.2139/ssrn.2692487

Raza, S., Shah, N., & Ali, M. (2019). Acceptance of mobile banking in Islamic banks: evidence from modified UTAUT model. *Journal of Islamic Marketing, 1*(1), 357-376. https://doi.org/10.1108/JIMA-04-2017-0038

Riviere, J. (2018). Blockchain technology and IP – investigating benefits and acceptance in governments and legislations. *Junior Management Science, 3*(1), 1-15. http://dx.doi.org/10.5282/jums/v3i1pp1-15

Roca, J.C., García, J.J., and De la Vega, J.J. (2009). The importance of perceived trust, security and privacy in online trading systems. *Information Management & Computer Security 17*(2), 96-113. http://dx.doi.org/10.1108/09685220910963983

Sair, S., and Danish, R. (2018). Effect of performance expectancy and effort expectancy on the mobile commerce adoption intention through personal innovativeness among Pakistani consumers. *Pakistan Journal of Commerce and Social Sciences, 12*(2), 501-520. tinyurl.com/295fz8f6

Sánchez-Torres, J.A., Arroyo, F.J., Varon, A., & Sánchez, J.A. (2017). Differences between e-commerce buyers and non-buyers in Colombia: The moderating effect of educational level and socioeconomic status on electronic purchase intention, *DYNA, 84*(202), 175-189. http://dx.doi.org/10.15446/dyna.v84n202.65496

Sánchez-Torres, J.A., Arroyo, F.J., Varon, A., & Sánchez, J.A. (2018). E-banking in Colombia: factors favouring its acceptance, online trust and government support. *International Journal of Bank Marketing, 36*(1), 170-183. doi.org/10.1108/IJBM-10-2016-0145

Salem, S., and Ali, N. (2019). A proposed adoption model for Blockchain technology using a Unified Theory of Acceptance and use of Technology (UTAUT), *Open International Journal of Informatics, 7*(2), 75-84. http://apps.razak.utm.my/ojs/index.php/ oiji/article/view/220

Sarfaraz, J. (2017). Unified theory of acceptance and use of technology (UTAUT) model-mobile banking, *Journal of Internet Banking and Commerce, 22*(3), 1-20.

tinyurl.com/5kp3k0bf

Shih, Y., & Chen, C. (2013). The study of behavioral intention for mobile commerce: Via integrated model of TAM and TTF. *Quality and Quantity, 47*, 1009-1020. doi:10.1007/s11135-011-9579-x

Slade, E., Dwivedi, N., Piercy, N., & Williams, M. (2015). Modeling Consumers' Adoption Intentions of Remote Mobile Payments in the United Kingdom: Extending UTAUT with Innovativeness, Risk, and Trust. *Psychology & Marketing, 32*(8), 860-873. https://doi.org/10.1002/mar.20823

Szmigiera, M. (2019). Mobile banking in the U.S. – Statistics & Facts. Statista. https://www.statista.com/topics/2614/mobile-banking/

Straub, D. and Carlson, C. (1989). Validating instruments in MIS research. *MIS Quarterly, 13*(2), 147-169. https://doi.org/10.2307/248922

Swan, M. (2015). *Blockchain: Blueprint for a new economy. O'Reilly Media, Inc.* https://ebookcentral.proquest.com

Swan, M. (2017). Anticipating the Economic Benefits of Blockchain . *Technology Innovation Management Review, 7(10), 6-13.* https://doi.org/10.22215/timreview/1109

Tak, P., & Panwar, S. (2017). Using UTAUT 2 model to predict mobile app based shopping: Evidences from India. *Journal of Indian Business Research, 9*(3), 248-264. doi:10.1108/JIBR-11-2016-0132

Tan, E., and Lau, J. (2016). Behavioural intention to adoption mobile banking among the

millennial generation. *Young Consumers, 17* (1), 18-31. doi:10.1108/YC-07-2015-00537

Tarhini, A., El-Masri, M., Ali, M., & Serrano, A. (2016). Extending the UTAUT model to understand the customers' acceptance and use of internet banking in Lebanon: A structural equation modeling approach. *Information Technology & People, 29*(4), 830-849. https:// doi.org/10.1108/ITP-02-2014-0034

Thompson, B. (2004). Exploratory and Confirmatory Factor Analysis: Understanding Concepts and Applications. *American Psychological Association*. https://doi.org/http://dx.doi.org/10.1037/10694-000

Venkatesh, V., Morris, M., & Davis, G. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27* (3), 425-478. https://doi.org/10.2307/30036540

Werbach, K. (2018). Trust, but verify: Why the Blockchain needs the law. *Berkley Technology law Journal, 33*, 487-549. https://doi.org/10.15779/Z38H41JM9N

Yusof, H., Mior, M., Zolkaply, Z., Jing, C., Hau, C., Ying, D., Zheng, L., Seng, L., &. Leong, T. (2018). Behavioral intention to adopt Blockchain technology: Viewpoint of the banking institutions in Malaysia. *International Journal of Advanced Scientific Research and Management, 3*(10), 274-279. http://ijasrm.com/wp-content/uploads/2018/10/IJASRM_V3S10_933_274_279.pdf

Zaheer, A. (2020). The forceful reevaluation of cash-based transactions by COVID-19 and its opportunities to transition to cashless systems in digital urban networks. *In*

Surveying the Covid-19 Pandemic and its Implications (pp.107–117).

doi: 10.1016/B978-0-12-824313-8.00008-5

APPENDIXES

Appendix A: IRB Protocol Approval Letter

UNIVERSIDAD ANA G. MÉNDEZ
UAGM

Vicepresidencia de Planificación y Asuntos Académicos
Vicepresidencia Asociada Recursos Externos y Cumplimiento
Oficina de Cumplimiento

PO Box 21345
San Juan, PR 00928-1345
787-751-0178 exts.7195-7284

Junta para la Protección de Seres Humanos en la Investigación (IRB)

Fecha	:	25 de febrero de 2021
Investigador	:	Sr. Carlos L. Ramón Rodríguez
Mentora	:	Dra. Isabel Rivera Ruiz
Título del protocolo	:	Factores que afectan la aceptación de la tecnología *blockchain* en transacciones y servicios financieros móviles
Número de protocolo	:	03-174-21
Tipo de solicitud	:	Protocolo inicial
Recinto, Escuela	:	Gurabo, Negocios, Turismo y Emprendimiento
Tipo de revisión	:	Exenta
Acción tomada	:	Aprobado
Fecha de revisión	:	25 de febrero de 2021

Certificamos que el estudio/investigación de referencia fue recibido, revisado y aprobado en la Oficina de Cumplimiento por la *Junta para la Protección de Seres Humanos en la Investigación (IRB)*. El mismo fue evaluado y cumple con los criterios establecidos bajo 45 CFR 46.101(b)(1-6) para ser clasificado como **Exento** con un periodo de vigencia del **25 de febrero de 2021 al 24 de febrero de 2022.**

Favor de tener presente lo siguiente:

- La hoja informativa es un documento que asegura que los sujetos o participantes entienden su participación en el estudio, además de ser un seguro de protección para los mismos. De acuerdo con las Regulaciones Federales se requiere que los participantes reciban copia de la hoja informativa antes de contestar el cuestionario.
- De realizarse algún cambio en los documentos anejados con este estudio deben ser sometidos nuevamente al IRB para su debida revisión y aprobación, utilizando la forma de IRB "Solicitud para Cambios/ Enmiendas".
- Todo evento adverso o no esperado debe ser informado al IRB utilizando la forma de IRB de Solicitud de Eventos Adversos y Problemas Inesperados.

- Todos los documentos relacionados con la investigación deben ser guardados hasta un término de cinco (5) años. Pasado este término los mismos deben ser eliminados/ triturados, no quemados.

- De no realizar su investigación en el término aprobado deberá someter una solicitud de "Revisión Continua" llenando la forma IRB para "Renovar un Protocolo ya Aprobado" antes de vencerse el mismo.

- Al finalizar su investigación debe someter una solicitud de cierre utilizando la forma de IRB "Solicitud para Cierre de Protocolo Aprobado por el IRB".

Para obtener los formularios mencionados previamente y/o instrucciones debe acceder a la ***Junta para la protección de seres humanos*** bajo el enlace http://compliance.suagm.edu.

Para más información, aclarar dudas o notificar algún caso de incumplimiento debe comunicarse con su Oficial de Cumplimiento en la **Universidad Ana G. Méndez, Recinto Gurabo** con la Prof. Josefina Melgar al (787) 743-7979 ext. 9-4126.

Para notificar un evento adverso, incumplimiento en la investigación llamar al (787) 751-3120, enviar mensaje electrónico a cumplimiento@uagm.edu o puede escribir a:

Oficina de Cumplimiento
Vicepresidencia Asociada de Recursos Externos y Cumplimiento
Vicepresidencia de Planificación y Asuntos Académicos
Universidad Ana G. Méndez
P.O. Box 21345
San Juan, PR 00928-1345

Appendix B1: Invitation Letter Spanish

Escuela de Administración de Empresas y Emprendimiento

Invitación a participar en un estudio/investigación

Carlos L. Ramón le invita a formar parte de su disertación titulada ***Factores que afectan la aceptación de la tecnología blockchain en transacciones y servicios financieros móviles***, esto como requisito al grado de Doctor en Administración de Empresas en Gerencia de Sistemas de Información de la Universidad Ana G Méndez, Gurabo PR.

El propósito de esta investigación es identificar los factores que influyen en la intención de adopción de la tecnología blockchain para realizar transacciones y servicios financieros móviles. Estos factores son importantes porque ayudarían en la evolución de esta nueva tecnología, lo que redundaría en beneficio para todos los usuarios de aplicaciones financieras móviles.

Esta investigación necesita una muestra mínima de 270 personas. Los requisitos de inclusión son: el utilizar aplicaciones móviles para realizar transacciones o servicios fiancieros móviles y tener entre 18 y 65 años de edad. Su participación consiste en contestar 38 preguntas de manera honesta y completa, lo que le tomará aproximadamente 10 minutos.

De antemano le agradezco por su valioso tiempo y apreciaría su apoyo reenviando esta invitación a sus amigos, familiares y personas que cumplan las condiciones antes mencionadas.

En caso de estar interesado en participar, favor acceder el enlace abajo en Español o Inglés, según su preferencia. En este enlace de la plataforma Survey Monkey se encuentra una hoja informativa para mayor información y el acceso para completar el cuestionario en o antes del 30 de marzo de 2021. El tiempo estimado para completar el cuestionario es 10 minutos.

Muchas gracias nuevamente y le deseo que tenga un lindo día.

Acceso a Hoja Informativa y cuestionario (Español)-

https://es.surveymonkey.com/r/Blockchain-Acceptance-Spanish

Acceso a Hoja Informativa y cuestionario (Inglés)-
https://www.surveymonkey.com/r/Blockchain-Acceptance-English

Appendix B2: Invitation Letter English

School of Business Administration and Entrepreneurship

UNIVERSIDAD ANA G. MÉNDEZ UAGM Recinto de Gurabo

Invitation to participate in a study/research

Carlos L. Ramón invites you to be part of his dissertation entitled ***Factors Affecting Blockchain Technology Acceptance in Mobile Financial Transactions and Services.*** This as a requirement for the degree of Doctor of Business Administration in Information Systems Management from the Ana G Méndez University, Gurabo PR.

The purpose of this research is to identify the factors that influence the intention to adopt blockchain technology for mobile financial transactions and services. These factors are important because they would help in the evolution of this new technology, which would benefit all users of mobile financial applications.

This research requires a minimum sample of 270 participants. The inclusion requirements are using mobile applications to carry out mobile financial transactions or services and be between 18 and 65 years of age. Your participation consists of honestly and completely answering 38 questions, which will take approximately 10 minutes.

I thank you in advance for your valuable time and would appreciate your support by forwarding this invitation to your friends, family and people who meet the above conditions.

If you are interested in participating, please access the link below in Spanish or English language, according to your preference. In this link on the Survey Monkey platform, you will find an information sheet for additional information and access to the questionnaire to be completed on or before March 30, 2021. The estimated time to complete the questionnaire is 10 minutes.

Thank you very much again and I wish you a nice day.

Access to Information Sheet and questionnaire (Spanish) –

https://es.surveymonkey.com/r/Blockchain-Acceptance-Spanish

Access to Information Sheet and questionnaire (English) -
https://www.surveymonkey.com/r/Blockchain-Acceptance-English

Appendix C1: Information Letter Spanish

Escuela de Administración de Empresas y Emprendimiento

Información para participar en un estudio/investigación Hoja Informativa

Factores que afectan la aceptación de la tecnología blockchain en transacciones y servicios financieros móviles

Descripción del estudio/investigación y tu participación en el mismo

Carlos L. Ramón Rodríguez le invita a formar parte de su disertación como requisito al grado de Doctor en Administración de Empresas en Gerencia de Sistemas de Información. El propósito de esta investigación es identificar los factores que influyen en la intención de adopción de la tecnología blockchain para realizar transacciones y servicios financieros móviles. Estos factores son importantes porque ayudarían en la evolución de esta nueva tecnología, lo que redundaría en beneficio para todos los usuarios de aplicaciones financieras móviles.

Esta investigación necesita una muestra de 270 participantes. Los requisitos de inclusión son: el utilizar aplicaciones móviles para realizar transacciones o servicios financieros móviles y tener entre 18 y 65 años de edad. Su participación consiste en contestar 37 preguntas de manera honesta y completa, lo que le tomará aproximadamente 10 minutos.

Riesgos e Incomodidad

El riesgo que tendrá esta investigación para los participantes será mínimo, ya que pudieran sentir cansancio al momento de completar el cuestionario.

Posibles Beneficios

Al usted participar en esta investigación, podrá obtener el beneficio de adquirir conocimiento más amplio y profundo de los servicios que ofrece la tecnología "blockchain".

Protección de la Privacidad y Confidencialidad

Toda información relacionada a su identidad será manejada de manera privada y confidencial y será protegida en todo momento. Bajo ninguna circunstancia se compartirá información del participante con terceros. Los datos recopilados electrónicos a través de la Plataforma Survey Monkey se guardarán en un lugar privado, seguro y bajo llave en la residencia de Carlos L. Ramón por un periodo de cinco (5) años. Al finalizar este período, el archivo será borrado.

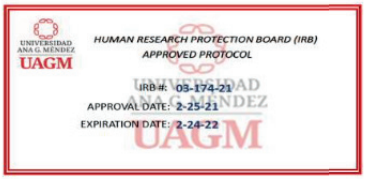
Decisión sobre su participación en este estudio

Su participación en este estudio es totalmente voluntaria. Usted tiene todo el derecho de decidir participar o no de este estudio. Si usted decide participar en este estudio tiene el derecho de retirarse en cualquier momento sin penalidad alguna.

Información contacto

Si usted tiene alguna duda o inquietud correspondiente a este estudio de investigación o si surge alguna situación durante el periodo del estudio, por favor contacte a Carlos L Ramón a su dirección de correo electrónico cramon3@email.uagm.edu; o vía telefónica llamado al (787)-458-8768. Si usted tiene preguntas sobre sus derechos como sujeto de investigación por favor comuníquense con la Oficina de Cumplimiento en la Investigación de UAGM al (787)-751-3120 o compliance@uagm.edu.

Una copia de esta carta informativa le será entregada.



Appendix C2: Information Letter English

School of Business Administration and Entrepreneurship

Informative letter for research participation

Factors Affecting Blockchain Technology Acceptance in Mobile Financial Transactions and Services

Description of the study / research and your participation

Carlos L. Ramón Rodríguez invites you to be part of his dissertation as a requirement for the degree of Doctor of Business Administration in Information Systems Management. The purpose of this research is to identify the factors that influence the intention to adopt blockchain technology for mobile financial transactions and services. These factors are important to understand the user acceptance on this new technology, which would benefit all users of mobile financial applications.

This research requires a sample of 270 individuals. The requirements to participate, you must conduct mobile financial transactions and services; and be between 18 and 65 years of age. Your participation consists of answering honestly and completely 38 questions, which will take approximately 10 minutes.

Risks and Discomfort

The risk that this research will have for the participants will be minimal, since participants may feel tired when completing the questionnaire.

Possible benefits

By participating in this research, you will be able to gain a broader and deeper understanding of the services that blockchain technology offers.

Protection of Privacy and Confidentiality

All information related to your identity will be kept private and confidential and will be protected at all times. Under no circumstances the participant information will be shared with third parties. The data collected through Survey Monkey will be kept in a private, secure and locked place at the residence of Carlos L. Ramón for a period of five (5) years. At the end of this period, the collected date will be deleted.

Decision about your participation in this study

Your participation in this study is completely voluntary. You have every right to decide whether or not to participate in this study. If you decide to participate in this study, you have the right to withdraw at any time without penalty.

Contact information

If you have any questions or concerns regarding this research study or if any situation arises during the period of the study, please contact Carlos L Ramón at his email address cramon3@email.uagm.edu; or by phone call at (787) 458-8768. If you have questions about your rights as a research subject, please contact UAGM's Office of Research Compliance at (787) - 751- 3120 or compliance@uagm.edu. A copy of this information letter will be given to you.

Appendix D1: Research Instrument Spanish

UNIVERSIDAD ANA G. MÉNDEZ
UAGM
Recinto de Gurabo

Instrumento de Investigación

Cuestionario para determinar los factores que afectan la aceptación de la tecnología blockchain en transacciones y servicios financieros móviles

El presente cuestionario es parte de los requisitos para obtener el grado de Doctor en Gerencia de Sistemas de Información de la Universidad Ana G Méndez, recinto de Gurabo, Puerto Rico. Como propósito principal es investigar los factores que afectan la aceptación del usos de tecnologías de "Blockchain" para realizar transacciones y servicios financieros en dispositivos móviles. El cuestionario solo se contestará en forma electrónica. La participación de este estudio es voluntaria y la información obtenida es estrictamente confidencial. Para contestar este cuestionario usted no tendrá que identificarse en ningún momento y los datos recopilados serán utilizados únicamente para fines de esta investigación. El tiempo estimado de completar el cuestionario es de aproximadamente 10 minutos.

Vocabulario:

Los siguientes conceptos son definidos según el contexto de esta investigación.

- **Tecnología de cadena de bloques "Blockchain":** mayormente utilizado en las criptomonedas. Es in libro mayor descentralizado y transparente con los registros de transacciones o una base de datos compartida y monitoriada por todos los nodos de la red. Existen aplicaciones móviles utilizando esta tecnología en el cual los usuarios pueden realizar transacciones directas y seguras con sus instituciones financieras y otros.
- **Aplicaciones móviles basadas en "Blockchain"**: es una aplicación móvil (que normalmente se encuentra en la tienda de Apple y/o Google) que incluye la tecnología "blockchain". Se creó para facilitar transacciones seguras y fáciles, y genera confianza entre los socios comerciales. Los bancos y otras instituciones financieras están utilizando la tecnología "blockchain" para optimizar sus servicios, reducir el fraude y reducir las tarifas para los clientes.
- **Dispositivo móvil:** cualquier equipo computarizado (teléfonos inteligentes, tabletas, computadoras personales, entre otros) utilizado con el cual el usuario utiliza aplicaciones de servicios en linea, tales como: servicios y transacciones financieras, compra en linea y otros.
- **Transacciones y servicios financieros:** son aquellos servicios o transacciones que el usuario realiza con una institución bancaria, entiéndase: depósitos o retiros bancarios, pagos electrónicos, compras por internet, servicios de banca móvil, entre otros.

Parte I. Información demográfica

Marque la alternativa que mejor le describe.

1) Género: ____Femenino ____Masculino ____Otro

2) Edad: ____18 a 29 años ____30 a 38 años ____39 a 49 años
____50 a 64 años ____65 años o más

3) Indique el nivel más alto de educación que ha alcanzado:
____Escuela Superior ____Grado Técnico ____Grado Asociado
____Bachillerato ____Maestría ____Doctorado
____Otro ¿Cuál? _____

4) Indique su lugar actual de residencia:
____Puerto Rico ____Estados Unidos continental
____ Otro ¿Cuál? _____

5) ¿Cuál de los siguientes describe mejor su ingreso anual?:
____$0 ____$1 a $9,999 ____$10,000 a $24,999 ____$25,000 a $49,999
____$50,000 a $74,999 ____$75,000 a $99,999 ____$100,000 o más.

6) ¿Qué nivel de conocimiento tiene sobre el tema de la tecnología "blockchain" (por ejemplo, criptomonedas, contratos inteligentes, aplicaciones de tecnologías "blockchain", otros)?
____no tengo conocimiento ____algo de conocimiento ____con conocimiento

7) ¿Usted, realiza transacciones o servicios financieros utilizando dispositivos móviles?
____Si ____No (muchas gracias por su participación)

Parte II. Escala de medición

Marque con una (x) la opción que usted considere más adecuada. Tenga en cuenta que (1) corresponde a altamente en desacuerdo, (2) muy en desacuerdo, (3) en desacuerdo, (4) neutral, (5) de acuerdo, (6) muy en acuerdo y (7) altamente en acuerdo.

Premisas		1-altamente en desacuerdo a 7-altamente en acuerdo
	Expectativa de desempeño	Escala Likert 1-7
	Al parecer, realizar transacciones y servicios financieros móviles con aplicaciones que contienen tecnología "blockchain"	
8)	es de mucha utilidad.	1 2 3 4 5 6 7
9)	me ofrece ventajas sobre formas tradicionales.	1 2 3 4 5 6 7
10)	no me toma mucho tiempo comparado con formas tradicionales (ir físicamente a la institución financiera).	1 2 3 4 5 6 7
	Expectativa de esfuerzo	1-altamente en desacuerdo a 7-altamente en acuerdo
	Al parecer, realizar transacciones y servicios financieros móviles con aplicaciones que contienen tecnología "blockchain",	
11)	la interacción es clara y entendible.	1 2 3 4 5 6 7
12)	será fácil para mi el hacerme diestro en usarla.	1 2 3 4 5 6 7
13)	es fácil el aprender a operar la aplicación movil.	1 2 3 4 5 6 7
	Influencia Social	
14)	La familia y amigos influye en mi decision de realizar transacciones y servicios financieros móviles con aplicaciones que contienen tecnología "blockchain".	1 2 3 4 5 6 7
15)	Los medios (TV, radio, medios sociales, noticias en linea) influye en mi decision de realizar transacciones y servicios financieros móviles con aplicaciones que contienen tecnología "blockchain".	1 2 3 4 5 6 7
16)	Entiendo que yo estaría mas preparado utilizando aplicaciones móviles que contienen tecnología "blockchain" para realizar transacciones y servicios financieros, si estos son utilizados por gente de mi círculo social.	1 2 3 4 5 6 7
	Condiciones Facilitadora UNIVERSIDAD ANA G. MÉNDEZ UAGM HUMAN RESEARCH PROTECTION BOARD (IRB) APPROVED PROTOCOL IRB#: 03-174-21 APPROVAL DATE: 2-25-21 EXPIRATION DATE: 2-24-22 UNIVERSIDAD ANA G. MÉNDEZ UAGM	1-altamente en desacuerdo a 7-altamente en acuerdo

17)	Tengo los recursos necesarios para utilizar nuevas tecnologías (ej. acceso a librerías de aplicaciones móviles- tienda Apple, Google) que proveen aplicaciones por el cual se puedan realizar transacciones y servicios financieros móviles.	1 2 3 4 5 6 7
18)	Tengo el conocimiento necesario para usar nuevas tecnologías (ej. Aplicaciones móviles que contengan tecnología "blockchain") para realizar transacciones y servicios financieros móviles.	1 2 3 4 5 6 7
19)	Puedo obtener ayuda si tengo dificultades utilizando nuevas tecnologías (ej. aplicaciones que contienen tecnología "blockchain") para realizar transacciones y servicios financieros móviles.	1 2 3 4 5 6 7
	Apoyo del Gobierno	1-altamente en desacuerdo a 7-altamente en acuerdo
	Creo que el gobierno	
20)	tiene políticas que promueven el uso de nuevas tecnologías (por ejemplo, tecnología blockchain) para realizar transacciones y servicios financieros móviles.	1 2 3 4 5 6 7
21)	está promoviendo el desarrollo de tecnologías de "blockchain".	1 2 3 4 5 6 7
22)	tiene legislación favorable para la utilización de tecnologías de "blockchain" para realizar transacciones y servicios financieros móviles.	1 2 3 4 5 6 7
	Antecedente de Confianza- Riesgo Percibido	1-altamente en desacuerdo a 7-altamente en acuerdo
	Realizar una transacción financiera utilizando una nueva tecnología (ej. "tecnología blockchain")	
23)	provocará una posible pérdida en mi rendimiento.	1 2 3 4 5 6 7
24)	provocará una posible pérdida financiera.	1 2 3 4 5 6 7
25)	provocará una posible pérdida de tiempo.	1 2 3 4 5 6 7
	Antecedente de Confianza- Privacidad Percibida HUMAN RESEARCH PROTECTION BOARD (IRB) APPROVED PROTOCOL IRB #: 08-174-21 APPROVAL DATE: 2-25-21 EXPIRATION DATE: 2-24-22	1-altamente en desacuerdo a 7-altamente en acuerdo
	Realizar una transacción financiera utilizando una nueva tecnología (ej. "tecnología blockchain")	
26)	provocaría una posible pérdida de mi privacidad personal.	1 2 3 4 5 6 7
27)	me hará sentirme personalmente incómodo.	1 2 3 4 5 6 7
28)	me hará tener preocupaciones sobre la privacidad.	1 2 3 4 5 6 7

	Antecedente de Confianza- Seguridad Percibida	1-altamente en desacuerdo a 7-altamente en acuerdo
29)	Creo que la tecnología "blockchain" es un sistema seguro en aplicaciones móviles para enviar información confidencial.	1 2 3 4 5 6 7
30)	Me siento seguro proveyendo mi información personal a través de equipos móviles que contengan tecnología de "blockchain".	1 2 3 4 5 6 7
31)	Yo no me preocupo que la información que proveo a través de equipos móviles que tienen tecnología "blockchain" pueda ser usada por otra gente.	1 2 3 4 5 6 7
	Confianza en Instituciones Financieras	1-altamente en desacuerdo a 7-altamente en acuerdo
	La organización que me permite realizar transacciones y servicios financieros utilizando aplicaciones de tecnología "blockchain"	
32)	es generalmente confiable.	1 2 3 4 5 6 7
33)	me da la impresión de cumplir sus promesas y compromisos.	1 2 3 4 5 6 7
34)	tiene mi mejor interés en mente.	1 2 3 4 5 6 7
	Comportamiento de intención de uso 	1-altamente en desacuerdo a 7-altamente en acuerdo
35)	Recomendaré a otros que utilicen nuevas tecnologías (ej. tecnologías "blockchain") para realizar transacciones y/o servicios financieros móviles.	1 2 3 4 5 6 7
36)	Probablemente, utilizaría nuevas tecnologías (ej. tecnologías "blockchain") para realizar transacciones y/o servicios financieros móviles.	1 2 3 4 5 6 7
37)	Tengo la intención de seguir utilizando nuevas tecnologías (ej. tecnologías "blockchain") para realizar transacciones y/o servicios financieros móviles.	1 2 3 4 5 6 7

Appendix D2: Research Instrument English

UNIVERSIDAD ANA G. MÉNDEZ
UAGM
Recinto de Gurabo

Research Instrument

Questionnaire to determine the factors that affect blockchain technology acceptance in mobile financial transactions and services

This questionnaire is part of the requirements to obtain the degree of Doctor of Information Systems Management from the Ana G Méndez University, Gurabo campus, Puerto Rico. Its main purpose is to investigate the factors that affect the acceptance of the use of "Blockchain" technologies to carry out transactions and financial services on mobile devices. The questionnaire will only be answered electronically. Participation in this study is voluntary and the information obtained is strictly confidential. To answer this questionnaire, you will not have to identify yourself at any time and the data collected will be used only for the purposes of this research. The estimated time to complete the questionnaire is approximately 10 minutes.

Vocabulary:

The following concepts are defined according to the context of this research.

- **Blockchain technology:** technology mostly used in cryptocurrencies. It is a decentralized and transparent ledger with transactions record, or a database shared and monitored by all nodes of the network. There are mobile applications using this technology in which users can make direct and secure transactions with their financial institutions and others.

- **Blockchain based mobile applications**- it is a mobile application (normally found in Apple and/or Google store) which the blockchain technology is enclosed. It is created to facilitates safe, easy transactions, and builds trust between trading partners. Banks and other financial institutions are using blockchain technology to optimize their services, cut back on fraud and reduce fees for customers.

- **Mobile device**: any computerized equipment (smartphones, tablets, personal computers, among others) used with which the user uses applications for online services, such as: financial services and transactions, online shopping and others.

- **Transactions and financial services** are those services or transactions that the user performs with a banking institution, understood: bank deposits or withdrawals, electronic payments, internet purchases, mobile banking services, among others.

Part I. Demographic information

Please check the alternative that best describes you.

1) Gender: ____ Female ____ Male____ Other

2) Age: ____18 to 29 years ____30 to 38 years ____39 to 49 years
____50 to 64 years ____65 years or more

3) Please indicate the highest level of education you have achieved:

____Higher School ____Technical Degree ____Associate Degree
____ Bachelor degree ____ Master degree____ Doctor degree
____Other Which one? _____

4) Indicate your current place of residence:

____Puerto Rico ____United States of America
____ Other Which one? _____

5) Which of the following best describes your annual income ?:

____ $ 0 ____ $ 1 to $ 9,999 ____ $ 10,000 to $ 24,999
____ $ 25,000 to $ 49,999____ $ 50,000 to $ 74,999
____ $ 75,000 to $ 99,999 ____ $ 100,000 or more.

6) How knowledgeable are you in the blockchain technology topic (e.g., cryptocurrencies, smart contracts, blockchain technologies Apps, others)?

___ not knowledgeable. ___somehow knowledgeable ___knowledgeable

7) Do you carry out financial transactions or services using mobile devices?

____Yes ____No (thank you very much for your participation)

Part II. Measurement scale

Mark with an (x) the option that you consider most appropriate. Note that (1) corresponds to highly disagree, (2) strongly disagree, (3) disagree, (4) neutral, (5) agree, (6) strongly agree, and (7) highly agree.

Item	**Wording**	1- highly disagree to 7- highly agree						
	Performance Expectancy	Likert Scale 1-7						
	It appears that conducting mobile financial transactions and/or services with enclosed blockchain technology applications:							
8)	is very useful.	1	2	3	4	5	6	7
9)	gives me the advantages over traditional forms.	1	2	3	4	5	6	7
10)	does not take longer to perform than traditional forms (physically go to the financial institution)	1	2	3	4	5	6	7
	Effort Expectancy	1- highly disagree to 7- highly agree						
	It appears that conducting mobile financial transactions and/or services with enclosed blockchain technology applications,							
11)	the interaction with the mobile application should be clear and understandable.	1	2	3	4	5	6	7
12)	it would be easy for me to become proficient at using it.	1	2	3	4	5	6	7
13)	is easy to learn operating the mobile application.	1	2	3	4	5	6	7
	Social Influence 	1- highly disagree to 7- highly agree						
14)	Family and friends influence my decision to conduct mobile financial transactions and services that contains new technologies (ex. enclosed blockchain technology applications).	1	2	3	4	5	6	7
15)	Media (TV, radio, social media, online news) influence my decision to conduct mobile financial transactions and services with enclosed blockchain technology applications.	1	2	3	4	5	6	7

16)	I would be inclined to use mobile applications to conduct financial transactions and services with enclosed blockchain technology applications if used by people from my social circle.	1 2 3 4 5 6 7
	Facilitating Conditions	1- highly disagree to 7- highly agree
17)	I have the necessary resources to use new technologies (ex. access to Apps libraries- Apple Store, Google store) which provide applications to conduct mobile financial transactions and services.	1 2 3 4 5 6 7
18)	I have the necessary knowledge to use new technologies (ex. with enclosed blockchain technology applications) to conduct mobile financial transactions and services.	1 2 3 4 5 6 7
19)	I can get help if have difficulties using new technologies (ex. with enclosed blockchain technology applications) to conduct mobile financial transactions and services.	1 2 3 4 5 6 7
	Government Support	1- highly disagree to 7- highly agree
	I think the government	
20)	has policies that promote new technologies (ex. blockchain technology) to conduct mobile financial transactions and services.	1 2 3 4 5 6 7
21)	is promoting the development of blockchain technologies.	1 2 3 4 5 6 7
22)	has a favorable legislation to use blockchain technology to conduct financial transactions and services.	1 2 3 4 5 6 7
	Trust Antecedents- Perceived Risk 	1- highly disagree to 7- highly agree
	Conducting a financial transaction using a new technology (ex. blockchain technology)	
23)	will cause a possible loss on my performance.	1 2 3 4 5 6 7
24)	will cause a possible loss financially.	1 2 3 4 5 6 7
25)	will cause a possible loss in time.	1 2 3 4 5 6 7

	Trust Antecedents- Perceived Privacy	1- highly disagree to 7- highly agree
	Conducting a financial transaction using a new technology (ex. blockchain technology)	
26)	will cause a possible loss on my personal privacy.	1 2 3 4 5 6 7
27)	will make me personally uncomfortable.	1 2 3 4 5 6 7
28)	will make me have privacy concerns.	1 2 3 4 5 6 7
	Trust Antecedents- Perceived Security	1- highly disagree to 7- highly agree
29)	I believe blockchain technology is a secure system on mobile applications to transmit sensitive information.	1 2 3 4 5 6 7
30)	I will feel secure providing personal information via mobile devices with enclosed blockchain technology applications.	1 2 3 4 5 6 7
31)	I am indifferent that other people could use the information I provide over enclosed blockchain technology applications.	1 2 3 4 5 6 7
	Trust in Financial Institutions	1- highly disagree to 7- highly agree
	The organization that allows me to conduct financial transactions and services using enclosed blockchain technology applications	
32)	are generally trustworthy.	1 2 3 4 5 6 7
33)	give me the impression that they keep their promises and commitments.	1 2 3 4 5 6 7
34)	have my best interest in mind.	1 2 3 4 5 6 7
	Behavioral Intention to use 	1- highly disagree to 7- highly agree
35)	I will recommend to others to use new technologies (ex. blockchain technologies) to conduct mobile financial transactions and/or services.	1 2 3 4 5 6 7
36)	Probably, I would use new technologies (ex. blockchain technologies) to conduct mobile financial transactions and/or services.	1 2 3 4 5 6 7
37)	I intend to continue to use new technologies (ex. blockchain technologies) to conduct mobile financial transactions and/or services.	1 2 3 4 5 6 7

Appendix E: CVR (Lawshe, 1975)

PERSONNEL PSYCHOLOGY

TABLE 1
Minimum Values of CVR and CVR_t
One Tailed Test, $p = .05$

No. of Panelists	Min. Value*
5	.99
6	.99
7	.99
8	.75
9	.78
10	.62
11	.59
12	.56
13	.54
14	.51
15	.49
20	.42
25	.37
30	.33
35	.31
40	.29

Appendix F: Expert Panel Results

	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Expert 8	Expert 9	Expert 10	Expert 11	Expert 12	Expert 13	CVR
Item 1	x	x	x	x	x	x	x	x	x	x	x	x	x	1.00
Item 2	x	x	x	x	x	x	x	x	x	x	x	x	x	1.00
Item 3	x	x	x	x	x	x	x	x	x	x	x	x	x	1.00
Item 4	x	x	x	x	x	x	x	x	x	x	x			0.69
Item 5	x	x	x	x	x	x	x	x		x	x	x	x	0.85
Item 6	x	x	x	x	x	x	x	x		x	x	x	x	0.85
Item 7	x	x	x	x	x	x	x	x	x	x	x	x	x	1.00
Item 8	x	x	x	x	x	x	x	x	x	x	x	x	x	1.00
Item 9	x	x	x	x	x		x	x	x	x	x	x	x	0.85
Item 10	x	x	x	x		x	x	x	x	x	x	x	x	0.85
Item 11	x	x	x	x	X		x	x	x	x	x		x	0.69
Item 12	x	x	x	x	x	x	x	x	x	x	x		x	0.85
Item 13	x	x	x	x	x	x	x	x	x	x	x	x	x	1.00
Item 14	x	x	x	x	x	x	x	x	x	x	x	x	x	1.00
Item 15	x	x	x	x	x		x	x	x	x	x	x	x	0.85
Item 16	x	x	x	x	x	x	x	x	x	x	x	x	x	1.00
Item 17	x	x	x	x	x	x	x	x	x	x	x	x	x	1.00
Item 18	x	x	x	x	x	x	x	x	x	x	x	x	x	1.00
Item 19	x	x	x	x		x	x	x	x		x	x		0.54
Item 20	x	x		x		x	x	x	x	x	x	x		0.54
Item 21	x	x	x	x		x		x	x	x	x	x		0.54
Item 22	x	x	x	x	x	x	x	x	x		x	x	x	0.85
Item 23	x	x	x	x	x	x	x	x	x	x	x	x	x	1.00
Item 24	x	x	x	x	x	x	x	x	x	x	x		x	0.85
Item 25	x	x	x	x	x	x	x	x	x	x	x	x	x	1.00
Item 26	x	x	x	x	x	x	x	x	x	x	x		x	0.85
Item 27	x	x		x	x	x	x	x	x	x	x	x	x	0.85
Item 28	x	x	x	x	x	x		x	x	x	x	x	x	0.85
Item 29	x	x		x	x	x	x	x	x	x	x	x	x	0.85
Item 30	x	x	x	x	x	x	x	x	x	x	x	x	x	1.00
Item 31	x	x	x	x	x	x	x	x	x	x	x	x	x	1.00
Item 32	x	x	x	x	x	x		x	x	x	x	x	x	0.85
Item 33	x	x	x	x	x	x	x	x	x	x	x	x	x	1.00
Item 34	x	x	x	x	x	x	x	x	x		x	x	x	0.85
Item 35	x	x	x	x	x	x	x	x	x	x	x	x	x	1.00
Item 36	x	x	x	x	x	x	x	x	x	x	x	x	x	1.00
CVR(Critical) for a panel size (N) of 13 is 0.538.														0.89