INVESTIGATING FACTORS RELATED TO FEAR, UNCERTAINTY, AND DOUBT (FUD) IN END-USER CRYPTOCURRENCY BEHAVIOURS

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Abstract

Fear, Uncertainty, and Doubt or FUD, is relatively understudied in relation to cryptocurrency. It is a feeling derived from negative cryptocurrency-related information and it prompts adverse sentiment. This thesis addresses knowledge gaps on FUD by exploring its relationship with trust, and cryptocurrency information-seeking practices. We conducted 23 semi-structured interviews with cryptocurrency adopters and non-adopters to investigate triggers of FUD, FUD-induced behaviours, and how people form trust assessments of cryptocurrency information. Using thematic analysis, we classified FUD triggers found in our data across the personal, societal, and systemic level. Furthermore, we identified how participants make either cursory, extensive, or negative trust assessments of cryptocurrency information using attachment and depth. To illustrate this process, we proposed a model of trust assessment pathways. We then provide four recommendations on combating FUD, and suggest areas of future work.

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Glossary

- **Blockchain** Blockchain is a decentralized, distributed, and public ledger that facilitates the process of recording transactions across a network
- **Cryptocurrency Exchange** A cryptocurrency exchange is a platform where you can buy and sell cryptocurrencies like Bitcoin
- **Decentralization** Decentralization is the process of transporting control and authority from a centralized entity (e.g., an organization) to a dispersed network
- **Digital Wallet** A digital wallet is a financial application or online service that securely stores payment information and passwords
- **FOMO** Short for 'fear of missing out', FOMO refers to an individual's fear that they may be missing out on a potentially lucrative opportunity. It can drive individuals to act impulsively and make emotionally-driven investment decisions
- **FUD** Short for 'fear, uncertainty, and doubt', FUD is a wave of negative sentiment towards cryptocurrencies stemming from cryptocurrency-related information
- **HODL** Short for 'hold on for dear life', HODL is a term used by investors to motivate others not to sell their assets when prices fall
- **Initial Coin Offering** An initial coin offering (ICO) is an event where a company may sell a new cryptocurrency to raise capital
- **Mining** Mining refers to the process of entering new cryptocurrencies into circulation and confirming new transactions on the blockchain
- **Pump and Dump** A pump-and-dump is a deceptive tactic used to artificially inflate the price of a currency using fictitious recommendations. These suggestions are founded on assertions that are untrue, deceptive, or excessively inflated

Chapter 1

Introduction

1.1 Motivation

According to a study done by the billion-dollar cryptocurrency firm Grayscale Investments [41], 55 percent of bitcoin investors claim to have started their investment in 2021. Analysts at Standard Chartered Bank declared that bitcoin could hit \$100,000 in the next 5 years [61]. Billionaires Mike Novogratz, Elon Musk, and Chamath Palipitaya consistently shared their predictions that various cryptocurrencies such as Ether, Dogecoin, and Solana will define the future of peer-to-peer payments, digital currency, and infrastructure [55, 67]. In the midst of heightened discussion in this space, cryptocurrency's price point and public interest also hit an all time high in November 2021. During a period of high living costs, soaring real estate prices, and stagnant wages, primarily young people seemed hopeful. News outlets such as the New Yorker described investing in cryptocurrency or "crypto" as the "the hail mary pass for people who missed the tech boom" [98]. With such melodramatic headlines, it is unsurprising that many people may view cryptocurrencies as a lucrative money-making opportunity. During this time, it was common to see cryptocurrency purchases spearheaded by the fear of missing out – or FOMO for short – where individuals would make impulsive investment decisions to capitalize on upward price volatility [29, 30, 47, 101]. But what happens when the market reverses, and cryptocurrencies aren't doing so well?

In late 2021, cryptocurrency markets started to depreciate [5]. Slowly throughout the course of 2022, they freefalled, with some reducing to a value of next to nothing [43,74]. The downswing stoked feelings of unease in online cryptocurrency spaces. A survey by Bankrate [80] in Fall 2022 found that only about 21% of Americans reportedly felt comfortable investing in cryptocurrency, down by 35% in 2021.

Previous research (e.g. [14, 35, 44, 48, 87, 101]) has typically focused on FOMOrelated perspectives and behaviours when it comes to cryptocurrency investing, but less so on its opposite counterpart – FUD. Short for "fear, uncertainty, and doubt", it is a commonly used term in cryptocurrency communities that refers to information shared to create negative sentiment about specific cryptocurrencies or the ecosystem as a whole. FUD may lead to sell-offs, paused buying, heightened uncertainty, and/or a decrease in purchase intentions [58, 79, 94].

While misinformation is often stated to be the most significant instigator of FUD [1,24], we believe that trust and general information-seeking practices also play an important yet overlooked role. This is because the evaluation of online information credibility is a largely heuristic process that may be influenced by a multitude of trust factors [57]. Our objective is to understand how people trust cryptocurrencies and cryptocurrency information, examine their experiences with FUD, and propose strategies to mitigate gaps in an ethical manner.

1.2 Research Questions

The goals of this study are to determine how people assess and trust information regarding cryptocurrencies and to broadly examine the holistic relationship between trust, cryptocurrency information-seeking practices, and FUD. We also aim to identify and categorize triggers of FUD, then explore what behaviours ensue from those triggers with the goal of improving user experience.

More specifically, we explore the following research questions:

- **RQ1** How do adopters and non-adopters make trust assessments of cryptocurrency information?
- **RQ2** What are triggers of FUD in relation to cryptocurrency and how do these manifest as FUD-induced cryptocurrency behaviours?

To investigate this phenomenon in more detail, we started off by conducting background research into cryptocurrency-related risks, models of trust, and sources of information. We then conducted 23 semi-structured interviews with cryptocurrency adopters and non-adopters regarding their experiences encountering (i.e., reading, hearing about) cryptocurrencies. Using thematic analysis, we were able to pinpoint how people make trust assessments of cryptocurrency information and categorize personal, social, and systemic triggers of FUD. From our results, we then crafted a model of trust assessment pathways to better detail how one's attachment and depth to cryptocurrency information leads to a positive (cursory, extensive) or negative trust assessment.

1.3 Contribution

The main contributions of our study are two-fold:

- 1. To our knowledge, this is the first study to investigate and categorize triggers of FUD for cryptocurrencies, and behaviours that may be induced by FUD. We identify and classify three levels of FUD and discuss their respective categories. Furthermore, we investigate how trust of cryptocurrency information is assessed and established. Relevant previous work on cryptocurrency end-users tends to focus on risk and security perceptions or security management practices, so we aim to fill a knowledge gap on 1) how end-users perceive and trust information on cryptocurrencies, and 2) the development of FUD from cryptocurrency information.
- 2. We summarized numerous relationships between attachment and depth into a table of corresponding positive or negative trust assessments. From these relationships, we created a conceptual model that illustrates the pathways adopters and non-adopters take when forming trust assessments of cryptocurrency information.

1.4 Thesis Outline

In Chapter 2, we review seminal papers and research work on cryptocurrency models of trust, risks, and information-seeking practices among cryptocurrency end-users. Chapter 3 describes our interview study's methodological approach and thematic analysis process. In Chapter 4, we propose our model of trust assessment pathways, followed by a classification of FUD triggers. Lastly, in Chapter 5, we discuss the possible implications of our research, present recommendations to counter FUD, and outline areas for future research.

Chapter 2

Background

The primary focus of our research is on how individuals form trust assessments based on cryptocurrency information and on the effect of fear, uncertainty, and doubt, but the literature in this area is sparse. Therefore, in this chapter, we explore previous research on related aspects of cryptocurrency. In Section 2.1, we outline the fundamentals of popular cryptocurrency technologies, we explore cryptocurrency ideology, and we investigate motivations for cryptocurrency purchase or non-purchase and for adoption. Our second section reviews literature on the most commonly researched aspects of cryptocurrency in the HCI community: trust and risk. Our final section explores the dissemination of cryptocurrency information and misinformation, and explores the impact of online community discussions about cryptocurrency.

2.1 What is Cryptocurrency?

A cryptocurrency is a digital currency that can be used as a medium of exchange, store of value, or unit of account that operates on its own blockchain [17, 64]. A single unit of cryptocurrency, or a coin, can be traded for an agreed-upon value or for a different coin that belongs to another blockchain [4]. It is an alternative form of payment created using cryptography, which makes it almost impossible to counterfeit or double-spend [36]. With cryptocurrency, transactions are verified digitally without the use of banks. Cryptocurrency technologies use a decentralized mechanism to track transactions and create new units rather than having a central body to issue or regulate them. Some benefits of cryptocurrencies include cheaper and quicker money transactions as well as decentralized systems that do not have a single point of failure [91].

Blockchain, a decentralized public ledger maintained by a dispersed network of computers, or nodes, is the foundation for the technology behind several cryptocurrencies [32,82]. As its name suggests, blockchain is a network of interconnected blocks



Figure 2.1: Cryptocurrency transaction process using blockchain. Image source: PwC "Making sense of bitcoin, cryptocurrency, and blockchain" [73]

that are linked into chains and verified by cryptographic proofs [17]. It is responsible for maintaining a public and permanent record of all previously confirmed transactions [3]. A group of transactions (e.g., a cryptocurrency transfer) are contained in each block, and each node of the network has independently validated each transaction. Each node supports the network's operation and security by keeping a copy of the blockchain [73]. Blockchain technology has been designed in a way to make it difficult for third parties to fabricate or tamper with transaction histories. This is because every new block that is created must first be verified by each node before it can be confirmed [17]. The full transaction process is illustrated in Figure 2.1.

2.1.1 Key Cryptocurrencies

Cryptocurrencies have no physical form, are not government-backed, and operate with little technical regulation [91]. They may be obtained through a process called mining, or interested parties may purchase cryptocurrencies from cryptocurrency exchanges or other brokers. In recent years, cryptocurrencies have seen recent rapid growth and widespread market adoption [33]. Once thought of as an individual investment, assets tied to cryptocurrencies have started to appear in the portfolios and trading methods of several hedge funds and asset managers as well [33]. Bitcoin is often credited as being one of the first established cryptocurrencies on an encrypted ledger, circa 2009. As Bitcoin eventually rose in popularity, other cryptocurrencies, often referred to as "alt coins", began emerging around 2011. Many of these alternative coins promised improvements to Bitcoin's design in terms of greater transaction speed, anonymity protections, or other specific purposes [63]. Today, there exists over 3000 cryptocurrencies [64].

Despite the mass proliferation of coins, the top 5 cryptocurrencies represent a majority of total cryptocurrency market capitalization. We review these currencies by order of significance at time of writing below.

Bitcoin: Bitcoin (BTC) is the most popular and widely used cryptocurrency with the highest market capitalization. It was first introduced in a white paper by anonymous creator(s) under the name Satoshi Nakamoto in 2009 [68]. As a decentralized peer-to-peer payment system, Bitcoin offers users the opportunity to have nearly anonymous transactions. When users make a transaction using Bitcoin, a change of ownership over the Bitcoin is sent to a public transaction log, and buyers and sellers are denoted by their digital wallet IDs. Each owner has software keys that only allow for them to have ownership and spend their Bitcoin, very low transaction fees compared to wire transfers, and authentication measures that prevent fraud better than traditional financial institutions [91]. Furthermore, its supply is limited to 21 million Bitcoins, keeping inflation low [13,91]. Bitcoin is often considered to be the least risky and speculative cryptocurrency [5].

Ether: Ether (ETH) was released in 2015 and is the native cryptocurrency of the Ethereum blockchain network. Its original objective was to make the Ethereum platform's operations easier and more profitable. Ether has two main purposes: 1) It can be used as a currency for sending direct peer-to-peer payments without an intermediary, or 2) it can be used to pay fees or "gas" when building decentralized applications on the Ethereum network [12, 64, 77]. Unlike Bitcoin, the total supply of Ether has no absolute limit; instead, it fluctuates and expands based on demand [77].

Binance Coin: Binance Coin (BNB) was launched in 2017 through an initial coin offering (ICO) by leading cryptocurrency exchange Binance¹. It is primarily meant to be used by Binance exchange users for discounted trading fees while using the platform. BNB was initially built on the Ethereum blockchain until it was later swapped out to its own native blockchain, the BNB chain [26]. Each quarter, Binance uses a portion of its earnings to buy back and burn Binance Coins, thereby eradicating them [16]. This procedure reduces the supply of Binance Coin and alters its rarity, which may have an impact on the asset's value.

Tether: Tether (USDT), was first introduced in 2014 by Tether Limited ² to promote virtual circulation of traditional and stable currencies. It is one of the largest stable coins (relatively stable cryptocurrencies often pegged to a commodity) available on the market and enables users to conduct blockchain transactions without the usual volatility and complexity that may be associated with other cryptocurrency transactions. Tether, which purports to be backed by USD reserves and permits dollar-like transactions without a banking relationship, accounts for greater Bitcoin transaction volume than the U.S. dollar (USD) [42].

Ripple: Ripple (XRP) was created in 2011 by founders of fintech company Ripple Labs³. Ripple was created to address inefficiencies in cross-border banking and remittances. This is done by unifying a network of banks and payment providers with a protocol, RippleNet, that can communicate, receive, and send low-cost payments worldwide [62]. Unlike Bitcoin and Ether, Ripple focuses on improving problems in the banking system rather than disrupting traditional finance. Only trusted validators that are typically financial institutions may approve transactions.

2.2 Fear, Uncertainty, and Doubt

Gene Amdahl, a mainframe computer architect and entrepreneur, is credited with popularizing the phrase fear, uncertainty, and doubt (FUD) in the 1980s. He coined

¹Binance: https://binance.com

²Tether: https://tether.to

³Ripple Labs: https://ripple.com

the phrase to describe IBM salespeople's efforts to delegitimize competitors' products by portraying them as unreliable and untrustworthy [1].

Nowadays, the term FUD has typically been co-opted to refer to one of three things in cryptocurrency [24, 27, 69]:

- 1. The act of spreading doubtful or incorrect information about a particular coin, project, or market as a whole in order to create negative perception.
- 2. General scepticism and cynicism towards cryptocurrency as an asset class, as well as any relevant news or events.
- A wave of negative sentiment that spreads among traders and investors when unfavourable news is released or the market is in a strong downward slump [24, 69].

FUD may be considered the polar opposite of FOMO (Fear Of Missing Out). While FOMO affects people on a more personal level because they don't want to lose out on potential advantages, FUD has a more collective effect that spreads uncontrollably, usually via social media. Many people fall prey to FOMO trading while markets are rising, and FUD spreads more quickly when prices are falling [69]. FUD can also be cyclical, as initial price drops may cause investors to panic and sell their holdings, leading to further drops in a currency's value.

Throughout this thesis, we will use a modified version of the third definition outlined above when referring to FUD:

FUD is a wave of negative sentiment towards cryptocurrencies stemming from given cryptocurrency-related information.

Unlike Amdahl, we believe that any form of information may cause FUD regardless of the intent of the person conveying the information. We acknowledge that other definitions are stricter and necessitate intent to mislead. We choose a broad definition to ensure that we account for the various kinds of uncertainties or doubts that may arise in the cryptocurrency world, including ones that are not specifically price-related or caused by deliberate intent. This updated definition also highlights the role that information plays in the development of FUD.

2.2.1 FUD in Other Domains

FUD is not limited to the sphere of cryptocurrency [1, 21, 71]. Below, we explore common instances of FUD observed in other domains.

Technology Marketing

In the domain of technology marketing, FUD is a marketing strategy used by a market leader to counteract a rival's first-to-market advantage. A FUD-inducing campaign typically uses a variety of tactics, such as warnings to customers about the dangers of switching to an unproven new product, a barrage of press releases intended to mislead customers about the benefits of the new product, and benchmark tests that raise concerns about the new product's performance and that are typically biased in favour of the market-dominating firm [71]. A well-planned FUD campaign may persuade individuals that switching technology suppliers is expensive and hazardous, and it can also stop new market entrants from overtaking established companies. However, Egyedi and Hommels [31] investigated FUD tactics and cast doubt on Pfaffenberger's assertion that FUD is deliberate and uses predatory tactics. They argue that existing definitions of FUD do not stress the subjective, perceived character of FUD and that FUD may also be accidental.

Vaccination

Another notable instance of fear, uncertainty, and doubt pertains to hesitations seen during the COVID-19 pandemic, more specifically, concerning newly-developed vaccines. Amidst the COVID-19 pandemic, uncertainty often pertained to 1) an inadequate understanding of vaccination, 2) incomplete or ambiguous information on vaccination, and/or 3) conflicting alternatives [51,86]. FUD that is characterized by anti-vaccination sentiment typically comes from an internal cost-benefit analysis of the tradeoffs between a perceived safe behaviour (inaction) and a potentially dangerous behaviour (vaccination) [21]. FUD regarding vaccination may often encourage people to retreat to the perceived safety of inaction [21]. According to Centola [21], the reason why pervasive doubt works is because it is asymmetrical, favouring one side more than the other. In this case, the spread of misinformation favours those who oppose vaccination while harming public health initiatives.

2.3 Purchase and Non-Purchase Motivations

Liu et al. [56] propose that there are typically two opposing perspectives on cryptocurrency. The first is that the majority of coins represent fraud and have inflated values. The second is that blockchain technology may prove to be a significant breakthrough, and that some coins may be valuable assets that stake a claim to this technology's future. Liu et al.'s proposition is validated by other scholarly work [39,59,72] that often highlights similar user perceptions. In this thesis, we wish to expand on these works and consider wider perspectives of both those who choose and choose not to purchase cryptocurrencies to better understand thought patterns around cryptocurrency purchase and ownership.

People purchase cryptocurrencies for a myriad of reasons. Common ones include technological curiosity, savings protection, payment, and speculative investment [15, 56,72]. Khairuddin et al. [49] found three main user motivations behind buying and using Bitcoins in their user study. They include positive perceptions of Bitcoin's future impact, positive perceptions of personal control over finances, and a positive perception that Bitcoin has real value. These findings align with other studies [17,88] that investigate cryptocurrency purchase motivations as well.

According to Dierksmeier [30], some people buy Bitcoin as a radical departure from the status quo while users of altcoins such as Ripple may prefer distinct incentives such as money transfer efficiencies. Stix [88] observed that owners are typically more risk-tolerant than non-owners. Profit expectations and the conviction that cryptocurrencies provide benefits for payment also had a significant impact on adoption intentions. Additionally, Mattke et al. [64] hypothesized that the use of cryptocurrencies may depend on how an individual perceives that cryptocurrencies fulfill the core functions of money: as a medium of exchange, store of value, and unit of account. If a person sees cryptocurrency as being tied to a function of money, they are more likely to adopt. Furthermore, purchase is not always a requirement for cryptocurrency ownership. Various cryptocurrencies may also be accumulated through mining, or play-to-earn blockchain games such as Axie Infinity [85]. These alternative methods of ownership help make cryptocurrency more accessible for those who see cost, volatility, or risk as barriers. In the case of non-adopters, reasoning for non-purchase has often been documented as being due to skepticism about the value and security of currency, waiting on others to start, fear of fraud, and a lack of awareness of its technological utility [49, 66, 72, 88]. Oftentimes, non-adopters tend to have misconceptions or mental restraints around why they cannot engage with digital currencies [59]. Gao et al. [39] found that non-users of itcoin believed that they were incapable of using it due to a lack of technical knowledge; while conversely, active Bitcoin users were performing transactions despite not being well versed in its function, protocol, or privacy mechanisms. While it may not take an expert to purchase and engage with cryptocurrency, it is not surprising that non-adopters may shy away from owning digital currencies because of technical and usability barriers. Common challenges for first-time users include confusing interface designs of cryptocurrency systems, friction from account verification, unexpected fees, complexity in understanding currencies, and complicated payment processes [38, 84].

2.3.1 Ideology

While ideology may not always be considered an integral factor for cryptocurrency purchase [88], it characterizes some of the motives and incentives of the most early adopters and participants of this space. The act of buying and selling cryptocurrency, Bitcoin in particular, is not merely a financial transaction for many people, it is a form of social, political, and financial activism [49, 50]. This activism is driven by the core belief that Bitcoin protects its users from undue power centralization and unethical governance exhibited by banks and governments. In their original 2009 white paper on Bitcoin, creator Satoshi Nakamoto detailed that the creation of Bitcoin was in response to frustration from having to relinquish control to traditional financial systems. They lamented "the root problem with conventional currencies is all the trust that's required to make it work. The central bank must be trusted not to debase the currency, but the history of fiat currencies is full of breaches of that trust" [68]. Shared grievances have attracted followers from various ideological underpinnings, particularly libertarian and anarchist groups who saw Bitcoin as a means of self-determination from flawed governmental authority [34]. A common defining characteristic among early cryptocurrency users is the saturation of anti-government sentiment ideas. In 1988, Timothy C. May introduced the concept of crypto-anarchism in his Crypto-Anarchist Manifesto [65]. Some of the core beliefs of these adopters include an emphasis on anonymity, anti-surveillance, anti-regulation, freedom of speech, and open/unrestricted money exchange. In 2021, these beliefs still stand, with a poll conducted by Morning Consult finding that similar shares of Democrats and Republicans in the United States favour fewer regulations on cryptocurrency [99]. It seems that regardless of political affiliation, members of several overlapping discourse communities have constructed a notion of freedom and a rejection of undue state interference through the floating signifier "crypto" [45].

These core conclusions – that governments are untrustworthy and that cryptocurrency is immune to government-driven manipulation – are still common among modern enthusiasts. Knittel et al. [50] investigated one of the largest online communities dedicated to Bitcoin discussion, r/bitcoin, and categorized a set of beliefs that appear frequently and dominate discourse in the r/bitcoin subreddit. They were able to identify a prominent ideology dubbed the "True Bitcoiner" belief. This mentality consists of three convictions: 1) that Bitcoin's technology has no risk and does not require trust in external agents, 2) that Bitcoin can save the world from corruption, and 3) that collective accumulation and 'HODL'ing will result in an idealized Bitcoin future that damages institution control and improves income inequality. They concluded that the "True Bitcoiner" ideology persists despite contradictory evidence because it helps participants more easily understand Bitcoin and make decisions by reducing perceived risk and uncertainty in the system.

Cryptocurrency adoption has exploded since 2021 [22], thereby diversifying the demographic of those who engage with cryptocurrencies greatly. While the average Bitcoin and cryptocurrency user may not be as ideologically driven as some of their earliest adopters, this space still attracts many people who use cryptocurrencies to circumvent government control and organize collective action online. Recent examples in 2022 include worldwide cryptocurrency donations made to the Ukrainian war effort and Freedom Convoy advocates in Canada using cryptocurrencies as a discreet funding source [35].

2.4 Adoption

When it comes to digital assets, adoption often refers to the process of a commodity becoming more established and widely utilized. Since its creation, organizations have become more interested in allocating capital to Bitcoin, which has led to increased uptake. The popularity of assets other than Bitcoin further expanded cryptocurrency adoption more broadly. Global adoption peaked in Q2 2021 and has fluctuated since [22]. In 2022, cryptocurrency markets were being described as experiencing a "crypto winter", referring to a poorly performing cryptocurrency market for an extended period of time. Despite markets currently falling, global adoption still remains above 2019 levels before the 2020 bull market run. This is largely due to the prevalence of long-term holders holding on to their cryptocurrency hoping that markets will bounce back [85].

As it stands today, global cryptocurrency adoption is largely being propelled by educated, tech-savvy young people in emerging markets [10, 85]. Blockchain firm Chainalysis created an annual index [22] which measures which countries' population are allocating the biggest share of their money into cryptocurrency. According to their 2022 *Global Crypto Adoption Index*, the top five countries are Vietnam, the Philippines, Ukraine, India, and the United States. Adoption is widely distributed across continents with users in lower and middle income countries turning to cryptocurrency for sending low-fee remittances, and to protect their money from unstable economic conditions at the national level [15]. Cryptocurrency users in these countries also tend to use Bitcoin and stable coins more [22, 30]. There are only two high income countries in the top 20 of the index, the United States and the United Kingdom. This is often attributed to greater stability leading fewer people to consider riskier assets.

Bhimani et al. [15] assessed how development factors at the national level affected cryptocurrency adoption across 137 countries. They discovered that the adoption of cryptocurrencies might have important economic benefits, such as safeguarded property rights, authenticated identification systems, and a decreased risk of corruption. They argued that digital currencies could potentially boost financial inclusion and connect local communities to bigger global markets by permitting simpler access to digital financial commodities and offering everyday services at a lower cost. On the other hand, they found that the absence of standardized transaction systems, poor governance, expensive set-up costs, and a lack of systems expertise are some of the most significant challenges that impede cryptocurrency adoption.

Merchant acceptance has also played a significant role in adoption rates and the perception of cryptocurrencies as a valid medium of exchange [15,75,84]. Companies such as Microsoft and Tesla have authorized cryptocurrencies as a payment option for select goods, and payment processors such as PayPal began offering their customers options to purchase and sell cryptocurrencies in 2020 [11]. As we begin to see greater digital currency permeation in the real world, merchant buy-in is a necessary tool for elevating consumer confidence and trust in cryptocurrencies.

2.5 Models of Trust

Cryptocurrencies were created with the intention of offering a new way to solve trust issues in payment systems and provide reliable records of transactions that are publicly viewable and tamper-proof [64]. When completing internet transactions, trust helps minimize users' feelings of vulnerability, social complexity, and perceived risk [66]. While few trust models have been developed for cryptocurrencies specifically, trust models in e-payment spaces have often been applied to explain how trust in Bitcoin and other cryptocurrencies is established and maintained. Sas and Khairuddin [84] break down models of trust applicable to Bitcoin technology into 3 categories: technological, social, and institutional. Technological trust refers to people's trust in Bitcoin's technology when making transactions or overall security of their coins. Social trust refers to trust developed between Bitcoin stakeholders. Institutional trust refers to governmental trust in Bitcoin technology. They claim that common trust issues among various Bitcoin stakeholders fall into one of these three levels of trust.

One particular model is Toufaily's [89] "integrative model of trust", which takes into account how four core characteristics affect one's trust disposition, risk perception and value perception of cryptocurrencies: 1) individual characteristics, 2) decentralized application (DApp) characteristics, 3) environmental characteristics, and 4) blockchain technology characteristics. This model emphasizes the significance of establishing an end-user trust layer on top of cryptocurrency's inherent "trustless" technical layer in order to foster systemic trust. Other popular trust models include various applications of Venkatesh's [93] "unified theory of acceptance and use of technology model", which is used to evaluate behavioural intention towards cryptocurrencies under the parameters of performance expectancy, effort expectancy, social influence, and facilitating conditions [6,8,13,66,70,75]. Overall, trust models in Bitcoin and other cryptocurrencies tend to indicate they are built on a combination of technical security features and the involvement and support of a wide community of users and stakeholders.

2.6 Risks

Despite the rise of cryptocurrencies as a form of alternative currency, its susceptibility to different sorts of risk has been a major factor in their worsening reputation over the past ten years. Cryptocurrencies are often praised for, and popularized by, their intense security protocols, privacy mechanisms, and "trust-less" operation but they are constantly used for scams, theft, 'pump and dumps', and embezzlement. This has led buyers, regulators, and cryptocurrency supporters to adopt a cautious approach on cryptocurrencies, appreciating their potential as innovative technology while also paying close attention to their weaknesses [23]. We take a closer look at some of the most recognized risks below.

2.6.1 'Pump and Dumps'

A class action lawsuit [28] was filed in January 2022 against famous personalities Kim Kardashian and Floyd Mayweather Jr due to their promotion of the EMAX currency to their followers. EMAX's value increased by over 1000% after receiving celebrity endorsement, and subsequently crashed to an all-time low. Investors claim they were misled into purchasing a pump-and-dump scheme.

The cryptocurrency market has become the newest arena for a type of longstanding fraud that has commonly afflicted the stock market. It's known as a pumpand-dump, where bad actors attempt to make a profit by spreading misinformation or exaggerated statements about a commodity (i.e., a specific cryptocurrency). Xu and Livshits [101] noted that there are three main actors participating in this scheme: a pump organizer (individuals or groups who coordinate the pump-and-dump), pump participants (traders who are the victim of the pump-and-dump), and a pump target exchange. Collective optimism and FOMO on making quick profits may interest potential cryptocurrency investors into joining a pump [48, 76]. Kamps and Kleinberg [48] provide an abstraction and description of three main stages: accumulation, pump, and dump. Firstly, pump organizers will use their insider information to prepurchase a coin for a lower price before they announce it. Next, they will begin spreading exaggerated information in various discussion groups to raise a coin's price (pump), before selling off what they bought to unsuspecting pump participants at the higher price (dump). Due to the absence of regulation in the cryptocurrency market, as well as the ambiguity and technological complexity of cryptocurrencies, they are especially well-suited for pump-and-dump operations [29].

2.6.2 Company Mismanagement

In early March 2014, the world's largest Bitcoin exchange at the time, Mt. Gox, filed for bankruptcy protection in the United States after halting transactions for a month in response to an alleged bug in the Bitcoin software [17]. Today, those missing coins are collectively worth over \$4 billion [30]. The downfall of Mt. Gox was a seminal moment in Bitcoin history, as it revealed the risk that comes with delegating trust of cryptocurrency safekeeping — theft and loss. For people not interested in storage using a local digital wallet, Mt. Gox's closure spurred fear over cryptocurrency purchase and ownership. 2022 saw some of the largest company crashes in the cryptocurrency world to date. FTX, a cryptocurrency exchange worth \$32 billion declared bankruptcy, leaving its list of over a million creditors and thousands of customers with their assets either gone or locked up [43]. Luna, created by Terraform Labs, crashed from a price of \$116 per coin to a fraction of a penny which created a ripple loss effect of approximately \$300 billion across the entire cryptocurrency space [74]. Unlike collapses for major banks, a government will not intervene and bail out cryptocurrency companies or exchanges.

Investors are not well protected when delegating risk management to third party

services. Krombholz et al. [53] found that most of their participants in a survey of 990 cryptocurrency owners used web-hosted tools such as Coinbase to manage the security of their coins. They reported that 22% of their study participants (n = 218) had lost money due to security breaches or other self-induced errors. In their comparison of banking and cryptocurrency management applications, Sai et al. [82] found that traditional banking applications have a lower rate of security vulnerabilities compared to cryptocurrency mobile applications. The most commonly reported issue was insufficient cryptography followed by insecure data storage.

2.6.3 Theft and Scams

Activities such as money laundering, trade in various illegal goods, Bitcoin loss or theft, combined with security exploits, have tarnished the image of Bitcoin with the general public [17]. Certain levels of anonymity afforded by Bitcoin has made it popular as a medium for exchanges involving illicit goods. An analysis by Nicolas Christin [25] estimated that approximately 4.5% - 9% of the Bitcoin economy moved through the original Silk Road website, an online market that facilitated the exchange of illegal goods around the world.

Furthermore, other authors have investigated various Ponzi schemes and scams that have recently taken over the cryptocurrency space [12]. These schemes operate through smart contracts: computer programs which execute using a set of rules coded into the blockchain. This benefits the bad actors who commit these crimes as scams or Ponzi schemes operated through smart contracts allow for organizer anonymity, create a false sense of trustworthiness with investors, and are intervention-proof from authorities such as governments [12]. Examples of fraud and illegal activity with impunity (such as those outlined above) often contribute to uncertainty regarding cryptocurrency's future among the general public. Conversely, Radic et al. [75] found that in countries such as China where regulatory watchdogs provide a clear and robust oversight framework, the negative effect of cryptocurrency-related risks on attitude towards cryptocurrencies is diminished.

Due to the risks that come with cryptocurrency ownership, users must ensure that they are employing proper security practices to secure their coins. In their qualitative

study of cryptocurrency security practices and risk management, Frohlich et al. [37] noted that while all their participants are aware of how crucial it is to keep their cryptocurrency secure, their approaches to doing so vary. Some users prefer to strictly adhere to the maxim of "not your keys, not your crypto" and self-manage, while others completely outsource key management to a custodial wallet or service, where a third-party controls and secures your private keys and funds. They concluded that many cryptocurrency users find key management a burden. Similarly, Mai et al. [59] conducted a user study that helped explain why some users of cryptocurrency tools may fail to secure their digital assets. Oftentimes, those with a poor or flawed understanding of cryptographic keys, anonymity, and fees were more vulnerable to security and privacy risks such as financial loss, fraud, or personal identification. Voskoboinikov et al. [96] found additional user misconceptions of cryptocurrency capabilities in their study, where they found that people thought transactions made using wallets were reversible, cancellable, and free. A lack of awareness on the basics of coin management and security can leave cryptocurrency users more vulnerable to attacks from bad actors.

2.7 Cryptocurrency Information

The cryptocurrency market can be extremely volatile, and is often impacted by the media. In other words, information circulating in cryptocurrency media channels has a significant role in determining the rise and fall of a coin [58]. Information dispersed through news stories, posts, and tweets play an important role in informing the public about the risks and benefits of cryptocurrencies, and the latest developments in the market.

2.7.1 Social Media

While information on cryptocurrencies is available on various media, it is most commonly and frequently accessed through social media platforms. Social media platforms help disseminate news articles by publishers and act as a communal space for informal cryptocurrency discussion. Some of the most popular cryptocurrency news publishers on Twitter by volume are Cointelegraph, CCN, and CoinDesk. Most of the top ranked articles on Twitter have positive attitudes regarding the future potential of cryptocurrency [14]. In their study of online forum posts dedicated to Bitcoin, Mai et al. [60] revealed a positive correlation between optimistic posts and high future Bitcoin prices. They note that the quiet majority, or the 95% of users who contribute less than 40% of all communications, is mostly responsible for the impact of social media on Bitcoin. This is because a larger percentage of community participants choose to consume information provided by other, more "louder", voices and prices fluctuate accordingly. Their findings show that social media sentiment is a significant predictor of Bitcoin price, but not all social media posts have the same influence. The idea that posts differ in influence is noteworthy, as it suggests that in the world of cryptocurrency, some opinions matter more than others.

Recently, social media influencers, celebrities, and other well-known personalities have begun to enter discussions in the cryptocurrency space. This can be seen in the form of independent cryptocurrency promotion (believing that a coin will be the future and promoting it to their followers) or formal promotion (participating in public cryptocurrency discussions or advertisements). Elon Musk, billionaire CEO of SpaceX and Tesla, has been known to make statements about cryptocurrency on social media that can have a significant influence on the market. For example, in December 2020, he tweeted about Bitcoin and the price of the cryptocurrency soared [103]. Following Musk's tweet on Dogecoin in January 2021, Dogecoin's market capitalization surged to \$6.9 billion, an increase of about 86% [35]. However, his tweets can also be unpredictable and he has been known to make controversial statements, which can cause the value of cryptocurrencies to fluctuate either up or down. This highlights the importance of why investors should exercise caution when making investment decisions solely on the statements of any one individual, as it can be extremely risky.

Cryptocurrency Communities

There are many online communities dedicated to cryptocurrencies, where people can discuss the latest news and developments, share information and advice, and connect with others who are interested in cryptocurrencies. Some popular social media communities for cryptocurrencies include Reddit, Telegram, and Twitter [87]. Making sense of information on social media can be challenging due to the technical knowledge needed to comprehend the differences between cryptocurrencies and the fact that information about specific cryptocurrencies might be scarce and dispersed. Therefore, communities can be a great resource for collective sense-making [47], learning about cryptocurrencies and staying up to date with the latest news and trends in the space. Dierksmeier [30] classifies cryptocurrency chat group content into two broad categories: 1) peer-to-peer investment discussion, where traders discuss the benefits and drawbacks of coins and prospective ICOs (initial coin offerings), and 2) 'ideological' bent discussion, focusing on how cryptocurrencies affect society as a whole.

Jahani et al. [47] investigated the extent to which cryptocurrency community discussions build excessive hype versus determine the true value over reasonable interpretations of public information (hype-based versus truth-seeking discussion). Their results indicate that the more serious a discussion on a particular coin is, the more likely the discussion is to serve a truth-seeking role. Their work cautions that not all information disseminated within communities is reliable and accurate. Jahani et al. recommend that people examine the nature of the conversation surrounding a news item to help distinguish between hype, fake news, and similar noise. By doing this, one can filter out substandard news items and encourage those that show signs of collective intelligence [47].

2.7.2 Misinformation

Misinformation about cryptocurrencies can be harmful and lead to misunderstandings and poor decision-making. Misinformation comes in several forms such as fabricated conversation, deception, and non-verifiable information or news. In their analysis of approximately 1.5 million tweets pertaining to cases of misinformation, Aswani et al. [9] found that that tweet emotion and polarity plays a significant role in determining whether shared content is authentic or not.

Some common misconceptions about cryptocurrencies include:

• Cryptocurrencies are anonymous: While it is true that cryptocurrencies offer a higher level of privacy than traditional financial systems, they are not completely anonymous, rather are pseudonymous [7]. Transactions on the blockchain can be traced, and law enforcement agencies have developed methods for tracking and investigating cryptocurrency transactions [23].

• Cryptocurrencies are only used for illegal activities: While it is true that cryptocurrencies have been used for illegal activities, such as money laundering and illegal transactions [25], they are also used for legitimate purposes, such as making payments and transferring money internationally [15,75].

These misconceptions can be spread through various channels, including social media, online forums, and traditional media. They can be spread intentionally by those who want to manipulate the market or undermine trust in cryptocurrencies, or unintentionally by those who are not well-informed about the technology.

2.8 Summary

Cryptocurrencies are digital currencies that are secured by blockchain technology and they serve fairly diverse purposes. Conviction in future potential, privacy, and prospective investment value play notable roles in purchase motivations while conversely, a fear of theft or scams, and a lack of clarity on the inherent value of cryptocurrencies may cause someone to forgo purchasing cryptocurrency altogether. Cryptocurrencies have also experienced a fairly large boom in popularity from social media fanfare, online information-sharing, as well as celebrity and influencer endorsement. Previous work on end-user perceptions of cryptocurrency has often focused broadly on issues with usability, risk, or trust. In this thesis, we specifically investigate cryptocurrency information-seeking practices, trust assessment of cryptocurrency information, and causes of cryptocurrency uncertainty.

Chapter 3

Methodology

Our study examines how individuals choose which cryptocurrency information to trust, and noteworthy factors that contribute to the development of a trust assessment. Secondly, we look for potential triggers that stimulate FUD in both cryptocurrency users and non-users. We use a qualitative approach due to a lack of literature on cryptocurrency trust models, cryptocurrency information-seeking practices, and end-user experiences with FUD. We conducted a short survey and semi-structured interviews with people who own cryptocurrency (*adopters*) and people who have never owned cryptocurrency (*non-adopters*) to answer the following research questions:

- **RQ1** How do adopters and non-adopters make trust assessments of cryptocurrency information?
- **RQ2** What are triggers of FUD in relation to cryptocurrency and how do these manifest as FUD-induced cryptocurrency behaviours?

We identify cryptocurrency adopters as people who have recently owned or currently own cryptocurrency. Non-adopters are people who have indicated that they have some or no familiarity with cryptocurrencies and have not owned cryptocurrency before. We included in the non-adopters one individual who owned very little a long time ago and claimed very low engagement. We received ethical clearance for this project from the Carleton University Research Ethics Board B, clearance number 117877.

3.1 Survey Structure

The purpose of our survey was primarily to identify potential individuals for the interviews. We asked whether they were a cryptocurrency adopter, how often they come across cryptocurrency information and why they choose or choose not to engage

with cryptocurrencies. Participants were asked demographic questions such as education level, profession, types and amount of cryptocurrency purchased (if adopter), and questions on self-rated knowledge of cryptocurrency, frequency of cryptocurrency information encounters, and reasoning for purchase/non-purchase. The survey consisted of a mix of single and multiple-answer multiple-choice items and a few openended items to indicate profession or insert "Other" choice text. At the end of the survey we asked respondents to indicate if they wished to participate in an interview. The complete survey is included in Appendix B.

3.2 Interview Structure

Through interviews, we explore how adopters and non-adopters navigate the process of making trust assessments of cryptocurrency information. Additionally, we investigate experiences around encountering cryptocurrency information (through either seeing, reading, or hearing) and learn more about what kinds of information trigger FUD. Our goal is to discover common stages of trust assessment formation and to categorize prevalent triggers of FUD.

During our interviews, we asked questions regarding the following topics and probed deeper as appropriate. Adopters and non-adopters were asked the same questions except for ones on purchasing cryptocurrency. The full interview guides for our study are included in Appendix C.

- General knowledge and perceptions of cryptocurrency: What is your understanding of cryptocurrency? How did you first become aware of cryptocurrency? How do you feel about cryptocurrencies and their associated technology? What are your thoughts on the future potential of cryptocurrencies?
- **Purchasing cryptocurrency (adopters only):** Can you tell us what cryptocurrencies you own? Why? What motivated you to choose to purchase them?
- **Purchasing cryptocurrency (non-adopters only):** Why do you believe people purchase cryptocurrency? Have you ever looked into purchasing a cryptocurrency before?

- Information-seeking practices: Can you tell me about the last time you heard/saw something about cryptocurrency where did you see/hear it? In general, where have you gotten information about cryptocurrency, if at all? When you hear about cryptocurrencies, how do you decide if the details are accurate or if they are misinformation? Has online information ever affected whether you bought a cryptocurrency? In what way?
- **Trust in cryptocurrency information sources:** Self-assessed trust of cryptocurrency information sources (5-point Likert scale). What makes an information source on cryptocurrency trustworthy to you?

3.3 Recruitment

All recruitment materials are included in Appendix A. From August to September 2022, we recruited participants for our survey using Prolific¹, and set our parameters to people residing in the United States or Canada, and people 18 years of age and older only. We used our survey to recruit people who indicated interest in being interviewed in September for a follow-up study. We invited everyone who expressed interest and interviewed all participants who scheduled and showed up for an interview from that pool.

Our interview inclusion criteria was the following: (1) are an adult currently residing in the United States or Canada; (2) are familiar with the concept of cryptocurrencies; (3) have read or heard of at least 1 cryptocurrency-related news piece; (4) are 18 years of age or older; and (5) are capable of participating in the study in English. These requirements were set to ensure that participants were able to hold a somewhat informed conversation on the topic of cryptocurrencies. We invited interview participants with varying levels of cryptocurrency familiarity and knowledge, including both adopters and non-adopters.

¹Prolific: https://www.prolific.co/

3.4 Participants

Demographic characteristics of our survey participants and our interview participants are presented below.

3.4.1 Survey

Non-adopters: We had 92 cryptocurrency non-adopters (48 women, 43 men, 1 non-binary person) respond to our survey. They were between the ages of 19-66 (M = 36.7, SD = 12.9), and varied in education levels from some high school to doctorate degrees. Reported levels of education were: 2% completed some high school (2), 23% completed high school (21), 17% completed college or an associate degree (16), 46% completed a bachelor's degree (42), 9% completed a master's degree (8), 1% completed a doctorate (1), and 1% reported "other" (1).

Adopters: We had 108 adopters (83 men, 24 women, 1 non-binary person), aged between 18-64 (M = 34.6, SD = 11.6). Their education levels ranged from some high school to doctorate degrees. Reported levels of education were: 2% completed some high school (2), 30% completed high school (32), 25% completed college or an associate degree (27), 34% completed a bachelor's degree (37), 5% completed a master's degree (5), 2% completed a doctorate (2), and 3% reported "other" (3).

3.4.2 Interview

From our survey pool, we recruited 23 participants: 18 men (13 adopters, 5 nonadopters), and 5 women (1 adopter, 4 non-adopters). Their ages ranged between 19-57 years (M = 32.3, SD = 12.2), and they varied in education from some high school to doctorate degrees. Reported levels of education were: 3 completed high school, 5 completed college or an associate degree, 11 completed a bachelor's degree, 1 completed a master's degree, 1 completed a doctorate, and 2 reported "other".

3.5 Procedure

3.5.1 Survey

First, we launched a survey on Prolific to source, and verify potential interview participants. It was administered using Qualtrics² and initially pilot tested on a small subset of Prolific users (n = 5). In total, we had 200 people complete the survey. As Prolific is based out of the United Kingdom, compensation was distributed in GBP, however, as their user panel is global, participants may convert earnings to a currency of choice. Participants were compensated £0.75 GBP in exchange for survey completion, which is the equivalent of \$0.88 USD and \$1.18 CAD. On average, surveys took approximately 2.09 minutes to complete.

3.5.2 Interview

84 people indicated interest in participating in the interview portion of the study. 31 of the interested people we contacted signed up for an interview, and after accounting for no-shows, we interviewed a total of 23 people; of which 14 were adopters and 9 were non-adopters.

We held semi-structured interviews over 1-hour video calls. All interviews were conducted online and remotely over Zoom³. Participants were compensated £13.55 GBP (16 USD/21.50 CAD) for their time, and were compensated through Prolific's payment service. Before starting data collection, we actively kept up with developments in news stories on cryptocurrency between May to August 2022 to help prepare us for discussion with high knowledge interview participants as well as to contextualize emerging concepts. Interviews were recorded onto the researcher's personal laptop, then uploaded to a software service for transcription. Audio files were automatically transcribed using Trint⁴. Once they were cleaned and checked for validity, we exported all transcripts to NVivo for analysis.

²Qualtrics: https://www.qualtrics.com

³Zoom: https://zoom.us

⁴Trint: https://trint.com/



Figure 3.1: Snapshot of coding process using NVivo.

3.6 Analysis

Below, we describe the steps we took for coding, categorizing, and analyzing our data. We include visuals of our coding process and themes in Figures 3.1 and 3.2, and our draft model of trust assessment pathways in Figure 3.3. We organized our main themes based on the layers of our model.

3.6.1 Researcher Background

This study's researcher is a Master's student in Human-Computer Interaction with prior background in International Relations. She has an intermediate level of familiarity with cryptocurrencies, having worked with user experience (UX) research teams dedicated to cryptocurrencies in industry and through personal research. For this reason the researcher acknowledges her positionality with respect to the research and has made an effort to maintain a neutral approach to encountering data or perspectives that are different from her own. This study is her first project where she will formally apply thematic analysis principles as a solo researcher. She is cognizant of how one collects their data affects which phenomena they see, how they view them, and what sense they make of them [19].
RQ1 How do adopters and non-adopters make trust assessments of cryptocurrency information?



Figure 3.2: Snapshot of RQ1 theme development process using initial codes.

3.6.2 Thematic Analysis

We chose a Thematic Analysis approach for data analysis. One of the advantages of thematic analysis is that it is a novice-friendly approach for new researchers who are still learning how to examine qualitative data.

We applied an inductive and reflexive approach of Thematic Analysis to investigate and interpret participant perceptions. We modelled our technique after Braun and Clarke's [19] six-step process. Thematic analysis is a flexible approach to qualitative analysis that enables researchers to generate new insights and concepts derived from data. Social scientists frequently use Braun and Clarke's process to comprehend and investigate social processes and develop theories where none previously existed [90]. This made it an ideal method for our research, given the dearth of inquiry into cryptocurrency FUD.

The key phases of thematic analysis are familiarization, coding, generating initial themes, theme development and review, refining themes, and writing [20]. For our study, the primary researcher familiarized themselves with the data by reviewing all transcripts and memos several times to gain a sense of direction with their main observations. Next, the researcher carried out the open coding process independently in order to look for underlying themes and ideas in the dataset. In initial coding, the researcher inductively generated as many codes as possible from early data. Codes were either noted immediately in memos or during the first pass of each transcript in NVivo. Approximately half of all transcripts were coded line-by-line to ensure key data was not overlooked and well captured. This process evolved into a less granular form of open coding for the last half of transcripts once a sufficient level of detailed codes had been generated. The researcher also added or removed codes as needed to adequately capture the interview data after separately reviewing each code. At the end, 411 initial codes had been generated from the data, which were later grouped and organized into categories, then themes. Figure 3.1 provides a snapshot of the coding process in NVivo.

As seen in Figure 3.2, we used Miro's online whiteboard⁵ to help organize codes, categories, and themes during our process of axial coding. Similar categories were

⁵Miro: https://miro.com



Figure 3.3: Preliminary draft of trust assessments model.



Figure 3.4: Snapshot of FUD trigger theme development.

grouped into broader themes (i.e., general distrust) and sub-themes (i.e., need to be wary), with consultation and discussion with the research supervisor. Finally, the researcher conducted a side-by-side analysis of the themes in adopter and non-adopter transcripts, noting key similarities and differences across their observed patterns. We used the results of this analysis as the basis for the creation of a draft model and terminology explaining how participants make trust assessments of cryptocurrency information (see Figure 3.3). Figure 3.4 shows how we also produced nine high-level themes that encompass commonly detected FUD triggers.

Chapter 4

Results

In this chapter, we first present our findings from 200 participants who completed a short survey, which included questions related to cryptocurrency behaviours and perceptions. We then present the bulk of our findings from 23 semi-structured interviews we conducted with cryptocurrency adopters and non-adopters. Our semi-structured interview sessions revealed how participants make trust assessments of cryptocurrency information using attachment, depth, and in some cases, blind trust or mining. We then present a model of trust assessment pathways that illustrates the potential pathways for an individual to establish a cursory, extensive, or negative trust assessment. Finally, we categorize and review personal, social, and systemic triggers of FUD that emerged from our interviews, and discuss FUD-induced behaviours consequent to those triggers.

4.1 General Survey Results

Our survey included questions pertinent to how frequently adopters and non-adopters encounter information on cryptocurrencies, and motivations for cryptocurrency use and non-use. We share the descriptive results of our survey. Direct relationships between survey and interview results may be investigated in a follow-up study or expanded survey.

4.1.1 Non-Adopters

We used a 5-point scale from very poor to very good to evaluate how participants perceived their understanding of cryptocurrencies. Our non-adopter sample (n=92) most commonly reported having a *neither good or bad* understanding of cryptocurrencies (n = 34), followed by *poor* (n = 32).

A majority of non-adopters also disclosed they typically come across cryptocurrency information *once or more a week* (n = 34), as seen in Figure 4.1. Our interview



Figure 4.1: How often *non-adopters* read, hear, or view information on cryptocurrencies.

data indicated that non-adopters frequently encountered cryptocurrency information due to its upward spike in 2021, which resulted in non-adopters passively encountering the information from persistent reporting on numerous media outlets.

Furthermore, our survey asked non-adopter respondents why they chose not to engage with cryptocurrencies by selection relevant factors from a list or adding their own. Non-adopters most frequently indicated *volatility* as their reason for choosing not to engage with cryptocurrencies, followed by *concerns over fraud*, *lack of funds*, and a *lack of regulatory support*; results are presented in see Figure 4.2.

4.1.2 Adopters

On a 5-point scale ranging from very poor to very good, our adopter sample (n=108) most commonly reported having a good understanding of cryptocurrencies (n = 60). They indicated having purchased \$100-\$500 worth of cryptocurrency (n = 31), followed by \$1,001-\$10,000 (n = 23), and \$501-\$1000 (n = 18). Most adopters claimed they purchased cryptocurrency every few months (40). We further asked adopters which platforms they used to purchase cryptocurrencies. The most popular used cryptocurrency exchanges were Coinbase (n = 65), Binance (n = 17), and Crypto.com (n = 14). Other popular means of obtaining cryptocurrency were cash and payment apps (n = 21) and online brokers such as PayPal or CashApp (n = 18).



Figure 4.2: Reasons for cryptocurrency *non-adoption* by survey respondents who have never owned cryptocurrencies. Respondents could select multiple options, or add their own.

Interestingly, Figure 4.3 shows that a majority of adopters also typically come across cryptocurrency information once or more a week (n = 49), further suggesting that frequent media reporting raised awareness for everyone. Furthermore, we asked respondents their purposes for using or engaging with cryptocurrencies. As shown in Figure 4.4, adopters most frequently indicated having cryptocurrency as an *investment*, followed by for *fun*, *trading*, and having an *interest in the technology*.

4.2 Survey results for interview participants

We further summarize survey results for the subset of 23 participants who took part in the subsequent interview.



Figure 4.3: How often *adopters* read, hear, or view information on cryptocurrencies. Respondents selected one of six options.

Most often, non-adopters reported having a *poor* understanding of cryptocurrencies (n = 5). Furthermore, our survey asked non-adopter respondents why they chose not to engage with cryptocurrencies by selecting relevant factors from a list or adding their own. Non-adopters most frequently indicated *volatility* as their reason for choosing not to engage with cryptocurrencies (n = 5).

Most adopters claimed they purchased cryptocurrency every few months (n = 5)and indicated having purchased \$1001-\$10000 worth of cryptocurrency (n = 5). The most commonly used cryptocurrency exchange was *Coinbase* (n = 9). A majority of adopters also typically come across cryptocurrency information once or more a week (n = 6). Furthermore, we asked respondents their purposes for using or engaging with cryptocurrencies. Adopters most frequently indicated having cryptocurrency as an *investment* (n = 11), followed by for *interest in the technology* (n = 7), and *trading* (n = 6).

4.3 Interview Results

Through our interview portion, we sought to principally address our research questions. By having participants narrate what sources they trust for cryptocurrency information and why, we piece together how a trust assessment of information is



Figure 4.4: Reasons for cryptocurrency use by survey respondents who own or have owned cryptocurrencies. Respondents could select multiple options, or add their own.

formed (see Appendix C for questions). We also prompted participants to share concerning news stories they encountered regarding cryptocurrencies, and reasons for general hesitancy in order to better understand FUD, its triggers, and its potential influence on behaviour. Throughout the chapter, adopter interview participants are identified with the notation with A(1-14) and non-adopter interview participants with N(1-9).

4.4 Trust Assessments

Our first research question was "How do adopters and non-adopters make trust assessments of cryptocurrency information?" We identified two primary components that influence how a participant makes trust assessments of new information on cryptocurrency: (1) *attachment*, and (2) *depth*. Additionally, we identified a secondary component that is sometimes connected to attachment, blind trust. Definitions of each component with respect to cryptocurrency information is presented in Table 4.4.

We use the term *trust assessment* to describe a person's positive or negative decision on whether or not they trust given information. We also differentiate between what we deem as a "cursory" trust assessment and an "extensive" trust assessment.

Component	Description
Attachment	Measure of how attached or close an individual is to an information source who owns or has interest in cryptocurrencies.
Depth	Measure of how competent (real or perceived) someone feels in their knowledge or understanding of cryptocurrency information, and their perception of cryptocurrency's future potential.
Blind Trust	Action of trusting information received by a source of attachment (i.e., friends) without verification of accuracy.

Table 4.1: Factors influencing trust assessments.

Trust assessments are subjective and highly influenced by an individual's previous experiences, knowledge, and relationship with the information source [54,57]. Hence, we wish to emphasize that our description of trust assessments is not absolute, but rather a way to orient HCI researchers through the process of how trust and cryptocurrency information intermingle. We explore this topic in more detail below.

4.4.1 Attachment

A participant's propensity to trust new information on cryptocurrency primarily depended on their closeness or "attachment" to the source. When processing trust assessments, adopters often reported that they had started engaging with cryptocurrencies because they received discerningly valuable information from a trustworthy source they considered close to them.

Sources of close attachment observed in our data (listed in order of significance) include:

- (i) peers/friends
- (ii) discussion circles
- (iii) frequented news sites
- (iv) recognized influencer or celebrity

(i) Peers/Friends

The most frequently self-reported trustworthy information sources across both adopters and non-adopters were knowledgeable colleagues, peers, or friends who openly discussed their experiences with cryptocurrency. These sources were often indicated as being our participants' closest information source, with whom they felt the greatest level of attachment. In one question of our interviews, participants were asked to provide a verbal rating on a 5-point Likert scale of much they trusted information or opinions provided by information sources they had encountered. Most adopters and non-adopters gave their peers or friends a rating of 4 or 5 (where 1 = not at alland 5 =completely trustworthy). When probed about why they trusted people in their social circles so heavily, our participants shared that their trust in peers came from trust built over time, and through a variety of information-seeking experiences not exclusive to cryptocurrency. In A6's case, they shared that trust came from long-standing friendship spanning several years: "I know my friends personally, and for years, so I trust them". Others such as A10 indicated awareness of their friends' strengths and knew that they could leverage it, saying: "I do have a friend who is a lot more knowledgeable than me on cryptocurrency. I will try to leverage their knowledge on it". Gathering expert information in an informal way seemed to be another direct benefit of asking peers or friends.

Adopters also discussed partaking in or overhearing peer discussions on cryptocurrencies, plus having friends foster excitement about cryptocurrencies either online or in-person. A6 recalled gaining interest from how "a few years ago, a friend was talking to me about it, and how much he's made from it". Others such as A8 came across cryptocurrency information from friends in a more passive manner: "Occasionally I'll see something on Facebook that a friend will post. If it's a friend that I know and they have some knowledge I'll look into what that person [posts]." Peers or friends also had sway in convincing participants who were on the fence about cryptocurrency adoption to ultimately adopt. A4 mentioned how they had previously looked into bitcoin on their own years ago, but never remained interested enough to continue browsing online discussion forums, follow information on cryptocurrencies, or adopt until their friend spoke positively about bitcoin. They recalled how "a friend of mine was talking about how this bitcoin thing kept going up and up and up in 2017. That's when I decided to figure out what to do and jump in. I think by that time though, it was easier to get into than it was in 2013 when I first heard about it."

It seemed that hearing first-hand experiences and having an easy access to information from friends proved extremely valuable for adopters. Seeing people in their own social circles "be involved" (A11) with cryptocurrencies made the concept appear less foreign, and like something that they themselves could realistically engage with as well. A8 also added how they thought that "friends are easy to access. Whenever I want to participate in something, I like to get other people's opinions and know about their experiences with it as well."

In the case of non-adopters, we found peer endorsement to be just as important for trust, and that non-adoption was often a result of reduced exposure to cryptocurrency in one's social circles. While some like N6 claimed that they 'trust their friends' opinions and take them into account" on a general level, others like N7 and N9 specified that they would consider cryptocurrencies more heavily if someone close recommended purchasing them. For example N7 noted they would "prefer something that would be on a more personal level. If people I knew and trusted were investing in cryptocurrency, that would actually hold a lot more weight to me than a celebrity [because] I don't really know what their angle is or where they might go in the future." Similarly, N9 said they "would certainly consider it and feel a lot more comfortable about it if [their financial advisor who is also a friend] recommended it." Furthermore, N5 and N9 emphasized that their lack of interest in cryptocurrency or lack of desire to engage with related information stemmed from poor overall interest within their social circles. They were open to the idea of learning about and potentially adopting cryptocurrency, but having few close sources of attachment prompted them to stay away.

On the other hand, N3 mentioned having several close friends who purchase and post about cryptocurrency on social media, however, this was insufficient to encourage them to look for more information or develop a personal interest.

(ii) Discussion Circles

From participant testimony, it was evident that the COVID-19 pandemic had fostered increased publicity to cryptocurrencies and their high valuations. While adopters had always seemingly remained updated on cryptocurrency news and recent developments, we observed that non-adopters were also remaining somewhat informed on cryptocurrency markets through their social networks. N3 described how "during the whole pandemic everyone was talking about the crypto market, talking about which ones to invest in and all that. And people are saying, 'oh, this company is going up' or 'this one'."

Many of our adopter participants seemed likely to trust information gathered from social media. A few claimed that they felt clickbait was relatively obvious to spot and avoid, and that they did not feel threatened by it. Some noted this was because clickbait was typically characterized by overly-biased reporting and poorly designed website interfaces. Certain sites like Twitter or Discord were considered great places to get quick information "because there is a huge crypto community there" (A4). Due to a perceived proliferation of informed users or well-regarded cryptocurrency pundits in these spaces, many adopters considered social media a viable source for information-seeking.

Non-adopters also thought that online discussions or social media comment threads gave them more nuanced and insight regarding cryptocurrency information than news articles alone. N9 commented on how back and forth discussion from readers helped information seem more trustworthy if internet strangers could vouch for it:

N9: "You can actually read a decent discussion about something if you go to the Washington Post site or the Los Angeles Times site or the New York Times site. You can get some comments that are a little bit more serious from people that know more about what they're talking about."

Despite some non-adopters stating appreciation for community input and opinion, they reported less trust in information encountered on social media channels, and explained that they "probably wouldn't use it" if they were "actually trying to research" cryptocurrencies (N3). A few non-adopters preferred to initially learn about cryptocurrencies using more traditional news sources.

(iii) Frequented News Sites

Participants reported having go-to trusted sources of information that they would typically frequent. Once they found a few sources they preferred and had chosen to trust, participants tended to return to those sources or "bookmark [them] for future use" (A8) for all their information because they had built perceived attachment to the source over time. Returning to news sources for whom they had built attachment appeared to diminish the cognitive load of having to vet and establish new trust assessments every time a unique source was used.

When asked why they would trust information they encountered in online publications, participants listed information objectivity, multiple reports, author credibility, and quality of writing as notable factors. Information perceived as "neutral" or unbiased put them "more at ease" (N7). The desire for objective sources may arise from the prevalence of sensationalist news headlines frequently used to report cryptocurrencies, and both adopters and non-adopters preferred more nuanced perspectives.

Cryptocurrency information found in online publications was often regarded as being very trustworthy, especially when compared to other sources such as social media. This may stem from the belief that most reputable online publications are known to do their due diligence and verify information before disseminating it widely. Some participants such as A2 expressed complete faith in well-regarded news broadcasting companies and said "If it's on the news, then I would be like, 'yeah, that's most likely true'." A8 shared similar faith when explaining how they "really don't think The Times, the Wall Street Journal, or Forbes are going to be spreading misinformation". Others, such as A4, indicated that they felt as if they never encountered false or non-credible reporting and that "there's never been misleading – or very seldom – is there misleading information." They were fairly confident that misinformation or news accuracy was not a concern for their information-seeking practices.

(iv) Influencers and Celebrities

Both adopters and non-adopters had mixed opinions when it came to celebrity ownership and impact. Some participants such as A14, A10, and N7 were open to the idea of listening to informed influencers with a background in cryptocurrency publicly share their opinions and investment advice. If an influencer was recognizable and appeared in a participant's designated feeds, their perceived attachment could "sway" (A14, N7) their impression. A14 said examples such as "if they had the credentials in that already, and are successful, they know the technology, they talk about a token, they talk about a new update" could impact their opinion. N7 said they would trust an influencer if "they were an expert in their field and their background supported their claims and especially if they were as neutral as possible. You know, not particularly trying to push something for their game, but rather it's just something that they happen to know a lot about and they can express that eloquently." A10 supported their thinking and concluded "to have people outside of that sphere give their opinion, always feels sort of disingenuous to me."

Additionally, both adopters and non-adopters held a negative impression of entertainment celebrities speaking on cryptocurrencies. A4 said that celebrity involvement "cheapened the space" and that excessive promotion usually foreshadowed that "the market is going to go down" and a coin's value will drop. They perceived that celebrities promoted less stable currencies which would then over-inflate their values and cause overall market volatility. Others such as N6 perceived celebrity endorsements as self-serving and not in the best interests of the average investor by commenting "I'm more inclined to believe that they're just doing whatever makes them appear better and more attractive to potential clients or customers. They're just saying whatever they can to convince someone to buy it. So there's not really that much credibility there." Because they were often compensated or incentivized for cryptocurrency promotion, entertainment celebrities' opinions were typically dismissed.

At a lesser level, we found that public figures, namely extremely wealthy ones, played a significant role in cryptocurrency perception. Billionaire Elon Musk was frequently brought up as an influential figurehead in cryptocurrency markets. Several adopters (A14, A2) and non-adopters (N3, N4, N9) mentioned his influence in the space, for example, N3 described how they found him to be a relatively credible source because someone in his position had a reputation to uphold, saying "I wouldn't see it as something that's like trying to have me scammed, because I don't think someone like Elon Musk would put themselves in a position like that." Some adopters even said that they invested in the coins he advocated for on Twitter, as they were confident it would nearly guarantee profit generation. Specifically, A2 had quite a lot to share on how Elon Musk persuaded them to develop an interest in cryptocurrencies:

A2: "I was talking to this one friend and he was like 'right when Elon Musk sent out this tweet, this coin went up insane amounts'. And so through that, I got into it [...] Elon Musk's tweets have such a big impact on whether something does good or not. Guess that's pretty off-putting as well. That should not be the case. But it is. One man holding so much power to change the economy with a single tweet [...] That's what made me buy Shiba. I figured anything he would tweet about would go up. So I put some money into there and it worked."

Elon Musk was already frequently mentioned in general news media, therefore when his attention turned to cryptocurrencies, his speculations received wide media coverage as well. Some of our participants' positive impressions of celebrities may come from *parasocial relationships* they have developed with them over time. Unlike relationships with peers that are "real" and two-sided, participants may have a perceived close attachment with someone that is entirely one-sided. A parasocial relationship it seems, is enough to warrant a certain level of trust with a public figure and heed their advice.

Blind Trust

Among adopters, we also noticed a pattern of behaviour we label as "blind trust". Blind trust is when someone consumes information from a source of attachment without following up on the accuracy of the given information (e.g., by checking online news sources). This can also be seen as delegating trust, where people choose a source to trust, and then pass on information verification to that source. For example, A10 described that they trusted their friends, and that they don't generally see a need to follow up as their friends are known for doing intensive research. Similarly, A8 confirmed high trust in certain online publications they had built attachment for, and when asked their thoughts on the accuracy of their information claimed: "I trust those institutions to do their homework". Verifying information from in-person or certain online sources didn't seem to come naturally to our the vast majority of our participants.

A2 also exhibited signs of blind trust, although their motivation seemed to come from a desire to minimize effort, and wanting to defer the mental load of verifying information to others.

A2: "I honestly don't care enough to check it out myself. Social media just comes up or my friends will just happen to tell me. I won't go out of my way looking into this."

A2's primary foray into cryptocurrency adoption rested on blind trust of information from friends and public figures such as Elon Musk. We observed that in some cases such as A2's, attachment on its own potentially leads to blind trust, which often spurs FOMO-investing — quick cryptocurrency adoption in order to take advantage of financial benefits occurring over a short period of time. Solely operating off of blind trust can potentially have serious consequences for adopters, in A4's case, they recalled how they "blew a few grand on some coins that went to zero in the past" because of FOMO.

At the other extreme, some adopters, like A14, indicated that all cryptocurrency information, no matter the source should be taken *"with a grain of salt"*. These adopters showed no sign of blind trust and had extensive trust assessments. Furthermore, we did not observe clear signs of blind trust from our non-adopters.

Summary of Attachment

In summary, our outlined sources of attachment (peers/friends, discussion circles, frequented news sites, influencers and celebrities) were often a participant's most decisive factor for gaining an interest in or purchasing cryptocurrency. High attachment was observed in both adopters and non-adopters, however, no adopters displayed signs of low attachment (barring mining which we will discuss later). Instances of blind trust were observed in adopters with high attachment, who preferred to delegate aspects of information verification. Attachment seemed to help put people at ease regarding cryptocurrency risks; if they see that the people close to them or who they listen to have adopted cryptocurrency, it makes them feel less fearful of the uncertainty that comes with adoption. That being said, there is an inherent risk that comes with sources of attachment. Adopters, and sometimes non-adopters, risk that these sources have ulterior motives or cross purposes that affect their given information. High attachment, at times, may not be in the best interest of the information consumer.

4.4.2 Depth

A participant's propensity to trust new information, in many instances, was also impacted by how competent they perceived themselves in their knowledge or understanding of cryptocurrency information, and of their conviction in cryptocurrency's future potential. We simplify this description by referring to it as one's "depth" of cryptocurrency competence. When determining trust, adopters often outlined how their knowledge of the cryptocurrency landscape served them well to ascertain information validity and build the "common sense to know what's not kosher" (A10). Sources of depth observed in our data (listed in order of most to least significant) include:

- (i) current knowledge of cryptocurrency
- (ii) immersion in cryptocurrency spaces
- (iii) faith in future potential

(i) Current Knowledge of Cryptocurrency

We found that adopters who had some sort of baseline knowledge of cryptocurrencies or cryptocurrency markets were often more comfortable navigating and making trust assessments of cryptocurrency information they encountered across various outlets. A4 explained their competency by saying that "I wouldn't call myself an expert. I would say my understanding is slightly advanced".

Oftentimes, non-adopters felt like they lacked the expertise to craft an opinion on information they encountered and, in response, tended to display avoidant behaviours towards cryptocurrency information overall. In cases such as N5's, they may find it "daunting going into the whole research of knowing how it works and if it's worth *investing in*" and choose to give up learning entirely. Most non-adopters were insecure over engaging with cryptocurrency information due to low awareness.

Many adopters said they resolved to purchase first, and then fill knowledge gaps over time as they continued to consume more information about cryptocurrency. Some of the main drivers of comfort with less information for adopters was their attachment – they were willing to operate with less depth in hopes they would build up that aspect over time. A8 recalled how they had initially purchased cryptocurrency with the intent that it might "motivate" them "to take some more action at that point" and continue learning, but realized that their current knowledge served their needs enough for now.

It was common for participants from both groups to prefer scanning cryptocurrency information rather than reading it in detail. Scanning allowed people to quickly gather information and obtain a general understanding of a topic without having to spend a lot of time sifting through excess details. This is significant as it shows that people aren't typically looking to breakdown the complexity of cryptocurrency at all times, and can be content with surface-level knowledge. N2 describes how they are satisfied with "following one cryptocurrency-related account, they just put the headlines of the news and I'm like, 'Oh, that's happening'" and that they "don't really get into it and read the whole document". For adopters, scanning was an efficient method for staying updated on the latest information to an extent they perceived as satisfactory. A1 explains how keeping to date with current events met their information needs: "I just follow trends, and how world events or regulations can affect the price or the valuation of cryptocurrency".

(ii) Immersion in Cryptocurrency Spaces

Adopters' depth was also heavily impacted by information gathered through one's immersion and participation within spaces of cryptocurrency discussion. Keeping tabs by means of social media and news stories, or participating in discussion groups was highlighted as a way adopters would immerse themselves within the culture of cryptocurrency. This sense of "community" (A14) helped maintain knowledge of the constantly evolving cryptocurrency landscape. Networks such as Twitter were

found helpful "because you get up-to-the-minute information" – making informationseeking on "the latest news" easier and "quick" (A4). While immersion had a smaller impact on depth as "current knowledge level", they thought it still bolstered one's overall cryptocurrency competency. Immersion in cryptocurrency spaces enable easy knowledge expansion in a passive manner, a preferred information-seeking behaviour as discussed in Section 4.4.2.

On the other hand, non-adopters (excluding N2) did not engage in cryptocurrency immersion. Participants would not intentionally seek cryptocurrency information; rather, it tended to "pop up on my page" (N8) or "on the sidebar" (N7). N7 outlined how cryptocurrency information happened to "be on the periphery of other things I'm looking at". Their indifference ostensibly came from a lack of interest for immersion – if cryptocurrencies had no direct impact on their current day-to-day, then why bother staying updated on a complex and uncertain area?

(iii) Faith in Future Potential

Another notable indicator of depth was related to the strength of one's conviction in the potential and future of cryptocurrency value. For some adopters, this future potential consisted of a full cryptocurrency revolution that would upturn whole financial systems, while for others, it was a more subtle addition to future payment options. Similarly to what was found in the literature review, strong ideology can reinforce one's decision-making for cryptocurrency adoption and continue to keep them invested in the space. For example, A12 described cryptocurrency as "the currency of the future" adding that "I think that someday the U.S. denomination will go away and everybody's just going to use crypto in the future". A4 shared similar predictions by stating "I think in the future, in the next 5 to 10 years, digital currencies will be the standard". However, they emphasized that this prediction was not conjecture and informed by peripheral signals that greater change is to come:

A4: "The Federal Reserve here in the U.S. just announced that they plan to launch their digital currency next year. That's a big thing. I think China has a digital version of their currency that's already in use as well".

Attachment	Depth	Trust Assessment	Assessment Completeness
Low	Low	Negative	Cursory
Low	High		Not observed in our data
High	Low	Positive	Cursory (blind)
High	High	Positive	Extensive
Mining	High	Positive	Extensive

Table 4.2: Summary of potential trust assessments and relationship between attachment and depth.

A4 was evidently paying attention to evolving world events to deepen their depth of cryptocurrencies while also applying new information to reinforce conviction in its potential takeover.

Non-adopters were unlikely to express faith in cryptocurrency as a viable longterm solution; and therefore did not exhibit this aspect of depth in our interviews.

4.5 Relationships between Attachment and Depth

We found that the interplay of attachment and depth laid the foundation for various trust assessments of cryptocurrency information. We outline and summarize all discussed relationships in Table 4.5.

We first discuss the differences in positive (cursory or extensive) and negative trust assessments. We define a *cursory* trust assessment as one where enough trust has been established so that individuals feel comfortable engaging with cryptocurrency information, sometimes adopting cryptocurrencies, or being open to learning more information. An *extensive* trust assessment is a continuation of a cursory one; we define it as coming from a further informed individual, thereby resulting in a more comprehensive trust assessment of cryptocurrency information. This is due to the greater number and comprehensiveness of information sources used to establish the trust assessment.

Finally, negative trust assessments observed in our data typically result in avoidant

and dismissive behaviour concerning cryptocurrency information and cryptocurrencies overall. This happened because an individual is educationally "out of the loop" or has received convincing information that cryptocurrencies are untrustworthy. It is possible that other circumstances may also lead to negative assessments, but these were not observed in our data.

Our outlined aspects of attachment (peers/friends, discussion circles, frequented news sites, influencers and celebrities) were often a participant's most decisive factor for gaining an interest in or purchasing cryptocurrency. Attachment seemed to help put people at ease regarding cryptocurrency risks; if they see that the people close to them or who they listen to have adopted cryptocurrency, it makes them feel less fearful of the uncertainty that comes with adoption. We do not assume that high attachment equates to cryptocurrency adoption, rather, that individuals with high attachment tend to establish a positive cursory trust assessment of cryptocurrency information at minimum. A cursory trust assessment, in turn typically conceives general interest or blind trust (which in some cases leads to FOMO-driven investing).

On the other hand, we found that our aspects of depth (current knowledge of cryptocurrency, immersion in cryptocurrency spaces, and faith in future potential) were not always necessary for establishing a trust assessment. Several participants only exhibited signs of attachment. That being said, participants who exhibited signs of depth were often more informed and performed more extensive trust assessments.

We noted an exception were participants who mined cryptocurrency – they began their journeys through high levels of depth on mining-specific aspects of cryptocurrencies instead. Attachment was not a necessary gateway for miners as it was for other individuals, however, mining was outside the scope of our study so we did not further pursue this line of inquiry.

Many non-adopters displayed signs of low attachment and low depth – resulting in a negative trust assessment. They expressed how they were "still a beginner" (N8), and found cryptocurrencies "baffling", expressing to the interviewer "I wish you could explain it to me" (N9). Usually, a negative trust assessment could be explained by a lack of overall information and exposure – non-adopters faced too many unknowns and did not feel like they were in a position where they could "confidently make that



Figure 4.5: Positive Trust Assessment Pathways of Cryptocurrency Information. Rectangles indicate components or end-states (if faded with dashed border, means outside of study scope).

full judgment call" (N7). In other cases, a negative trust assessment was driven by alarming information of investors *"losing everything"* (N4), which prompted some to feel safer staying away and remaining distrustful.

4.5.1 Proposed Trust Assessment Pathways

Gaining inspiration from the design of trust models previously mentioned [83, 89], we identified trust assessment pathways that combine the components of attachment and depth to explain how cryptocurrency adopters and non-adopters make positive trust assessments of cryptocurrency information. Our proposed model, shown in Figure 4.5, shows how attachment either independently or together with depth leads to an individual trusting (and possibly acting upon) given information. The first component is *attachment*, which is considered most important, as it is often a participant's most decisive factor for gaining an interest in or even purchasing cryptocurrency. For some, attachment may suffice to develop a *cursory trust assessment*, but as we have

found through participant experiences, it may not be enough to develop what we describe as being an *extensive trust assessment*. We observed that attachment on its own may sometimes lead to *blind trust*, which often spurs FOMO-investing – quick cryptocurrency adoption to take advantage of financial benefits occurring over a short period of time.

The second component is *depth*. We did not encounter instances where participants solely had high depth and low attachment with the exception of a few adopters who indicated that they had initially achieved depth through their early experiences with mining cryptocurrencies. We tentatively include this on our model but consider it outside the scope of our study since we did not focus on mining and have relatively little data on miner perspectives.

All adopters indicated signs of attachment, or an amalgamation of attachment and depth. Adopters who exhibited both attachment and depth were often the most knowledgeable and informed on cryptocurrency news and developments; these adopters had trust assessments we label as "extensive".

Non-adopters in our study typically did not possess either attachment or depth, which led to avoidant or apathetic behaviours towards cryptocurrency information. Some non-adopters detailed information-seeking experiences that resulted in negative or weakened attachment and/or depth. This was seen with a few non-adopters such as N8 who reported having done some cryptocurrency research, but never acting on information or developing enough interest to "continue" keeping up with information on cryptocurrencies. We do not reflect negative trust assessments in our model due to limited data.

In summary, our model attempts to visually express how attachment and/or depth may lead to a positive (cursory or extensive) trust assessment of cryptocurrency information. This model is still in its infancy, and may be further iterated upon to refine the interplay between core components.

Category	Applies to
	Non-adopters
• Perceived inadequate knowledge	
• Expected investor profile	
• General confusion	
• Delayed entry	
	Adopters
• Fringe adoption	Non-adopters
• Questionable promoters	
	Adopters
• Price volatility	Non-adopters
• Scams, risks	
• Government intervention or regulation	
	Category Perceived inadequate knowledge Expected investor profile General confusion Delayed entry Fringe adoption Questionable promoters Price volatility Scams, risks Government intervention or regulation

Table 4.3: Three classifications for triggers of FUD

4.6 Triggers of FUD

Participants were asked to detail circumstances under which they didn't feel as comfortable purchasing, maintaining their cryptocurrency, or maintaining overall interest in cryptocurrency. From our analysis, we organize information or sentiments that incites or "triggers" fear, uncertainty, and doubt into three classifications: personal, social, and systemic. At the *personal* level, triggers are the result of internal hesitations and preconceived notions of who or how one should engage with cryptocurrencies. We found that personal triggers largely impacted non-adopters. At the *social* level, triggers arise from an individual's negative perceptions of the cryptocurrency community. Triggers of FUD at the social level may afflict both adopters and non-adopters, but were seemingly most impactful on non-adopters. And finally, at the *systemic* level, triggers are caused by the actions of other actors involved with cryptocurrency. Of the three classifications, systemic triggers were often the most influential on both adopter and non-adopter sentiment.

Each category we identified is outlined in Table 4.3. These triggers were mentioned frequently during our interviews and were determined to be significant. Further description of each category's features are explained in detail below.

4.6.1 Personal

Our data revealed four triggers of FUD at the personal level: perceived inadequate knowledge, expected investor profile, general confusion, and delayed entry. These triggers stem from an individual's hesitations or from pre-conceived notions of who or how one should engage with cryptocurrencies. Personal triggers were found to largely afflict non-adopters and they varied person-by-person. This was because personal triggers often stemmed from idiosyncratic misconceptions on cryptocurrencies. We analyze them in greater detail below.

Perceived Inadequate Knowledge: Many non-adopters mentioned a lack of personal knowledge or research as a barrier to engaging with new information on cryptocurrency. This was typically conveyed by expressing how they lacked enough information to make decisions based off what they saw or heard. However, the meaning and threshold of "enough" was ambiguous. Oftentimes, non-adopters would mention they felt "overwhelmed" (N5, N6) by cryptocurrency information. N6 described how they felt overwhelmed because "there's lots of different information and terms – there's just so much on it that sometimes it's hard to get started to learn more." We heard additional reasons for why participants may have felt this way, including the technicality of the information presented, frequent jargon, and abundance of coins and technology. N7 said they were often hesitant of cryptocurrencies because "their understanding of it is not very great" and how the cryptocurrency community "always seems to sound like you [should already] know what you're talking about."

Expected Investor Profile: Many of our adopter and non-adopter participants held preconceived notions on who they believed should and should not participate in cryptocurrency investment. A few adopters acknowledged that the associated risk is not meant for everyone and that "crypto is kind of a thing where rich people can

afford to lose money on something less stable and more inviting" (A13). A8 added that cryptocurrency investment primarily had benefits for "people who are smart and have good practical business sense and could really get into it and make some money in a way that maybe they might not otherwise be able to", however this description may also be interpreted as investor hubris.

In some cases, non-adopters conveyed that their reasoning for staying away from cryptocurrencies was tied to their mental image of the typical cryptocurrency investor. Investors were described as being smart, wealthy, or technically-informed – a profile some thought did not exactly suit themselves. This mental image would incite FUD for individuals who felt out of the loop on how to make the most out of cryptocurrency investing. For example, N7 claimed they "don't know" much about personally investing in cryptocurrency but supposed investment would be fine "if it's something where you're a bit of an expert and perhaps if you went in really confident and knowing what you're investing in". Safety was also a concern for non-adopters, as they believed that the everyday investor had much more to lose than wealthier investors: "It's mainly only something that like rich people can invest in safely without worrying about using their entire life savings for anything." (N4).

General Confusion: Oftentimes, non-adopters claimed that feelings of FUD regarding cryptocurrencies originated from general confusion regarding what cryptocurrencies are, how they operate, and what their blanket purpose is. On occasion, cryptocurrency information would reportedly "raise more questions than answers" (N7) for some. N5 reported being extremely confused whenever they would try to read cryptocurrency information shared by friends: "I see people post stuff online to read a little bit about it. So I actually went to [a page] and read some of the stuff. It was confusing, you know? I mean to me, I found it confusing." N7 added that "it just all seems too vague for my tastes" and outlined how seeing "more concrete examples of why it's a good thing" would be helpful for them to understand the hype behind cryptocurrencies better. **Delayed Entry:** Personal FUD also seemed to develop among non-adopters due to the timing of an individual's interest in cryptocurrencies or entry into the market. In 2021, several cryptocurrencies had reached their all-time high value, and had only dropped slightly during the course of this study's data collection (2022). Many non-adopters expressed that they would have more interest had they invested or kept up with the cryptocurrency space earlier. A delayed entry seemed to present drawbacks in terms of the current value or opportunities that could be extracted from cryptocurrencies. N4 recalled feeling like they had missed out when they had "heard stories about people buying Bitcoin when it first came out and now having hundreds of thousands of dollars because they invested so much in it early when it was not expensive to buy any." Similarly, N3 felt like they should have bought "some years ago when Bitcoin's value boosted" and recalled thinking "Oh damn, I wish I bought Bitcoin back then".

4.6.2 Social

Our data revealed two triggers of FUD at the social level: fringe adoption, and questionable promoters. Social triggers arise from one's hesitations concerning the wider cryptocurrency community. Examples of actions exhibited by the cryptocurrency community that incite FUD and raise suspicion may include excessive coin and exchange promotion, the prevalence of day-trading, and a lack of every-day use cases. These triggers may afflict both adopters and non-adopters, but affect non-adopters more strongly.

Fringe Adoption: Our non-adopter participants alluded that one cause of their hesitations with cryptocurrencies arose from a perception that cryptocurrencies have not yet reached mainstream adoption. Through casual observation, the immediate value of cryptocurrency was not apparent to them, and it seemingly needed to reach a threshold or *"tipping point"* (N1) where it is considered viable for payment to seem more enticing. That threshold was typically described as cryptocurrencies being used for day-to-day use. Some examples we heard were:

N5: "It hasn't reached that point where it's like money where, you can actually buy cryptocurrencies to pay for your groceries or your goods."

and

N8: "If I were to see more people or more stories of people actually using it in their everyday lives, that could provide more of an incentive for me to look into it."

Questionable Promoters: Another determinant of social FUD, albeit unintentional, was hearing from vocal and biased proponents of cryptocurrency who promoted it in such a way that was reminiscent of a sales pitch. Their fervent demeanor would often raise suspicion about certain coins or the cryptocurrency community overall. It seemingly spurred FUD for non-adopters more than adopters, perhaps because it was something that adopters had learned to ignore.

A14 explained how most informed adopters notice excessive promotion frequently, but know to be wary as promoters have a personal agenda: "Everybody knows people who say they're in the ecosystem for the technology or are already rich and are promoting their own token. I'm not saying that the technology is not good, but everybody who says something like 'Oh, this is going to be super good for the technology' is trying to promote their token to get people to buy it so they make money."

Similar, non-adopters acknowledged and took note of promoters' personal "motives to get you to invest and buy the product" and that they largely distrusted them because "they just say whatever you need or want to hear in order to achieve that" (N6). N1 outlined how their doubts came from "people promoting the potential of it" and unsubstantiated claims on future cryptocurrency value, rather than current benefits that could be derived from using cryptocurrency.

4.6.3 Systemic

Lastly, our data revealed three triggers of FUD at the systemic level: price volatility, scams, risks, and government intervention or regulation. Systemic triggers are generated from actions caused by cryptocurrency actors. While some of these actions are visibly malicious (e.g., scams and risks), others such as government intervention or regulation may be well-intentioned but still trigger FUD among proponents of decentralization. Systemic triggers were noted as the most broadly influential triggers of negative cryptocurrency sentiment among both adopters and non-adopters.

Price Volatility: The volatility of the cryptocurrency market can often be a cause for concern and apprehension. The prices of cryptocurrencies may fluctuate wildly, making it difficult for investors or traders to predict their value and make informed decisions. Adopters had seemingly became accustomed to volatility over time and were prepared to manage their emotions during periods of fluctuation. A12 states, *"it's just like the stock market crashes, it will go back up"*. They later explain that it is crucial to sit on those feelings of hesitancy as market adjustments are normal, and sizeable drops are to be expected.

However for non-adopters, information regarding volatility felt more concerning. Participants shared worries like "you could lose a lot of money if you do invest in crypto" (N4) and "they can invest a good amount of money and they can lose it the next day. So that means not much protection as well. As I said, it's kind of risky to go invest in it." (N5)

Scams, Risks: Throughout our interviews, we heard frequent mention of negative sentiment concerning cryptocurrency scams, or risks from nearly all of our participants, regardless of adopter or non-adopter status. However, the two groups differed in how they interpreted and were affected by scam and risk-related information on cryptocurrencies.

Adopters recalled instances of scam or risk-related news they had heard about but noted how they were ultimately not affected and continued to maintain their longterm faith in cryptocurrency. Stories of malicious cryptocurrency actors were clearly expressed as downsides for adopters, but not as a deterrent to owning or obtaining more cryptocurrencies. A6 explains how there are many visibly dubious participants in cryptocurrency communities: "I've seen plenty of suspicious people, especially people they're always like making it sound like something is going to $100 \times$ soon and you've got to get in on this. A lot of people that basically just scam stuff. There's a lot of sketchy people." Non-adopters tended to qualify their uncertainty over cryptocurrency with mention of stories they encountered of cryptocurrency scams and risks. N3 detailed their discomfort arising from "multiple news of like smaller startup cryptocurrencies that have just scammed their investors and all that". Constant news reporting of cryptocurrency scams and risks was considered a sufficient disincentive to deter nonadopters from investing.

Government Intervention or Regulation: A defining characteristic of cryptocurrencies that was conveyed by many participants was how cryptocurrencies seemed to operate "above" (A13) or outside government confines. News stories concerning government intervention or regulation triggered FUD for different reasons among adopters and non-adopters.

For adopters, we observed that stories of heightened regulation would stir fear as it negates the concept of decentralization - a core tenet of cryptocurrency. There were also adopters who were unsettled by news on regulation because of perceived negative market effects. A3 described their fears regarding how regulation could affect the value of their cryptocurrency holdings: "newspaper [articles] about regulation would make me concerned because the value would not be as high if it's restricted in a certain place. When people have less access to a cryptocurrency the value will decrease because less companies are going to be supporting it if it's not a popular cryptocurrency."

Conversely, non-adopters reported how a lack of government intervention in protecting their investments seemed concerning and prompted them to avoid cryptocurrencies overall.

4.7 FUD-induced Behaviours

From our results, we identified three common behavioural responses that arose when adopters and non-adopters felt FUD. In the case of adopters, we found that they either stopped keeping up with cryptocurrency markets or in more extreme cases, would panic-sell their cryptocurrencies in response to falling markets or negative news stories. A1 mentioned how they had lost access to their cryptocurrency that was not stored locally due to the bankruptcy of the Celsius Network [100]. Afterwards, A1 said they stopped engaging with cryptocurrency markets until their value looked more promising. In the case of non-adopters, many participants mentioned ceasing their interest in cryptocurrencies or discontinuing cryptocurrency research they were in the midst of conducting in response to negative news or sentiment. We review and discuss examples of these actions in more detail below.

4.7.1 Adopters

Keeping information "out of sight, out of mind"

Adopters sometimes said they avoided checking the value of their cryptocurrency holdings, participating in discussion circles, or following cryptocurrency news stories when facing systemic FUD. A6 noted how "with the recent crash that started happening I stopped looking for months now... so I haven't been keeping up." A2 and A6 downplayed their avoidant behaviour by explaining they have confidence in cryptocurrency for the long-term, therefore their action of avoiding markets for a while shouldn't be interpreted as a significant deal. A6 explained that "[while it] feels pretty bad, I just try not to look much for a while. Basically, in the end I just treat it like a savings account anyways, so I'm not too worried about it. In the short term I know I'm confident it will eventually go back up. So I just try not to look at it much." In A2's case, they described how they similarly dismiss uncertainty with hopes that their holdings will return to the same value or higher: "I lose some money, but I don't have too much in there. In terms of like how I feel – I don't really care too much about it. I feel like at one point it will probably go back up."

Selling cryptocurrency

For some adopters who didn't describe themselves as long-term cryptocurrency investors, FUD concerning extreme market dips sometimes resulted in a full withdrawal of investment. FUD during a past cryptocurrency market crash had scared them into panic-selling or *"moving off a platform"* (A10) until they had ultimately *"waited out the storm"* (A9) and became confident again to re-purchase.

N2 (a non-adopter who had once owned cryptocurrency) had a similar experience, but decided that the stress of volatility was ultimately not worth it to re-purchase. They recalled: "In 2021 it crashed in half. And then I kind of thought this is too stressful. I decided to sell everything. Then I decided not to look again and take my time now because I had so much stress on that."

4.7.2 Non-adopters

Ceasing interest or research on cryptocurrencies

To re-affirm their choice not to adopt, non-adopters frequently mentioned feeling glad they had never participated in cryptocurrency ownership when speaking about negative cryptocurrency information. Rapidly rising markets sometimes piqued their interest, but down markets typically caused fear. Said fear resulted in non-adopters either ceasing ongoing research on cryptocurrencies (N8) or ceasing overall interest (N3, N5, N6, N7, N9). For example, N9 and N2 divulged that downward volatility or negative news stories led to internal and external apathy: they either personally stopped caring about cryptocurrency information or stopped seeing cryptocurrency information pop up on their social media or news feeds as frequently. For example, N9 shared how "now I don't think too much about it. It's interesting, but it's not something that that I follow really unless something comes on the news about it." Similarly, N2 "hadn't followed cryptocurrencies since last year... but I still read if there is a paper with something interesting happening".

4.8 Summary of Study Findings

In this study we were able to identify the role and impact of factors such as attachment and depth on how a person navigates making trust assessments regarding cryptocurrency information. We define and break down these factors, while also introducing the concept of blind trust. We then summarize and visualize our findings into a tentative model. Finally, we determine and classify triggers of FUD across the personal, social, and systemic level; accompanied by relevant examples and explanations. An overview of behaviours that may ensue when adopters and non-adopters feel FUD is also presented.

Chapter 5

Discussion and Conclusion

In this chapter, we discuss noteworthy participant observations of how an individual chooses to perceive, trust, and potentially act on cryptocurrency information and we bring forth general perspectives on fear, uncertainty, and doubt. We began our process by completing a literature review on adoption, common purchase motivations, models of trust, risks, and online information spaces associated with cryptocurrencies in order to examine this topic in greater detail. After that, we surveyed 200 people and interviewed a subset of 23 cryptocurrency adopters and non-adopters about their experiences encountering cryptocurrency information or purchasing cryptocurrency (if applicable). Using thematic analysis, we were able to classify FUD triggers found in the data into personal, societal, and systemic levels, and determine their respective levels of significance. Furthermore, we identified how people establish trust assessments of cryptocurrency information using attachment and depth. To illustrate this process, we developed a model of trust assessment pathways that visually express how an individual makes positive (cursory, extensive) or negative trust assessments of cryptocurrency information.

To our knowledge, this is the first study that formally investigates the following: 1) triggers of FUD and behavioural responses that may arise from FUD, and 2) how positive or negative trust assessments are established regarding cryptocurrency information. Therefore, our research provides novel insight into the impact of trust and information on cryptocurrency uncertainty among adopters and non-adopters. We compare our model to similarities found in Riegelsberger et al.'s [78] framework on the mechanics of trust. We also refer to Rehman's [76] taxonomy of cryptocurrency trust issues to review our systemic findings of FUD triggers. We conclude by providing recommendations on combatting FUD along the personal, social, and systemic level and suggest areas where future research can fill gaps or build upon our work.

5.1 Addressing Our Research Questions

We return to our research questions and demonstrate how our study addresses each of them. To re-iterate, our research questions were:

- **RQ1** How do adopters and non-adopters make trust assessments of cryptocurrency information?
- **RQ2** What are triggers of FUD in relation to cryptocurrency and how do these manifest as FUD-induced cryptocurrency behaviours?

5.1.1 Addressing RQ1: Trust Assessment Attributes

From our results, we created a model that details how adopters and non-adopters make trust assessments of cryptocurrency information. The key components of our model, attachment and depth, align closely with attributes identified in Riegelsberger et al.'s [78] framework on the mechanics of trust. Their framework highlights two key properties that warrant trust in another person: contextual and intrinsic properties. Contextual properties encapsulate factors external to an individual, and intrinsic properties encapsulate an individual's internal attributes which can be expressed even in the absence of contextual properties [78,84]. We find contextual properties similar to our component of attachment, where individuals rely on others (close to them) to develop trust in cryptocurrency information. Intrinsic properties align with our component of depth, where individuals rely on their pre-existing knowledge levels instead. Furthermore, we observe that our components align with findings from Kow and Ding's [52] research on bitcoin adoption. They make the case for the importance of social (communal knowledge) and conceptual (personal knowledge) affinities for participation in bitcoin. They argue that while any individual can learn on their own using the Internet, this is an insufficient condition for developing trust in a technology - a communal learning aspect is integral. Additional academic research supports the legitimacy of our outlined components, and we go over these in greater detail below.

Attachment: Sources of attachment varied in terms of impact and importance by participants. Participants relied more heavily on peers and trusted news sources (or

Twitter pundits for some adopters) before turning to discussion circles, influencers, and beyond. The stated importance of attachment highlighted how one's personal social networks can have a profound impact on the perceived usefulness of cryptocurrencies.

Mendoza-Tello et al. [66] have previously identified perceived usefulness as an important indicator of cryptocurrency adoption and trust. In many cases, people may turn to discussion from their social networks to gauge perceived usefulness [66]. Sas and Khairuddin [84] refer to this phenomenon as "social learning", where one leverages the power of social media, peers, and self-guided research to learn about bitcoin. This could be because people perceive their social circle to have their best interests at heart. Furthermore, as we saw in the literature and among our participants, people prefer to leverage online discussion groups or forums for collective sense-making, and to help demystify the complexity of cryptocurrency with other individual investors [50].

We also found that attachment may lead to blind trust for some adopters. While attachment can often be useful, it may also expose individuals to the risks that accompany blind trust – that the provider of said cryptocurrency information is contributing verifiable and reliable information, but this may not necessarily be the case. The source may be uninformed, or deceptive with their offered information (i.e., pump and dumps). We believe that attachment may be extremely helpful to ease one's entry into the cryptocurrency landscape, but should be supported by extensive personal research.

Depth: Depth was found to augment attachment for crafting trust assessments. Depth was perceived as more difficult to achieve for some participants because wading through cryptocurrency's complexity came across as daunting and overwhelming. That being said, participants who had a greater sense of depth crafted extensive trust assessments as opposed to cursory ones. Many adopters who had extensive trust assessments indicated having done personal research before engaging with cryptocurrencies. For example, A6 and A13 mentioned taking their time to research or participate in discussion circles on cryptocurrencies when they first started. This behaviour is similar to bitcoin informants in Kow and Ding's [52] study, where the period of time from users' first bitcoin encounter to when they were ready to engage with
the community ranged from months to more than one year. Furthermore, we found that our participants preferred to delegate some aspects of information-seeking and information clarification to trusted sources. In Frohlich et al.'s [37] work of security management practices, they similarly found that managing cryptocurrencies felt like a burdensome task, and that users would delegate as many oversight responsibilities as possible.

Additionally, the act of maintaining depth was passive. It was common for our participants to prefer scanning information rather than reading it in detail. This is consistent with research on information-seeking – people spend a majority of time looking for material and scanning it, and a minor portion on organizing and processing [18,97]. For adopters, scanning was an efficient way to keep tabs on online discussion groups, and tools such as Twitter were an effective way to do this. However, it is important to note that scanning information can sometimes lead to a superficial understanding of a topic, and it is often necessary to read more in-depth to fully understand a concept or idea, especially one as complex as the cryptocurrency ecosystem. While depth may not be considered necessary by all people to begin engaging with cryptocurrencies, it serves as an important safeguard against misinformation, deception, and other risks.

5.1.2 Addressing RQ2: Personal, Social, and Systemic FUD

Before conducting our research, we were familiar with a number of possible triggers of FUD that have been outlined by members of the cryptocurrency community [1,69]. Notable ones include volatility, scams, and pump and dumps [12,29,33,48,76,92,101]. In our study, we confirm and expand on some of these known triggers and classify them into categories spanning across the personal, social, and systemic level. We think the separation of each of these levels is important, as it helps illustrate that FUD is bred from both external and internal considerations, and that not all FUD creates the same impact.

In the literature, trust issues that are typically highlighted for the cryptocurrency ecosystem pertain to the *systemic* level, such as *transparency*, *privacy*, or *security* [76]. Academic work also tends to focus on perceived risk (one of our systemic triggers) as a guiding point for overall hesitancy concerning cryptocurrency adoption [2,95]. Our work confirms the existence of the systemic triggers found in Rehman et al.'s [76] taxonomy of cryptocurrency trust issues. Specifically, we noted triggers such as *shadow economy*, *constant price manipulations and volatility*, and *regulation*.

We extend the literature by also reporting evidence of *personal* and *social* triggers, creating a classification across all three levels, and distinguishing differences across adopters and non-adopters. We identify personal triggers as an individual's internal hesitations or compartmentalizations of who or how someone should engage with cryptocurrencies and we noted the prevalence of personal triggers among non-adopters following the cryptocurrency market's all-time market high in 2021. We define social triggers as an individual's hesitations concerning the wider cryptocurrency community and we noted that although social triggers impact both adopters and non-adopters, they seem more prominent for non-adopters.

To our knowledge, this is the first study that looks for evidence of FUD-induced *behaviours* and differentiates them across adopters and non-adopters. We identify FUD-induced behaviours as behavioural responses to information that creates FUD, and note how they apply to both adopters and non-adopters.

5.2 FUD: Is it Ultimately Good or Bad?

There are several arguments that can be made for why FUD should be considered good or bad. Starting with the positives, FUD can be beneficial in the sense that it causes people to review decision-making and regulate emotions driven by FOMO. FUD can counter situations such as those described by billionaire and popular cryptocurrency critic Warren Buffett who once commented on the popularity of FOMO-investing in cryptocurrency markets: "A rising price does create more buyers and people think 'I've gotta get in on this' and it's better if they don't understand it. If you don't understand it you get much more excited than if you understand it." [46]. Criticism in the cryptocurrency community should be recognized as an asset, and conducive to its development and growth. FUD, in some ways, directly opposes FOMO, which considering the volatility and proliferation of risks present in the cryptocurrency world, should be lauded as a protective mechanism. Outside scrutiny and honest reporting ensures that investors don't hype up mismanaged currencies and companies that crash during periods of downward volatility.

On the other hand, proponents of cryptocurrency tend to negatively view FUD as a weapon that encourages unease and behaviour led by rash decisions such as panic selling [58, 79, 94]. It can be argued that FUD drives people to doubt or dismiss the future potential and capability of cryptocurrencies entirely. This is detrimental for the cryptocurrency community as it drives further separation between them, private corporations, and governments, rather than foster partnership and collaboration. As we also found in our results of FUD triggers (Section 4.6), FUD seemingly affects non-adopters to a greater extent and in more ways than adopters; non-adopters were affected by personal, social, and systemic triggers. FUD may encourage non-adopters to continue to be fearful and dismissive of cryptocurrency, especially when targeted by sensational news headlines.

On par with our results, we propose a middle ground: that FUD is inherently neither good nor bad, but nonetheless, should have a place in cryptocurrency discussions. Cryptocurrency investment requires ample trust in a coin, company, or exchange. Accepting and becoming comfortable with FUD ensures that a person sits back and thinks about the potential consequences of what might go wrong when trusting the wrong coin, company, or exchange. But as our adopter participants suggest, one should avoid overly-biased, alarmist news reporting primarily intended to incite fear (see Section 4.6.2).

5.3 The Dangers of Cryptocurrency Influencers and Promoters

Celebrities and influencers have been increasingly entering the cryptocurrency space to advertise, endorse, and recommend cryptocurrencies. They often have large followings and can wield significant influence. This can make it difficult for people to think critically about the information and recommendations they provide, and may lead to people making decisions that are not in their own best interests. As heard from our participants, billionaire Elon Musk held tremendous sway when it came to encouraging others to purchase cryptocurrencies, and his endorsement of numerous coins was constantly seen in news media. This was not surprising, as "knowledgeable" celebrities and influencers are considered a source of attachment and may seem trustworthy by some when providing cryptocurrency information.

The blind endorsement of cryptocurrency by public figures is worrisome, as they may not have any particular expertise in the products or services they are promoting. They may simply be repeating information provided to them by the companies they are working with, rather than offering unbiased, well-informed recommendations. Furthermore, celebrities are often paid (in cash or equity) to promote cryptocurrencies and exchanges, which means that they may be more focused on their own financial gain than the average investor. Investing in cryptocurrency is risky, and there is always a possibility that one could lose all or part of their investment if they invest in a poorly-performing or poorly-managed cryptocurrency – an incessant fear projected by our adopters and non-adopters alike.

In our results, some notable sources of FUD at the personal level were often tied to a lack of knowledge and wealth; a pervasive concern was that their current knowledge or wealth levels are not "enough" compared to rich mogul investors. Their worries are also shared by prominent cryptocurrency skeptics such as Microsoft co-founder Bill Gates. He once said, "Elon [Musk] has tons of money and he's very sophisticated, so I don't worry that his Bitcoin will sort of randomly go up or down. I do think people get brought into these manias who may not have as much money to spare. My general thought would be that if you have less money than Elon, you should probably watch out." [55]. On the other hand, some adopters claimed they looked to rich investors such as Elon Musk to capitalize on upward price spikes. While perceived benefits exist, consumers of cryptocurrency information should be careful blindly trusting sources of attachment without due diligence.

5.4 Recommendations for Combatting FUD

Based on our results, we propose the following recommendations to combat FUD at the systemic, social, and personal level respectively. **Transparency on conversations concerning government regulation or heightened governance.** The issue of government regulation or heightened governance of cryptocurrencies is complex and multi-faceted. While the core purpose of cryptocurrencies is strongly tied to decentralization, as a few of our participants even noted, research has shown that many individual cryptocurrency investors are in favour of heightened governance. This is largely due to significant risks that adopters face when it comes to theft or volatility. Which leads us to the "paradox of unregulation" [39,84], where end-users of cryptocurrencies such as bitcoin like the independence it gives them over their assets, but it no longer offers the protection that consumers are used to from regulated financial institutions.

There are different arguments for and against government regulation or heightened governance of cryptocurrencies. In this thesis, we do not take a position on whether regulation or governance is good or bad. However, we do want to bring to light the ambiguity that pervades conversations on regulation. Government legislators and politicians tend to make vague statements on how they expect to enact rules and limits over cryptocurrencies. As Grant and Hogan [40] assert "Most legislators worldwide have made no clear decision as to how Bitcoin and other virtual currencies should be classified. Since Bitcoin is a peer-to-peer, digital currency, with no central issuing or regulatory body, the question arises, 'Who is to be regulated?"'.

We believe that that there should be greater transparency on what proponents of regulation and governance are exactly trying to achieve or target before provoking news headlines with vague goals. Regulation, in some ways can be helpful, if it is specific and targets a need. For example, legislation that targets cryptocurrency promoters and advertisers, and public fraudsters can be helpful to curb risk. However, the use of empty promises and unclear declarations often leads to FUD and undermines trust in cryptocurrency technology.

Tiered cryptocurrency information resources. Cryptocurrencies are still a relatively new and complex technology. As we observed from our non-adopter participants with low depth, many people may not have a clear understanding of how they work and what they are used for. This can make it difficult for people to make informed decisions about whether to invest in or use cryptocurrencies.

We suggest the introduction of tiered educational resources for the dissemination of cryptocurrency information. These resources would be organized into a series of modules or learning programs that target users with various knowledge levels of cryptocurrency, with an emphasis on amateurs. Users may not trust a government or corporate entity for impartial information as cryptocurrencies were initially created to subvert excessive government oversight. Therefore, we believe that organizations dedicated to impartial cryptocurrency education may be needed to fulfill this role. By adding more entry-level resources that are comprehensive, and come from verifiable sources into a tiered module or learning program based on expertise and current knowledge levels, people can get the information they need to make informed decisions about cryptocurrencies. The creation of cryptocurrency resources that are organized in a way that considers usability and minimizes information overload can help educate people about the technology behind cryptocurrency, protect them from fraud, and promote the wider adoption of cryptocurrencies. They would also provide clarity on areas of cryptocurrency that often cause confusion such as the basic capabilities of cryptocurrencies, overall purpose, and future potential.

Design for everyday transactions. Small and large businesses have been interested in cryptocurrencies throughout the years, and it appears that adoption is expanding rather than diminishing [40]. Since their early, less reputable days, when cryptocurrencies were mostly used for the online purchase of illicit goods, they have earned credibility [40]. The legitimacy of cryptocurrencies increases with the number of authorized retailers [40]. As we saw in our results, non-adopter hesitation sometimes arose from doubts concerning cryptocurrency legitimacy and its everyday applications. As it stands, current systems only allow for the purchase and storage of cryptocurrencies, and peer-to-peer transactions, but do not connect with most mainstream commercial entities. Their interfaces are typically riddled with jargon and contain no interoperability between traditional financial applications and cryptocurrencies.

We recommend that cryptocurrency systems be designed in a way that allows for easier access by non-tech savvy users, a segment that cryptocurrency fails to appeal to. Participatory design may lead to the development of new wallets, vendors, or applications that address outlined gaps and provide a seamless process for purchasing goods and services using cryptocurrencies. The mass-market appeal of cryptocurrency may only become a reality when we're able to build guided, intuitive, user interfaces. Then, once users obtain cryptocurrency, they will be able to confidently use this resource for legitimate goods and services.

Easier storage mechanisms. Cryptocurrency acceptance is still in its infancy [40], and part of that may be attributed to ambiguity concerning safe storage. From our interviews, one concern raised was the need to know where to store their cryptocurrencies when not actively used, and how to easily access them from storage.

Although cryptocurrencies are intended to be kept in a local digital wallet, many individuals nowadays just keep them in online accounts associated with the exchanges from which they were purchased [53]. This practice exposes users to significant risk, as exchanges face numerous operational challenges such as security breaches or liquidity constraints [23] which may result in users losing control of their cryptocurrency. The majority of a user's cryptocurrency should be kept offline and out of the reach of bad actors, with only sufficient funds being kept online to support imminent transactions.

Unfortunately, many individuals are unlikely to protect their cryptocurrencies correctly unless they receive expert advice/help or invest the time to conduct their own in-depth research – a task many may find burdensome [37]. Ideally, a software solution that combines the ease and safety of payment provider applications (e.g., online banking, Paypal, Venmo), connects with major cryptocurrency exchanges such as Coinbase, and easily enables local digital wallets could help cryptocurrency acceptance grow.

5.5 Future Work

Despite having addressed knowledge gaps on FUD, and cryptocurrency information trust factors, our results raised several questions and areas that can use more exploration. **Celebrity Influence:** Firstly, our study revealed that there are nuances to celebrity influence, and that it sometimes played a role in how one trusts, perceives, and/or acts on cryptocurrency information. Future studies could investigate the impact of celebrities and influencer participation in cryptocurrency discussions and how their contributions may lead to the generation of FOMO or FUD perceptions and behaviours in cryptocurrency discussion circles. Following these results, user interface modifications could be explored to moderate influence or better inform users susceptible to blind trust in these circumstances.

Discerning Affordances of Misinformation: Another noteworthy discovery was that participants often reported rarely encountering what they perceived to be misinformation on cryptocurrencies. This falls in line with Yang and Tian's [102] work on how people often believe they are less vulnerable to fake news due to various and complex rationales. It would be interesting to see a study that investigates and categorizes end-user assumptions of which website or social media affordances signal misinformation, disinformation, or accurate information, followed by exploration of improved user interfaces for this purpose.

End-User Design Requirements: Abramova et al.'s [2] research revealed that cryptocurrency adopters can be broadly categorized into "cypherpunks" (experienced advocates and enthusiasts), "hodlers" (security-concerned and profit-oriented traders and investors), and "rookies" (inexperienced adopters motivated by FOMO). Each of these adopter groups differed in how their beliefs affected decision-making on cryptocurrency management. Future work could expand upon their findings in combination with ours. For example, a novel study could extend their research by similarly categorizing non-adopter profiles, then investigate and break down cryptocurrency design requirements across both groups with trust assessment attributes and FUD triggers in mind.

Alternative Perspectives: Future studies could look at similar topics, but from a more global lens. As previously mentioned in our literature review, the largest share of individual cryptocurrency investors live outside of western countries such as the United States and Canada, thereby affecting the applicability of our results to all adopters and non-adopters. Usability, security, and privacy concerns are often raised in academic works [38, 39, 59], yet have only been identified for a western user/nonuser base. It would be interesting to compare our participants' FUD triggers and FUD behaviours with people from other areas with notable adoption rates to see if triggers differ by region.

Quantitative Review: A quantitative follow-up study can help determine if our findings can be extrapolated to a wider sample. Our results established that triggers of FUD can be organized into personal, social, and systemic classifications – it would be insightful to see how each of them rank in significance on a larger scale, and the extent to which each may perpetuate FUD. The core components of our proposed framework, attachment and depth, may also be tested to corroborate their significance.

5.6 Limitations

Recruitment: Many crypto adopters are typically privacy-conscious, thereby limiting our adopter sample size to those who feel somewhat comfortable revealing aspects of their portfolio and history purchasing cryptocurrencies. This level of secrecy may have also impacted self-reported data collected in our survey, as some participants may have been more careful with what they chose to share.

Generalizability: Additionally, it is difficult to select a small sample and extrapolate their perceptions to the worldwide or English-speaking crypto community as cryptocurrencies are generally decentralised and anonymous [17]. As was covered in our literature review, some of the countries with the highest individual crypto investment relative to income are not the U.S. and Canada. While there is no reported difference in crypto-asset usage behaviour across countries [95], cultural or geographical differences may influence causes of FUD, or FUD-induced behaviour.

Our sample is also heavily skewed towards men — while this is a normal representation of crypto owners [13, 88], it may impact potential learnings from women adopters and non-adopters, who as research has shown, are more risk-averse and unlikely to engage with speculative investments [81]. **Timing:** Furthermore, we acknowledge that the timing of this study's data collection may have an effect on our results. All interviews were conducted in the wake of the Terra Luna collapse [74] and prior to the bankruptcy of FTX [43]. Had they been conducted during a time of stability or where cryptocurrency value was at an all time high, end-user perceptions may have differed.

5.7 Conclusion

In this thesis, we explored the relationship between FUD, trust, and cryptocurrency information. Our background section surveyed cryptocurrency risks, models of trust, and information-seeking practices and information dissemination in cryptocurrency spaces. Following interviews with 23 cryptocurrency adopters and non-adopters, we found evidence that participants make either cursory, extensive, or negative trust assessments of cryptocurrency information depending on their level of attachment and depth. We then introduced a model that visually expresses the relationship between these two components. Furthermore, we found that triggers of FUD exist at the personal, social, and systemic level; systemic triggers were the most consequential among both adopters and non-adopters, and personal triggers seemed to only impact non-adopters. From our results on FUD triggers and behaviours, we propose four overarching recommendations to combat FUD along these three levels: increased transparency on regulation discussions, tiered cryptocurrency information resources, design for everyday transactions, and easier storage mechanisms.

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Appendix A

Recruitment Notice



We are looking for U.S. and Canadian residents to participate in a research study about their experiences regarding online information on cryptocurrencies. We invite participants from all backgrounds. Ownership or high familiarity of cryptocurrency is not required for participation.

This is a two-part study consisting of a pre-screening survey and an interview.

In Part 1, you will complete the pre-screening survey: <link> Depending on the number of responses, we may only interview a subset of the individuals who fill out the survey. You will be compensated \$0.75 USD for completing the pre-screening survey.

In Part 2, we will ask about your experiences encountering, reading about, researching, and/or purchasing cryptocurrencies in a 60-minute Zoom interview. Interviews will be audio-recorded to ensure that we accurately capture your comments, but audio-recordings will be deleted as soon as they are transcribed by the research team. Interview participants will receive \$16 USD.

If you have any questions about this research study, entitled **Exploring perceptions of cryptocurrency**, please contact the research team via email at <u>ashimann@cmail.carleton.ca</u>

This research has been cleared by Carleton University Research Ethics Board-B (Clearance #117877). If you have any ethical concerns with the study, please contact the Carleton University Research Ethics Board-B (via email at <u>ethics@carleton.ca</u>)

Appendix B

Screening Survey

This survey is about your experience with encountering, reading about, researching, and/or purchasin cryptocurrencies. Please answer each question to the best of your ability.

Q1 How would you rate your current knowledge of cryptocurrency?

- Very good
- Good
- Neither good nor bad
- Poor
- Very poor
- Prefer not to answer

Q2 How often do you read, hear, or view information on cryptocurrencies?

- Once or more a day
- Once or more a week
- Once or more a month
- Once or more every few months
- Once or more a year
- Once or more every few years
- Other:

Q3 Have you ever owned cryptocurrency?

- Yes, I currently own them.
- Yes, I have owned them in the past and stopped using/sold them.
- No, I have never owned them but am familiar with their purpose.
- I have never heard of cryptocurrency / only know them by name.

[If yes selected on Q3]

Q4 For what purposes do you use these cryptocurrencies? [multi-select]

- Investment
- Trading
- For fun
- Interest in the technology
- Anonymity
- Decentralization
- Services exclusive to crypto

- P2P payments
- other:

Q5 How much have you approximately spent on the purchase of cryptocurrencies?

- Less than \$100
- \$100-\$500
- \$501-\$1000
- \$1001-\$10,000
- \$10,001-\$100,000
- More than \$100,000

Q6 On average, how often do you purchase new cryptocurrencies?

- Once or more a day
- Once or more a week
- Once or more a month
- Every few months
- Once a year
- Every few years
- Other:

Q7 What platform(s) do you use to purchase cryptocurrencies? [multi-select]

- Coinbase
- Binance
- Gate.io
- Huobi Global
- Bitfinex
- FTX.US
- Crypto.com
- Kraken
- KuCoin
- Uniswap
- DYdX
- PancakeSwap
- Online brokers (I.e. Robinhood, Webull, Wealthsimple, etc.)
- Cash and payment apps (I.e. CashApp, PayPal, Venmo, etc.)
- Other:

[If no selected on Q3]

Q8 Please select all the factors that describe why you do not own any cryptocurrencies. [multi-select]

- Interested in purchase, but don't know how
- Interested in purchase, but haven't gotten around to it
- Lack of funds
- Lack of awareness or knowledge of its technology
- General disinterest
- Volatile nature of cryptocurrency
- Lack of regulatory support
- Lack of incentives or use cases
- Fear of possible security vulnerabilities in cryptocurrencies
- Fear of possible security vulnerabilities in wallets or exchanges
- Negative experience with service providers such as exchanges or wallets
- Negative stigma associated with cryptocurrency
- Concern of falling victim to fraud or crime
- Other:

[All]:

Q9 What is your age? _____

Q10 What is your current occupation?

Q11 What is the highest level of education you have completed or are in the process of completing?

- Some high school or less
- High school graduate (or an equivalent)
- College or associate degree
- Bachelor's degree
- Master's degree
- Doctorate degree
- Other postgraduate or professional degree
- Prefer not to answer

Q12 Which of the following gender categories best describes how you self-identify (optional)

- Gender-fluid
- Man
- Nonbinary
- Trans man
- Trans woman
- Two-Spirit

- Woman
- I don't identify with any options provided, I am:
- Prefer not to answer

Consent to be contacted for a follow-up interview

Q13. We are interviewing people about their perceptions of and experiences with cryptocurrency. Selected participants can expect the interview to take one hour to complete via Zoom, and be compensated for their time. If you agree to be contacted about the interview, you will be asked to provide your Prolific ID for sending you study information. Your decision will not impact your payment for the current survey.

Would you like to be contacted?

1. Yes, please send me more information about the follow-up interview. What is your Prolific ID? (Please insert below)

2. No, I do not wish to be contacted.

Appendix C

Interview Guides

Interview Guide: Adopters

The interview is intended as semi-structured and we do not intend to ask all questions to each participant. We will skip questions or ask follow-up probes, depending on the participant's responses/interests. We will keep track of time to ensure that we remain within the agreed upon time.

Interview script/reminders

- · Reminder about the right to withdrawal from study, skipping questions
- Reassurance of anonymized data, no personal information linked to interview responses
- Reminder to turn off video prior to recording

Introduction

Thank you for taking the time to meet with me. My name is Ashi and I'm a graduate student at Carleton University, working with Dr. Sonia Chiasson for this project. For this interview, our objective is to listen to your experiences encountering, reading about, researching, and/or purchasing cryptocurrencies. We have planned an open session to foster a conversation around the aspects most relevant to you.

Before we start, I wanted to assure you that we will remove any disclosed personally identifiable information during the interview (like names) from the transcript; and delete the audio recordings after transcribing the interview. In addition, you can turn off your video; can skip any question; and, have the right to withdraw from the study at any time during the session (while still receiving compensation for your time).

Do you have any questions before we get started? Let's start with some general questions.

General Questions

- 1. What is your understanding of cryptocurrency?
 - a. How would you define it?
 - b. How would you compare it to other forms of currency such as cash?
 - c. Can you name some examples?
- How do you view your own understanding of cryptocurrency? Digital assets? Blockchain technologies? (I.e. novice, advanced beginner, competent, proficient, or expert)

 Can you tell us a bit about what you know about cryptocurrencies?
- 3. How did you first become aware of cryptocurrency?
- 4. How do you feel about cryptocurrencies and their associated technology?
 - a. Crypto exchanges? Crypto wallets?
- What are your thoughts on the future potential of cryptocurrencies?
 a. How confident are you in those convictions?
- 6. What do you think the role of cryptocurrencies will be in the next 5-10 years?

Purchasing Cryptocurrency

7. Can you tell us what cryptocurrencies you own? Why?

- 8. What motivated you to choose to purchase them?
- a. How knowledgeable are you about currencies that you have invested in? 9. What made you decide to purchase crypto?
 - a. Do you research the currency prior to an investment? How?
 - b. What factors do you look for when purchasing new coins (if any)?
 - c. What sources of information do you use before you purchase a coin?
- 10. Can you tell me about the first time you purchased cryptocurrency?
 - a. How does this compare to your most recent transaction?
- 11. Have any of your experiences gone particularly well, or do you have any regrets associated with your purchases?
 - a. What happened?

Information on Cryptocurrency

- 12. Can you tell me about the last time you heard/saw something about cryptocurrency where did you see/hear it?
 - a. Do you think this was accurate information or misinformation? How did you decide?
 - b. How did you react?
 - c. What emotions would you associate with it?
 - i. Why/can you tell me more?
- 13. In general, where have you gotten information about cryptocurrency, if at all? (I.e. online publications, social media, peers, etc.)
 - a. Why these sources? What makes them valuable/useful to you?
 - b. Are there sources that you don't trust/won't use?
 - i. If not, why?
- 14. On a scale of 1-5, how much do you trust that/those source(s)?
 - a. Why?
 - b. What makes an information source on cryptocurrency trustworthy to you?
- 15. When you hear about cryptocurrencies, how do you decide if the details are accurate or if they are misinformation?
- 16. Have you seen/heard anything about cryptocurrencies in recent news that has impacted vour opinion?
 - a. Can you tell me about it?
 - b. How did you react?
 - c. What emotions would you associate with it?
 - i. Why/can you tell me more?
- 17. Have you ever read or learned something that affected your confidence in
 - cryptocurrencies in the immediate future (this year)? (negative or positive)
 - a. What are some examples that made you feel that way?
 - b. How did you react to that piece of news? Why?
 - What emotions would you associate with it? c.
 - i. Why/can you tell me more?
- 18. Have you ever read or learned something that affected your confidence in
 - cryptocurrencies in the longer-term future (5-10 years)? (negative or positive)
 - a. What are some examples that made you feel that way?

- b. How did you react to that piece of news? Why?
- c. What emotions would you associate with it?
 - i. Why/can you tell me more?
- 19. How do you typically feel when the crypto market is down? Up?
 - a. Why?
 - b. How do you react?
- 20. Has online information ever affected whether you bought a cryptocurrency? In what way?
- 21. Have you ever seen a celebrity or influencer promote a cryptocurrency before?
 - a. Who was it?
 - b. Did that impact you in some kind of way?
 - c. Would it matter what type of influencer they were? Entertainment? Educational? Businessperson? Leading expert?

Final Questions

- 1. Is there anything else you'd like to share that we haven't covered yet?
- 2. What do you think are the most important points that you'd like me to remember from our conversation?

Closing Remarks

Thank you for participating and taking your time to meet with me. Prolific will send you the \$16 compensation in exchange for your time. If you don't receive it by [TBD date], please let someone from our research team know.

Interview Guide: Non-Adopters

The interview is intended as semi-structured and we do not intend to ask all questions to each participant. We will skip questions or ask follow-up probes, depending on the participant's responses/interests. We will keep track of time to ensure that we remain within the agreed upon time.

Interview script/reminders

- · Reminder about the right to withdrawal from study, skipping questions
- Reassurance of anonymized data, no personal information linked to interview responses
- Reminder to turn off video prior to recording

Introduction

Thank you for taking the time to meet with me. My name is Ashi and I'm a graduate student at Carleton University, working with Dr. Sonia Chiasson for this project. For this interview, our objective is to listen to your experiences encountering, reading about, researching, and/or purchasing cryptocurrencies. We have planned an open session to foster a conversation around the aspects most relevant to you.

Before we start, I wanted to assure you that we will remove any disclosed personally identifiable information during the interview (like names) from the transcript; and delete the audio recordings after transcribing the interview. In addition, you can turn off your video; can skip any question; and, have the right to withdraw from the study at any time during the session (while still receiving compensation for your time).

Do you have any questions before we get started? Let's start with some general questions.

General Questions

- 1. What is your understanding of cryptocurrencies?
 - a. How would you define it?
 - b. How would you compare it to other forms of currency such as cash?
 - c. Can you name some examples?
- 2. How do you view your own understanding of cryptocurrency? Digital assets? Blockchain technologies? (I.e. novice, advanced beginner, competent, proficient, or expert)
- a. [If applicable] can you tell us a bit about what you know about cryptocurrency?3. How did you first become aware of cryptocurrencies?
 - a. Have you ever gone looking to learn more information on them?
 - i. If yes, why did you decide to do this? Did you find the information you needed?
- How do you feel about cryptocurrencies and their associated technology?
 a. Crypto exchanges? Crypto wallets?
- 5. What are your thoughts on the future potential of cryptocurrencies?
 - a. How confident are you in those convictions?

6. What do you think the role of cryptocurrencies will be in the next 5-10 years?

Purchasing Cryptocurrency

- 7. Why do you believe people purchase cryptocurrency?
- 8. Have you ever looked into purchasing a cryptocurrency before?
 - a. If yes, what happened?
 - b. If not, why have you chosen not to purchase any to date?
 - i. Would anything get you to change your mind?

Information on Cryptocurrency

- 9. Can you tell me about the last time you heard/saw something about cryptocurrency where did you see/hear it?
 - a. Do you think this was accurate information or misinformation? How did you decide?
 - b. How did you react?
 - c. What emotions would you associate with it?
 - Why/can you tell me more?
- 10. In general, where have you gotten information about cryptocurrency, if at all? (I.e. online publications, social media, peers, etc.)
 - a. Why these sources? What makes them valuable/useful to you?
 - b. Are there sources that you don't trust/won't use?
 - i. If not, why?
- 11. On a scale of 1-5, how much do you trust that/those source(s)?
 - a. Why?
 - b. What makes an information source on cryptocurrency trustworthy to you?
- 12. When you hear about cryptocurrencies, how do you decide if the details are accurate or if they are misinformation?
- 13. Have you seen/heard anything about cryptocurrencies in recent news that has impacted your opinion?
 - a. Can you tell me about it?
 - b. How did you react?
 - c. What emotions would you associate with it?
 - i. Why/can you tell me more?
- 14. Have you ever read or learned something that affected your confidence in
 - cryptocurrencies in the immediate future (this year)? (negative or positive)
 - a. What are some examples that made you feel that way?
 - b. How did you react to that piece of news? Why?
 - c. What emotions would you associate with it?
 - i. Why/can you tell me more?

15. Have you ever read or learned something that affected your confidence in

- cryptocurrencies in the longer-term future (5-10 years)? (negative or positive)
 - a. What are some examples that made you feel that way?
 - b. How did you react to that piece of news? Why?
 - c. What emotions would you associate with it?

- i. Why/can you tell me more?
- 16. How do you typically feel when the crypto market is down? Up?
 - a. Why?
 - b. How do you react?
- 17. Has online information ever affected whether you considered buying a cryptocurrency? In what way?
- 18. Have you ever seen a celebrity or influencer promote a cryptocurrency before?
 - a. Who was it?
 - b. Did that impact you in some kind of way?
 - c. Would it matter what type of influencer they were? Entertainment? Educational? Businessperson? Leading expert?

Final Questions

- 1. Is there anything else you'd like to share that we haven't covered yet?
- 2. What do you think are the most important points that you'd like me to remember from our conversation?

Closing Remarks

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