October 2018

Banking on Blockchain: A Grounded Theory Study of the Innovation Evaluation Process

Priya D. Dozier

University of South Florida, priya.dozier@gmail.com

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Banking on Blockchain:
A Grounded Theory Study of the Innovation Evaluation Process

by

Priya D. Dozier

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Business Administration
Muma College of Business
University of South Florida

Co-Major Professor: Gaole Chen, Ph.D.
Co-Major Professor: Troy A. Montgomery, DBA.
Jung C. Park, Ph.D.
Carol S. Saunders, Ph.D.

Date of Approval:
October 12, 2018

Keywords: Innovation, Blockchain, Distributed Ledger, Financial Services, Grounded Theory, Proof of Value

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DEDICATION

To my husband for your kindness, support, and strength. You have been my steady rock during this process and in life. You challenge me, believe in me, and encourage me to achieve my best. Thank you for helping me to see things from different perspectives and for your patience and thoughtfulness. You are an amazing life partner, husband, and father to our children, and I am forever grateful to tackle new adventures with you by my side.

To my daughters for your exuberance, love, and support. You have always been the cure to life’s ills, and I am so grateful to have both of you in my life. You have allowed me to see the world from your perspective, a world removed from cynicism and doubt. The world needs to experience the best of your love, talents, and intellect. It will be my greatest joy to see both of you chase your dreams and to contribute to the world, and I look forward to cheering you on every step of the way.

To my parents who always put their children’s needs before their own and who had the courage to emigrate to the United States of America to seek a better life for our family. I know the journey was hard, but your sacrifice and love have allowed me to follow my dreams. Without your strength and support, I would not be the person I am today.

To all of the people who encouraged me along the way with your kind words, interest, and unrelenting support. Thank you to my friends, colleagues, and teachers for asking how it is going, telling me I can do it, and not doubting in me.
ACKNOWLEDGMENTS

I acknowledge my dissertation co-chairs with gratitude, Dr. Troy Montgomery and Dr. Gaole Chen, for their constructive feedback, time, and support during this dissertation journey. I acknowledge Dr. Troy Montgomery for his astuteness, in-depth feedback, and overall encouragement during this process. I acknowledge my other faculty dissertation committee members, Dr. Jung Chul Park and Dr. Carol Saunders, for their challenging questions, insightful comments, and ongoing interest in the topic of my research and for sharing their valuable experiences. I am grateful the committee dynamics provided for a challenging, learning, and growth-oriented dissertation process.

I acknowledge all of the participants in this study for their generosity in time and commitment to ongoing research and knowledge. Thank you for saying “yes” to me and for allocating your time to share your insights and experiences, without which this dissertation would not be possible.

I acknowledge my classmates in the USF DBA 2018 Cohort for the critical role they played in my journey to learn, grow, and develop. This group of individuals represents some of the most talented, intellectually stimulating, and charismatic people I have ever met, and I am grateful for their acquaintance. I would like especially acknowledge Minnie Ahuja, Ramil Cabela, and Valerie Mockus for our unique journey through “the process” together. I could not have made it without our meetings after “the meeting” and you raise the bar so high. Your humor, humility, and helpfulness are forever treasured.
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ABSTRACT

Blockchain technology emerged as the underlying database structure for Bitcoin, a cryptocurrency, in 2008. Interest in blockchain by the Financial Services industry grew because of its purported transparency, security, and trust elements which resulted in over $240 million in venture capital funds raised by blockchain firms mostly from banks in the first half of 2017.

The purpose of this study was to examine the underlying innovation evaluation process that Financial Services organizations employed as they evaluated blockchain technology. In this research study, blockchain was considered a technology innovation, which drove the research question: “How do financial services organizations evaluate blockchain technology for potential use?”

The study followed the grounded theory methodology to address the research question by gathering data from semi-structured interviews of participants involved in the blockchain evaluation at Financial Services organizations. In total, 19 individuals representing 12 organizations participated in the study and provided insights into how their organizations are evaluating blockchain technology.

Results indicated that organizations understand how the technology works, are organizing resources to evaluate it, are identifying use cases, and are employing strategies to test it. Together, these processes contribute to the creation of a Proof of Value model to explain the processes organizations are engaged in to evaluate blockchain. Academic and practical implications are noted as well as limitations and opportunities for future research.
CHAPTER ONE:
INTRODUCTION

Background

Blockchain technology, also known as distributed ledger technology (DLT), came to light as the underlying database structure for Bitcoin, a cryptocurrency, widely introduced in 2008 (Gupta, 2017, p. 168). As Bitcoin, the cryptocurrency grew, interest in the underlying technology called blockchain piqued interest across several industries, especially the financial service industry, because of its purported transparency, security, and trust elements (Beck, Czepluch, Lollike, & Malone, 2016; Nærland, Müller-Bloch, Beck, & Palmund, 2017; The Economist, 2015).

About blockchain technology. Blockchain technology was considered a technological innovation because it gave a new approach to database architecture where records get stored across a network of users versus existing relational database approaches where data is centralized through a trusted authority and organized for rapid search and update (Lewis, McPartland, & Ranjan, 2017). The essential elements of a DLT include a ledger, a consensus mechanism, which is the agreed upon way that participants agree to a change in the distributed ledger state, and a network of operators (Lewis et al., 2017). Users of relational databases must trust the central authority to maintain and protect the data which makes this central authority a potential single point of failure where data can be lost if the central authority fails (Lewis et al., 2017). A key differentiator between relational and blockchain databases is that blockchain eliminates reliance
on a central authority for record keeping because each user’s copy of the ledger is updated to reflect any changes based upon the agreed-upon consensus mechanism (Lewis et al., 2017).

**How it works.** In its simplest form, each user can read and write to the database, and each user’s copy is updated through an agreed upon consensus mechanism (Lewis et al., 2017). Figure 1 was adapted from Lewis et al. (2017) because it illustrates the evolution of the network through four potential states: 1) setup showing how the key elements are connected, 2) all records are updated, so consensus is achieved, 3) a new record is added or modified so the state changes and consensus is not achieved, and 4) reconciliation and consensus is gained with the new record. A cryptographic hash, which is a set of characters associated with each block that is difficult to calculate but easy to verify, is calculated to link a new transaction to the previous transactions (Lewis et al., 2017). The cryptographic hash makes it simple to verify a legitimate block but difficult to engineer and insert a block into the chain with illegitimate transactions (Lewis et al., 2017).

The main driver of changes in state is when a transaction occurs on the blockchain, which depends on the interconnectivity of blocks to reconcile after the transaction. Transactions on a blockchain work simply by leveraging the connection of blocks where each block is linked to the previous block because it contains the hash of the previous block along with the hashed transaction data (Nærland et al., 2017). Each node has identical versions of the blockchain and must all reach consensus on the state of the blockchain which by design prevents fraud because if one node alters their version of the blockchain, then that version of the blockchain is rejected by the other nodes which make blockchain virtually tamper-proof (Nærland et al., 2017). An overview of the transaction process within blockchain is shown in Figure 2, adapted from Pricewaterhousecoopers (2015).
Figure 1. Distributed Ledger Overview

Distributed ledger network - Setup

- Each node operates independently to update its local copy of the ledger.
- Consensus is achieved through a network of nodes that validate transactions.
- Each node maintains a copy of the ledger, ensuring data integrity.

Distributed ledger network - all records are updated

- Records are updated when all nodes agree on the new transactions.
- This ensures that all nodes have the same state of the ledger.

Distributed ledger network - new record added, state changes

- A new record is added to the ledger, altering the state of the network.
- All nodes must agree on the new state before it is accepted.

Distributed ledger network - reconciliation and consensus

- Consensus is reached when all nodes agree on the current state of the ledger.
- This ensures that all nodes have an identical copy of the ledger.

Figure 2. Blockchain Transaction Overview

- Someone requests a transaction (e.g., cryptocurrency, contracts, records, or other info).
- The requested transaction is broadcast to the network consisting of computers known as nodes or operators.
- The network validates the transaction and user's state using mathematical algorithms.
- Once verified, the transaction is combined with other transactions to create a new block of data for the ledger.
- The new block is then added to the blockchain in a way that is permanent and unalterable.
There are different types of blockchain due to variations related to how access is defined and managed. There are permissioned versus permissionless blockchain which relates to how transactions are validated and private versus public blockchain which relates to how a user can access transactions (Peters & Panayi, 2016). Table 1 provides a matrix outlining the different versions with details on how transactions are treated in each and adapted from Nærland et al. (2017) and Peters and Panayi (2016).

**Table 1. Two Types of Blockchain**

<table>
<thead>
<tr>
<th>Transactions</th>
<th>Access to Transaction Validation</th>
</tr>
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<tbody>
<tr>
<td><strong>Public</strong></td>
<td>Permissioned</td>
</tr>
<tr>
<td></td>
<td>All nodes can read blockchain data and submit transactions. Only predefined nodes can validate transactions.</td>
</tr>
<tr>
<td></td>
<td>Permissionless</td>
</tr>
<tr>
<td></td>
<td>All nodes can read blockchain data and submit transactions. All nodes can validate transactions.</td>
</tr>
<tr>
<td><strong>Private</strong></td>
<td>Permissioned</td>
</tr>
<tr>
<td></td>
<td>Only predefined nodes can read blockchain data and submit transactions. Only predefined nodes can validate transactions.</td>
</tr>
<tr>
<td></td>
<td>Permissionless</td>
</tr>
<tr>
<td></td>
<td>Not applicable</td>
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The power of the blockchain technology resides in its ability to store a list of records of a transaction shared via the decentralized network of computers which are accessible based on mathematics and advanced cryptography (Beck & Müller-Bloch, 2017).

**Blockchain appeal and potential uses cases.** The blockchain technology could potentially eliminate the need for a trusted third party in a transaction where the value is moved, and trust is needed to ensure that the parties operate as agreed upon (e.g., ex. money, goods, property, or votes) (Beck & Müller-Bloch, 2017). Several industries were experimenting with blockchain such as retail to reduce counterfeit goods, healthcare to share data among providers, and academic and education to streamline verification of credentials (Accenture, 2018; CB Insights Research, 2018). However, due to the power of maintaining trust while transferring...
value, the Financial Services industry took an interest in the use of blockchain. Evidence of the initial and publicly announced explorations described below:

a) *Clearing and settlement* – banks were trying to simplify the costly infrastructure required to store records, loans, and securities through blockchain technology with one analyst estimating that the biggest investment banks could save $10 billion annually by using blockchain to improve efficiency (Accenture, 2017a; Arnold, 2017).

b) *Credit bureau* – since the risk of a data breach has increased, the financial service industry was looking at whether a decentralized blockchain concept, which does not rely on social security number as an identifier, could be a good place to build a better credit bureau (Crosman, 2017c).

c) *Cross-border transactions* – more than 100 financial firms have joined a startup consortium to focus on completing cross-border payments using blockchain technology (Eha, 2017).

d) *Digital assets* – transforming physical assets such as real estate and stock certificates into digital form through DLT could make it easier for them to change hands through a ledger format and reduce the amount of time necessary to verify and examine each time a trade is made (Lewis et al., 2017).

e) *Digital record keeping* – blockchain could be useful in transactions where an audit trail of every step is beneficial to all parties involved due to its standardized and immutable properties (Lewis et al., 2017).
f) **Faster payments** – a DLT designed with identity verification properties could reduce the varying regulatory checks and lengthy settlement cycles which occur between financial entities to move funds for payments (Lewis et al., 2017).

g) **Identity verification** – several Canadian banks announced they are piloting an identity verification solution leveraging IBM’s blockchain technology to have customers authenticate through a mobile app (Crosman, 2017a).

h) **Payments** – some central banks around the world are examining whether to shift portions of their payment systems to blockchain or even launch their cryptocurrencies on it (Arnold, 2017).

i) **Post-trade settlement** – settlement periods (time between the execution of a trade and completion of all duties to satisfy all parties’ obligations) could decrease with a blockchain that accounts for ownership of funds and securities and could bring finality and certainty to transactions by settling among the parties near real-time (Lewis et al., 2017).

j) **Smart contracts** – legal contracts written in computer code that automatically execute once certain conditions as specified in the contract are satisfied. DLT can allow smart contracts to self-execute which allows the process to become fully automated without manual interventions (Lewis et al., 2017).

A Harvard Business Review article underscores the current state of blockchain and potential use by drawing parallels between the current state of blockchain and the internet in the early 1990s when organizations weighed topics such as advances in core technologies, interoperability and network effect to evaluate the potential impact on their businesses (Joichi, Neha, & Robleh, 2017).
Blockchain use in financial services. Blockchain moved from being viewed with skepticism by banks to becoming the hottest buzzword in the sector due in part to an estimated $240 million in venture capital funds raised by blockchain firms mostly from banks in the first half of 2017 (Arnold, 2017). An Accenture (2017b) survey confirmed that blockchain is top of mind for nine out of 10 banking executives who responded that their bank was exploring the use of blockchain with most in the early stages of adoption and about three-quarters in a proof-of-concept, formulating a strategy or just beginning to look at it. The Financial Services industry’s interest in blockchain is also evident in blockchain patent filings in the United States where the Financial Services industry is the second leading group of patent holders behind blockchain specific companies, see Figure 3 adapted from Lee (2018).

![Blockchain Patents by Industry](image)

**Figure 3.** Blockchain Patents by Industry

Approximately 54% of the patents held by the top blockchain patent holders in the United States are held by Financial Services companies with Bank of America leading with 43 patents (Lee, 2018). Figure 4 breaks down the key blockchain patent holders in the Financial Services industry adapted from Lee (2018).
Figure 4. Blockchain Patent Holders – Financial Services Industry

Some Financial Services organizations are working in consortium types of ventures with other banks and startup companies to carry out proofs-of-concept. Examples of widely known consortium startups include:

- R3 is a startup launched in 2015 with a goal to bring together key Financial Services players such as Bank of America, Merrill Lynch, Wells Fargo, Citigroup, TD Bank, BBVA, Northern Trust, HSBC, and Barclays to test blockchain technology for potential commercialization across banks (Arnold, 2017; Crosman, 2017b).

- Ripple is focused on developing banking, and payments use cases on behalf of Financial Services firms, including partners such as Santander, BBVA and Start One Credit Union (Patterson, 2017).

Statement of Purpose

The purpose of this study was to examine the underlying innovation evaluation process that Financial Services organizations employ as they evaluate blockchain technology. In this research, blockchain was considered a technology innovation, which was supported by Beck and Müller-Bloch (2017). Blockchain was considered technology innovation because it is perceived to
have implications on infrastructure and business models in the Financial Services industry by its implicit trust mechanisms. This study aimed to contribute a new model to explain the innovation evaluation processes considered as organizations face technology innovation and to provide explanations for when these processes might differ based on elements of the technology. The research focused on the innovation evaluation since most financial service organizations are currently in the exploratory phase of evaluating blockchain. The concept of innovation evaluation process was a significant component of this research because it was a process that organizations in the Financial Services industry are engaged in order to evaluate blockchain. The process was a crucial component of both the interview and data analysis phases in order to analyze and explain the actions and interactions occurring as participating organizations evaluate blockchain technology.

The Motivation for the Study

This study was motivated by the convergence of a relatively unknown technological innovation facing the Financial Service industry and a desire by the researcher to understand the evaluation process organizations are leveraging to decide how to adopt an innovation. From the industry perspective, Financial Services organizations were grappling to figure out how to make short and long-term decisions about blockchain while no easy answer is in sight due to the complexity and nature of the technology. As an industry participant, the researcher was exposed to how Financial Services organizations were discussing blockchain at industry conferences and reading about industry related use cases in trade journals. As a researcher and practitioner focused on the Financial Services industry, the researcher capitalized on the research opportunity to study how organizations evaluate technology at the beginning stages of the evaluation process.
Researcher Bias & Assumptions

One potential challenge considered in qualitative research design was the researcher’s knowledge of the topic considering their role in the industry. As a practitioner, the researcher leads innovation activities at a small technology provider in the Financial Services industry, which could result in the researcher having in-depth knowledge of the process as a participant. The researcher maintained a bias and assumptions memo from the start of the study to note preconceived notions or ideas they had going into the study and referenced the memo throughout the study to determine whether ideas were influenced by knowledge or by the data. The researcher took steps to ensure that research insights from the study did not influence their practitioner decision-making activities by keeping data, contacts, and artifacts in physically separate locations. The researcher only relied on publicly available information to cultivate curiosity in the study such as data from press releases and LinkedIn to identify potential participants (Creswell, 2013).

Research Question

The research question driving this study was: “How do financial service organizations evaluate blockchain technology for potential use?” This research project aimed to explain the underlying innovation evaluation process, which organizations used to examine and evaluate technological innovation. This research question was important because as organizations face innovation, they go through an evaluation process to determine whether and how to adopt. This question helped to understand some of the dynamics involved in the evaluation process from the perspective of individuals responsible for the innovation decisions on behalf of their organizations.
The unit of analysis for this study was organizations in the Financial Services industry. Organizational insights for this research question came from groups of individuals in roles which were formally or informally responsible for strategy or innovation decisions related to blockchain at their organization. Since blockchain was new at the time of the study, the researcher anticipated that the evaluation process might be limited to a few individuals within the organization. Where possible, the researcher tried to recruit multiple participants at each organization to obtain a holistic organizational perspective for the study. As outlined in the introduction, about three-quarters of financial service organizations were evaluating blockchain technology, so individuals involved in the evaluation process from these organizations were ideal study participants.

**Definition of Terms**

There are several key terms used when discussing innovation, technology innovation, and blockchain. The following is a list of definitions related to how these terms and concepts were leveraged in this study.

*Block:* contains the data of all of the transactions and a reference to the block before it (Beck & Müller-Bloch, 2017).

*Blockchain (database):* also known as distributed ledger technology (DLT), can be viewed as a chain of blocks which operate as a peer-to-peer software technology through a network of computers. A blockchain is similar to a ledger of records of transactions because it may contain transactions associated with any value (Beck & Müller-Bloch, 2017; Lewis et al., 2017).

*Cryptocurrency:* is a means of transacting within a cryptographic economic system which is a system whereby transactions are organized without any human interaction and follows a set
of rules defined in a computer protocol (Beck et al., 2016). Cryptocurrencies do not require an intermediary such as a central bank to ensure trust and security; examples include Bitcoin, Litecoin, and Dogecoin (Beck et al., 2016).

**Distributed Ledger Technology (DLT):** also known as blockchain, can be viewed as a chain of blocks which operate as a peer-to-peer software technology for processing database related transactions (Lewis et al., 2017).

**Genesis block:** the first block that can be traced back to throughout the entire blockchain (Beck & Müller-Bloch, 2017).

**Hashing algorithm:** mathematic process used to ensure that all blocks are secure and unbreakable (Beck & Müller-Bloch, 2017).

**Incremental:** sometimes called routine innovation, involves the process of introducing something that can be implemented with only minor adaptations of existing organizational routines and fits with the norms and values of the organization (Tornatzky, Fleischer, & Chakrabarti, 1990).

**Incumbent** organizations are organizations that sold the previous generation of products, before the innovation (Danneels, 2004). In this study, incumbent organizations referred to organizations in the Financial Services industry that have been in business for at least five years.

**Technology:** usually contains a hardware aspect which is typically a physical or material object and software which is the information basis (Rogers, 2010). In this study, technology refers to the software component of innovation related to the blockchain.

**Technological innovation:** involves new development and the introduction of tools, artifacts, and devices with which people interact in their environment. The process of technological innovation is tied to renewing a function in the social system (Tornatzky et al., 2000).
In this study, blockchain is considered technological innovation and the social system is an organization in the Financial Services industry.
Overview

The literature review process consisted of two sets of literature reviews, conducted at different times in the research process. First, a preliminary, noncommittal literature review as recommended by Urquhart and Fernández (2013) and Birks and Mills (2011) to orient the researcher to the field of study “without prejudicing them towards existing, theoretical concepts” (p. 2) was conducted during the proposal process. The purpose of this research was to orient the researcher to the field of study related to the blockchain, to justify the need for the study to the dissertation committee, and to review examples of how other researchers have approached grounded theory studies. The preliminary literature review was revisited and extended once the model was generated from the data during analysis (Urquhart & Fernández, 2013). The results of the preliminary, noncommittal and extended literature review are summarized in this chapter, while the results of the grounded theory literature search were referenced throughout Chapter Three: Methodology.

The preliminary literature review was useful to provide more insights into blockchain technology and to support the growing demand for concurrent innovation research. This research study leveraged the preliminary literature search to explore key blockchain concepts and to validate a need for innovation research occurring while the evaluation process occurred. The preliminary literature review consisted of searches through online data sources such as ABI/Inform, JSTOR, and Google Scholar using search phrases “blockchain financial services,”
“blockchain innovation banking,” “blockchain financial service use cases,” and “blockchain technology overview.” Although Corbin and Strauss (2014) suggested that “a researcher can turn to the literature to formulate questions for initial observations and interviews” (p. 50), the preliminary literature was not used to develop a framework for the interviews in this study. Data from the initial search helped to frame the understanding of blockchain technology as well as the current state of use within the financial service industry. This exploratory literature was useful for the researcher to understand and use widely accepted vocabulary about blockchain in the interviews.

This extended literature review was conducted after data analysis was completed and during the write up of the findings to compare the model to established theories, in order to identify key findings or discrepancies related to existing knowledge (Corbin & Strauss, 2014; Urquhart & Fernández, 2013). Relevant, existing theories or frameworks found during the data analysis were also summarized in this chapter to provide references for key ideas in Chapter Five: Discussion.

**Blockchain related literature.** The exploratory literature review revealed a relevant, qualitative case study completed in 2017 centered around five individuals at a large international bank to gain insights how organizations cope with blockchain, which was characterized as a radical innovation, through the lens of the discovery, incubating, and accelerating processes (Beck & Müller-Bloch, 2017). The researchers contributed that blockchain “is a radical technological innovation that has the potential to disrupt large parts of [bank] business models” (Beck & Müller-Bloch, 2017, p. 5391) and “will trigger significant organizational changes through the introduction of new business models and organizational practices” (Beck & Müller-Bloch, 2017, p. 5392). The article examined blockchain adoption according to an existing radical
innovation framework (discovery, incubation, acceleration), adapted from O’Connor (2005), and offered a for organizations to reference as they transitioned between stages (Beck & Müller-Bloch, 2017).

Although the article referenced that the principle of “emergence” from grounded theory was followed, grounded theory was not the primary methodology used in the case study (Beck & Müller-Bloch, 2017). While the topic and context were similar between Beck’s case study and this research study, there are key differences to the research methodology proposed for this research which further contributes to the knowledge of innovation evaluation. Specifically, this research study attempted to expand knowledge related to the process by which organizations use to evaluate blockchain. The research approach in this study is different from the Beck study which used a set of predefined competencies outlined by O’Connor (2005) to address the research questions “how do incumbent organizations respond to blockchain as a radical innovation?” and “how can they build the needed competencies to rethink their current business models in the light of radical innovation?” (Beck & Müller-Bloch, 2017). This study leveraged grounded theory methodology fully to create a new model to explain “how do financial service organizations evaluate blockchain technology for potential use?” Another significant difference between Beck’s study and this study is this study examined and compared how financial service organizations evaluated blockchain across several organizations versus a single organization as was done in the case study. The research methodology, research question, and some participants in this study provided a more holistic opportunity to examine the topic of how Financial Services organizations evaluate blockchain.

**Demand for advancements in innovation research.** While Beck and Müller-Bloch (2017) assumed that blockchain innovation is radical innovation in his study, Danneels (2004)
suggested that there is a lack of clear-cut criteria to determine whether and at what point technology is considered radical or disruptive. Rogers (2010) and Tornatzky and Klein (1982) suggested that an ideal research design would be to gather insights of the innovation and processes either before or concurrently (in pre-diffusion stages) as decisions are being made. Hopp, Antons, Kaminski, and Salge (2018) underscored the need for advancements in innovation theory through a meta-analysis of 1,078 journal articles published between 1975 and 2016. They found that Markides (2006) “Disruptive Innovation: In Need of Better Theory” and Danneels (2004) “Disruptive Technology Reconsidered: A Critique and Research Agenda” were the most downloaded articles from the Journal of Product Innovation Management, a leading publisher of disruption research, in 2016. In his article, Markides (2006) argued for more research to treat technological, business-model, and radical product innovations as “distinct phenomena” because they might succumb to different processes, affect incumbent organizations in different ways, and have different managerial implications. In his article, Danneels (2004) also challenged existing innovation studies for the limitation that they analyzed historic case studies for theory building purposes at which point the innovation is typically widely known or accepted. Danneels (2004) provided a list of potential research opportunities for researchers to consider to help address the gaps which included research to spot potentially disruptive technology in its early stage, to look at incumbent characteristics when they face technological change, and to determine what innovation processes (resources, culture, decision-making) are used by incumbents facing potentially disruptive technology.

Diffusion of Innovations: The innovation-decision process. Rogers’ (2010) Diffusion of Innovations theory defines the innovation-decision process as “the process by which an individual (or another decision-making unit) passes from gaining initial knowledge of an
innovation to forming an attitude toward the innovation, to making a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision” (p. 168). The innovation-decision making process is described as a set of information-seeking and processing activities to help reduce uncertainty about the innovation and consists of the following five stages (Rogers, 2010):

1. Knowledge – occurs when the decision-making unit becomes aware of the innovation and starts to understand how it works. There are three types of knowledge about an innovation: awareness-knowledge is information that an innovation exists, how-to knowledge is what is need to know to use the innovation properly, and principles-knowledge is the principles about how the innovation works.

2. Persuasion – occurs when the decision-making unit develops either a favorable or an unfavorable attitude toward the innovation. Decision-making units become more psychologically involved by actively seeking information about the new idea while deciding what messages are credible how to interpret the information. Decision-making units also develop a favorable or unfavorable attitude toward innovation and seek social reinforcement from others, such as their peers, related to their attitude about the innovation. In the persuasion stage, decision-making units seek to reduce uncertainty related to innovation evaluation information to develop a favorable or an unfavorable attitude toward the innovation.

3. Decision – occurs when the decision-making unit participates in activities that may lead to a choice to adopt or reject the innovation. Adoption is a decision to make use of the innovation while rejection is a decision not to use an innovation.
In the decision stage, decision-making units may use methods to break up the innovation to try it, which can generally speed up the rate of adoption or diffusion process. The decision stage may also lead to an active rejection where the innovation is considered for adoption but a decision not to adopt was made, or a passive rejection occurred where it was never considered.

4. Implementation – occurs when the innovation is in use. This stage involves overt behavior to put the innovation into practice. In organizations, some individuals might be part of the decision-making process to adopt the innovation; however, implementation is typically done by a different set of people.

5. Confirmation – occurs when the decision-unit examines an innovation-decision that is made either to reinforce or to reverse.

There is no linear sequence between the first three stages of the innovation-decision making process, for example, it can be knowledge, persuasion, and decision or knowledge, decision, and persuasion. Rogers (2010) also suggested that communication channels might vary at each stage of the innovation-decision process and the innovation-decision period, measured from first knowledge to the decision to adopt or reject, will vary in average length, but early adopters will have a shorter innovation-decision period than late adopters. The innovation-decision process described above is summarized in Figure 5 which was adapted from Rogers (2010).
Figure 5. A Model of the Five Stages in the Innovation-Decision Process

The Diffusion of Innovations theory also provides a concept of network externalities, which is defined as a quality of innovation when it becomes more valuable as the number of users increases (Rogers, 2010). A lack of network externalities will initially slow the rate of adoption in the early stages but once enough adoptions occur, adoption rate speeds up, for example, the internet in the early stages compared to the 1990s in North America (Rogers, 2010).

The processes of technological innovation. Tornatzky et al. (1990) suggested that the Diffusion of Innovations theory is problematic when applied to advanced technology and organizations because communication structures are hard to define in complex social systems where individual-level attributes may not sufficiently represent the organizations facing the complex technology. The “choices within context” concept is offered to consider when examining technology for deployment, which looks at the nature of the technology, the
characteristics of users, the characteristics of deployers, the boundaries within and between deployers and users and the characteristics of communication and transaction mechanisms (Tornatzky et al., 1990 241). Complex technology means bringing different things to different participants during the deployment activities, and communication channels are hard to define. Context does not determine the process, but it can constrain or facilitate it and is not stagnant because managers can make strategic choices to create structures and processes to influence their ability to innovate while technology context can shift based on market structures (Tornatzky et al., 1990). There are three key elements of context which influences how organizations adopt and implement technological innovations: technological, organizational, and environmental as shown in Figure 6 adapted from Tornatzky et al. (1990).

**Figure 6.** Technology, Organization, and Environment Model

The Technology, Organization, and Environment (TOE) Model provides details about each of the three areas of context as summarized below:
a) Technological context – describes the technologies that are relevant to the organization including current internal technology in use as well as the pool of available technology externally. The separation helps to focus on how the features of the technology can influence both the adoption and implementation. Industry conditions and innovation type can provide greater technological context related to innovation choices. Researchers can focus their study on organizations in a single industry in order to identify organization- and market-specific behaviors associated with similar technological opportunities (Tornatzky et al., 1990). The type of innovation and resulting uncertainty could lead to distinctions in decision-making processes. For example, uncertainty increases the information processing needs of the organization related to the external environment in order to learn more about the innovation and internal communication and to increase problem-solving and decision-making (Galbraith, 1973; Tushman & Nadler, 1986).

b) Organizational context – is viewed regarding the organization’s size, centralization, and complexity of its managerial structure, the quality of resources, and amount of internal slack resources. It also includes decision-making and internal communication, which are informal links between employees. Organizations also set up communication and decision-making links to their external network and environment such as with suppliers, knowledge producers through boundary-spanning mechanisms.

i. Structure – can be both formal and informal structures and processes to facilitate the adoption and implementation of technological innovation. Tornatzky et al. (1990) found that prior research provided evidence that structural characteristics of
organizations such as complexity, formalization, and centralization are related to innovation. However, they did not give insights into which, if any of the structural features contribute most to innovation or which are most responsive to intervention. Tornatzky et al. (1990) and Galbraith (1973) found that when organizations face uncertain tasks, such as processing complex data information related to new technologies, they design linking structures to orient the external environment with the rest of the organization to help with decision making. These linking structures promote communication-related to coordination and keeping up to date through processes such as task forces, committees, project managers and joint problem-solving teams designed to maximize ownership across the organization (Tushman & Nadler, 1986).

ii. Process – according to Tornatzky et al. (1990), informal linkage and communication and top management strategic behavior are two key elements to establish a favorable environment for technological adoption decision making. Informal, internal linking roles such as product champion, idea generator, and boundary spanners are not necessarily formal within the organizations but fulfilled by individuals with a propensity to acquire and exchange information within the organization about innovations. These communication agents serve as bridges, including in early, preadoption decision phases of the evaluation process. Since these roles can be informal and dynamic, organizations can support them through conditions such as reward systems because they can promote faster decision making about technology adoption and implementation (Tushman & Nadler, 1986).

Tushman and Nadler (1986) also recommend that leadership behaviors support
innovation through clear communication of strategy, serving as role models, rewarding innovation, building an innovation culture and building their technical, social and conceptual skills.

iii. Slack and Size – the availability of slack resources such as financial or human are often presumed to be necessary for technological innovation. However, several studies have supported the conclusion that slack resources are helpful but not necessary for innovation (Tornatzky et al., 1990). Aggregate indicators of size, such as a number of employees, budget, annual revenue, are not useful measures of organization traits because similarly sized organizations may have different organizational structures, which may provide processes more closely correlated to innovation adoption and implementation than size itself (Tornatzky et al., 1990).

c) Environmental context – where the organization conducts business as defined by its industry, competitors, access to external resources and interactions with the government. The environment can be both a constraint and an opportunity because the players can provide innovation-related information, resources, policies, and restrictions.

i. Industry Characteristics – Combinations of market conditions, size, and competitiveness, have led to studies and general conclusions related to how organizations might use innovation. For example, large organizations tend to be earlier adopters, to use more technologies, to achieve economies of scale and more likely to find a given innovation applicable to their operations (Tornatzky et al., 1990). High market concentration, measured by the percentage of the industry’s output contributed by its four largest firms, slows the adoption process while high
market share speeds up the adoption process (Tornatzky et al., 1990). Other industry factors such as supplier relationships, market stability, competitive dimensions, and industry lifecycle studied, but none explicitly provided empirical evidence of their effect on technology adoption.

ii. Technology Support and Infrastructure – organizations need to consider the skills and cost of labor when evaluating new technological innovation, labor quality, and new technology. This is also crucial for older industries facing modernization through technology (Tornatzky et al., 1990). Organizations may delegate decision-making, adoption, and implementation activities to outside specialists who can provide technology-related training and consulting to help them carry out their innovation strategies (Tornatzky et al., 1990).

iii. Government Regulation – government regulation has shown to both discourage and stimulate innovation in various industries.

Technology, organization, and environment provide context to how innovation adoption occurs in the organization to move the technology innovation into use (Tornatzky et al., 1990). There are three core behaviors which may occur during the adoption decision process where you a) define a problem by determining that something is wrong or needs to be changed, b) search for solutions by finding different ways to solve the problem, and c) choose among two or more innovations or an option to not change (Tornatzky et al., 1990). All three behaviors may not occur in order, in which case the Tornatzky et al. (1990) suggests that the Garbage Can Model of Organizational Choice can help to explain organizational decision-making behaviors related to how solutions find problems.
Garbage can model of organizational choice. The Garbage Can Model of Organizational Choice suggests that decision situations in organizations have three general properties—problematic preferences, unclear technology, and fluid participation (M. Cohen, March, & Olsen, 1972). Problematic preferences refer to how organizations discover preferences through actions rather than take actions based on preferences (M. Cohen et al., 1972). In light of unclear technology, organizations operate with simple trial and error processes to learn by accident and to create pragmatic inventions. Participants in the decision-making processes vary the amount of time they spend in the process which creates uncertainty around boundaries (who is involved), audiences (how much do they know), and decision-makers (who is in charge) (M. Cohen et al., 1972). This paradigm leaves organizations with a collection of choices looking for problems, issues looking for decision situations, solutions looking for issues, and decision-makers looking for work (M. Cohen et al., 1972) or the Garbage Can Model of Organizational choice.
Perceptions of innovation – A meta-analysis. Tornatzky and Klein (1982) conducted a meta-analysis of 75 articles to examine how innovation characteristics related to innovation adoption and implementation. They found thirty different characteristics but focused on ten: 1) compatibility, 2) relative advantage, 3) complexity, 4) cost, 5) communicability, 6) divisibility, 7) profitability, 8) social approval, 9) trialability, and 10) observability. While the meta-analysis highlighted inconsistencies in research design and methodology across innovation adoption literature, it concluded that there was a direct relationship of innovation attributes to adoption with strong deference towards compatibility and relative advantage positively related to adoption while complexity was negatively related to adoption (Tornatzky & Klein, 1982). The meta-analysis also called for future research to be predictive in order to obtain an assessment of an innovation attributes before or concurrently with a decision to adopt the innovation and to focus on innovations in organizational settings to have implications for organizational and inter-organization processes versus individual settings (Tornatzky & Klein, 1982).

Technological innovation and adoption in the financial services industry. Studies related to the evaluation and adoption of Automated Teller Machines (ATM) in the Financial Services industry found that industry context such as network effect, Schumpeterian tradeoff, and technology perceptions could affect the probability of adoption of new technology (Hannan & McDowell, 1984; Rugimbana & Iversen, 1994; Saloner & Shepard, 1995). A study related to the adoption of internet banking focused on innovation adoption decision-making based on the individually perceived attributes of innovation (Black, Lockett, Winklhofer, & Ennew, 2001). One study examined the adoption of small business credit scoring by large banks concluded that banking organizations have more centralized organizational structures which influenced
technology adoption while organization size indirectly influenced it (Akhavein, Frame, & White, 2001).
CHAPTER THREE:

METHODOLOGY

Overview

This chapter provides details about the methodology used in this research study. The research design section provides details about grounded theory, why it was selected, and evidence to support its use in Information Systems research. Next, a summary of the data collection process and procedures are described, including elements of the data collection process that apply to the grounded theory methodology. The chapter concludes with descriptions and high-level summaries of the open, axial, and selective coding processes used in this study.

Research Design

This qualitative study followed the principles of grounded theory methodology to generate a new model related to the innovation evaluation process. Grounded theory was used to allow the researcher to gain insights into the process involved when organizations evaluate technology innovation. In this study, blockchain was considered a technology innovation that Financial Services firms are evaluating (Beck & Müller-Bloch, 2017). The study aimed to capitalize on the timing of the evaluation of blockchain technology to obtain rich insights from participants, involved in the evaluation process, to generate a model. The study focused on understanding the evaluation process as shared by groups of individuals within Financial Services organizations evaluating blockchain. Birks and Mills (2011) suggested that grounded theory research is appropriate when little is known about the area of study, generating a model to
explain something is the desired outcome, and a process embedded by the research situation is likely to surface with grounded theory methods. According to Wiesche et al. (2017), grounded theory is often chosen to study technological change and socio-technical behavior in emerging research domains.

**About grounded theory.** Barney Glaser and Anselm Strauss originally developed the grounded theory methodology in sociology in 1967 (Creswell, 2013). Grounded theory methodology was developed to provide a set of procedures for constructing a theory from data by allowing the researcher to make sense out of the shared experiences of the participants (Corbin & Strauss, 2014). The output of grounded theory is an overarching structure or framework to explain why things are happening, in the form of a theory or model (Corbin & Strauss, 2014).

Since its original development in 1967, there have been three widely known variations of the grounded theory processes and procedures: the “classic” based by Glaser (1978), the “Straussian” by Corbin and Strauss (2008), and the “constructionist” by Charmaz (2006). Throughout the years there have been various interpretations of grounded theory processes as summarized by Birks and Mills (2011). The underlying characteristics of all grounded theory research help the researcher organize, code, and analyze qualitative data. Throughout these variations, the core principles of grounded theory such as memo writing, constant comparison, and theoretical sampling, have remained, however, deviations in coding, literature use, and philosophies have driven the differences (Kenny & Fourie, 2015). Urquhart and Fernández (2013) tackled some of the pervasive myths of grounded theory research and suggested that in practicality the researcher may know some literature, the grounded theory can be neutral (not positivist or interpretivist), and produce a substantive theory. Table 2, adapted from Birks and
Mills (2011), goes further to summarize the fundamental differences in coding that the researcher may engage in during the research process.

**Table 2. Grounded Theory Types and Coding Differences**

<table>
<thead>
<tr>
<th></th>
<th>Initial Coding</th>
<th>Intermediate Coding</th>
<th>Advanced Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glaser (1978)</td>
<td>Open coding</td>
<td>Selective coding</td>
<td>Theoretical coding</td>
</tr>
<tr>
<td>Charmaz (2006)</td>
<td>Initial coding</td>
<td>Focused coding</td>
<td>Theoretical coding</td>
</tr>
</tbody>
</table>

**Why grounded theory?** According to Corbin and Strauss (2008), Birks and Mills (2011), and Creswell (2013), grounded theory is appropriate little is known about the study area, the generation of a model is the goal, and participants have experienced the process being studied. In grounded theory, the researcher “focuses on a process or an action that has distinct steps or phases that occur over time,” thus grounded theory studies try to explain the action or movement in the process (Creswell, 2013, p. 85). Grounded theory was the ideal research method for this study because little is known about how innovations are evaluated during the decision-making processes, since Financial Services organizations are actively evaluating blockchain technology, and the evaluation is occurring over a period. Existing theories may not fully explain the process by which organizations evaluate innovation as documented by a call for better theories and more studies related to the innovation evaluation process (Creswell, 2013; Markides, 2006; Rogers, 2010). The timing of the study allowed the researcher to capture shared experiences of participants as they are going through the process to explore the technology for potential use in their organizations. The results could offer a framework for others to leverage when facing similar conditions in their industry (Creswell, 2013). Interviews, a crucial characteristic of grounded theory, was used in this study to obtain individual and organization to obtain insights and perspectives of the evaluation process (Creswell, 2013).
**Grounded theory in information systems research.** Urquhart and Fernández (2013) suggested that the value of grounded theory in Information Systems (IS) research has been acknowledged due in part to the widespread recognition of the Orlikowski (1993) paper which won an *MIS Quarterly* best paper award. A more in-depth survey of IS literature and related discipline journals found that grounded theory studies offered an opportunity for research contribution because citations referred to grounded theory based articles more frequently than articles published in the same journals in the same year (Wiesche et al., 2017). The Corbin and Strauss (“Straussian”) grounded theory approach was selected for this research study because it provided an unambiguous process to guide data analysis and was most widely used in IS research, as evidenced by an analysis 43 articles which found that 81% of them adopted Strauss and Corbin (Wiesche et al., 2017). The same survey also found that citations skewed toward articles that developed theory more than ones that developed models (Wiesche et al., 2017). Theory development was strongly correlated to the use of the maximum number of grounded theory procedures, especially core category, which is a vital component of the Corbin and Strauss guidelines (Wiesche et al., 2017).

Data analysis followed the guidelines to grounded theory outlined by Corbin and Strauss (2008) which support analyzing the data in stages to identify categories, subcategories, and dimensions to explain a central phenomenon and then to theory generation (Corbin & Strauss, 2008; Creswell, 2013). This research study relied on the grounded theory procedures to identify variables, relationship among variables, justification and boundaries of a theory to explain the process by which organizations evaluated innovation through the use of a central phenomenon to understand the conditions, strategy, context, and consequences surrounding the phenomenon (Corbin & Strauss, 2008; Creswell, 2013; Wiesche et al., 2017).
Grounded theory research presented a few challenges that the researcher addressed in the study design. Some grounded theory experts have cautioned that researchers approach a subject with a blank mind while some authors acknowledge that a blank slate might not be a possible state in every grounded theory study (Giles, King, & de Lacey, 2013; Urquhart & Fernández, 2013). In this study, the researcher’s knowledge of existing literature is at the novice level to only seminal theories. This research followed a method recommended by Birks and Mills (2011) to draft memos at the outset of the study to put forth assumptions, to avoid bias and to stay grounded throughout the research process. In consideration of Birks and Mills’ (2011) recommendation that researchers lay out their “existing assumptions, experience, and knowledge of the area of research” (p. 22) in the study as is done above. Dissertations using grounded theory provided unique challenges for researcher especially related to the use of literature and the writing structure. To overcome the literature challenge, the research design accounted for the literature review in two phases: 1) a preliminary and noncommittal literature review was done to orient the researcher to current work related to the overall topic and knowledge gap, and 2) an extended literature review was done during the analysis phase to confirm emerging findings in relation to existing literature as outlined in Chapter Two. To overcome the writing structure challenge, the researcher referred to completed, grounded theory dissertations in ProQuest Dissertation and Theses Global database and grounded theory articles to see how other researchers organized their results to share relevant findings as recommended by Corbin and Strauss (2014). Dissertations by Mewborn (2005) and Kratz (2018) were helpful from a formatting perspective because they were both dissertation research studies that leveraged the grounded theory methodology and adhered to university formatting.
Data Collection

Primary data for this study was from 30 to 60-minute semi-structured interviews of nineteen individuals employed at twelve U.S. banking organizations (a financial institution or technology service provider financial institutions) who provided 54,235 words (does not include the interviewer’s words). The researcher interviewed participants within each organization who are actively participating in the evaluation of blockchain technology on behalf of their organization. Due to the complexity of blockchain, the researcher expected a limited number of individuals in the organization to be involved in the innovation evaluation, for example, Beck and Muller-Bolch (2017) interviewed five individuals at a large, international financial service organization about blockchain. Individuals with titles identified in the Beck and Muller-Bolch (2017) case study were targeted as ideal study candidates, and a snowball technique was employed to identify whether others within the organization were ideal candidates for the study. Each participant was asked interview questions, noted in Appendix D, in a semi-structured format which allowed for probing and clarification about their experience going through an evaluation of blockchain in their organization (Creswell, 2013). The interview questions were open-ended and developed to acquire insights into various aspects of the evaluation process they are using related to the blockchain, including resources, decision makers, factors to move forward, processes and prioritization considerations.

Interviews occurred between February and July 2018 and were recorded and immediately transcribed, then loaded into the NVivo 11 software for coding. Following IRB protocol, each participant and organization was assigned a random identifier and individually identifiable characteristics about participating organizations and individuals were removed from the transcripts. The participating organization information and individual data were stored in a
password-protected file on a secured, shared drive. Most of the interviews were conducted via telephone and the rest in-person. Telephone interviews comprised of participants calling into a telephone conference line and all participants signed the Informed Consent form. The interviewer acknowledged receipt of the signed informed consent form before the start of each interview.

**Participant selection.** Trade journals, patent data, industry conferences, snowball technique, and social media groups focused on discussing, examining or analyzing blockchain in the Financial Services industry were techniques used to identify and select ideal participants for this study. Participant recruitment occurred by word of mouth, networking at industry conferences, and via email solicitations targeting publicly identifiable individuals at ideal organizations. It was difficult to predict an absolute number of interviews for this study before the start because theoretical saturation, which occurs when the analysis is exhausted, and no new data was emerging, drove the ideal number of participants. As guidance, a survey of grounded theory studies in IS literature supported a variation in the ideal participant size because they showed that theoretical saturation was achieved between two and seventeen organizations and up to nineteen individuals (Kesseler, 2008; Nasirin & Birks, 2003; Orlikowski, 1993; Tschang, 2007). Organizations and individuals were added until theoretical saturation was achieved as described by Corbin and Strauss (2008) and summarized by Creswell (2013) where interviewees were engaged to help form the model.

Participant criteria, described in Table 3, outlines the organization and individual criteria for the study.
Table 3. Research Study Participant Criteria

<table>
<thead>
<tr>
<th>Organization Criteria</th>
<th>Individual Criteria</th>
</tr>
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<tbody>
<tr>
<td>Must be an incumbent/established organization operating as a bank or credit union in the United States or a third-party technology provider to banks or credit unions in the United States for the past five years.</td>
<td>Responsible for evaluating blockchain within the organization, titles such as Head of Technology Strategy, Head of Innovation Lab, Head of Debt Capital Markets, Head of the blockchain, and Head of Digitization (Beck &amp; Müller-Bloch, 2017).</td>
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</table>

Twelve organizations participated in the study—seven large and five small. The distinction between large and small was their annual revenue amount where greater than $1B was considered large and less than or equal to $1B was considered small. Organizations were categorized by the type of service they provide as either technology provider or financial institution as described in Table 4.

Table 4. Participant Summary by Type and Size

<table>
<thead>
<tr>
<th>Type</th>
<th>Size</th>
<th>Organizations</th>
<th>Individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Institution</td>
<td>Large (Annual Revenue &gt; $1B)</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Small (Annual Revenue = $1B)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Technology Provider</td>
<td>Large (Annual Revenue &gt; $1B)</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Small (Annual Revenue = &lt; $1B)</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>12</td>
<td>19</td>
</tr>
</tbody>
</table>

Table 5 summarizes the job titles and interview location of each participant in the study. Individual titles varied in the study by the organization; however, all of the titles below are involved in the evaluation of blockchain for their organization.
Table 5. Participants by Job Title and Interview Location

<table>
<thead>
<tr>
<th>Size</th>
<th>Type</th>
<th>Job Title</th>
<th>Interview Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>Technology Provider</td>
<td>Senior Vice President, Product Strategy</td>
<td>Telephone</td>
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<tr>
<td></td>
<td></td>
<td>Director of Engineering</td>
<td>Telephone</td>
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<tr>
<td></td>
<td></td>
<td>Vice President, Blockchain and Distributed Ledger</td>
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<td></td>
<td></td>
<td>Vice President, Innovation</td>
<td>Telephone</td>
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<tr>
<td></td>
<td></td>
<td>Global Head of Digital Enablement</td>
<td>Telephone</td>
</tr>
<tr>
<td>Large</td>
<td>Financial Institution</td>
<td>Head of Corporate and Investment Banking Technology</td>
<td>Telephone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Senior Vice President and Product Innovation Director</td>
<td>Telephone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>First Vice President of Enterprise Architecture</td>
<td>Telephone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blockchain Product Owner</td>
<td>Telephone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Strategic Investments Director</td>
<td>Telephone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chief Technology Officer</td>
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<tr>
<td>Small</td>
<td>Technology Provider</td>
<td>Senior Innovation Strategist</td>
<td>In-Person</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Senior Vice President of Product</td>
<td>Telephone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chief Operating Officer</td>
<td>In-Person</td>
</tr>
<tr>
<td></td>
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<td>Chief Executive Officer</td>
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<td>Chief Operating Officer</td>
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<tr>
<td>Small</td>
<td>Financial Institution</td>
<td>Senior Vice President of Payments</td>
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<td>Vice President of Payments</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Chief Information Officer</td>
<td>Telephone</td>
</tr>
</tbody>
</table>

Study invitation. Each study participant received an email invitation, similar to the one in Appendix A, along with a copy of the University of South Florida Informed Consent in Appendix B before the interview. All participants signed and returned the informed consent form before the start of the interview, per IRB protocol. Interviews occurred either face-to-face or via conference call and were recorded and transcribed for data analysis. Organization and individual data, such as the individual’s role within the organization, the organization size (based on annual revenue), and organization type (based on business type), was confirmed at the beginning of the interview.

IRB approval. Permission to conduct the study was obtained from the Institutional Review Board (IRB) at the University of South Florida under study ID PR00033678. The researcher notified the IRB that participants in this study are business professionals sharing their
expert opinions related to their organization’s processes for evaluating blockchain. Participants voluntarily participated in the study by email invitation similar to the one outlined in Appendix A. If they chose to participate, then they signed and returned the informed consent form before the start of the interview. The study is an expedited study because, as documented in the approval letter in Appendix E, it involved voice recording of the participants whose individual characteristics were available through the informed consent process from participant signatures. The IRB approved that this study involved minimal risk to participants who participate voluntarily and have an option to terminate participation at any point during the study (i.e., withdraw from the interview; request that their interview is excluded from data analysis).

**Theoretical sampling.** Theoretical sampling began with the first interview and continued throughout the research study. Corbin and Strauss (2008) recommended that data collection and analysis go hand in hand to allow the research to gather, analyze, and get more data until categories reach a point of saturation, which is where the concepts are well defined and explained. Collecting and analyzing data allowed the researcher to generate a deeper understanding of the evaluation process and to identify strong categories to lead to a core category in the study (Corbin & Strauss, 2008). The process also helped the researcher to start looking for common patterns that emerged across organizations when they described similar processes and allowed the researcher to start clarifying concepts related to emerging themes in subsequent interviews. Theoretical sampling drove the number of interviews which continued until the categories of information became saturated, and the model’s complexities could be sufficiently elaborated (Corbin & Strauss, 2008, 2014; Creswell, 2013). Corbin and Strauss (2014, p. 135) described saturation as when all significant categories “are fully developed, show variation, and are integrated” because the researcher must look for opportunities maximize
similarities and differences related concepts in the study. In this study, the concept of “proving value” emerged in open coding from a reflection memo associated with coding the tenth participant. This concept started to evolve into a category as the eleventh participant provided more insights into how their organization’s approach to “proving value.” Subsequent sampling continued in order to maximize depth of understanding related to concepts associated with “proving value.” Open coding continued until all related categories were sufficiently saturated and no relevant concepts or categories emerged. Table 6 provides details related to the number of participants and organizations that contributed concepts to each category in this study leading to adequate sampling.

**Table 6. Categories, Participants, and Organizations**

<table>
<thead>
<tr>
<th>Category</th>
<th>Participants (n = 19)</th>
<th>Organizations (n = 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Formality of Process</td>
<td>19</td>
<td>12</td>
</tr>
<tr>
<td>2. Internal Roles Involved</td>
<td>19</td>
<td>12</td>
</tr>
<tr>
<td>3. Perceptions of Blockchain</td>
<td>19</td>
<td>12</td>
</tr>
<tr>
<td>4. Proving Value</td>
<td>19</td>
<td>12</td>
</tr>
<tr>
<td>5. External Entities Involved</td>
<td>18</td>
<td>11</td>
</tr>
<tr>
<td>6. Understand Blockchain</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td>7. Process to Keep Up</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td>8. Prioritization</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>9. Compared to Current Process</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>10. Time Boxes</td>
<td>16</td>
<td>11</td>
</tr>
<tr>
<td>11. Use Cases</td>
<td>19</td>
<td>12</td>
</tr>
</tbody>
</table>

**Constant comparison.** Constant comparison was done during the data collection process to compare references for similarities and differences between new concepts and to validate or align individual, nuanced terminology in the coding process. One example in this study was related to the varying ways in which participants discussed value in the study such as “return on investment,” “economic opportunity,” and “business case.” Constant comparison of participant answers and codes guided the research study.
**Memoing.** In this research study, memos captured thoughts, ideas, and questions encountered during interviews, coding, and data analysis. Memos were written during interviews to annotate thoughts based on what the participant was saying and then immediately following the interview to document reflections, ideas and questions. They were then typed and linked to the transcript in NVivo. Memos were created during the coding process to identify concepts to watch for or evaluate later and were delineated as a “coding memo” if they were linked to a participant. Memos were noted during the constant comparison process, primarily to denote areas where the participants might have differed in their answers. Memos were created throughout all of the coding processes to summarize emerging thoughts, highlight open questions, and to surface emerging connections among concepts.

**Data Analysis**

The coding procedures of open coding, axial coding, and selective coding as outlined by Corbin and Strauss (2008, 2014) were used to analyze the qualitative data in this study. NVivo Pro v. 11, a qualitative analysis software, was a tool that helped the researcher to organize and manage data throughout data analysis. The researcher first hand-coded the first ten interviews in parallel with adding them to NVivo to expand knowledge of NVivo capability and to validate that NVivo features could be useful to analyze the data. NVivo features such as nodes, cases, and matrix-coding queries provided opportunities for the researcher to streamline data analysis and to gain insights across multiple layers of participants. For example, all participants were grouped by organization, type of organization, and size of the organization, which allowed queries, comparisons of codes and comparisons of categories to occur at each level. Figure 8 is an outline of the organization structure of the study data in NVivo. Corbin and Strauss (2008) supported the use of software to aid in the analysis process.
The following sections describe the open, axial, and selective coding procedures used in this study in more details.

**Open coding.** An initial, line-by-line coding of the interviews data started the process to identify concepts and categories of information. This process allowed the researcher to break the interview data apart and to start thinking about properties and dimensions related to it. As lines were coded to concepts, concepts started to make sense when put into groupings. Categories, which are groupings of similar codes or concepts, started forming during the open coding process. During the open coding process, line by line coding marked specific statements, thoughts, and ideas to a concept. These concepts provided an abbreviated snapshot of what the participant said and served as the foundation for higher-level analyses. This study leveraged a structure described by LaRossa (2005) to maintain consistency during open coding process as categories started to emerge. Figure 9 is an example of how structure started to evolve in the open coding process as categories started to emerge in this study, in the diagram, each reference is the actual participant’s verbiage related to the overarching concept and category. One participant could have multiple references in one concept.
An initial set of codes were generated during the open coding process; however, during the constant comparison process throughout the study, several codes with similar meaning or properties were merged. This process was iterative as new data was added into the study, codes were grouped into categories, and dimensional categories started to emerge—e.g., the “Prioritization” category remained with low, medium, and high concepts, although only one organization noted that blockchain was considered a ‘high’ priority for them. The open coding process resulted in 67 concepts and 11 categories at the end of the study. The result of the open coding process is in Table 7, which provides a reference number for each concept and the associated category. Each concept in Table 7 is associated with one or more reference from the study participants in the form of direct quotations from the interview that ties to the concept.
<table>
<thead>
<tr>
<th>#</th>
<th>Concepts</th>
<th>Categories</th>
<th>#</th>
<th>Concepts</th>
<th>Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Authentication and Identity</td>
<td></td>
<td>36</td>
<td>Identifying Use Cases</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Loan Exchange Platforms</td>
<td></td>
<td>37</td>
<td>Researching and Monitoring</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Asset Management</td>
<td></td>
<td>38</td>
<td>Building Proof of Concept or Prototype</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Smart contracts</td>
<td></td>
<td>39</td>
<td>Missing Value/ROI</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Cross-Border Payments</td>
<td></td>
<td>40</td>
<td>Side Investigation</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Payments</td>
<td></td>
<td>41</td>
<td>Evaluating and Exploring</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Trade Finance</td>
<td></td>
<td>42</td>
<td>Internal Organizing</td>
<td></td>
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<td>8</td>
<td>Reconciliation</td>
<td></td>
<td>43</td>
<td>Investing</td>
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<td>9</td>
<td>Lending</td>
<td></td>
<td>44</td>
<td>Coming Next</td>
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<td>Real-Time Payments</td>
<td></td>
<td>45</td>
<td>Both Informal and Formal</td>
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<td>Loyalty and Rewards</td>
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<td>46</td>
<td>Formal</td>
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<td>12</td>
<td>Smart Bond</td>
<td></td>
<td>47</td>
<td>Informal</td>
<td></td>
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<tr>
<td>13</td>
<td>Financing</td>
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<td>48</td>
<td>Uncertainty</td>
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<td>Stored Value</td>
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<td>49</td>
<td>Interconnected</td>
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<td>15</td>
<td>Disputes Management</td>
<td></td>
<td>50</td>
<td>Positive</td>
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<td>16</td>
<td>Proprietary Cryptocurrency</td>
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<td>51</td>
<td>Internet Like</td>
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<td>17</td>
<td>Dynamic Currency Conversion</td>
<td></td>
<td>52</td>
<td>Client</td>
<td></td>
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<td>Ten years</td>
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<td>53</td>
<td>Vendor</td>
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<td>Started</td>
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<td>Competitor</td>
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<td>Payback Period</td>
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<td>55</td>
<td>Consortiums</td>
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<td>Technology Team</td>
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<td>56</td>
<td>Consortium 2</td>
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<td></td>
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<td>Line of Business</td>
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<td>60</td>
<td>Looking for Network adoption</td>
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<td>26</td>
<td>Product Team</td>
<td></td>
<td>61</td>
<td>Industry Factors</td>
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<td>Dedicated Resource</td>
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<td>62</td>
<td>Thought Leadership</td>
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<td>28</td>
<td>Security</td>
<td></td>
<td>63</td>
<td>Separate Bitcoin</td>
<td></td>
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<tr>
<td>29</td>
<td>Compliance</td>
<td></td>
<td>64</td>
<td>Understand It</td>
<td></td>
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<td>30</td>
<td>Strategy Team</td>
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<td>65</td>
<td>Different Than Existing Process</td>
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<td>31</td>
<td>Limited Roles</td>
<td></td>
<td>66</td>
<td>Similar to Existing Process</td>
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<td>32</td>
<td>Competing Priorities</td>
<td></td>
<td>67</td>
<td>Overview of Process</td>
<td></td>
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<tr>
<td>33</td>
<td>Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>High</td>
<td></td>
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</tbody>
</table>

**Axial coding.** Axial coding and open coding go hand in hand by creating memos and conducting constant comparison during the open coding process to think of connections between
the emerging categories (Corbin & Strauss, 2008). During axial coding, the researcher looked for and linked actions and interactions within the categories and concepts to try to give them meaning and to devise explanations (Corbin & Strauss, 2008). The categories identified during the open coding process were evaluated to identify causal conditions, strategies, contextual or intervening conditions, and consequences (Creswell, 2013). Creswell (2013) recommended that the output of the axial coding process is a visual representation to use as a tool to outline dimensions of the core category called a coding paradigm. According to Corbin and Strauss (2014), “the paradigm is an analytic tool to help analysts carry out axial coding or coding around a category” (p. 156). Creswell (2013) and Amar (2017) provided descriptions that a researcher can follow when creating the coding paradigm as follows:

a) Causal conditions – categories of conditions that influence the phenomenon, could be events, incidents, or happenings.
b) Context – the narrow conditions influencing the strategies such as the settings in which the phenomena is occurring.
c) Intervening conditions – conditions that influence the strategies, could force the strategy to occur with context.
d) Strategies – actions resulting from the central phenomenon that could manage or respond to phenomena.
e) Consequences – outcomes of the strategies or interactions as observed in the group.

In this study, the axial coding paradigm is in Figure 10—which was adapted from Amar (2017) and described by Creswell (2013) and Corbin and Strauss (2008)—was used as a tool to conceptually frame how the categories related to the core category. The paradigm emerged from an iterative process of reviewing the data, examining memos, and reflecting on open codes. The
coding paradigm tool served as an interim step to help the researcher navigate understanding between the detailed, open codes and the abstract, selective coding process.

**Figure 10. Banking on Blockchain Axial Coding Paradigm**

The core phenomenon is that organizations are trying to prove the value of blockchain technology. The process to prove value is caused by their understanding of blockchain technology and knowing generally what it’s supposed to do along with the current stage where it is missing value or ROI. The combination of these two events created opportunities for participants to develop strategies to prove the value of the technology and to produce the consequences identified in the study. Organizational and participant perspectives lend context to proving the value of blockchain while the industry and technology characteristics offer intervening conditions.

**Selective coding.** The selective coding process leveraged the results of the open and axial coding procedures as well as relied on memos and insights from sufficiently saturated categories to refine the core category and create a visual representation and story to explain the model. The
researcher leveraged the visual model created from the axial coding process to think about propositions intended to interrelate categories to develop an explanation of the interrelationships between the categories. Memos and heavily saturated concepts and categories helped to make sense of emerging themes and structure related to organizing the results of the study. The output of the selective coding included a storyline to summarize the model and a visual diagram to provide an abstract view of the main results of the study. In this study, the results of axial coding were helpful to assemble a story that described the interrelationships of concepts in the model (Creswell, 2013). Corbin and Strauss (2008) explained that researchers must link concepts in order to integrate them into a model. According to Birks and Mills (2011), the new model must explain how a set of concepts are related to each other through logical connections. Developing a model in grounded theory requires raising the analysis to the highest conceptual level where a core category, theoretical saturation, and memoing must be present (Birks & Mills, 2011).

In this study, the core category is identified as the “proof of value” because the activities demonstrated by participating organizations need to be centered around attempts to prove the value of blockchain technology. The “proof of value category” offers the best opportunity for integration because it has explanatory power related to the other categories and concepts in the study. The core category is “a concept that is abstract and broad enough to be representative of all participants in the study” and provides the greatest explanatory power because it can “link the other categories to it and each other” (Corbin & Strauss, 2014, pp. 188-189). A reflection memo noted immediately after the interview of the tenth participant in the study was helpful to bring awareness to the potential “proof of value” concept as a potentially overarching theme throughout the interview. As other participants mentioned value, the researcher was able to probe
further to understand more context and dimensions related to the state of value in the evaluation process.

The model building process encourages the researcher to look for density and dimension in the categories and to fill in as many as possible around the core category (Corbin & Strauss, 2008). Corbin and Strauss (2008) advise researchers to drop extraneous concepts or ones that were not fully developed and do not fit the model from the study and pursue them later if they are interesting because they may clutter the model with concepts that do not contribute to understanding. This “trimming the theory” process was used in this study; however, some of the extraneous concepts and ideas are discussed as opportunities for future in Chapter Five: Discussion (Corbin & Strauss, 2008, p. 113). In this study, category density and dimension emerged with categories and concepts related to the “proving value” category. Density was observed with the concepts outlined in Table 8 where at least 75% of the participating organizations (n=12) contributed data. Dimension was strongest in the “proving value” category because multiple concepts are present to develop a deeper understanding of the category. Table 8 shows the most highly saturated concepts in the study based on the number of organizations.

Table 8. Most Saturated Concepts by Number of Organizations

<table>
<thead>
<tr>
<th>Category</th>
<th>Concepts</th>
<th>Organizations (n = 12)</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proving Value</td>
<td>1: Identifying Use Cases</td>
<td>12</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>2: Researching and Monitoring</td>
<td>11</td>
<td>92%</td>
</tr>
<tr>
<td></td>
<td>3: Building Proof of Concept or Prototype</td>
<td>9</td>
<td>75%</td>
</tr>
<tr>
<td></td>
<td>4: Internal Organizing</td>
<td>9</td>
<td>75%</td>
</tr>
<tr>
<td></td>
<td>5: Missing Value/ROI</td>
<td>9</td>
<td>75%</td>
</tr>
<tr>
<td></td>
<td>6: Side Investigation</td>
<td>9</td>
<td>75%</td>
</tr>
<tr>
<td>Perceptions of Blockchain</td>
<td>7: Interconnected</td>
<td>10</td>
<td>83%</td>
</tr>
<tr>
<td></td>
<td>8: Uncertainty</td>
<td>9</td>
<td>75%</td>
</tr>
<tr>
<td></td>
<td>9: Positive</td>
<td>10</td>
<td>83%</td>
</tr>
<tr>
<td>Understand Blockchain</td>
<td>10: Separate Bitcoin</td>
<td>10</td>
<td>83%</td>
</tr>
<tr>
<td>Internal Roles Involved</td>
<td>11: Technology</td>
<td>9</td>
<td>75%</td>
</tr>
</tbody>
</table>
The research methodology outlined in this chapter allowed the researcher to pull back and analyze emerging models, patterns, and specific words to create a model to explain a process that is occurring as participating firms are evaluating blockchain technology in the Financial Services industry.
CHAPTER FOUR: RESULTS

Overview

This chapter provides the findings from this study organized to provide details to support the model and to show how it all comes together in a framework. The purpose of the study was to develop a model to explain how Financial Services organizations are evaluating blockchain technology. This study used the grounded theory methodology detailed in Chapter Three to interview and analyze data from nineteen participants at twelve Financial Services organizations. The study explored the processes that the organizations are using to explore blockchain technology to gain insights into where they currently are, how they got here, and what they might do next.

The resulting model from this study proposes that organizations are engaged in processes designed to prove the value of blockchain technology as a part of the evaluation process. As described in Chapter Three, the analysis resulted in an overarching category of “proof of value” which describes the goal of the activities that organizations are engaged in as they evaluate blockchain technology. Other categories from this study, such as “Understand Blockchain,” “Roles Involved” and “Perceptions of Blockchain,” help to construct context related to the emergent “Proof of Value” model.

The next sections of this chapter discuss details of how a common thread of a lack of value creates the processes that are constructs of the “Proof of Value” model using direct
quotations and summary statistics. First, more details related to how participating organizations understand and perceive blockchain technology based on the timelines, descriptions, and perceptions that participants shared in the interviews. Second, detailed insights highlight how organizations pull together resources to participate in steps to help to prove the value of blockchain technology via internal resources, partnerships, and group sharing. Third, insights into how organizations generated use cases related to problems that blockchain could potentially solve are shared. Fourth, insights into the processes that participating organizations use to test the use cases outlined by participants. Fifth, details about the organizations, industry, and technology provide context to help create a framework and explanation about similarities and differences in the evaluation process. The chapter concludes with an elaboration of the core category, “proof of value,” and a description of the emerging theory together with a supporting diagram aimed to show how the explanations in the previous sections are interrelated.

Following a format similar to Mewborn (2005), specific terms will indicate the frequency of evidence by participating organizations. The words “a majority of,” “many,” and “most” describes at least nine of the twelve organizations, “some” or “several” describes six to eight of the organizations, and “a few” describes five or fewer organizations.

**Understanding Blockchain**

The study revealed that participating organizations have been evaluating blockchain for a couple of years and their explorations have resulted in a general understanding of the technology by individuals within the organizations. Study participants described their understanding of blockchain based on its origins as a cryptocurrency and shared positive perceptions of the technology as it related to potential use in the Financial Services industry. The study also surfaced inherent uncertainty related to how blockchain technology fit in the participating
organizations as evident by some of the questions the participants shared during the interviews. Details about how participating organizations understand blockchain, shared in the next few sections, highlight what they know, and establishes some context for the rest of the evaluation steps.

**Blockchain evaluation context – Where are they?** Participants from several organizations gave insights into timelines related to the evaluation of blockchain by discussing when they started evaluating it and how they see it in the Financial Services industry ten years from now. Elements of the timeframes shed light on dimensions such as how long organizations have been evaluating blockchain, where they are now, and their anticipations about the future of the technology. As shown in Figure 11, several organizations have been evaluating blockchain technology for about three years now or since 2015.

![Year Org Started Evaluating Blockchain](image)

**Figure 11.** Timelines Related to the Beginning of Blockchain Evaluation

A few participants speculated that blockchain might see traction in the next three to five years range, which is also when they expect it to become more relevant as noted below.

*There is a big ecosystem with many players, many rules, and much structure. Blockchain does not fit in any existing technological model. Therefore, I think it puts it outside of the five-year window for what I [would consider] significant relevancy. – Chief Operating Officer (Small Technology Provider)*
Participants from a majority of the organizations in this study expressed bullish descriptions of what blockchain technology might look like ten years from now in the Financial Services industry. They also acquiesced that their investment to explore blockchain today may not pay off until the long term. Participants from both large and small organizations expressed similar, positive views of where the technology might be ten years from now. The following excerpts from three participants from various organizations provide specific insight into where they see blockchain ten years from now in Financial Services.

Ten years from now, I think one or two things are going to happen. One, this is the one I would lean 70/30. I think we will have a relatively mature network. A permissioned network within our industry that is just kind of reaching the point where we can do some innovative thing...My 30% guess would be we just do not get any traction. We do not get the level of engagement, and it just languishes out [but] then we end up hopping on some other financial services blockchain and start leveraging it that way. Therefore, either way, either we are going to drive the bus, and we are going to make it successful, or if we do not, we are going to ride on the network the big banks create. One way or the other, I think blockchain will be a prominent part of financial services. – Chief Information Officer (Small Financial Institution)

I think that it is one of the major technologies in transactions that require multiple banks. Whether that it is helping to drive greater efficiencies in international payment or loan syndication that I do not know. I think that is where we go as driving efficiency over the course of the next few years. – Senior Vice President and Product Innovation Director (Large Financial Institution)

I think you are just going to see blockchain underneath the exchanges, the settlement, and the clearing solutions. The individual products are going to be blockchain based. They are going to be a lot more efficient. There is a lot less need for reconciliation. It will just be pervasive. Like Intel inside, you will not even see it. You will not even know it is there, but it is there. – First Vice President of Enterprise Architecture (Large Financial Institution)

One common sentiment among the 73% of participants (n=19) who gave insights into blockchain is that they saw blockchain evolving into an “industry tech,” meaning that they thought it would be used to conduct transactions among Financial Services organizations in a multi-party environment versus as an internal technology being used by individual organizations.

All of the participants who shared their prediction of blockchain ten years from now predicted that it will get traction in the industry.
The difference between Blockchain and Bitcoin. Evaluating blockchain for a couple of years and speculating on how it might fit into the industry has led participating organizations to discuss their understanding of blockchain technology separate from its origins in the cryptocurrency Bitcoin. Participants from most organizations described an understanding of blockchain technology outside of its use in cryptocurrency and expressed an interest in the value of the technology is the distributed ledger properties. The following participants provided details into how they view the technology aspects of the blockchain, using cryptocurrency roots as context.

It became clear that blockchain was going to be leveraged for more than just cryptocurrency. When that started to happen and the use cases from the constituent groups, such as, and partners that we had worked with started to evolve, those use cases and financial services applied to us and basically increased our interest in trying to figure out how to use it. - Head of Commercial and Investment Banking Technology (Large Financial Institution)

Everybody knows that everybody is familiar with Bitcoin or at least the basis of Bitcoin, [which is] a cryptocurrency. It is a subset of blockchain or blockchain technology solutions, so that was kind of the start for us. And then, as you listen and then as an organization we try to think two to five years out, as Bitcoin you got a lot of the hype started to die down, and the underlying technology started to kind of become discussion, more prevalent, we started looking at it like we look at all kinds of new technology. - Chief Information Officer (Small Financial Institution)

We are very interested in the benefits of the distributed ledger. I would say we are cautious about what is going on with the cryptocurrencies. – Senior Vice President Product Strategy (Large Technology Provider)

A few participant’s understanding of blockchain beyond Bitcoin allowed them to discuss how blockchain evolved from a decentralized system that was designed to displace financial services entities by replacing institutional trust with the blockchain technology for financial services transactions. A few also further commented on the irony of the Financial Services industry now looking to use the technology that originally aimed to disrupt the industry.

Positive perceptions of Blockchain. As knowledge of blockchain technology increased, participants continued to develop and refine their attitudes about the technology. Participants
from 83% of the organizations (n=12) in this study shared positive perceptions of blockchain in this study. Positive perceptions appeared when participants used adjectives such as “transformative,” “efficient,” and “promising,” to describe properties of blockchain technology based on their current understanding. Participants from a few organizations were also hopeful that blockchain might be the answer to mending the fractured infrastructure they experience in the Financial Services industry. The following are examples of positive attitudes provided by individual participants related to the blockchain.

So that is the supposed to the beauty of distributed ledger right, and blockchain is that you can have multiple parties simultaneously conducting a transaction in real time that would, with blockchain, lead to a tremendous increase in efficiency. Moreover, you can do that, and start eliminating some of that manual process that is involved as well as protect identity, protect data, protect intellectual property. – Senior Vice President, Product Strategy (Large Technology Provider)

Our interest in this space is the technology holds much promise and is deciding on the evolution of how we do business and how we service our clients. Therefore, it is important for our organization to have a say in the evolution of this. – Strategic Investments Director (Large Financial Institution)

Participants from all large organizations expressed positive attitudes about blockchain technology. However a question was not specifically asked of participants to ascertain their perceptions of the blockchain, therefore the absence of data by small organizations may not imply a lack of positive attitudes.

**Signs of uncertainty in the evaluation process.** While participants expressed positive perceptions of blockchain technology, signs of uncertainty also surfaced by participants from a majority of organizations in this study. Uncertainty surfaced was characterized either in the form of questions that participants shared they were thinking about or when they noted complexities and scalability concerns related to the current state of the technology.

Questions such as, “How do put something like [standards] in place with Blockchain?” “Do we want everything distributed?” “Is it worth it?” “Is there a true opportunity here?” “Does
this need to inform our roadmap of the future?” “Is there another existing solution that we just haven’t deployed to solve for that problem?” “Why does it have to be blockchain?” and “What are my competitors doing?” arose related to blockchain in this study.

Uncertainty also surfaced as a few participants reflected on the lack of specifications, lack of maturity, and the underlying complexities associated with the technology. Nine participants provided both positive and uncertainty about blockchain, which suggests that the two are not mutually exclusive.

**Summary of understanding Blockchain.** Organizations have been engaged in the evaluation of blockchain technology for about three years now, and participants demonstrated an understanding of how blockchain technology works. Participants have also developed positive perceptions of the technology while also surfacing some uncertainty related to the value and business case of the technology.

**Organizing to Evaluate Blockchain**

A majority of organizations in this study had processes in place to organize their resources, partnerships, and processes related to evaluating blockchain technology. The study revealed that the evaluation process typically started informally with side investigations within the organization and then activities started to connect all of the side investigations to collaborate on behalf of the organization. As a result, limited internal resources are involved in the evaluation process and organizations rely heavily on consortia to expose them to know about the technology. Inconsistencies in the formality and similarity of the blockchain evaluation process underscore that organizations are still organizing to evaluate blockchain technology in the Financial Services industry.
Side investigations. Participants from most of the participating organizations reported that blockchain evaluation started as a side investigation. Participants described the side investigation process as one that started with individuals or small groups exploring blockchain based on their interest and curiosity about the technology. The two perspectives below show that one participant admitted to kicking off the side investigation on behalf of their organization, while the other participant joined in the evaluation process after it became more formal, however, he/she acknowledged that the process started as a “pet project” by someone else in the organization.

Kind of as a jumping off point, that meeting, I started to do my own, I would not say deep research, but looked at a variety of different sources that I respect. Moreover, some of those are technical, and some of those are non-technical, so just getting a better feel for the technology itself, and what it could do, so that was kind of I felt comfortable that this is potentially something that could solve some problems for us in the future. – Chief Information Officer (Small Financial Institution)

Someone somewhere was looking at it outside of, as a side pet project if you will. It was then moved into more of a formal. Once it was agreed upon it was moved into the formal POC phase. Someone brought it into the group to discuss, but the group decided to move forward with it and then resources were assigned against it. – Global Head of Digital Enablement (Large Technology Provider)

Participants from two organizations gave details about how they started to organize internally to move from side investigations to a larger group that is representative of the organization in order to ascertain the organization’s blockchain needs and priorities. Large organizations were more likely to have a process to organize into one large group than small organizations as is described by two participants below. Small organizations transitioned from side investigations into working with their Executive team as a way to identify organizational needs and priorities.

There are different groups or individuals throughout that have taken our approach. We only just recently, and I say recently within this year, the last four months, have coalesced together into a single working group. These were all efforts that were done individually, or let me just say separately, not individually, but separately. – Vice President, Blockchain and Distributed Ledger (Large Technology Provider)
One line of business was looking at blockchain for one purpose, another line of business was looking at it just trying to figure out does it hold the promise that you are hearing from the various vendors out there... [We] created [a] common interest forum and we all came together. Then the [Enterprise Product Office] started tracking that and creating, capturing and identifying proof of concept candidates that everyone agreed which were the top five to eight good use cases that were going to be the most impactful to their businesses. – Senior Vice President, Product Strategy (Large Technology Provider)

The side investigations process sheds light on why the number of participants in this study is limited to a handful of individuals since the full scope of who is involved in the evaluation process is not widely known at the organization.

We needed to get better visibility across the organization, so some folks started participating in this forum and started looking for ways to share information. One line of business was looking at blockchain for one purpose, another line of business was looking at it just trying to figure out does it hold the promise that you are hearing from the various vendors out there. – Senior Vice President, Product Strategy (Large Technology Provider)

We have established an internal distribution list where people can post either various news stories or ideas that they hear. We formalized a working group that meets biweekly. – Vice President, Innovation (Large Technology Provider)

All of the organizations now are giving their input into a central group that is running through technology and development to prioritize. As soon as you get past the, I will call it into the ‘productization’ side of it; it becomes much more of a centralized group. Multiple inputs from the different market-facing groups. – Head of Digital Enablement (Large Technology Provider)

This study revealed a three-step process organizations in this study leverage as they move from side investigations to identify various business unit needs to organize into a central, knowledge sharing group.

**Internal resources.** Internal most likely to be involved in the evaluation of blockchain at participating organizations come from the Technology and Executive teams. The Technology team was involved at 75% of the participating organizations (n=12), and the Executive team was involved 67% of the time. The next closest was a cross-function team, which was involved at 42% of the participating organizations. Other roles mentioned noted as somewhat involved are
the Innovation team, Product and Strategy team, and the Line of Business. Additionally, two participating organizations had a resource dedicated to the evaluation of blockchain technology.

This study revealed differences between the types of resources involved at large organizations versus small organizations because participants from small organizations referenced 6 of the ten total roles mentioned by all participants in the study. Large organizations had the most variety of internal resources involved in the process—e.g., Product and Strategy and Line of Business and two large organizations had a dedicated resource allocated to evaluating blockchain technology.

Some participants described how they work internally to bring other resources from the organizations into the process and to spread knowledge with the rest of the organization. Details of the process are outlined below by two Technology resources from the same organization who gave the insights below into how they related to and interacted with other parts of the organization, for example, their Executive team and the line of business, to educate them about blockchain technology.

We are doing something that we refer to as an innovation immersion series, with our Executive leadership team and our, we have an operating council, so it’s basically the top 30 or so executives in the company, where we are bringing in subject matter experts, paired up with internal experts, on a variety of financial technology innovation topics, and doing an education sessions. Moreover, we asked that group to prioritize the top five emerging trends and blockchain was one of those.

So we will be doing a blockchain session with them in the next few weeks... there has been a, honestly, a kind of a wait and see approach for many folks that are dealing with day-to-day business pressures and core demands. – Chief Technology Officer (Large Financial Institution)

On the IT side, we have been educating them and bringing them along. They are engaged to that level, but they are not leading. It is not that the Business is coming to IT and saying we need to do this. It is something that IT [is] briefing and let them know about the potential, the technology. – First Vice President, Enterprise Architecture (Large Financial Institution)
The results showed that organizations had a few internal resources involved in the evaluation process thus far; however, participants described efforts to engage other parts of their organizations to bring them into the process.

**Using consortiums.** With limited internal resources involved, half of the participating organizations (n=12) indicated that they are relying on external entities to help them evaluate blockchain technology. The most common action taken to involve external entities involve a strategy to invest in a consortium, which is an association of several businesses, as part of the blockchain evaluation process. All of the small financial institutions and two of the large financial institution organizations had a partnership with a blockchain consortium as part of their evaluation process. Participants in the evaluation process named two consortiums, and it was apparent that one consortium focused on small financial services organizations while the other consortium focused on large Financial Services organizations.

The way in which the participants described their reliance on the consortiums varied between the large and small organizations. Small organizations indicated that they rely heavily on their consortium partnership for blockchain exploration and technical expertise. As described below, small organizations openly collaborated with their consortium and participating organizations to identify a common use case that was applicable across all of the participating organizations for their consortium partner to prototype.

Well, at this point, our investment in [consortium] as an entity, that was a big step for us because now it's up to them, [...] to provide leadership, to provide direction, to provide long-range planning, and I will just help contribute to that where I can, so I'm not necessarily taking an active role in building it out or defining what it's going to be. – Chief Information Officer (Small Financial Institution)

Many of us [...] got together and met and talked about it a lot, white-boarded, brought in some industry knowledge in the blockchain community, and had some presentations. So we did a lot studying and education early. Then we built a prototype, a consortium of eight [...] that worked for a small company to put together a prototype. – Senior Vice President of Architecture (Small Financial Institution)
So we are utilizing outside resources to keep the staff focused on the shorter term and the priorities. Then I think when it starts to move into a five-year window or less, we will augment with internal staff. – Chief Operating Officer (Small Technology Provider)

Large organizations participated cautiously in consortiums, noting concerns related to intellectual property (IP) rights. Large organizations also varied in how they used the consortiums because some watched and learned while others are actively working to collaborate on the technology. Insights from the following two participants from large organizations show highlight the variation in use of consortium as a resource to explore blockchain because it shows that one organization views the consortium as a research arm to increase transparency into how others are collaborating related to blockchain technology while the other works closely with the consortium related to technology projects.

They provide this blockchain network and the tools. It is a platform, and then they invite people to come in and collaborate. So, you can engage as much or as little as you want as a paying subscriber. You can really lean into it and reach out to other participants to [establish] joint ventures, or you can use that resource and be more introspective, and not collaborate outside as much, but you can leverage their tools and learning. One thing that is interesting with these types of consortiums is that there is a fair degree of caution around IP, and if you come up with something cool in a consortium with different players, who gets the IP rights for that? How do you think about the legal contractual structures for it? – Chief Technology Officer (Large Financial Institution)

Therefore, a lot of our work has been done through our membership in a consortium run by a technology company called [consortium 1] that's about a hundred-bank consortium that has most of the biggest banks in the world. [They are] looking at building out distributed ledger solutions for banks within this space. – Senior Vice President and Product Innovation Director (Large Financial Institution)

Participants from all six of the organizations that are leveraging consortiums referenced that they paid a fee to participate and considered it an investment as part of their overall blockchain evaluation process.

**Research and monitor.** Participants from 92% of the organizations (n=12) in this study described processes to research and monitor blockchain developments as part of the evaluation process. Participants described extensive collaboration with partners, such as consortiums, as a
source of keeping up with blockchain innovations. During these activities, participants looked for insights into how other entities are leveraging blockchain technology and provided opportunities for some participants to supply thought leadership to their clients to demonstrate their interest in the blockchain. A strong driver to monitor blockchain activities in the industry was the need to know what others in the industry are doing. As understanding of the network properties of blockchain technology become clearer to participants, they describe how they monitor to look for scenarios where blockchain might bring multiple parties together in the Financial Services industry. Insights into the research and monitor activities revealed that they are actively working to increase knowledge about the technology while collaborating with others to examine the merits of the technology as described below.

I think it is right now, largely, an R and D related technology where people know that it has potential based on the merits of the attributes of the tech, but it's going to be very incremental test and learn, ravage, fail, learn, adjust, develop, use cases, until you really start to see more mainstream adoption. Chief Technology Officer (Large Financial Institution)

Our biggest initial time investment was around learning about it. I think with innovation; you cannot tell someone what you are [going to] do until you figure it all out. Therefore, approaching it from an innovation standpoint of what is it? So, we studied for a while. – Senior Vice President of Architecture (Small Financial Institution)

There were no differences between small and large organizations as it relates to researching and monitoring for blockchain developments.

**Process formality and similarity.** In this study, participant perspectives were inconsistent on whether organizations are using a formal or informal process to evaluate blockchain technology. As demonstrated in the chart in Figure 12, participants characterized the evaluation process as formal, informal, and both. In this study, participants associated investment activity, group discussions, and frequency of discussions with formality. Informality was associated with a lack of a blockchain project in the organization, a lack of prioritization, and the
level of learning still occurring within the organizations. Participants who were on the fence regarding formality of the blockchain evaluation process drew on differences in the evaluation process in different parts of the organization, the conundrum of investing in a consortium yet having limited internal resources assigned, and blockchain evaluation started because it was a solution when other evaluations started with a problem as reasons.

![Figure 12. Formality and Similarity of Blockchain Evaluation](image)

A similar, inconsistent pattern was also evident related to whether the evaluation process for blockchain is similar or different from evaluations of other technologies. Figure 13 shows a summary of organizational insights as to whether the process they use to evaluate blockchain is similar or different from their existing process. Further insights in the reasons given for the differences by the participants highlight the other technology targeted a specific gap or problem, blockchain evaluation is driven from the bottom up versus the top-down approach used for other technologies, and there is no real champion for blockchain within the organization as is typically present with other innovation evaluation.
Summary of organizing to evaluate Blockchain. In this study, blockchain evaluators are organizing within their organizations to evaluate blockchain. The step to organize is important because blockchain evaluation typically started as side investigations by an individual or group, so participants need to organize these side groups to develop a collective approach to identify the value of blockchain on behalf of the organization. The lack of value may contribute to the limited internal resources which are involved in the process because many organizations are outsourcing some of their decision-making activities to consortiums. Organizations in this study have established processes to continue to research and monitor blockchain while acknowledging inconsistencies in the formality and similarity of the evaluation process.

Deciding on Blockchain Use Cases

As participants expanded their understanding of blockchain technology and organized to evaluate, they are also trying to identify and decide on potential use cases for the technology. Participants shed light on the priority of blockchain within their organizations as well as the opacity of value at this stage in the evaluation process. Some participants also hinted that blockchain might be a solution looking for a problem and many organizations describe a use case
identification process to match the blockchain technology as a solution to existing and emerging problems. Organizations also establish processes to keep up with what others are doing in the industry related to blockchain use.

**Missing value.** Participants from 75% of the organizations (n=12) in this study explained that the value of blockchain is currently elusive or far away especially when compared to legacy technology. In the details below, terms such as “economic opportunity,” “ROI,” and “payoff” were considered akin to value. Participants noted below that the lack of value influences blockchain prioritization, when it might become mainstream, and the speed it goes through the evaluation process.

*However, those use cases do not have, I say, nearly the economic opportunity. Therefore, I think they are moving slower because the economic opportunity is not as big.* – Chief Operating Officer (Small Technology Provider)

*So, at that point or now, we are in for $xxx, and again there, we do not necessarily expect a return on that in the short term. It is an investment in the kind of in the fundamental building blocks of, and no pun intended, the fundamental building blocks of a blockchain infrastructure that will serve our entire [...] industry.* – Chief Information Officer (Small Financial Institution)

*We knew that any sort of payoff associated with it was not going to be nearly as short-term as other efforts that we had underway, so we were prioritizing based on revenue potential.* – Vice President, Innovation (Large Technology Provider)

*So right now, we do not believe that blockchain is [going to] give us a great ROI. It is more we need to understand it today so that when and if a real big opportunity comes down the road, we are in a place to move quickly.* – Vice President, Blockchain and Distributed Ledger Technology (Large Technology Provider)

*We knew it would not garner significant investment until we could paint a clearer end state on how it would affect the business and draw value, which we did not necessarily have. So, I think it is still elusive. I have access to many major firms that have already started to invest a lot in blockchain practices. It is certainly far from mainstream at this point, from a business case development.* – Chief Technology Officer (Large Financial Institution)

*When you look at the ROIs, and when we look at all of our mappings in terms of the business case for, that tends to still get outweighed by the heritage infrastructure/architecture that they have in place today, and it’s harder to make the business case on why to make a move to the blockchain or a distributed ledger*
There were no unique patterns or differences relevant to large or small organizations related to the missing value of blockchain at this point in the evaluation process.

**Low prioritization.** Overall, most participants who discussed the prioritization of blockchain technology at their organizations considered it a low priority. In this study, participants from 57% of the organizations (n=12) gave specific insight into how blockchain is prioritized, and over half of them prioritized it as low within their organization as evidenced in Figure 14.

![Blockchain Priority in Organizations](image)

**Figure 14.** Blockchain Prioritization in Organizations

Participants from 58% (n=12) of the organizations in this study discussed details of other technology innovations they thought were ranked higher than blockchain. Participants gave insights into higher priority technology solutions such as those associated with faster payments, robotic process automation, and artificial intelligence in the study. One participant shared that a distinction between blockchain and other higher-ranking technology solutions is that the other solutions have a more clear-cut business case, which then puts blockchain further out from a prioritization perspective.

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*I do think that we are slowly getting there, but we are still a product cycle away.* – Head of Digital Enablement (Large Technology Provider)
I would say, there are two contexts for prioritization, one of which is the broader investment there is in technology at the bank, which I would just tell you that blockchain and some other emerging technologies are lower in the list. Right now, blockchain is lower, whereas something like artificial intelligence and robotics is much higher, for example. That is because there are much more clear-cut, quantifiable and more easily attained near-term business cases and benefits for things like robotics. Robotic process automation versus things that we think are future looking around blockchain. – Chief Technology Officer (Large Financial Institution)

I think there are other more relevant technologies that will compete with our core shortly. Therefore, I think faster payments is on, no pun intended, a faster track to intersect with some of the things we do within Blockchain. Therefore, from my perspective, faster payments have a higher priority to Blockchain. – Chief Operating Officer (Small Technology Provider)

No unique patterns were evident related to prioritization between small and large organizations in this study.

Solution looking for a problem. Participants from 75% of the organizations (n=12) in this study gave insights into how they perceive blockchain technology to be a solution seeking a problem in the Financial Services industry. Participants reflected on differences in approaches between blockchain technology and other innovation whereas they identified a specific problem to solve in other evaluations, but in blockchain evaluation, they take it as the solution and try to match it to an existing problem or cast a wide net to find problems that blockchain may solve.

Below is how one participant described the position of blockchain as a solution seeking a problem based on what they know in the evaluation process.

We are not even sure if it is a good match for it. It was simply a match, and so we decided to lean forward and take the risk to see how it would work. In other words, in other certain evaluations that are more formalized, we have specific criteria that we would measure ... Number one, we would have the specific problem we are trying to solve. Number two, we would establish formal criteria to evaluate various types of solutions against and go through a full evaluation. We had neither of those nor did we do a completely exhaustive evaluation of the various blockchain technologies. For us, it is still about understanding what problem that needs to be solved and then see if evaluating blockchain as a potential solution to that problem. – Vice President, Innovation (Large Technology Provider)

We are always asked [if] blockchain is the right solution. It is something we always have to justify. So, because also sometimes blockchain is just trying to fix an underlying problem. – Blockchain Product Owner (Large Financial Institution)
So it is casting a very broad net, looking to understand how problems are being solved with this technology so that for context we are aware of other things that are happening in the space. I think broadening our context; we do not have a formal application to do that. It is being open to seeing things from a different perspective and going through as many sources as we can to inform our perspective on things. – Senior Vice President and Senior Innovation Director (Large Financial Institution)

The solution-seeking-problem sentiment was common among participants from large and small organizations, and there were no distinguishable differences.

**Use case identification process.** Participants from 83% the participating organizations (n=12) described a process to identify use cases for blockchain during the evaluation process. Use cases referred to the types of business problems or use that organizations may need a solution to, meaning what types of scenarios blockchain can help to resolve. Participants described that they looked to identify use cases based on its perceived opportunity to generate value, reach critical mass, and implementation ease. Here is how some of them described it the use case identification process related to the blockchain.

> Well, of course, we had to identify those top use cases and then we looked to see who would provide that technology for those specific use cases. Then we would work with them. – Senior Vice President, Product Strategy (Large Technology Provider)

> It is about finding the right use cases that make sense and add value. Moreover, the use cases that we decided on were [because of] ease of business buy-in, then ease of implementation, and add impact. Therefore, when we were looking into the use case that we are looking at now, it is right now also ease of implementation. Where can we achieve quick wins to prove that this technology works and add value? – Blockchain Product Owner (Large Financial Institution)

> I think we will start to see the signs as we continue our research with blockchain to see how far this will really go and the use cases that likely will make it to market. – Senior Vice President, Product (Small Technology Provider)

> That is what we see a lot of in discussions around use cases, discussions around business use, and different constituents coming together to decide what they think they could get critical mass around the process and implement it. – Head of Commercial and Investment Banking Technology (Large Financial Institution)
One common theme among the descriptions related to the use case identification process is that participants described how it typically involved bringing other resources into the evaluation process such as another organization, another line of business, or a product owner.

**Summary of deciding on blockchain use cases.** A major theme associated with deciding on how to use blockchain is the lack of value or business case associated with the technology at the time of this study. This lack of value is likely causing blockchain technology to be mostly prioritized low at participating organizations. Participants are using their knowledge of blockchain along with their internal and external resources to pair use cases or emerging problems to blockchain as a potential solution.

**Testing Blockchain**

As organizations understand blockchain technology, start to organize internally, and try to identify use cases, they also leverage processes to test propositions from previous steps through prototyping and proof of concepts.

**Proof of concept & prototypes.** Participants from 75% of the organizations (n=12) in this study described processes to test blockchain technology by developing prototype applications and proof of concepts. Participants described that testing through prototypes and proof of concepts helped to maximize understanding, minimize risk, and identify value.

*Having to go through the proof of concept, to finding the objective to finding the outcomes and then getting the consensus saying that yes, whatever promise this technology offers we see a solution to that. – Strategic Investment Director (Large Financial Institution)*

*We have been through a prototype, building something physically and presenting it to customers to refine things and get to a point where we could start using it in a production bar. – Chief Technology Officer (Large Financial Institution)*

*We would do some business value proof of concept testing (for example) if you had information X, Y, and Z, to what extent you would be able to mitigate risks such that settlement time could decrease. If you were able to decrease settlement time, what sorts of capital costs incurred over a seven-day period versus a two-day period, and how much business value does that generate? If the numbers continue to be good from there, then*
we raise a choice of okay, can we pilot something right now, or is the technology not in a
space where we can take it into production. If it is in that space, then we can take it live
on a very limited basis. – Senior Vice President and Product Innovation Director (Large
Financial Institution)

There were no discernable differences between large and small organizations related to
prototyping and proof of concepts, except as noted earlier that small organization relies on
consortiums to execute on the prototype and proof of concept.

**Use cases.** This study also provides insights into the emerging blockchain use cases in the
Financial Services industry. Figure 15 provides insights into the use cases mentioned by the
participants of organizations in this study. These use cases can help other Financial Services
organizations that are contemplating blockchain to identify potential opportunities for
collaboration or focus. Patterns related to use case varied between large and small organizations
regarding how they were concentrated and the number of use cases they identified. All of the
participants from small organizations (n=5) identified Authentication and Identity as their use
case, but participants from small organizations only identified 35% of the total use cases (n=17)
identified in the study. On the other hand, large organizations identified 94% of the total use
cases (n=17) in Figure 15 above which gives insights into potentially more opportunities related
to blockchain for large organizations.
One participant provided an interesting perspective on the use cases by encouraging Financial Services organizations to look more broadly at blockchain and beyond matching it to existing use cases but instead to look at the potential of the technology it relates to intermediation and decentralization. This participant’s assertion, noted below, is that blockchain could have an impact on the intermediary models that the industry relies on, which is an invitation for the industry and organizations to consider the long-term implications of such a technology on their business models during the evaluation process.

*I think it requires you to look at things differently, more broadly to understand what the implications of the technology will be. If all we are doing here is just applying new technology to make things operate more efficiently in the financial services space, there is much value to be gained there over the next three to five years. I think beyond that, though, if we are not open to other effects that this sort of philosophical context of this intermediation and this decentralization might have. We are sort of missing the larger picture. Moreover, so being open to other things that are happening in the space and the potential impact that they may have on the sort of intermediary driven value exchange I think is important context to keep in mind.* – Senior Vice President and Product Innovation Director (Large Financial Institution)
Summary of testing Blockchain. Organizations in this study are taking steps to build prototypes and proof of concepts for the use cases they identify related to the blockchain. In this study, 17 potential use cases were identified by all organizations, all of which demonstrate how blockchain could be impactful to the core business of participating organizations.

Blockchain Evaluation in Context

Data from this study also surfaced context related to blockchain technology. Corbin and Strauss (2008) encourage researchers to analyze data for the context in order to identify the set of conditions that could shed light on the circumstances to which participants might respond with a certain action. In this study, participants shed light on context related to technology, their organization, and the industry in which they are evaluating blockchain. Details of the context from this study are in the following sections.

Technology. Participants from 42% of participating organizations (n=12) noted that the attributes blockchain technology today might be similar to the attributes of the internet when it started in the early 1990s, which did not get traction until the late 1990s and early 2000s. Many participants compared blockchain to the internet by drawing parallels in timing by saying that they think blockchain is currently in the stage where the internet was in the early 1990s. Some participants referenced the internet to examine how their organization’s role on the internet today could be similar to their eventual role in the blockchain. For example, today they leverage the internet to deliver services so they will leverage blockchain to add services. Some participants also called out similarities between the internet and blockchain because they indicated that both could efficiently facilitate the transfer of value and create opportunities for new business solutions for their organizations. The following quotes provide more details regarding participant perspectives on how blockchain might be similar to the internet.
I think the best comparison that I feel is that the internet was developed 20 years before it was ever commercialized. We’re only 10 years into understanding blockchain, so another 10 years and I guess the comparison that I’m trying to make is, I don’t think when the internet was first originally developed I don’t think anybody could have foreseen the impact that it has to businesses far and wide and to society. – Vice President, Innovation (Large Technology Provider)

If we go back to the world-wide web, that was largely created in the early ’90s and it kind of languished around in a kind of lack of definition until right around ’98, ’99, 2000. So, around that same time, we (our organization) decided, ”Well, we want to start leveraging this thing called the world-wide web,” so we started building out our own internal infrastructure here to hop on the web. So, the web already existed, but we were just building our own on-ramp onto the web. Now, so that is the closest thing I can equate to in the past. – Chief Information Officer (Small Financial Institution)

Participants from many organizations in this study contemplated how blockchain technology might have implications for their technology infrastructure. Participants from some organizations suggested that blockchain might be useful to enhance their solutions while others openly wondered how they could dismantle and replace the current infrastructure with blockchain. Participants from a few organizations reflect on the difficulty of balancing decision making between heritage infrastructure and blockchain technology as a potential replacement, noting that blockchain as a replacement is further away while implying that it is difficult to make the full shift because of the ecosystem conditions in the Financial Services industry. The following provides greater insights into how participants from participating organizations think about the potential use of blockchain to replace existing infrastructure.

Most of what we deal with is heritage infrastructure, heritage architecture. Therefore, making the argument with FIs on why they should switch to blockchain versus what they have today running, it is a little bit of a different conversation. I think the older the technology, the easier the conversation is to have with them, but as I said, for the most part, we live in the ecosystem, I think we are still a generation away from making the full shift. – Global Head of Digital Enablement (Large Technology Provider)

I would say that there are some features and functions of blockchain or distributed ledger technology that hold some transformative capabilities that would enable us to enhance our either our infrastructure internally or enhance the solutions that we offer to our client base. – Senior Vice President, Product Strategy (Large Technology Provider)
Organization. This study focused on two types and sizes of organizations in the Financial Services industry; technology providers and financial institution, each based on size. As such, the researcher was able to gain insights into how the two types of organizations viewed each other in the evaluation process and how the evaluation processes compared based on organization size.

Technology providers are organizations that supply technology products to financial institutions and financial institutions are typically users or clients of the technology products. The relationship between technology supplier and client surfaced in this study by participants from technology providers sharing how their clients fit in the evaluation process and financial institutions sharing how their vendors fit in the evaluation process. Participants from technology provider organizations indicated that they want their clients engaged in the blockchain evaluation process in order to gather feedback and input into the types of solutions they would want to see. Meanwhile, the financial institutions see the technology provider’s role is to supply either blockchain services or blockchain products to them. The perspectives of these two types of organizations shared in this study confirmed each other’s expectation and understanding of their role in the evaluation process. The researcher was not able to establish direct relationships between participating technology suppliers and financial institutions in this study; therefore, the perceptions shared in this study show a general view of how the two types of organizations see each other.

Comparisons large and small organizations evaluation processes revealed mostly similarities and some key differences. Most of the processes organizations said they used to understand, organize, decide, and test blockchain technology were similar across all organizations; however, a few differences emerged. Differences surfaced in three areas:
consortium use, type of resources, and use cases. The large organizations partnered with a different consortium than the small organizations. Participants from large organizations referenced a broader set of resources involved in the evaluation of blockchain including “security,” “compliance,” and “strategy,” and a few had a dedicated resource assigned to evaluate blockchain technology. Figure 16 shows the types of roles involved in the blockchain evaluation by organization size found in this study.

![Figure 16. Roles Involved in the Blockchain Evaluation by Large and Small Organizations](image)

Participants from large organizations in this study also shared three times as many use cases as participants from small organizations.

**Environment.** Participants from 83% participating organizations (n=12) discussed how interconnected the Financial Services industry is, and the role blockchain could play in streamlining, simplifying, and efficiently bringing the interconnected parties closer together. Participants magnified the positive perceptions of blockchain when they described what it could
do regarding minimizing risk, protecting data, and eliminating manual processes for the industry. The context of the industry also surfaced network characteristics of blockchain where trusting the other party in a transaction and ubiquity between platforms are essential considerations for potential adopters. The interconnected nature of the Financial Services industry caused participants to view themselves as part of an ecosystem and wonder whether blockchain can reach critical mass in the ecosystem. The following participants provided insights into ubiquity, interconnectivity, and multi-party benefits of blockchain and the Financial Services industry.

"You kind of look at the market because financial institutions are interconnected with each other and with the market infrastructure. It does not help me if, I do not know, my platform speaks Chinese, and the other platform speaks English, and I need a translator."

– Blockchain Product Owner (Large Financial Institution)

"It is about creating a network where there is information exchange and shared business logic around the execution of transactions. If we try to do all this individually, we are never going to be able to build a network. So, the economic benefits that we believe through the introduction of this new set of infrastructure are beneficial such that you see most of the industry participate in these sorts of activities."

– Senior Vice President and Product Innovation Director (Large Financial Institution)

The virtues of blockchain and the interconnected industry created collaboration conditions and murky competitive boundaries are shared by several organizations in this study. Participants from some organizations noted that their perspective of a competitor differs with blockchain because they are collaborating with competitors to explore blockchain technology. The following participant succinctly summarized the difference in how they are collaborating with other financial institutions on blockchain versus other technologies.

"We are much more collaborative I think than we have been with the introduction of prior technologies or any sort of technologies that are operating on the same timeline, like AI (artificial intelligence). I do not think you see a great deal of collaboration between financial institutions outside of a few specific areas, like fraud, that you see with blockchain and distributed ledger."

– Senior Vice President and Product Innovation Director (Large Financial Institution)
Summary of Results

To summarize, organizations in this study have been evaluating blockchain technology for almost three years now; however, no organization confirmed that a production implementation of blockchain technology has occurred. Overall, organizations in this study had an understanding of how the technology works and participants shared positive characteristics of it. They also had a lot of uncertainties and questions as they continue to monitor and research the technology. Participants recognized that the technology and the industry are interconnected therefore they are leaning toward use cases and applications that will bring efficiencies across the industry. The study revealed that although the evaluation started about three years ago, many still considered themselves in the early stages of the evaluation process as evident by informal processes and side investigations by a limited set of resources within the participating organizations. The lack of value and ROI are also indicators that the evaluation process might be in the early stages of evaluation and decision-making. Much of the organization and activities shared by participants in this study highlight an effort to ascertain the value of blockchain technology for their organizations. These processes led to efforts related to reducing ambiguity through partnerships, collaboration, and testing. Overall, participants had positive expectations of where blockchain will be ten years from now in the Financial Services industry, which is helping them drive activities forward today and eventually arrive at the destinations they have in mind.
CHAPTER FIVE:
DISCUSSION

The purpose of this study was to use grounded theory methodology to examine processes to answer the research question: “How do financial services firms evaluate blockchain technology for potential use?” The grounded theory methodology allowed the researcher the opportunity to take an open-ended, semi-structured approach to understand the process by which Financial Services organizations are evaluating blockchain technology. The analysis resulted in a Proof of Value Model that explains a series of processes that are occurring to help organizations prove the value of the technology for their organization. This chapter provides an explanation of the Proof of Value model based on evidence from the results chapter. It also outlines the practical and academic contributions of the research study while addressing limitations and opportunities for future research.

The research question that guided this research sought to understand how Financial Services organizations are evaluating blockchain technology for potential use. Information provided by the participants gave insights into how they understand the technology, are organizing resources to evaluate it, deciding on use cases, and testing through prototypes and proof of concepts. They also shed light on how characteristics of the technology, their organization, and the environment in which they operate which gave context for some of the actions taken to evaluate blockchain.
The Proof of Value Model

The relationships and explanations from the results in Chapter Three along with the selective coding process produced the “Proof of Value” model, depicted in Figure 17 below. The model proposes that organizations are engaged in a series of four processes that interact to help improve transparency in the value of blockchain technology. This study showed that participants leveraged the four processes, which are not mutually exclusive: understand, organize, decide, and test congruently at organizations to determine the value of blockchain technology. Evidence from the study supports the processes occur simultaneously and may influence each other, for example, participant-understanding increases as they test the technology, organize to get perspectives from other parts of the organization and identify new use cases. The four processes are iterative and continue to occur until participants have enough data to decide on whether they will adopt or reject the innovation.

**Figure 17. Proof of Value Model Overview**
Participants in the innovation evaluation process demonstrated that they know the technology does what it is supposed to do. The evaluation of blockchain has been in progress for about three years, and participants understand blockchain to be the underlying technology of Bitcoin. Understanding the difference between blockchain and Bitcoin was an important step for participants to start to see how the technology could be useful for non-Bitcoin use cases and allowed participants to explore the core benefits and values of the technology itself. This understanding of the core benefits helped organizations to make assumptions about the use of the technology and to develop curiosity about it. In this study, participants displayed positive assumptions of blockchain technology when they used terms like “transformative,” “efficient,” and “holds lots of promise.” Participants also exhibited signs of uncertainty and curiosity based on their understanding of the technology through questions related to potential value, opportunity, and roadmap. Together, the steps described above support that participants understand that blockchain technology does what it is supposed to do so they explore to learn more, to reduce uncertainty, and to validate their positive assumptions.

Although organizations understand that blockchain technology does what it is supposed to do, they still have to organize to evaluate it to confirm assumptions and lower uncertainty. In this study, the evaluation process primarily started through informal channels by an individual or a group researching blockchain on the side of their regular job or as a “pet project” as one participant described it. The side investigations became more formally organized across large organizations while the number of resources involved in the process remains relatively small to Technology resources and Executives. Education strategies bridged the side investigations to more formal internal structures as shared by participants from a large financial institution hosting an educational session on blockchain for 30 of their Executives. Organizations in this study
supplemented the limited number of internal resources exploring blockchain by leveraging consortiums, which are startup companies focused on building blockchain solutions for Financial Services organizations. Although there were variations in how organizations leveraged consortiums, in general, consortiums appeared to serve as an arm to explore blockchain until value can be determined without leveraging internal resources. Almost all organizations have implemented processes to research, monitor, and keep up with blockchain in the Financial Services industry. These activities played a role in reducing the ambiguity of the value of blockchain especially since they are looking for signs of how other organizations might deploy blockchain. Inconsistencies in participant’s perspectives regarding the formality and similarity of blockchain evaluation compared to other technology imply that participating organizations are still working to learn more and bring resources together to evaluate further. Collectively, these steps contributed to a process aimed at developing and evolving how resources in organizations evaluate blockchain.

As organizations understood the technology and organized in the blockchain evaluation process, all of them used a process to decide on blockchain use cases. The context for the use case process is a lack of confirmed value related to blockchain technology at the current stage of evaluation. Participants gave insights in the study that the lack of business value or ROI is contributing to a low prioritization of the technology when compared to other technologies they are currently evaluating. Participants also described that blockchain appears to be a solution looking for a problem to solve and as a result, they employed strategies to match blockchain technology to problems in the organization. This use case identification process leveraged what participants understand about blockchain and the organizational structures focused on blockchain to search for business problems that blockchain could potentially solve. The use case
identification process relied on strategies to further educate resources within the organization about blockchain and how it might be used a solution to their emerging problems. These steps created a process in the evaluation for organizations to leverage what they know about the technology and how they are organized to come up with potential use cases, which may bring value to the organization.

Organizations in this study employed processes to test the use cases through prototypes and proof of concepts in order to prove the value of the technology. A large and diverse set of use cases were generated by organizations in this study as opportunities to test to identify value. The use cases confirmed that the participants understanding of how the technology works and sets up areas where it might produce value for the organization.

The processes to understand, organize, decide, and test blockchain technology occurred in the context of interconnectivity between the technology, organizations, and the industry. Participants recognized the value of blockchain technology could help to tighten interconnected organizations and bring efficiencies to the Financial Services industry. Parallels to the internet and participants’ expectations that blockchain could be “transformational” for the industry supported processes that participants are leveraging to research, monitor, and keep up with blockchain technology while collaborating with consortiums to look for signs of network adoption.

**Key Findings**

Consistent with the knowledge and persuasion stages of Rogers’ (2010) five stages of the innovation-decision process, participants in this study described behaviors to support that they have knowledge of blockchain existence and have formed a favorable attitude towards what the innovation can do for their organizations. Evidence of awareness-knowledge and how-
knowledge surfaced in this study through acknowledgment that blockchain innovation exists and participants speculated on how they could use it (Rogers, 2010). Knowledge and attitude about blockchain technology surfaced uncertainty about the technology’s value, which participants are trying to reduce in order to move to the decision to decide to adopt or reject the innovation. No instances of decision, implementation, or confirmation stages of the innovation-decision process were evident by organizations participating in this study. The cumulative evidence suggested that Financial Services organizations might be between the first two phases of the innovation-decision process and are employing strategies to move them to the decision phase.

Some responses in this study suggested that blockchain might be a Discontinuous Technology Change (DTC), which is a phenomenon where a mature industry starts product innovation from new or different technology (Lambe & Spekman, 1997). In this study, some participants speculated that blockchain might affect the infrastructure and has potential to modernize systems. Additional evidence of blockchain potentially being DTC surfaced in the use cases, many of which are associated with core financial services products. Lambe and Spekman (1997) suggest that alliances, collaborative relationships between organizations for a common goal, form when organizations face DTC because of technology urgency, the need to add new skills and to reduce industry uncertainty. Evidence of alliances between the Financial Services organizations and consortiums is strong in this study.

Organizations in this study leveraged the partnerships with alliances such as consortiums as an additional arm of their blockchain evaluation process. This ability to evaluate and use outside knowledge to build on prior knowledge within the organization is the organization’s absorptive capacity (W. Cohen & Levinthal, 1990). Absorptive capacity relies on a pre-existing knowledge base of the potential users, and an organization’s absorptive capacity depends on the
absorptive capacities of the individual members (W. Cohen & Levinthal, 1990). In the organizational context, absorptive capacity is dependent on the organization’s capacity to exploit external information through communication systems and gatekeeping or boundary-spanning roles to monitor the external environment and translate technical information, so it is an understandable internal group (W. Cohen & Levinthal, 1990). In this study, those boundary-spanning roles were mainly in Technology who are serving to bridge blockchain technology in the Financial Services industry and within their organizations.

Gourlay and Pentecost (2002) studied the diffusion of automated teller machines (ATM) in the U.K. Financial Services industry to conclude that internal learning and learning-by-doing are two important factors that play a role in faster diffusion. Evidence from this study supported the cooperative activities between organizations to access the technology and to share skills through consortiums (de Faria, Lima, & Santos, 2010).

According to Rosner (1968), organizational slack helps to determine innovation and can afford organizations to innovate, absorb failures, bear the cost of innovation, and explore the new ideas before they need it. Slack is a pool of resources over the minimum necessary for an organization to produce their standard output (Nohria & Gulati, 1996). In this study, slack resources were observed at large organization in the form of the number of roles that large organizations had involved in the evaluation of blockchain technology when compared to small organizations.

Evidence of network effects, where the value increases as the network increases, was evident in this study as participants indicated that a part of their process to keep up is to look at what use cases other companies are evaluating for blockchain (Rogers, 2010; Saloner & Shepard, 1995). Five participants in the study referenced the adoption of the internet as a parallel to
blockchain and one extended the thought to imply that they view their organization as participating in blockchain in a similar manner to which they leverage the internet to provide services today. Black et al. (2001) studied the adoption of the internet in the Financial Services industry and concluded that it was not a choice but a natural development because organizations redesigned their services to leverage the internet to move customers away from other channels.

The solution matching problem scenario described by participants in this study suggested that some level of the Garbage Can Model of Organizational Choice, the idea that organizations are filled with solutions looking for problems and problems looking for solutions, might be in effect with blockchain technology (M. Cohen et al., 1972). Participants described the use case process as one where they match blockchain solution to business problems within the organization.

The TOE Model provided a useful framework to discuss the results of this study in the context of the technology, organization, and environmental (Tornatzky et al., 1990). Table 9 provides evidence of the TOE descriptions in this study along with the number of references by organization and size. This study was of a single technology across a single industry; therefore, the available technology, industry characteristics, and market structure are constant. Tornatzky et al. (1990) suggest that organizations in the industry face similar technological opportunities; therefore, differences in their adoption decision might be due to organizational factors. Characteristics of the technology mostly surfaced as either positive or negative perceptions of blockchain while a handful of participants mentioned it was internet-like. Galbraith (1973) found that when organizations take on complex information about new technologies, they leveraged strategies to process information rapidly through the structure. Although participants in this study inconsistently characterized linking structures, evidence of informal linking and slack were
present in the form of side investigations, which are individuals or groups that bridge external knowledge about blockchain to internal processes. Organizations in this study have implemented processes to research, monitor, and keep up with blockchain technology. Evidence of slack also surfaced in the differences between large and small organization related to the number of roles and uses cases identified in the evaluation of blockchain. One common characteristic that participants used to describe the industry and link to blockchain was “interconnected.” Most participating organizations in this study delegated technology support and infrastructure to external entities such as consortiums to leverage them as suppliers of skills and labor to explore blockchain (Tornatzky et al., 1990). Tornatzky et al.’s (1990) technology support and infrastructure characteristics also surfaced as the context in the evaluation process of blockchain in financial services, specific to how older industries need new technology for modernization. There was no mention of government context in this study.
Table 9. TOE Model Presence in This Study

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Practical Contribution

The Proof of Value model provides a framework that organizations in other industries, such as healthcare, that are starting to examine blockchain technology can use to develop their strategy. Organizations that are evaluating blockchain technology should look for the side investigations and informal communication structures in their organizations as starting points of collaboration. Organizations should also look for potential partnerships with blockchain consortiums in their industries to collaborate with to explore blockchain technology. A key process in the evaluation of blockchain is the use case identification process, which all
organizations in this study leveraged and organizations in other industries can support and encourage the use case process to ensure that blockchain can meet the organization’s needs.

Organizations with similar industry and technology context can use the results of this study to help them to organize resources and processes to evaluate technology innovation, especially in the early stages when value and participants are not yet clear. Organizations can also benefit from understanding the activities related to proving the value of technology innovation to support more formality and expediency of the process within their innovation practices. Results from this study can be used to recognize and encourage informal innovation evaluation practices, which might help to bridge their organizational awareness of emerging innovation.

Organizations that are evaluating blockchain for potential use, with similar context, can leverage the Proof of Value model to help them engage in activities to gain insights and clarity related to the potential use of blockchain within their businesses. Additionally, organizations facing examination of similar technology in the future could leverage the Proof of Value model to establish processes that support gaining transparency into the value of the new technology for their businesses.

The use cases identified in the results of the study provides insights regarding to how organizations might leverage blockchain in the Financial Services industry. This list is useful to Financial Services organizations planning to evaluate blockchain because they can see and identify potential use cases where they might have similarity with others in the industry. Organizations in other industries may find the use cases valuable for scenarios where they might need to interact with the Financial Services industry’s products and services. For example,
organizations in other industries where authentication is important might use the list to consider how their authentication needs might leverage what is emerging in Financial Services.

**Academic Contribution**

Most innovation literature relies on studies that take a retrospective look at data and case studies to create innovation theory, which does not allow researchers to gain insights into the innovation process as it is occurring. Authors of seminal innovation theories called on researchers to explore this gap in innovation research and to study innovation concurrently as decision-makers are in the process to gain insights into the organization and inter-organizational processes (Rogers, 2010; Tornatzky et al., 1990; Tornatzky & Klein, 1982). Recent authors have also echoed the call for research of innovation during the evaluation process instead of after the adoption or rejection decision is made (Danneels, 2004; Markides, 2006). The gap in existing literature was underscored by a meta-analysis published in the January 2018 edition of *The Journal of Product Innovation Management*, which called for more evidenced-based research related to innovation (Hopp et al., 2018). This study filled some of that gap because it explored the innovation evaluation process prior to organizations making a decision to adopt or reject it.

This study contributed more details into processes and considerations organizations made as they moved between the first three stages of the innovation-decision making model supplied by Rogers (2010). The Proof of Value model serves as a parallel and in-depth view of the organization and intra-organization processes as they acquire knowledge, develop an attitude, and identify value in order to move to the decision stage of the Diffusion of Innovations theory. The Proof of Value model fits between the persuasion and decision in stages decision-making process of the Diffusion of Innovations theory to help explain some of the activities occurring as organizations move toward making a decision.
This study offered an in-depth perspective into the core behaviors which are happening during the decision-making process proposed by Tornatzky et al. (1990) because it validates that the first two behaviors—define the problem and search for solutions—may not happen before organizations start choosing among alternatives. The decision-making paradigm in this study supports that organizations have chosen blockchain as the solution and decision-makers are working through the process to identify problems to match to the solution and contributes to knowledge related the Garbage Can Model of Organizational Choice (W. Cohen & Levinthal, 1990).

Danneels (2004) offered a research agenda to inspire research to understand the nature and effects of technological change and to clarify understanding of disruptive technology. Danneels (2004) hopes researchers can help to address a question of “whether technology is inherently disruptive or if ‘disruptiveness’ is a function of the perspective of the companies subject to it” (p. 247). The proposed research agenda called for further insights into how technological change affects organizations and industries, how potentially disruptive technology is spotted in the early stage, and how resource acquisitions (i.e., alliances) affect incumbents. Markides (2006) also surfaced challenges to prevailing literature that incumbent firms must exploit technological innovation by suggesting alternative approaches, including investing in traditional ways to remain competitive. This study outlined some of the ways technological change is affecting organizations in the Financial Services industry and gave an account of how these organizations are allocating resources in the early stages of innovation evaluation. This study captured perceptions and characteristics of blockchain technology; however, it might be too soon to conclude that blockchain is a disruptive technology in the Financial Services industry.
so the attributes and details of organizational processes could be analyzed if blockchain is ever accepted as disruptive.

**Limitations**

The sample size in this research could pose a limitation, especially when compared to general research studies using other methodologies. A sample size of n = 12 was conducive saturation of the model in this research and a survey of Information Systems focused grounded theory studies supports a sample size of n = 12 because theoretical saturation was achieved with between 2 and 17 organizations and up to 19 individuals (Kesseler, 2008; Nasirin & Birks, 2003; Orlikowski, 1993; Tschang, 2007).

This study suggested organizational implications from interviews with participants at organizations. Although organizational structure may emerge from patterns of informal and structured individual behaviors (Brass, 1984), diverse perspective in this study was based on the limited number of individuals involved in the evaluation of blockchain at financial services organizations and the side investigations and informal processes that emerged during the study. Organizational inferences based on the narrow depth of individual participants is a limitation of the study.

This study leveraged insights from technology providers and financial institutions in the Financial Services industry but no link could be established between providers and institutions. One potential limitation is that the perspectives of each group might be limited to their interactions and activities with the other, therefore providing a narrow understanding of the evaluation process. For example, if the technology providers in this study are supplying blockchain technology the the financial institutions in this study, then together, their perceptions may be limited to their realationships with each other.
This study focused on a group of organizations within the Financial Services industry, which is only one industry evaluating blockchain technology. It is possible that nuances of the Financial Services industry related to how they evaluate technological innovation may limit the generalizable reach of the Proof of Value model into other industries with different characteristics. Since there was no evidence of blockchain technology implementation in the Financial Services industry, the results of the Proof of Value model cannot be leveraged to draw conclusions about potential adoption of technology innovation.

**Future Research**

Opportunities for future research exist to go deeper into organizational processes to examine blockchain, go across industries to compare how other industries are exploring, and to extend the analysis of the evaluation process to draw conclusions and predictions about technology adoption potential. Also, greater analysis of the data in this study could develop tools and understanding of the boundary conditions that surfaced in the study.

A case study into one of the participating organizations in this study could help a researcher to gain deeper insights into the mechanics of the evaluation process and to highlight how and when organizations bring additional resources into the evaluation process. The case study could examine strategies for leveraging partnerships and alliances and to define the use case selection.

A comparative research study could examine the similarities and differences of blockchain technology in other industries. The study could also examine whether the Proof of Value model applies to how non-Financial Services organizations evaluate blockchain technology.
A longitudinal study of the organizations in this study could examine where they adopted or rejected blockchain technology and generate insights into the reasons. A study ten years from now could also compare the state of blockchain in the industry to predictions from this study. This study could also be designed to address some literature gaps that Danneels (2004) called for in his research agenda on innovation, especially related to spotting whether an innovation is disruptive and how incumbent organizations react to it.

Future research can develop a quantitative tool to measure the attributes in the Proof of Value model to determine where in the process organizations might be as they evaluate new technology. A research study could look at the data from the perspective of trying to predict whether Financial Services organizations will adopt or reject blockchain technology based on the conditions documented in this study. A quantitative tool could help to confirm that participants move into the decision phase as the next step from the proof of value process.

This study focused on developing a model supported by the saturated categories and concepts to address the research question while another study could examine the extraneous data to determine if there are explanations or opportunity to develop further. Examples of such opportunities are that one organization prioritized blockchain as “high” and about half of the organizations indicated they were using an evaluation process that was different from what they have previously used. Organizations in this research study belonged to two groups; technology providers and financial institutions but compared based on their size in the Financial Services. Opportunities exist to analyze the data based on the organization’s core business model and to compare technology providers to financial institutions to determine if their group perspectives are similar or different.
Conclusions

As industries face new technology and innovation, they must consider ways in which to efficiently explore and to determine whether they can capitalize for use. The process to evaluate innovation is subject to many factors including the type of innovation, organization resources, and processes. Technology innovation is generally complex and may require specific processes and skills to evaluate. In this study, blockchain technology was examined as technology innovation in the Financial Services industry. The study leveraged the grounded theory methodology to acquire data from individuals participating in the evaluation process on behalf of their organizations. The organizational analysis was conducted to discover a Proof of Value model, which summarizes the series of activities that are occurring as organizations transition through the innovation-decision making process. The results of this study are useful to give insights into how a group of organizations in the Financial Services industry is evaluating blockchain to determine whether it will bring value to their organization and the industry. Data in this study is useful for organizations to leverage to understand if they are making decisions regarding similar technology. For the academic community, this study contributes innovation data about organizations, technology, and an industry captured as the innovation is occurring. It also creates opportunities to develop future research surrounding the topic of technological innovation. As organizations face continuous disruption, especially from digital innovation, they must simultaneously innovate to stay relevant and improve ways to meet their customer needs. This study provided insights into practices participating organizations are engaging in and a model that organizations can leverage in the future to support innovation activities.
REFERENCES


APPENDIX A: STUDY INVITATION

To: Potential University of South Florida Doctor of Business Administration Participant

From: Priya Dozier

Re: Pro00033678 Doctoral Study, “Banking on Blockchain”

I am writing you because I am conducting a research study related to the evaluation of blockchain in the financial services industry at the University of South Florida’s Muma College of Business. This study aims to examine how financial services organizations evaluate the potential use of innovation such as blockchain.

You are eligible to participate in this study because of your organization’s active role in financial services industry events related to potential blockchain use. In this study, participants will engage in a 60-minute interview with the principal investigator, Priya Dozier, regarding the process that their organization is using to examine potential uses of blockchain technology. This study aims to develop a theory, model or rich description to explain the evaluation process which organizations use to evaluate innovation. Your participation in this study may contribute to knowledge on how organizations might evaluate innovation and how blockchain technology might be used in the financial services industry. The results of this study will be generalized so no personally identifiable information about you or your company will be shared.

Would you be willing to participate in the study? If so, then please reply to this LinkedIn message with your contact info or contact me at ppersau2@mail.usf.edu if you have questions. If you are not the appropriate contact, will you please let me know who might be?

Thank you in advance for your consideration,

Priya
APPENDIX B: INFORMED CONSENT – NONVERBAL

Informed Consent to Participate in Research Involving Minimal Risk

Pro # 00033678

You are being asked to take part in a research study. Research studies include only people who choose to take part. This document is called an informed consent form. Please read this information carefully and take your time making your decision. Ask the researcher or study staff to discuss this consent form with you, please ask him/her to explain any words or information you do not clearly understand. The nature of the study, risks, inconveniences, discomforts, and other important information about the study are listed below.

We are asking you to take part in a research study called: Banking on Blockchain: A Grounded Theory Study of the Innovation Evaluation Process

The person who is in charge of this research study is Priya Dozier. This person is called the Principal Investigator. However, other research staff may be involved and can act on behalf of the person in charge. She is being guided in this research by Jung Chul Park.

The research will be conducted at any site of your preference or via conference call.

Purpose of the study

The purpose of the study is to gain insights to explain the process by which financial services organizations are evaluating blockchain technology. The study aims to develop a theory, model, or rich description of the evaluation process for innovation based on data gathered during the organizational evaluation phase. The research will be conducted by analyzing blockchain adoption in financial services via academic research, trade journals, and popular press along with gathering insights from individuals within organizations involved in evaluating blockchain technology.
Why are you being asked to take part?

We are asking you to take part in this research study because you work for an organization in the financial service industry which is currently evaluating blockchain technology and meet the following criteria:

- You are an individual taking part in the evaluation process at your organization related to blockchain technology.

- You are employed at a financial services organization operating either as a bank or credit union or a third party technology provider to banks or credit unions.

Multiple individuals from a single organization may be interviewed in order to gain a broader understanding of the process from the organization’s perspective.

Study Procedures:

If you take part in this study, you will be asked to participate in a single, 60-minute interview. During the interview, you will be asked to describe the innovation evaluation process which your organization may use to evaluate blockchain technology, how you are approaching the technology and which elements of blockchain you are examining. Additional questions related to the evaluation of blockchain may be added based on emerging theories from prior interviews. The researcher may contact you with follow-up or clarifying questions via an agreed upon format after the interview has concluded and as is reasonably needed. The expected duration of participation and include the number of visits/sessions, how long it will take to complete procedures. Interviews will take place at a date, time, and place that is convenient for you between January and July of 2018. Advanced notice and this consent form will be provided ahead of scheduling your interview session.

The interviews will be audio recorded, stored, and transcribed by a designated transcriber. Once transcribed, anonymized transcripts of the interview data will be analyzed by the Principal Investigator and another researcher to validate the coding process. These are the only individuals who will have access to the full audio file. During the initial reading and the analysis of transcripts, you may be asked follow-up questions to clarify information you gave during the actual interview.

Names, genders, the age of study participants, and names of past or present employers/organizations will not be included in the analysis or any discussions. A subject identifier will be put in place to anonymize the participants in the analysis. Data will be analyzed in an aggregated manner to ensure anonymity of individuals. In the coding and analysis of the data, a secure, master list will be stored in a separate folder for reference only as needed by the principal investigator only.

Total Number of Participants

About [30] individuals will participate in the study at all sites.
Alternatives / Voluntary Participation / Withdrawal

You do not have to participate in this research study.

You should only take part in this study if you want to volunteer. You should not feel that there is any pressure to take part in the study. You are free to participate in this research or withdraw at any time. There will be no penalty or loss of benefits you are entitled to receive if you stop taking part in this study. Your decision to participate or not to participate will not affect your job status, employment record, employee evaluations, or advancement opportunities.

Benefits

You will receive no benefit by participating in this research study.

Risks or Discomfort

This research is considered to be minimal risk. That means that the risks associated with this study are the same as what you face every day. There are no known additional risks to those who take part in this study.

Compensation

You will receive no payment or other compensation for taking part in this study.

The findings from this research may result in the future development of products that are of commercial value. There are no plans to provide you with financial compensation or for you to share in any profits if this should occur.

Costs

It will not cost you anything to take part in the study.

Privacy and Confidentiality

We will keep your study records private and confidential. Certain people may need to see your study records. Anyone who looks at your records must keep them confidential. These individuals include:

- The research team, including the Principal Investigator, study coordinator, transcriber, coder, dissertation committee and all other research staff.

- Certain government and university people who need to know more about the study, and individuals who provide oversight to ensure that we are doing the study in the right way.

- Any agency of the federal, state, or local government that regulates this research.
• The USF Institutional Review Board (IRB) and related staff who have oversight responsibilities for this study, including staff in USF Research Integrity and Compliance.

We may publish what we learn from this study. If we do, we will not include your name. We will not publish anything that would let people know who you are.

**You can get the answers to your questions, concerns, or complaints**

Research results will be generalized, individual research results will not be disclosed to subjects.

If you have any questions, concerns or complaints about this study, or experience an unanticipated problem, call Priya Dozier at 727-424-4037.

If you have questions about your rights as a participant in this study, or have complaints, concerns or issues you want to discuss with someone outside the research, contact the USF IRB at (813) 974-5638 or by email at RSCH-IRB@usf.edu.

**Consent to Take Part in this Research Study**

I freely give my consent to take part in this study. I understand that by signing this form I am agreeing to take part in research. I have received a copy of this form to take with me.

__________________________________________  ____________
Signature of Person Taking Part in Study  Date

____________________________________
Printed Name of Person Taking Part in Study

**Statement of Person Obtaining Informed Consent**

I have carefully explained to the person taking part in the study what he or she can expect from their participation. I confirm that this research subject speaks the language that was used to explain this research and is receiving an informed consent form in their primary language. This research subject has provided legally effective informed consent.

__________________________________________  ____________
Signature of Person obtaining Informed Consent  Date

____________________________________
Printed Name of Person Obtaining Informed Consent
APPENDIX C: INFORMED CONSENT – VERBAL

Script for Obtaining Verbal Informed Consent

Researchers at the University of South Florida (USF) study many topics. To do this, we need the help of people who agree to take part in a research study. We are asking you to take part in a research study that is called Banking on Blockchain: A Grounded Theory Study of the Innovation Evaluation Process.

The person who is in charge of this research study is Priya Dozier. This person is called the Principal Investigator.

You are being asked to participate because you are an individual taking part in the blockchain evaluation process at your company. The purpose of this study is to gain insights to explain the process by which financial services organizations are evaluating blockchain technology.

If you take part in this study, you will be asked to participate in a single, 60-minute interview. During the interview, you will be asked to describe the innovation evaluation process which your organization may use to evaluate blockchain technology, how you are approaching the technology and which elements of blockchain you are examining. The interviews will be audio recorded, stored, and transcribed by a designated transcriber. Once transcribed, anonymized transcripts will be analyzed by the Principal Investigator and another researcher to validate the coding process. These are the only individuals who will have access to the full audio file. During the initial reading and the analysis of transcripts, you may be asked follow-up questions to clarify information you gave during the actual interview. Names, genders, the age of study participants, and names of past or present employers/organizations will not be included in the analysis or any discussions. A subject identifier will be used to anonymize the participants in the analysis. Data will be analyzed in an aggregated manner to ensure anonymity of individuals. In the coding and analysis of the data, a secure, master list will be stored in a separate folder for reference as needed by the principal investigator only.

You have the alternative to choose not to participate in this research study.
You should only take part in this study if you want to volunteer and should not feel that there is any pressure to take part in the study. You are free to participate in this research or withdraw at any time. There will be no penalty or loss of benefits you are entitled to receive if you stop taking part in this study. Your decision to participate or not to participate will not affect your job status, employment record, employee evaluations, or advancement opportunities.

This research is considered to be minimal risk.

We will not pay you for the time you volunteer while being in this study.

We must keep your study records as confidential as possible. We may publish what we learn from this study. If we do, we will not let anyone know your name. We will not publish anything else that would let people know who you are. However, certain people may need to see your study records. By law, anyone who looks at your records must keep them completely confidential. The only people who will be allowed to see these records are:

- The research team, including the Principal Investigator, study coordinator, transcriber, coder, dissertation committee and all other research staff.
- Certain government and university people who need to know more about the study. For example, individuals who provide oversight on this study may need to look at your records. This is done to make sure that we are doing the study in the right way. They also need to make sure that we are protecting your rights and your safety. These include:
  - The University of South Florida Institutional Review Board (IRB) and the staff that work for the IRB. Other individuals who work for USF that provide other kinds of oversight may also need to look at your records.
  - The Department of Health and Human Services (DHHS).

If you have any questions about this study, you can contact the investigator Priya Dozier at 727-424-4037. If you have questions about your rights as a research participant please contact the USF IRB at (813) 974-5638 or contact by email at RSCH-IRB@usf.edu.

Would you like to participate in this study?
APPENDIX D: INTERVIEW QUESTIONS

Thank you for taking the time to meet with me for this interview.

Confirm job role/title at the organization:

Confirm the company’s revenue (> or < $1B annually):

Confirm the type of company (3rd party/bank or credit union):

Acknowledge that signed consent form was received

Relay purpose of the study: To understand the processes by which existing organizations evaluate technological innovation. For the sake of this study, blockchain is considered technology innovation and the questions are related to the processes which companies are taking to explore, understand and potentially adopt this technology.

Potential Interview Questions

1. Tell me about what attracted your organization to blockchain technology.
2. How did you take action start exploring blockchain?
   a. Probe on prioritization, resources, financial considerations
3. Would you say your organization has a formal or informal process to evaluate blockchain?
   a. Tell me about the steps the organization has used.
   b. Tell me, how did your organization decide on these steps?
   c. How are they similar or different than other evaluation processes you use?
4. Which step would you say your organization is currently in as it relates to evaluating blockchain?
5. How does your org know when it is time to move forward to the next step or activity in evaluating blockchain?
   a. What would you say are some key factors you look for in this transition process?
   b. Probe on prioritization, more resources/players, financial considerations
6. Tell me about some of the intended use case(s) of the blockchain.
   a. How did your organization decide on these?
7. Who is involved in the evaluation and how was that determined?
8. How does your organization keep up and stay relevant to what’s happening with blockchain in financial services?
9. If they have not surfaced or aren’t clear, then ask
   a. What role (if any) do competitors play in the evaluation process?
   b. What role (if any) do existing clients play in the evaluation process?
   c. What role (if any) do existing vendors play in the evaluation process?
Additional questions

- What is the current priority of blockchain in your organization?
- Where do you see blockchain technology 10 years from now in Financial Services?

Thanks again for participating in the study. Confirm that follow-up questions via email would be ok.

Ask if there are others within the organization involved in the evaluation processes who might be good candidates to participate.
APPENDIX E: IRB APPROVAL NOTICE

1/26/2018

Priya Dozier
College of Business Administration
St Petersburg, FL 33701

RE: Expedited Approval for Initial Review
IRB#: Pro00033678
Title: Banking on Blockchain: A Grounded Theory Study of Innovation Evaluation Process

Study Approval Period: 1/26/2018 to 1/26/2019

Dear P. Dozier:

On 1/26/2018, the Institutional Review Board (IRB) reviewed and APPROVED the above application and all documents contained within, including those outlined below.

Approved Item(s):
Protocol Document(s):
Banking on Blockchain_Protocol_v4_012218.docx

Consent/Assent Document(s)*:
Banking on Blockchain_Informed Consent_v2.011418.pdf
Banking on Blockchain_Verbal Consent_v1_012218.docx**

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent documents are valid until the consent document is amended and approved. **Verbal consent is not stamped.

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45CFR46.110 and 21 CFR 56.110. The research proposed in this study is categorized under the following expedited review category:

(6) Collection of data from voice, video, digital, or image recordings made for research purposes.
(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Your study qualifies for a waiver of the requirements for the documentation of informed consent as outlined in the federal regulations at 45CFR46.117(c) which states that an IRB may waive the requirement for the investigator to obtain a signed consent form for some or all subjects if it finds either: (1) That the only record linking the subject and the research would be the consent document and the principal risk would be potential harm resulting from a breach of confidentiality. Each subject will be asked whether the subject wants documentation linking the subject with the research, and the subject's wishes will govern; or (2) That the research presents no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside of the research context. [For verbal consent]

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval via an amendment. Additionally, all unanticipated problems must be reported to the USF IRB within five (5) calendar days.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

[Signature]

John Schinka, Ph.D., Chairperson
USF Institutional Review Board