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ORIGINAL RESEARCH

Comprehending the Crypto-Curious: How Investors and Inexperienced Potential Investors Perceive and Practice Cryptocurrency Trading

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ABSTRACT

With the increasing popularity of cryptocurrency, many people are interested in cryptocurrency investments, but have so far hesitated. Many others have made investments without adequate preparation. To help interested investors improve their understanding of cryptocurrency and make rational investment decisions, it is important to study their concerns and motivations, and to draw upon experienced investors' experiences and practices. Therefore, we surveyed crypto investors and inexperienced potential investors interested in trading cryptocurrency ($n = 395$). Our results showed that extreme price volatility is the primary incentive and a substantial obstacle to market participation. Fraud risks, lack of personal funds, insufficient knowledge, and difficulty identifying credible information sources are also common barriers. Our findings highlight the need to build trustworthy exchange platforms and integrate educational features. Based on the reported concerns and experiences, we 1) identify learning components for new investors, and 2) formulate design recommendations for beginner-friendly exchange platforms.

KEYWORDS

Cryptocurrency; Price Volatility; Market Manipulation; Investor Concerns

1. Introduction

Cryptocurrency is a new technology that is said to revolutionize how people trade and make payments and investments. Bitcoin first appeared in 2009, and other cryptocurrencies like Ethereum and Dogecoin followed. Investments using cryptocurrency have rapidly increased in popularity. The number of active cryptocurrency wallet users was 5.8 million worldwide in 2017 (Hileman & Rauchs, 2017). By 2022, this number had reached approximately 300 million (Tuwiner, 2022).

In addition to the millions of cryptocurrency users, many people are *interested* in cryptocurrency investments, but have so far hesitated to do so due to lack of trust and low self-efficacy in cryptocurrency (Voskobochnikov, Abramova, Beznosov, & Böhme, 2021). Meanwhile, many novices have invested in cryptocurrencies but have lost their money due to insufficient security practices, improper key management, and basic misconceptions about the technology (Abramova, Voskobochnikov, Beznosov, & Böhme,

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2021; Krombholz, Judmayer, Gusenbauer, & Weippl, 2016). Studies have found that novices prefer convenient, secure, and easy-to-use wallets, and often rely on such tools for key management and security protection (Abramova et al., 2021), while many wallets and exchanges do not have great usability, especially for beginners (Fröhlich, Wagenhaus, Schmidt, & Alt, 2021; Fröhlich, Waltenberger, Trotter, Alt, & Schmidt, 2022; Voskobochnikov, Wiese, Mehrabi Koushki, Roth, & Beznosov, 2021). These are significant problems: the low self-efficacy and lack of trust in this technology result in hesitation to adopt cryptocurrency among those interested in it and significant losses among those who invested. At the same time, people’s financial stability is at stake if investments are made without proper preparation and supporting tools. Therefore, it is crucial to provide technology resources that meet the needs and address the concerns of novice and experienced investors.

Previous research has explored investors’ characteristics and behaviours through data-driven approaches (Bouri, Gupta, & Roubaud, 2019; Caferra, 2020; Hackethal, Hanspal, Lammer, & Rink, 2022). The rationale behind the decisions of cryptocurrency investors and their adoption of cryptocurrencies were often neglected. Some studies have investigated concerns of investors and non-investors with limited samples (Fröhlich et al., 2022). Furthermore, research investigating motivations and barriers to cryptocurrency engagement has predominantly relied on male-dominated samples (Abramova et al., 2021; Fröhlich et al., 2022). The requirements for supporting non-investors to overcome their hesitancy in entering the cryptocurrency market remain unclear. Although there have been suggestions to provide training sessions for beginners (Fröhlich, Wagenhaus, et al., 2021; Voskobochnikov, Abramova, et al., 2021), little has been done to develop detailed requirements and learning components for educating beginners.

Therefore, in this paper, we seek to gain a thorough understanding of the concerns, perceptions, and practices surrounding cryptocurrency among individuals who are interested but hesitant about investing in cryptocurrency and those who have experience with cryptocurrency investments. Identifying potential pitfalls and obstacles when it comes to cryptocurrency investments is critical. To do this, it is important to recognize the differences between these two groups and leverage investors’ experiences. All this knowledge together will inform the design of exchange platforms and other useful resources that support potential and inexperienced investors during their cryptocurrency investment.

To this end, we conducted an online survey ($n = 395$), in which we included both **investors** ($n = 255$) and people who are *interested* in cryptocurrency investments but do not have any experience doing so ($n = 140$). We refer to the latter group as **potential investors**. Thus, we focus on three primary research questions:

- RQ1:** What are the reasons that have encouraged, stopped, or prevented people from trading cryptocurrency?
- RQ2:** What are people’s concerns about cryptocurrency trading, and what actions have they taken to address them?
- RQ3:** Which aspects of cryptocurrency do investors consider crucial to learn about?

To answer these questions, we deployed our survey to investors and potential investors worldwide. The questions contained a mix of closed- and open-ended questions and Likert scales; most questions were presented to both groups, but each group was also presented with group-specific questions (Figure 1). We analyzed closed-ended questions and Likert scales through statistical analyses using R, and we clustered and

synthesized open-ended responses. We describe our method in Section 3 and present all survey questions in the Appendices.

We identified five common issues among the investors' and potential investors' responses: 1) price volatility is both the primary incentive and a substantial obstacle for cryptocurrency investment; 2) insufficient knowledge is a barrier for cryptocurrency trading; 3) untrustworthy and manipulative learning resources interfere with self-education; 4) security and fraud issues pose difficulties in investment decisions; and 5) there is need for appropriate assurance and regulations in the cryptocurrency space. Altogether, these findings highlight the necessity of providing user education prior to and during engagement with cryptocurrency, and call for requirements for design features in exchange platforms. Based on our results, we identify learning components for new and potential investors, and formulate design recommendations for beginner-friendly exchange platforms.

In summary, our study makes the following contributions. *First*, in contrast to prior studies that examined investors' behaviour based on market data, our survey investigates and contrasts the perceptions from investors and potential investors through an online survey. The large sample size ($n = 395$) and the data collected directly from market investors' perspectives allow us to draw comprehensive conclusions from both groups and thoroughly identify the divergence and convergence in their concerns, mitigation strategies, and reasons that have encouraged or prevented them from trading cryptocurrency. *Second*, based on our results, we identify learning components that educational platforms should consider for helping new and potential investors learn about cryptocurrency. *Third*, we formulate guidelines for the design of beginner-friendly exchange platforms. Our results, learning components, and guidelines will enable trustworthy cryptocurrency exchange platforms with integrated educational features. We believe this is the first step in making cryptocurrency technology accessible for a mass audience and helping potential and new investors make informed investment decisions.

2. Related Work

In this Section, we discuss previous studies that focused on cryptocurrency risks, investors' behaviours and perceptions, the usability of trading platforms, and cryptocurrency market phenomena.

2.1. Risks in Cryptocurrency

Cryptocurrency relies on *blockchain* technology, a distributed digital ledger of transaction records (Tapscott & Tapscott, 2016). In this Section, we demonstrate the risks associated with blockchain technology and cryptocurrency transactions.

2.1.1. Fraud and security breaches

Although blockchain is cryptographically protected, exchanges and wallets are prone to security breaches (Decker & Wattenhofer, 2014; Karpeles, 2014; Microsoft Threat Intelligence, 2022), technical flaws (Palladino, 2017), and human errors (Browne, 2021; Popper, 2021); and various types of frauds such as Ponzi schemes (Bartoletti, Carta, Cimoli, & Saia, 2020; U.S. Securities and Exchange Commission, 2013; Vasek & Moore, 2015) and cryptocurrency wallet and exchange scams (Vasek & Moore, 2015) that target investors, and double-spending (Goffard, 2019) and mining scams (Vasek &

[Moore, 2015](#)) that target miners and the blockchain network. In addition, COVID-themed cryptocurrency scams have appeared ([Xia et al., 2020](#)). Reversing transactions or recovering lost or stolen cryptocurrencies is difficult because there are no centralized authorities to control the transaction flow.

2.1.2. Market fluctuation, herding behaviour, and market manipulation

As one of the remarkable features of cryptocurrency, extreme market volatility has drawn significant attention in academia and the public. Although studies have attempted to understand market volatility in cryptocurrency (e.g., [Almeida & Gonçalves, 2022](#); [Baek & Elbeck, 2015](#); [Fry, 2018](#); [Katsiampa, 2019](#)), it is still difficult to make predictions.

Notably, even the stablecoins, which are designed to maintain a stable value by being pegged to a reference asset, such as a national currency or precious metal ([Bullmann, Klemm, & Pinna, 2019](#)), have been proven to be fragile ([Clements, 2021](#)). A noteworthy example was the Terra-Luna collapse in April 2022. The crash of algorithmic stablecoin TerraUSD (UST) consequentially led to the crash of its connected cryptocurrency—LUNA ([Briola, Vidal-Tomás, Wang, & Aste, 2023](#)). The meltdown of both UST and LUNA impacted the entire cryptocurrency market and led to the bankruptcy of crypto leaders such as Voyager, Celsius, and Three Arrows Capital (3AC) ([Forbes.com, 2022](#)).

In addition, a significant source of cryptocurrency market volatility is investors' behaviours. Several studies have investigated investors' herding behaviour in the cryptocurrency market, with contradicting results. For instance, [Bouri et al. \(2019\)](#) found that significant herding behaviour tended to occur during increased market uncertainty. [Coskun, Lau, and Kahyaoglu \(2020\)](#) identified herding in the low volatility regime and anti-herding during high volatility periods. [Kumar \(2021\)](#) observed herding during market stress or high volatility, while anti-herding was found in less volatile or bullish markets. [Shrotryia and Kalra \(2022\)](#) identified robust herding activity in the cryptocurrency market during the COVID-19 outbreak but did not observe contagion between cryptocurrency and stock market herding. [Papadamou, Kyriazis, Tzeremes, and Corbet \(2021\)](#) identified that herding is intense in the bull market. High volatility in cryptocurrency price might lead to bubbles that attract speculative tradings [Baek and Elbeck \(2015\)](#). The irrational decisions based on market sentiment and the uncertainty from cryptocurrency's fundamental lack of values ([Cheah & Fry, 2015](#)) contributed to dispersed beliefs among investors, resulting in high trading and speculative bubbles ([Almeida & Gonçalves, 2023](#); [Mnif, Salhi, Mouakha, & Jarboui, 2022](#)).

Despite that, the cryptocurrency market can also suffer from market manipulation such as fake or non-economic wash trades ([Arsi, Ben Khelifa, Ghabri, & Mzoughi, 2022](#); [Bitwise Asset Management, Inc., 2019](#); [Chen, Lin, & Wu, 2022](#)) and pump-and-dump schemes ([Li, Shin, & Wang, 2021](#)). Such manipulation alters the trustworthiness of the cryptocurrency market, misleads investors, and eventually results in them risking their investments ([Alexander & Cumming, 2020](#); [Arsi et al., 2022](#); [European Banking Authority, 2014](#)). Both high price volatility and market manipulation raise the additional issue of liquidity ([Arsi et al., 2022](#); [Fry, 2018](#); [Trimborn, Li, & Härdle, 2020](#)). Consequently, compared to traditional assets, cryptocurrencies exhibit lower liquidity, and investors should consider this factor when making investment decisions ([Trimborn et al., 2020](#)). Investors may face difficulties converting their cryptocurrencies to fiat currencies without losing value ([European Banking Authority, 2014](#)). Other unpredictable factors, such as the global pandemic, can also influence the cryptocurrency market ([Caferra & Vidal-Tomás, 2021](#); [Mnif et al., 2022](#); [Vidal-Tomás, 2021](#)).

Overall, the extreme market volatility and unpredictability of cryptocurrency pose significant challenges for investors regarding portfolio and risk management.

2.1.3. Regulations and legal issues

As a decentralized ledger, blockchain replaces central authorities (e.g., banks, governments, and financial institutions) that serve as trusted third parties to process fiat currency payments with peer-to-peer verification of transactions (Farell, 2015). Therefore, investors' protection remains an unsolved problem for regulators. Currently, regulatory clarity in cryptocurrency spaces is still elusive (Arsi et al., 2022; Global Legal Insights, 2021; Yeoh, 2017). Governments take different approaches in their own countries. Some countries (e.g., the United States) employed specific regulations to manage cryptocurrency, while others (e.g., Canada, and the United Kingdom) allowed its use and have some regulations in place. Some countries (e.g., Ireland) neither regulate nor prohibit the use of cryptocurrency. A few countries (e.g., Algeria) have forbidden cryptocurrency transactions. As cryptocurrency continues to grow in the market, ambiguity regarding legal frameworks leaves investors unprotected against criminal activities (Houben & Snyers, 2018), unexpected tax charges (European Banking Authority, 2014), and possible price collapses (Fry, 2018).

Altogether, investing in cryptocurrency can be complex. Although cryptocurrency investments provide great earning opportunities, they also introduce risks to investors. Thus, we argue that understanding the concepts around cryptocurrency and the associated risks is crucial for investors' success.

2.2. Investors' Perceptions, Experience, and Considerations of Trading Cryptocurrency

Previous studies have explored investors' and non-investors' perceptions of cryptocurrency, their experience with transactions and exchange platforms, and factors influencing their (non-)adoption of this technology. We present a summary of these studies in this Section. We discuss how our study bridges the gaps in Section 2.3.

2.2.1. Cryptocurrency perceptions and misconceptions

Studies have explored the mental model of investors and potential investors and identified a general lack of knowledge and misconceptions of blockchain technology, transaction speed and fees, and security and privacy properties (Fröhlich, Wagenhaus, et al., 2021; Gao, Clark, & Lindqvist, 2016; Voskobochnikov, Obada-Obieh, Huang, & Beznosov, 2020). These misconceptions led to skewed risk perceptions and erroneous mitigation strategies (Voskobochnikov et al., 2020) and discouraged non-users from trading cryptocurrency (Gao et al., 2016; Voskobochnikov, Abramova, et al., 2021).

In addition, studies have highlighted users' perceptions of risks they have to face when trading cryptocurrency. These risks include, but are not limited to, lost passwords or private keys, problematic investment decisions, dishonest trading partners, attacks on wallets and exchanges, and incorrectly sent transactions (Abramova et al., 2021; Fröhlich, Gutjahr, & Alt, 2020; Sas & Khairuddin, 2017). Interestingly, it remains unclear whether risk perception has a significant association with actual crypto-investment behaviour. For example, Voskobochnikov et al. (2020) found no significant effect of perceived risks on the adoption of cryptocurrency technology and argued that this is because (non-)users are aware of common risks. On the other hand, Zhao

and Zhang (2021) found a significant negative association. Other studies found that risk perceptions have a significant association with people's stock market participation (Sivaramakrishnan, Srivastava, & Rastogi, 2017).

2.2.2. Factors influencing consideration and behaviour of investing in cryptocurrency

As mentioned above, previous studies found a significant association between risk perception and the adoption of cryptocurrency technology (Sivaramakrishnan et al., 2017; Zhao & Zhang, 2021). In addition, several studies confirmed the crucial role of trust in users' and non-users' consideration and actual behaviour of adopting blockchain technology (Craggs & Rashid, 2019; Sas & Khairuddin, 2015, 2017; Voskobochnikov, Abramova, et al., 2021; Voskobochnikov et al., 2020). In these studies, *trust* were found to be the main reason that led to (non-)adoption of cryptocurrency in three aspects: *technological trust* on blockchain technology, *social trust* among and between investors and online communities, and *institutional trust* on the governmental institutions involved. In addition, self-efficacy was identified to have an indirect impact on (non-)users' adoption consideration through trust (Voskobochnikov, Abramova, et al., 2021). Various recommendations were provided to increase trust in the cryptocurrency ecosystem, such as mimicking conventional payment systems, providing structural assurance for newcomers, and providing training sessions before beginning to trade (Voskobochnikov, Abramova, et al., 2021). In addition, subjective (self-assessed) financial literacy and risk tolerance were both significantly positively associated with the consideration and behaviour of investing in cryptocurrency (Bannier & Neubert, 2016; Liao, Xiao, Zhang, & Zhou, 2017; Zhao & Zhang, 2021).

In addition, several studies have investigated the factors influencing market investors' behaviours and have identified that investors' investment decisions are driven by factors such as media sentiment (Caferra, 2020; Hackethal et al., 2022), social influence and public sentiment (Almeida & Gonçalves, 2023), and market inefficiency (Almeida & Gonçalves, 2023). In addition, socio-demographic characteristics of investors (Xi, O'Brien, & Irannezhad, 2020), and government authority-related news (Zhang, Zhou, Pan, & Jia, 2019) have also been identified as factors affecting Chinese investors' behaviours.

2.2.3. Motivations and barriers to trading cryptocurrency

Many studies have also investigated user motivations and barriers for non-users to trade cryptocurrency (Abramova et al., 2021; Fröhlich et al., 2020; Sas & Khairuddin, 2017; Voskobochnikov, Abramova, et al., 2021; Voskobochnikov et al., 2020). Among these studies, interest in financial gain and underlying technology were the most frequently mentioned motivations (Abramova et al., 2021; Fröhlich et al., 2020; Sas & Khairuddin, 2017). On the other hand, low self-efficacy and lack of knowledge of technical aspects of Bitcoin, lack of regulation, concerns about illicit activities and privacy, frequent association with negative contexts among the general public, different exchange rates among exchange platforms, and the belief that there is limited room for further price increase were found to be major reasons for not using cryptocurrency (Gao et al., 2016; Voskobochnikov, Abramova, et al., 2021; Voskobochnikov et al., 2020; Voskobochnikov, Wiese, et al., 2021). Many studies reported the perceived difficulty of starting with cryptocurrency because of how complex exchange platforms are or because people lacked technical cryptocurrency knowledge (Fröhlich, Wagenhaus, et al., 2021; Voskobochnikov et al., 2020). On the other hand, Gao et al. (2016) found that technical

knowledge is not necessary to perform the actual transactions.

2.2.4. Usability of wallets and exchange platforms

Trading platforms are the fundamental tools that support investment activities. Prior research has emphasized the crucial role of efficiency, user-friendliness, and the inclusion of useful functions in financial trading platforms, as they significantly impact user adoption (Sharif & Naghavi, 2021). Studies that evaluated the user experience (UX) of cryptocurrency wallets and exchange platforms have identified usability issues and provided UX recommendations (Abramova et al., 2021; Fröhlich et al., 2020; Fröhlich, Kobiella, Schmidt, & Alt, 2021; Fröhlich, Wagenhaus, et al., 2021; Voskobochnikov, Wiese, et al., 2021), and found that wallets, in general, do not have great usability, especially for beginners (Fröhlich, Wagenhaus, et al., 2021; Fröhlich et al., 2022; Voskobochnikov, Wiese, et al., 2021). Common usability issues included poor interface design, problematic functionality, inaccurate information, confusing terminology or icons, lack of guidance, and confusing error messages (Fröhlich, Wagenhaus, et al., 2021; Voskobochnikov, Wiese, et al., 2021). To address these issues, many recommendations were proposed. For example, Voskobochnikov, Abramova, et al. (2021); Voskobochnikov, Wiese, et al. (2021) suggested mimicking existing online banking or payment systems with which users are familiar and highlighted the importance of error recovery. Fröhlich, Wagenhaus, et al. (2021) recommended supporting user learning experience, and Gao et al. (2016) suggested design for fun use. Other studies have highlighted designing for transparency and control (Fröhlich et al., 2022) or designing specific wallets for different user groups (Abramova et al., 2021; Fröhlich et al., 2020; Fröhlich, Wagenhaus, et al., 2021; Voskobochnikov, Wiese, et al., 2021).

2.3. Connection to Our Research

Although existing research has studied blockchain and cryptocurrency risks, investors' behaviours, the usability of trading platforms, and cryptocurrency market phenomena, several gaps remain. First, existing research has explored investors' characteristics and behaviours primarily through data-driven approaches, such as the analysis of investors' holdings and trading activities (Hackethal et al., 2022), review of the literature (Almeida & Gonçalves, 2023), and an examination of the online trading volume (Almeida & Gonçalves, 2023; Caferra, 2020; Zhang et al., 2019). The rationales of cryptocurrency investors behind their investment decisions and adoption of cryptocurrencies were often neglected. Second, although some studies have explored the perceptions of investors and non-investors (e.g., Fröhlich, Kobiella, et al., 2021; Fröhlich, Wagenhaus, et al., 2021; Gao et al., 2016; Voskobochnikov et al., 2020), limited samples were included. A few in-depth studies were conducted separately for investors (e.g., Abramova et al., 2021) or non-investors (e.g., Voskobochnikov, Abramova, et al., 2021), but there is a lack of comprehensive research encompassing both groups. Third, while previous studies emphasized the importance of training newcomers (e.g., Fröhlich, Wagenhaus, et al., 2021; Voskobochnikov, Abramova, et al., 2021), there is a lack of understanding regarding their specific learning requirements and topics. Fourth, existing research has often been limited in terms of demographics, focusing solely on Bitcoin investors (e.g., Gao et al., 2016; Khairuddin, Sas, Clinch, & Davies, 2016; Knittel, Pitts, & Wash, 2019; Sas & Khairuddin, 2015, 2017), specific geographical regions like North America, Europe and China (e.g., Fröhlich et al., 2022; Xi et al., 2020), or male-dominated participants (e.g., Fröhlich et al., 2022). Because the cryptocur-

rency market has moved far beyond Bitcoin, we believe an investigation focused on investors from diverse backgrounds and with experience with diverse cryptocurrencies is necessary.

Our study addresses these gaps by conducting an online survey that explores the perceptions, motivations, and needs of both experienced investors (n=255) and potential future investors (n=140) from 23 different countries. We ensured an equal distribution of male and female respondents (see Table 1). In contrast to prior studies that relied on econometrics modelling of investors' activity data (e.g., Coskun et al., 2020; Hackethal et al., 2022; Kumar, 2021), we gained direct insights from market investors and potential investors through an online survey. These participants have invested in various types of cryptocurrencies, and some have experience with stock investment (see Table 2). The large sample size and the data collected directly from the participants' perspective allow us to comprehensively understand and contrast common issues from each group's concerns, motivations, and needs when investing in cryptocurrency, and obstacles that have prevented them from trading cryptocurrency (see Section 5). Our results from globally distributed investors and potential investors contributed to specific requirements for learning interventions for beginners and detailed design recommendations to build beginner-friendly exchange platforms.

The remainder of this paper is organized as follows. We describe our methodology in Section 3, and discuss our findings in Section 4 and Section 5. Finally, we chart a path for future directions in Section 5.4 and conclude in Section 6.

3. Methodology

We conducted a survey with 395 participants. Since we were interested in similarities and differences in the perceptions and practices of experienced investors and potential future investors, we collected data from both groups. In the following, we describe our survey design, content, and participant recruitment.

3.1. Survey Design

Our survey consisted of questions related to participants' attitudes, concerns, practices and needs for cryptocurrency trading. A flow chart of the questions is shown in Figure 1. Below, we summarize our survey questions.

[Figure 1 about here.]

3.1.1. Screening and participant groups

Our survey began with a study information letter and a consent form. Only participants who agreed to participate were allowed to complete the screening questionnaire, which asked about the participants' age, cryptocurrency investment history, and consideration for investing in cryptocurrency. Based on their experience, we divided the participants into two groups:

Investors: Participants who had experience buying and selling cryptocurrency, including full-time investors and those who invested in addition to their primary activities (e.g., work, study).

Potential investors: Participants who are interested in cryptocurrency investment but had not invested. Therefore, they are potential future investors.

3.1.2. Survey content

Upon completion of the *Screening Questionnaire*, we asked investors about their cryptocurrency investment experience (see Table 2). In addition, we asked investors what motivated them to start trading cryptocurrency, and if they quit investing, what had stopped them from trading cryptocurrency (RQ1). On the other hand, we asked potential investors what had prevented them from making cryptocurrency investments so far (RQ1). Then, for both investors and potential investors, we asked about their attitudes and concerns toward cryptocurrency trading (RQ2). Investors were asked further questions about the mistakes they made, and the topics they wish they had learned as a beginner (RQ3).

Moreover, we included questions to assess participants' subjective financial knowledge, risk tolerance levels, and previous investments in the stock market, given that these factors were found to be correlated with people's investment considerations and their actual behaviour of trading in cryptocurrency (Zhao & Zhang, 2021) and the stock market (Sivaramakrishnan et al., 2017; Van Rooij, Lusardi, & Alessie, 2011). We did not assess the objective financial knowledge of the participants, because it has less influence on their investment consideration and behaviour (Sivaramakrishnan et al., 2017; Zhao & Zhang, 2021).

We closed the survey with demographic questions, asking participants about their gender, race and ethnicity, marital status, education level, employment status, household income, and how many dependent children (under 18 years) lived in the household. These factors have been influential on household investment decisions (Bannier & Neubert, 2016; Liao et al., 2017; Zhao & Zhang, 2021), and the likelihood of owning cryptocurrencies (Auer & Tercero-Lucas, 2022; Zhao & Zhang, 2021). In addition, we included the 9-item Affinity for Technology Interaction (ATI) scale (Franke, Attig, & Wessel, 2018) to assess participants' tendency to actively engage in technology interaction since technical incapability prevents people from adopting new technology such as cryptocurrency. Lastly, we included one attention check question, phrased as "To demonstrate that you are continuing to read instructions, please select the option 'I prefer not to respond' for this question". Figure 1 presents the survey flow. The complete set of questions asked in our survey is included in the Appendix.

3.2. Participant Recruitment (n = 395)

We conducted a power analysis using G*Power (Faul, Erdfelder, Buchner, & Lang, 2009) and determined that a minimum sample size of $n = 356$ is needed to achieve a power of 99%, allowing a margin for random error of less than 5% (estimated effect size = 0.5).

Upon receiving the ethics clearance, we recruited 465 participants through Prolific¹ in August 2022. Participants entered the survey through a web link. They were first presented with the study information and a consent form, and then were screened for eligibility at the beginning of the survey (see Figure 1). To be eligible for survey participation, people had to be 18 years or older, and either had to have cryptocurrency investment experience or be interested in doing so in the future. We did not limit participants to specific countries because cryptocurrency users are widely spread around the world (Hileman & Rauchs, 2017; Tuwiner, 2022).

Among these 465 participants, we removed the responses from 53 participants (out of 465 participants) because they completed less than 50% of the survey. The remain-

¹<https://www.prolific.co/>

ing 413 participants each received £6.39 (approx. \$10 Canadian dollars) to appreciate their time spent completing the survey. In addition, 17 out of 412 participants failed our attention check question. We excluded their responses to ensure our data quality, but we paid them for their efforts. Thus, our results were based on the analysis of the remaining $n = 395$ participants. These participants included 255 investors with cryptocurrency trading experience and 140 potential investors interested in cryptocurrency investment. We summarize their demographic background in Section [4.1](#).

3.3. Data Analysis

Our survey consisted of closed-ended questions, Likert scales, and open-ended questions (see Appendix). We analyzed closed-ended questions and scale questions using R (ver.4.2.1). Likert scale responses were encoded as numerical values to facilitate analyses. A Shapiro-Wilk Test ([Peat & Barton, 2008](#)) was performed to assess the data distribution and to determine whether the data were parametric or non-parametric. We calculated the descriptive statistics (e.g., Mean (M), Median (Mdn), Standard deviation (SD), Maximum (Max), Minimum (Min), and Variance (Var)) for each data item. We measured the Likert scale internal reliability using Cronbach’s α . A Mann-Whitney U test was used to measure the statistical difference between investors and potential investors.

For each open-ended question, we excluded blank responses and incoherent or unintelligible responses. We kept responses such as “None,” “Not applicable to me,” or “I do not have anything to say” because having no concern is a valid answer. The rest of the open-ended responses were analyzed through a rigorous analysis using the grounded theory open-coding method, following established procedures outlined by [Corbin and Strauss \(1990\)](#) and [Charmaz \(2014\)](#). In several iterations, we utilized affinity diagramming ([Scupin, 1997](#)) to categorize data segments and gain a comprehensive understanding of participants’ responses. To support these analytical processes, we utilized the collaborative qualitative data analysis tool, Dovetail². The resulting core categories derived from the data were primarily aimed at answering the corresponding RQs. In the following Section (see Section [4](#)), we present the synthesized findings in detail.

4. Results

In this Section, we present our results, including participants’ demographics, and results to each research question (RQ).

[Table 1 about here.]

4.1. Participants Characteristics

In general, our participants are young, with high technology affinity, highly educated, and have mostly never been married and have zero dependent children. In addition, most participants had experience trading stock, had relatively high subjective financial literacy, perceived high risk in cryptocurrency investments, and have moderate risk tolerance levels. We present our participants’ demographics and previous investment

²<https://dovetail.com/>

experience in Section 4.1.1. Their subjective financial literacy, perceived risk levels in cryptocurrency, and risk tolerance are presented in Section 4.1.2.

4.1.1. Demographic information

As shown in Table 1, our $n = 395$ participants include 197 women, 191 men, 5 non-binary/third gender, 1 participant preferred to self-describe, and 1 participant preferred not to disclose their gender. Most of the participants were between 18 to 37 years (Ages 18 to 27 = 59%; Ages 28 to 37 = 26%), have completed an Associate's or higher level degree (Associates or technical degree = 5%, Bachelor's degree = 37%, Graduate or professional degree=13%), never been married (61%), do not have dependent children (No = 67%), with high affinity with technology (average ATI score 4.23 ± 0.82 , Max = 6). These $n = 395$ participants came from 23 different countries.

[Table 2 about here.]

Based on their experience with cryptocurrency, 255 (65%) participants were classified as investors, and the other 140 (35%) were classified as potential investors. We suspect that the slightly lower proportion of potential investors was caused by people who do not have experience with cryptocurrency having a lower interest in participating in our survey. Overall, our participants have diverse backgrounds.

4.1.2. Financial literacy, perceived risk, and risk tolerance

[Table 3 about here.]

We gathered participants' subjective financial literacy, risk tolerance levels, and perceived level of risks in cryptocurrency because these variables were influential in people's investment consideration and behaviour (Sivaramakrishnan et al., 2017; Van Rooij et al., 2011; Zhao & Zhang, 2021). Table 3 presents a distribution of participants' responses. Compared to potential investors, we observed a slightly higher subjective financial literacy and risk tolerance from investors. A between-group Mann-Whitney U test confirmed this difference and indicated that compared to potential investors, investors had significantly higher levels of subjective financial literacy ($p = .010$) and risk tolerance ($p < .006$). The perceived risks in cryptocurrency trading were about the same ($p = .084$) between investors and potential investors.

We further discuss how these variables interact with participants' perceptions and concerns in Section 5.

4.2. RQ1: What Are the Reasons That Have Encouraged or Prevented People From Trading Cryptocurrency?

To answer our RQ1, we investigated the reasons that have encouraged, stopped, or prevented investors and potential investors from trading cryptocurrency through three survey questions. The complete questions can be found in Appendices. Below we demonstrate the result from each.

[Figure 2 about here.]

[Figure 3 about here.]

4.2.1. Incentives that have encouraged investors to trade cryptocurrency

We asked investors ($n = 255$) the primary incentive that has encouraged them to trade cryptocurrency. Among the 255 investors, 67% of them were fascinated by the “high profits” from cryptocurrency investments (see Figure 2). Eighteen percent of investors were influenced by its “popularity on social media,” and another 7% started investing because it is “peer-to-peer transactions, no third-party involved.” Five percent of participants joined the cryptocurrency market because it is “politically charged aspirations (e.g., the unregulated set-up makes it appealing to Libertarians who philosophically oppose “inflationary central-bank meddling.”)” In addition, 1% participants were curious about this newly emerged technology, and believed it is the future. Another 1% of participants used cryptocurrency as an alternative investment to the stock market. Lastly, 1% of the participants stated other reasons, such as being encouraged by referral offers on exchange sites, got paid in cryptocurrency at the beginning, believed that cryptocurrency is better than fiat currency, or were just curious about this new technology.

“I really wanted to be a part of it, to understand the ‘new stock,’ and to be updated of the new trends.” — Participant 100 (investor) (A)

4.2.2. Obstacles that have stopped investors from continuing trading cryptocurrency

We further asked investors whether they still trade cryptocurrency. A total of 103 (40% out of 255) investors said that they sold their cryptocurrencies and temporarily gave up on cryptocurrency investments. Among these 103 investors, nearly half (44%) chose “high price volatility,” and another 38% chose “lack of knowledge” as the main reasons that stopped them from continuing trading. This result reveals an issue that many investors jumped into the cryptocurrency market without adequate preparation. In addition, possibly impacted by COVID-19, 7% of investors quit buying and selling cryptocurrency because of low income or unemployment. Another 6% of investors quit investing because of tax or legal issues in their own countries. Figure 2 shows a distribution of participants’ responses.

“I fear losing money since I did not have enough knowledge.” — Participant 212 (investor) (B)

4.2.3. Reasons that have prevented potential investors from trading cryptocurrency

We asked potential investors ($n = 140$) about the reasons that have made them hesitant to start cryptocurrency investments. Among the 140 potential investors, 46% reported “lack of knowledge” as the primary obstacle (see Figure 3). This includes lacking knowledge of how cryptocurrency technology works, how to perform transactions, and how to perform market research and analyze trends properly.

“I’ve lacked the proper skills, guidance and tools which has prevented me from dabbling in crypto.” — Participant 203 (potential investor) (C)

In addition, potential investors extensively mentioned “risk and safety concerns” (27%) and “lack of personal funds” (24%). “Market instability” (11%) and “fear of financial loss” (9%) were mentioned as the fourth and fifth biggest reasons that prevented potential investors from participating in the market. A small number of potential investors (4%) also said they had a hard time finding credible learning resources (“lack of credible learning resources”). A few potential investors (4%) hesitated to invest because of “legal or political issues” in their countries and were concerned about the “uncertainty” (4%) regarding its value and legitimacy in the future. They were afraid of the possible legal consequences of joining the market because many countries have banned or might be banning cryptocurrency in the future (Global Legal Insights, 2021).

Moreover, the lack of a physical form (“Intangible”) makes cryptocurrencies appear less reliable, which became another reason that has stopped 3% of potential investors from joining the market. In addition, 2% of potential investors mentioned “lacking time” to start investments or having a hard time finding a reliable exchange platform in their country (“lack of reputable trading platform”). Five percent of potential investors were stopped by “Other” reasons such as energy consumption and global warming problems, personal laziness, being too young to invest, being overwhelmed by the diverse types of cryptocurrencies, or waiting for better buying opportunities.

4.3. RQ2: What Are People’s Concerns About Cryptocurrency Trading, and What Actions Have They Taken to Address Them?

To answer **RQ2**, we present the qualitative results of participants’ concerns, and actions they took to address the concerns related to cryptocurrency trading from two open-ended questions. The complete questions can be found in Appendix 6.

[Figure 4 about here.]

[Figure 5 about here.]

4.3.1. Investors’ and potential investors’ concerns for trading cryptocurrency

We asked both potential investors and investors about the aspects of cryptocurrency investment that worry them. As presented in Figure 4, “price volatility”, “fear of financial loss”, and “market instability” are the top three concerns reported by both investors and potential investors. They believed that the cryptocurrency market was associated with sudden drops in value, and it was possible to crash until worthless and never rebound. Compared to investors, a slightly more proportion of potential investors mentioned about “fear of financial loss”. This is in line with our assessment in Section 4.1.2, where potential investors showed a significantly lower risk tolerance.

In addition, participants were also concerned about numerous cryptocurrency scams and cyber attacks (“fraud/security breaches”) and the “general safety” of their accounts on the exchange platforms and cryptocurrencies in their wallets (“general safety/security concerns”). A few participants were scared by the horror stories from friends and media and noted that the exchange they use might be hacked, and the thefts of coins are not recoverable. Moreover, participants expressed concern about personal “lack of knowledge” about cryptocurrency and the projects they invested in, and some doubted the value of cryptocurrency (“lack of intrinsic value”). Unlike fiat currency, cryptocurrencies lack physical substance, which made participants question whether they owned the coins. They were also concerned that they would be left with

nothing if the market crashed. Their insufficient knowledge also led to them feeling insecure about the invested projects. Some expressed concern about falling for scammy coins (“random/fake/shitcoin”).

Moreover, participants worried about the legitimacy of the exchange platforms they used (“lack of trustworthy trading platforms”). Five percent of potential investors stated they had difficulty finding a trustworthy place to buy. On the other hand, 10% of investors were concerned about the stability of the platforms they used and were worried that cryptocurrency transactions are susceptible to technical glitches and human errors. Consequently, they might not receive the correct amount of coins they bought. Both groups were worried that their coins disappear if a platform was shut down.

Some participants were concerned that even if they made a profit, it might be problematic to convert it to fiat currency in their country (“low liquidity”), or they might not get the anticipated rate (“inflation/devaluation”). Inadequate regulation in cryptocurrency worsens concerns (“unclear/lacking regulation frameworks”). Some participants worried that cryptocurrency might be banned in their country and they would lose their investments.

A small number of participants mentioned concerns about “media manipulation”, “market manipulation”, “energy consumption”, and getting stuck with shitcoins (“random/fake/shitcoin”). Five participants (0.39%) stated that they are concerned about not having sufficient funds to invest in the future because of personal financial instability (possibly caused by the COVID-19 pandemic). Two percent of potential investors and 5% of investors stated they were not worried about anything at the moment (“no worries”).

4.3.2. Investors’ and potential investors’ strategies for addressing the concerns

We further asked investors and potential investors what they did to mitigate the concerns. A distribution of responses is presented in Figure 5. Thirty-eight percent of potential investors and 23% of investors said they spent time reading and educating themselves about cryptocurrency and the market through online tutorials, articles, and online forums (“self-learning/market research”), but that they were also overwhelmed by the countless “beginner guides” on the Internet. Moreover, 34% of potential investors and 18% of investors indicated that they did not take action to address their concerns because they felt that these were beyond their control.

“There is a lot of information which is overwhelming and all claim different lessons for beginners, stuck in that ‘what beginners should and shouldn’t do’ rut. It’s exhausting... — Participant 287 (potential investor) (D)

Furthermore, 3% percent of potential investors and 17% of investors reported that they would start with small investments before committing to a large purchase (“lower trading frequency/amount”) to allow themselves to monitor market change and gain enough information about the project they invested in. Reducing investments and temporarily pausing trades were also seen as strategies against sudden market drops.

On the other hand, 6% of potential investors and 11% of investors mentioned that they would sell all their shares and completely quit trading (“quit trading”) mostly because of concerns about price volatility, fraud and security breaches, and unclear

regulation frameworks in their countries, which made them feel vulnerable to a market crash.

Four percent of potential investors and 8% of investors highlighted the importance of choosing reputable exchange sites and apps, and reliable learning resources (“choose reputable apps and resources”) because these platforms usually have mature security protections in place and are liable for information they share. That way, they thought they would be less likely to become victims of scammers or hackers. Eleven percent of potential investors and 4% of investors claimed that they sought to “consult experienced experts” for advice, but in parallel, they were concerned about being scammed by people who posed as crypto-investment gurus.

Eight percent of investors and only 1% of potential investors reported that they would stick with stablecoins and only invest money they can lose (“invest wisely”). They believed that bigger coins were less likely to “disappear” so that their investment can be safer. Even if losses occur, they would only lose the amount of money they feel comfortable losing.

One percent of potential investors and 6% of investors said “be careful” when making investment decisions. Two percent of potential investors and 5% of investors also mentioned they read news articles and company reports to stay up-to-date with market change. In addition, 1% of potential investors and 1% of investors talked about calculating the risks, assessing the situation before making investment decisions, and being prepared for taking losses when they happen (“risk management”).

Four percent of investors pointed out the necessity of “portfolio diversification” such as investing in multiple cryptocurrencies, diversifying investment types, and having multiple wallets/accounts to reduce market volatility. Moreover, 3% of investors reported that they use “security protections” such as VPN, a firewall, and complex passwords on their hardware devices and exchange accounts to prevent security breaches. On the other hand, none of the potential investors reported these two strategies, highlighting the user education requirement.

Overall, we observed a significantly lower proportion of potential investors mentioning strategies other than “self-learning” and “consult experienced experts” or “did not take actions”. This result echos their lack of real trading experience, and aligns with our quantitative assessment in Section [4.1.2](#), where potential investors showed significantly lower subjective financial literacy.

“I consider that money gone the moment I put money into crypto” — Participant 382 (investor) (E)

4.4. RQ3: Which Aspects of Cryptocurrency Do Investors Consider Crucial to Learn About?

To answer **RQ3**, using two survey questions, we asked investors about the mistakes they made as a beginner, what they could have done to mitigate these mistakes, and what they perceived as crucial to learn before joining the market. The goal was to draw on their experience and practices and provide useful recommendations for potential investors. The complete questions can be found in Appendix [6](#). Below we present the result from each.

4.4.1. Topics investors viewed as crucial to learn

The top two topics (see Figure 6) investors wish they could have learned before buying and selling cryptocurrency were: “technical analysis of market trends” (49% of new investors and 21% of experienced investors) and “risks associated with cryptocurrency investment” (48% of new investors and 20% of experienced investors). In addition, many investors reported that they wish they would have learned about the basics of cryptocurrency, such as “what cryptocurrency is” (29% of new investors and 17% of experienced investors), “cryptocurrency mining” (30% of new investors and 13% of experienced investors), and “blockchain technology” (9% of new investors and 29% of experienced investors). Two percent of new investors mentioned “Other” topics such as how to properly do market research, cryptocurrency-related tax issues, the functionality of exchange platforms, and how to properly hold cryptocurrencies for the long term. Overall, the perceived importance of these topics was similar between new investors and investors with years of experience.

[Figure 6 about here.]

4.4.2. Mistakes investors made as a beginner

We further inquired investors about the beginner mistakes they made using an open-ended question. As presented in Figure 7, the most common beginner mistake reported by investors was to “invest without understanding” (mentioned by a total of 61% investors). This included lacking understanding of cryptocurrency-related concepts such as blockchain and crypto-mining, the coins they invested in, and market conditions. This result is in line with our findings in Section 4.2.2 that many investors started trading cryptocurrency without adequate preparation.

In addition, a total of 33% investors noted that when they first started investing, they were excited and ended up investing too much money at once (“invest too much too soon”). Moreover, 25% investors indicated that they were overwhelmed by opinions online, and could not recognize the “bad advice” among media hype, rumours, and untrustworthy mentors. Twenty-one percent investors also pointed out that they used to buy and sell cryptocurrency in panic and ended up losing their investments (“emotional buy and sell”), 19% investors said they had unrealistic expectations such as expecting a high profit overnight (“expect quick & high profit”), and 17% investors reported they failed to diversify their portfolio when they just started investing (“failing to diversify”).

Furthermore, 16% investors reported fear of missing out (“FOMO”) and said they used to jump on trends or close a trade at an inopportune moment because others were doing it, 10% investors reported their risk management failures (“bad risk management”), and 9% fell into scams (“fall for scams”). In addition, 9% investors started investing without an appropriate investment plan (“lacking investing plan”), 7% reported “lack of patience” with market changes, and 7% mentioned they used untrustworthy exchange platforms (“choose untrustworthy platforms”).

Other common beginner mistakes mentioned by investors include: “timing the market” (4%), “buy high and sell low” (4%), “insufficient security protection” (2%), “overlooked fees” (2%), and “other” mistakes (5%) such as ignoring the referral offers on exchange platforms, and using exchange platforms for storage purposes.

[Figure 7 about here.]

4.4.3. Mitigation strategies investors suggested to avoid the beginner mistakes

When asked about mitigation strategies to prevent these beginner mistakes, a total of 35% investors recommended “research before actions,” and recommended beginners do their own research on the market and analyze the situation before jumping in (see Figure 7). In addition, a total of 23% investors recommended “learning” about the cryptocurrency technology, the projects they invested in, the associated risks, the legal regulation in their countries, the possible fees, and how to use the exchange platforms properly.

Furthermore, a total of 16% investors suggested that beginners should “be patient and calm”. For instance, beginners should avoid following media hype or selling when the market is too bad, and should regulate their investment frequency and keep a cold mind when making buying and selling decisions. In addition, a total of 14% investors suggested that beginners should have an investment plan (“plan your trades”), including setting a financial goal and knowing when to take profit, considering investing long-term. Investors noted that cryptocurrency should be a long-term investment. Short-term and highly frequent trades will potentially lead to high transaction fees. In addition, they should avoid using new trades to fix the bad ones; otherwise it will easily end up freezing all their funds on one single cryptocurrency, and potentially lose other good investments.

Moreover, 9% investors recommended that beginners invest only the money they can afford to lose (“only invest the money I can lose”), 9% suggested that beginners should have proper “risk management.” For instance, beginners should be aware of possible risks, have a stop-loss plan, and be mentally and financially prepared to take a loss. In addition, 9% of investors suggested starting with a small amount on stablecoins (“start small and stable”).

Apart from that, 8% investors recommended beginners to “follow credible information resources”. They pointed out that beginners can easily be cheated by misleading information online. Similarly, 3% investors recommended to “consult experienced experts” but were worried about their trustworthiness, as many influencers were paid to promote certain coins, and scammers could also pose as crypto-investment gurus and spread false information. Thus, beginners should be careful when choosing the information source.

Other advice from investors includes: “diversify portfolio” to avoid significant losses at once (6%); “choose most used/known platforms” (5%) because these platforms usually have good usability and security protections; “implement security practices” (3%) on their devices to keep their coins and accounts safe; and “build self-confidence” (0.4%) to avoid misleading advice from others.

Lastly, some investors pointed out that beginners usually expect high and quick profit overnight and to get rich quickly. Instead, they should learn to have more realistic expectations (1%) and be smarter about their actions.

5. Discussion

In this Section, we discuss the underlying value of our findings and what implications they have for future design. We begin by discussing common issues that we found in our results. Then, we identify learning components for beginner investors, and formulate design recommendations for beginner-friendly exchange platforms.

5.1. Common Issues and Implications

5.1.1. Price volatility is both an incentive and an obstacle

Our findings suggest that *price volatility* plays a significant role in both motivating and hindering participants' investment in cryptocurrency (Figures 4 and 2), aligning with previous studies (Abramova et al., 2021; Fröhlich et al., 2020; Sas & Khairuddin, 2017). It is important to note that our survey was conducted in August 2022, shortly after the Terra-Luna Collapse in May 2022 (Briola et al., 2023). The failure of this stablecoin and the consequential market volatility might have influenced our participants' perceptions.

Our participants were interested in financial gain, as many of them reported having unrealistic expectations to be rich overnight as a beginner (Figure 7). At the same time, they were also worried about the possible losses caused by market instability. Undoubtedly, cryptocurrency is a volatile investment compared to other investment types. However, the volatility is not purely a bad feature, because it creates earning opportunities.

5.1.2. Insufficient knowledge is a barrier for cryptocurrency trading

The lack of sufficient knowledge of cryptocurrency, market insight, the coins they invested, and the associated risks were mentioned by investors and potential investors as general concerns and obstacles that have stopped investors from continuing to trade and prevented potential investors from joining the market (see Figures 2,4). In addition, investing without understanding was also mentioned as the most common beginner mistake (see Figure 7), highlighting the issue that many investors started trading cryptocurrency without adequate preparation. The lack of understanding or even misconceptions of this newly emerged technology was a common pattern in previous work (e.g., Gao et al., 2016; Knittel et al., 2019; Voskoboynikov et al., 2020). Limited knowledge became a barrier to establishing trust in this technology (Knittel et al., 2019; Sas & Khairuddin, 2015), because any actions the participants took were perceived to have uncertain outcomes and were associated with risks, that they were afraid they had insufficient knowledge to address.

Even though 58% of our participants had experience with the stock market (see Table 2), this experience did not seem to facilitate their cryptocurrency trading activities, as cryptocurrency was perceived to be more complex to understand than traditional stocks. The lack of understanding prevented them from taking advantage of the extreme crypto-market changes and turning losses into returns. These results highlight the need for user onboarding and education.

5.1.3. Untrustworthy and manipulative learning resources interfere with self-education

Self-learning about the basics of cryptocurrency and the market, and doing market research before investments were mentioned by investors and potential investors as the top countermeasures for their concerns and the most important mitigation strategies for beginners' mistakes (see Figures 5,7). At the same time, many participants were overwhelmed by the countless resources online (e.g., too many "beginner's guides"). These results suggest that there is a need for well-structured education about cryptocurrency.

Moreover, studies have shown that online communities such as forums (see Knittel et al., 2019) played an essential role in supporting collective visions of a positive Bitcoin

future, which helped build trust in Bitcoin. However, in our survey, investors suggested consulting experienced experts, but simultaneously they worried about being cheated by “fake” experts that spread misleading information. Many reported encountering manipulative information on the Internet, and some potential investors indicated they could not find learning resources that they felt were trustworthy and factual (Figure 3). This introduced difficulties for investors and potential investors to determine the credibility of the information they gain and make investment decisions. These results further highlight the requirements for providing easy-to-access and credible information to investors.

5.1.4. Security and fraud issues pose difficulties in investment decisions

As presented in Figures 3 and 4, our participants expressed concerns about fraud, security, and general safety of their exchange accounts, as many frauds (e.g., Moore, Han, & Clayton, 2012; Vasek & Moore, 2015), security breaches (e.g., Microsoft Threat Intelligence, 2022), technical failures (e.g., Krombholz et al., 2016) and human errors (e.g., Browne, 2021; Popper, 2021) are associated with user accounts. Many participants questioned the legitimacy and reliability of the exchange platforms they use. The concerns and the existence of fraudulent exchange platforms (e.g., Vasek & Moore, 2015) and “scammy” investment projects (e.g., Moore et al., 2012; Vasek & Moore, 2015) posed further obstacles in the participants’ investment decisions. These results highlight the importance of building trustworthy exchange platforms with security protections and the necessity of user education regarding these risks and appropriate mitigation strategies.

5.1.5. Call for appropriate assurance and regulations

Unlike fiat currency, cryptocurrency is not backed by financial intermediaries or governments. It does not have a physical form. As seen in Figures 3 and 4, a few participants suspected the actual value and future of cryptocurrencies, and their ownership of the coins. These participants were concerned that they will have no way to retrieve the coins if wallets or exchange platforms suddenly go bankrupt or the cryptocurrency becomes banned in their country.

Currently, cryptocurrency is not legal tender in most countries. Although El Salvador has embraced Bitcoin (Faux, 2022), existing laws and regulations are inadequate in helping investors recover their funds when the exchange files for bankruptcy³. Most countries still lack adequate legal frameworks that regulate cryptocurrency (Global Legal Insights, 2021), leaving investors unprotected. Given the uniqueness of cryptocurrency, these results call for suitable insurance policies and improved regulation.

Similar to the “paradox of regulation” discovered by prior studies (Gao et al., 2016; Knittel et al., 2019), our participants had conflicting views on the unregulated nature of cryptocurrency. The participants viewed cryptocurrency investment as a way to escape human institutions because transactions happen without third-party involvement (see Figure 2). It appeals to libertarians who oppose inflationary central-bank meddling (Knittel et al., 2019; Yelowitz & Wilson, 2015). On the other hand, the lack of regulation was a barrier for potential investors to join the market (see Figures 2, 4), mainly because it posed difficulties in retrieving their coins once hacked or caused legal consequences in their countries. Overall, our results emphasize the need for assurance

³Investors of Mt. Gox are still waiting to get repaid after its bankruptcy in 2014 (Karpeles, 2014; Ostroff, 2022)

or regulations that protect users while not stifling the innovation of this technology.

5.2. User Education and Learning Components

Our results identified the urgency of having user education, providing credible market information, providing security protections, building reputable platforms, and exploring appropriate regulations. Previous studies have emphasized the role of improving consumers’ knowledge and skills of online trading (Sharif & Naghavi, 2021), and have proposed to familiarize beginners with training sessions (Fröhlich, Wagenhaus, et al., 2021; Voskobochnikov, Abramova, et al., 2021), while little has been done to develop detailed requirements for the necessary learning components that can better prepare beginners. Since exchange platforms are usually the entry point for users to engage with cryptocurrency trading, we propose that there is a need for these platforms to embed learning components to help beginners overcome entry barriers. These learning components will potentially facilitate interested investors to understand cryptocurrency technology and market insights and help them make rational investment decisions. Below, we discuss the specific learning components that could possibly address the concerns and obstacles reported by investors and potential investors, based on the investors’ recommended strategies.

5.2.1. Support users’ better and correct understanding of cryptocurrency technology

As discussed earlier, lacking knowledge of cryptocurrency technology was mentioned as a general concern and an obstacle for investors and potential investors to trade cryptocurrency. We believe that embedding learning components into exchange platforms that introduce the technical aspects of cryptocurrency can address this issue. A better and correct understanding of this technology will help reduce uncertainty and separate fact from fiction around this technology. Although Gao et al. (2016) noted that such knowledge is unnecessary to perform actual transactions, we argue that investors will be mentally more confident about investment decisions with a better understanding of this technology.

5.2.2. Promote users’ abilities on market research and trend analysis

Another key to making a rational investment decision is to keep up with market changes. Prior studies have confirmed the impact of media sentiment (Caferra, 2020; Hackethal et al., 2022) and social influence (Almeida & Gonçalves, 2023) on investors’ behaviours. As discussed, our participants were concerned about the credibility of the information they found online and thought these could manipulate their decisions (“media manipulation,” “bad advice”). In addition, while investors recommended consulting experienced experts (see Figures 5 and 7), they were also worried about the trustworthiness of their advice. These results highlight the importance of having credible and easy-to-access information resources. Additionally, some participants stated that they do not know how to properly do market research. Therefore, we propose that exchange platforms integrate features to provide up-to-date information to users, and tools to facilitate market trend analysis.

5.2.3. Inform users about crypto-risks and appropriate mitigation strategies

Our participants expressed concerns about fraud, security breaches, and the general safety of their exchange accounts. First, we suggest that the learning components integrate content to help investors understand how wallets and exchanges work, the possible risks, and how to take proper mitigation strategies to protect their funds. Second, we propose that exchange platforms have sufficient security protections in place to prevent breaches. We will discuss this further in the next Section.

5.3. User Experience Design Recommendations for Beginner-Friendly Exchange Platforms

5.3.1. Provide credible market information and analysis features

As we mentioned in Section 5.2.2, the participants reported an inability to gain market insights and were concerned about manipulative advice online. In addition to educational content, we suggest that exchange platforms include information features such as news feeds and up-to-date reports to help investors avoid media hype and misleading information. That way, users can acquire relevant information directly from a platform they already use and trust, instead of consulting potentially harmful resources online.

Moreover, participants reported a lack of tools, guidance, and skills to conduct proper market research (see quote C). Thus, we suggest that exchange platforms provide tools (and corresponding learning content) to help users analyze the market trends (e.g., tips on how to look at trading volumes) and encourage users to use those as a signal to enter or leave the market, as data are less easy manipulable, despite the existence of wash trades (Bitwise Asset Management, Inc., 2019).

5.3.2. Build security management and reputation score

In Section 5.2.3, we proposed to address investors' and potential investors' concerns about fraud, security risks, and the general safety of user accounts by providing educational features. In addition, we suggest that exchange platforms include sufficient security management strategies to prevent breaches and a post-incident response plan to identify, eliminate, and recover from threats (see Fröhlich, Hulm, & Alt, 2021). Moreover, given participants' concerns about the legitimacy of platforms, we suggest that exchange platforms work on improving their reputation score so that they can stand out from competitors, especially the fraudulent ones. A high reputation also makes investors more confident when investing on the platform.

5.3.3. Inform decisions with user interface features

Given our proposed integration of learning components in section 5.2, one way to implement these learning components could be to embed them into the user interface, and display information and advice to users at relevant points to improve their awareness of beginner mistakes and help them make rational decisions. An example could be the stencil-based tutorials proposed by Kelleher and Pausch (2005) that appear directly in the user interface. Another example could be Microsoft's Clippit which provides relevant information to users graphically, although further research is required on "less intrusive and more semantic" suggestions so that users become aware of information without getting annoyed (Grossman, Fitzmaurice, & Attar, 2009).

5.4. *Limitations and Future Work*

We acknowledge some limitations in our work and propose directions for future work. First, even though we had a diverse sample consisting of participants from 23 different countries (see Table 1), a significant proportion of respondents were from South Africa (25%) and the United Kingdom (25%). South Africa has experienced a cryptocurrency boom since December 2021 (Ovex, 2021; Sami & Abdallah, 2022) and recently approved a cryptocurrency-friendly legal framework (Handagama, 2022), which likely explains the high number of South African respondents. The high number of participants from the UK may be related to the time of the day we conducted our survey (2 PM EDT = 7 PM UK). Therefore, our results are influenced by participants from these two countries.

Second, our results are based on participants' self-reported responses, which are unavoidably subject to their honesty and cognitive understanding of themselves. Therefore, the responses may potentially skew toward socially desirable answers or be biased because they have taken similar surveys before. Participants' self-underestimation or self-overestimation may slant the results, too. However, this is a typical and irresolvable limitation of empirical studies.

Third, we attempted a global reach for investors and potential future investors using an online survey. However, given the manifold cryptocurrency users, we cannot assure that the results are generalizable to the entire population. Further, our survey was conducted on Prolific, and we did not collect opinions from people that do not use this platform. We encourage future researchers to reach out to participants using diverse tools and platforms.

Fourth, our survey was conducted shortly after the Terra-Luna collapse (Briola et al., 2023). It is possible that the failure of the Terra project had some impact on our results, particularly in terms of how investors reported sold shares and left the market, and concerned about high market instability, and potential investors perceived price volatility as a substantial obstacle of joining the cryptocurrency market. However, it is important to note that despite the collapse, investors still recommended beginners to start with small investments in stablecoins. Therefore, we believe that any influence from the Terra-Luna collapse on our findings was likely limited. We encourage further research to investigate the lasting effects of the market collapse and how investors perceive issues such as fraud, scams, and bankruptcies during such extreme market events.

Lastly, with the identification of learning components in this work, a logical direction for future work would be to design an exchange platform that embeds these learning components. Previous studies have found that gamification is a great design approach to make learning more engaging, motivating, and fun, and to achieve better learning outcomes (Domínguez et al., 2013; Filsecker & Hickey, 2014). It has been widely applied for education purposes, thus, we propose that designing and evaluating gamified learning features embedded into exchange platforms is a valuable future research direction.

6. Conclusion

Previous research has revealed various challenges in the realm of cryptocurrency, including fraud, security risks, legal concerns, market volatility, manipulation, usability issues of trading platforms, investor misconceptions, and the influence of media, public

sentiment, social factors, and trust on investor behaviour. In this paper, we provide a comprehensive insight into investors' and potential future investors' concerns, motivations, obstacles, and needs regarding cryptocurrency investments.

Our contribution to the existing literature is threefold. *First*, in contrast to prior studies that analyzed investors' behaviours through econometrics modelling, we examined and compared the opinions of both investors and potential investors through an online survey. With a large sample size and direct input from market investors' perspectives, we were able to draw comprehensive conclusions from both groups and identify the similarities and differences in their concerns, mitigation strategies, and reasons for trading or not trading cryptocurrency. *Second*, our findings revealed five issues identified by market investors and potential investors. These issues include 1) unpredictable price volatility; 2) insufficient knowledge about cryptocurrency, market insight, and risks; 3) untrustworthy and manipulative learning resources; 4) security and fraud issues; 5) the need for appropriate assurance and regulations in the cryptocurrency space. These issues emphasized the importance of investor education in the cryptocurrency market and led to a number of suggestions for learning components that educational platforms should include to assist new and potential investors in understanding cryptocurrency. *Third*, based on our results, we provide guidelines for the design of beginner-friendly exchange platforms to meet user expectations while addressing their concerns.

We believe that by integrating these design implications, the exchange platforms can equip investors with a more complete and correct understanding of cryptocurrency technology, foster their ability to analyze market changes and make rational decisions, better prepare potential investors and help them overcome typical beginner barriers.

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Disclosure statement

In accordance with Taylor & Francis policy and our ethical obligation as researchers, we are reporting that Mitacs Accelerate (#IT30275) funds this research project in partnering with Steam Exchange Inc. This financial support does not conflict with our obligations as researchers. We have disclosed those interests fully to Taylor & Francis, and we have in place an approved plan for managing any conflicts arising from that involvement.

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Appendices

Appendix A. Ethical Statements

The study materials have been reviewed and received ethics clearance through the University of Waterloo Research Ethics Board (REB #44273). The study was performed following the guidelines set by the University REB. Informed consent for participation was obtained from all participants. If you have questions for the Board, contact the Office of Research Ethics at 1-519-888-4567 ext. 36005 or reb@uwaterloo.ca.

Appendix B. Affinity for Technology Interaction (ATI) Scale

The ATI scale is used to assess participants' affinity for technology interaction (i.e., tendency to actively engage in technology interaction) (Franke et al., 2018). Participants answered the following questions on a six-point scale from "completely disagree" to "completely agree". Their ATI score was then calculated based on the procedures listed by Franke et al. (2018).

- I like to occupy myself in greater detail with technical systems.
- I like testing the functions of new technical systems.
- I predominantly deal with technical systems because I have to.
- When I have a new technical system in front of me, I try it out intensively.
- I enjoy spending time becoming acquainted with a new technical system.
- It is enough for me that a technical system works; I don't care how or why.
- I try to understand how a technical system exactly works.
- It is enough for me to know the basic functions of a technical system.
- I try to make full use of the capabilities of a technical system.

Appendix C. Experience with Cryptocurrency

The following questions were shown to investors only.

- Q1:** You reported you have experience buying and selling cryptocurrency, what is the main reason that encouraged you to trade cryptocurrency?
- High profit from investments
 - Politically charged aspirations (e.g., the unregulated set-up makes it appealing to Libertarians who philosophically oppose "inflationary central-bank meddling")
 - Peer-to-peer transaction, no third-party involved
 - Popularity on social media
 - other, please specify:
- Q2:** Do you still trade cryptocurrency now?
- Yes
 - No
- Q3:** How long did/have you been trading cryptocurrency in total?
- Less than 6 months
 - 6 months to 1 year
 - 1 year to 5 years
 - 5 to 10 years
 - More than 10 years
- Q4:** (if no longer trading cryptocurrency) What stopped you from continuing trading cryptocurrency?
- high price volatility
 - lack of understanding of cryptocurrency technology, the market, and different coins, etc.
 - tax burden
 - other, please specify:
- Q5:** which cryptocurrency do/did you trade?
- Q6:** how often do/did you trade cryptocurrency?
- Everyday

- Once a week
- More than once a week
- More than once a month
- Once a year or less

C.1. What Stopped you from making cryptocurrency investment so far?

The following question was shown to potential investors only. Participants answered this question in an open-ended space.

Q7: You reported you are interested in buying and selling cryptocurrency but haven't had experience doing so. What prevented you from trading cryptocurrency so far?

C.2. Attitudes and Concerns toward Cryptocurrency Trading

The following questions were shown to potential investors and investors. Participants answered the Q8&Q9 in an open-ended space, and answered Q10 on 5-point Likert scales from "1-not at all concerned" to "5-extremely concerned".

Q8: What aspects of buying and selling cryptocurrency worry you? In what way? Please elaborate on your response.

Q9: What did you do (if any) to address those concerns?

Q10: Please indicate how concerned you are towards the following issues when you trade cryptocurrency.

- Technology (e.g., computer, device, server) outage/malfunctions
- High price volatility (e.g., price volatility within a short time, unexpected trading price due to delayed processing of transactions)
- Anonymity issues (e.g., identifying users by linking their transactions and funds movements)
- Cyber attacks (e.g., hacking of user wallet/account, ransomware, DDoS)
- Fraud (e.g., double-spending, identity theft, Ponzi scheme)
- Legal issues, inconsistent regulations across different countries (e.g., unclear tax requirements, unexpected violation of laws)
- Market manipulation (e.g., fake trading volumes to attract investors and influence price)
- Not being able to convert cryptocurrency to Fiat currency, or not at the expected price
- Personal lack of knowledge about cryptocurrency and trading

C.3. Things you consider critical to learn about

The following questions were only shown to investors. The Q11 was a multiple-choice question with an open-ended space. The Q12 was answered in an open-ended space.

Q11: What cryptocurrency-related concepts do you wish you could've learned about before buying and selling cryptocurrency? (*select all that apply*)

- What cryptocurrency is
- Blockchain technology
- Cryptocurrency mining

- Risks associated with cryptocurrency investment
- Technical analysis of cryptocurrency market price and trends
- Other, please specify: [open-space]

Q12: Think about your experience when you just began to trade cryptocurrency. Please list three mistakes you believe new investors are likely to make, and elaborate on what you did or what could be done to avoid them.

C.4. Financial Literacy, Risk Perception and Tolerance, and Stock Investment Experience

The following questions were shown to potential investors and investors.

Q13: How would you assess your understanding of economics [Subjective Financial Literacy measure adopted from Zhao and Zhang (2021), answered on a 7-point scale from “1-very low” to “7-very high”.]

Q14: How risky do you think cryptocurrency investments are [Risk Perception measure adopted from Zhao and Zhang (2021), answered on a 5-point scale from “1-not at all risky” to “5-extremely risky”.]

Q15: I do not mind taking risks with respect to financial matters [Risk Tolerance measure adopted from Zhao and Zhang (2021), answered on a 10-point scale from “1-complete disagree” to “10-complete agree”]

Q16: Do you have experience buying and selling stock?

- Yes
- No
- Prefer not to disclose

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Table 1. Participants demographic information

	Investors (n=255)	Potential Investors (n=140)	All (n=395)
Age			
Median (Mdn)	25	26	25
Min	18	18	18
Max	53	64	64
Gender			
Female	118	79	197
Male	135	56	191
Non-binary / third gender	2	3	5
Prefer not to say	0	1	1
Prefer to self-describe	0	1	1
Education level			
Some high school or less	10	4	14
High school diploma or GED	52	29	81
Some college, but no degree	51	32	83
Associates or technical degree	12	8	20
Bachelor's degree	99	46	145
Graduate or professional degree (MA, MS, MBA, PhD, JD, MD, DDS etc.)	31	21	52
Marital Status			
Never been married	154	86	240
Living with a partner	55	24	79
Married	39	26	65
Divorced/Separated	7	3	10
Widowed	0	1	1
Dependent Children			
No	163	101	264
Yes	92	39	131
Employment Status			
Working full-time	123	52	175
Working part-time	46	30	76
A homemaker or stay-at-home parent	7	6	13
Student	60	37	97
Unemployed and looking for work	16	9	25
Retired	0	2	2
Other	3	4	7
Household Income			
Less than \$25,000	89	58	147
\$25,000-\$49,999	85	38	123
\$50,000-\$99,999	57	20	77
\$100,000-\$199,999	8	7	15
More than \$200,000	1	2	3
I prefer not to respond	15	15	30
ATI - Affinity for Technology Interaction			
Mean(SD)	4.30(0.75)	4.10(0.93)	4.23(0.82)
Cronbach's α	0.824	0.883	0.851
Country of origin			
Canada	15	11	26
Chile	3	4	7
Estonia	3	1	4
Greece	8	2	10
Hungary	7	2	9
Italy	7	1	8
Mexico	13	12	25
Poland	37	16	53
Portugal	27	10	37
South Africa	62	36	98
United Kingdom of Great Britain and Northern Ireland	54	42	96
United States of America	3	1	4
Other ^a (11 countries)	16	2	18

^a **Note.** "Other" includes 11 European countries, each containing fewer than four participants: Austria, Belgium, Czech Republic, Denmark, Finland, Ireland, Latvia, Netherlands, Slovenia, Spain, Sweden.

Table 2. Participants' Investment Experience

	Investors (n=255)	Potential Investors (n=140)	All (n=395)
Have Experience Trading Stock			
Yes	173	55	228
No	82	85	167
Length of Cryptocurrency Investment Experience			
Less than 6 months	60	0	60
6 months to 1 year	115	0	115
2 to 3 years	65	0	65
4 to 5 years	14	0	14
6 to 10 years			
More than 10 years	1	0	1
Recently Still Trading Cryptocurrency			
Yes	152	0	152
No	103	0	103
Types of Cryptocurrencies Invested			
Bitcoin	206	0	206
Ethereum	156	0	156
Dogecoin	87	0	87
XRP	62	0	62
Cardano	58	0	58
Solana	42	0	42
Binance USD	29	0	29
BNB	28	0	28
USD Coin	27	0	27
Tether	27	0	27
PolkaDot	10	0	10
Shiba Inu	6	0	6
Litecoin	5	0	5
Prefer not to say	3	0	3
Other ^a (44 coins)	71	0	71

^a**Note.** "Other" includes 44 cryptocurrencies, each was reported by less than 5 investors. These include: Algorand, AMP, ANKR, ApeCoin, AVAX, BAT, BOBA, Brise, Btr, CHZ, COS, Cosmos, CRO, Decentraland, Eurx, Everdome, Filecoin, FITFI, Gas, GBP Pound, Gmt, HOT, IOTA, IQ, Luna coin, MINA, Monero, Nano, Nexo Token, Oasis Network, OMG, Polygon, SafeMoon, Sandbox, Shiba, SLP, Stellar, Tezos, Tron, UMI, Uniswap, VeChain, VTHO, VVS.

Table 3. Participants' financial literacy, perceived risk in cryptocurrency, and risk tolerance

	Investors ($n = 255$)	Potential Investors ($n = 140$)	All ($n = 395$)
Subjective Financial Literacy			
Median (Mdn)	4	4	4
Mean (SD)	4.392 (1.259)	4.058 (1.301)	4.274 (1.282)
Min	1	1	1
Max	7	7	7
Shapiro-Wilk's test (Normality)	$p < .001$	$p < .001$	$p < .001$
Mann-Whitney U test (between-group)		$p = .010$	
Perceived Risk Levels in Cryptocurrency Investments			
Median (Mdn)	4	4	4
Min	2	1	1
Max	5	5	5
Mean (SD)	3.675 (.874)	3.514 (.877)	3.618 (.877)
Shapiro-Wilk's test (Normality)	$p < .001$	$p < .001$	$p < .001$
Mann-Whitney U test (between-group)		$p = .084$	
Risk Tolerance Level			
Median (Mdn)	6	5	6
Min	0	0	0
Max	10	10	10
Mean (SD)	5.592 (2.267)	4.843 (2.391)	5.327 (2.336)
Shapiro-Wilk's test (Normality)	$p < .001$	$p < .001$	$p < .001$
Mann-Whitney U test (between-group)		$p = .006$	

Note. We used Shapiro-Wilk's test to assess the data normality. A Mann-Whitney U test was used for between-group comparison for non-parametric data (Shapiro-Wilk's $p \leq .05$ indicates that the data was not normally distributed). All Mann-Whitney U test $p > .05$ indicating there is not significant difference between investors and potential investors.

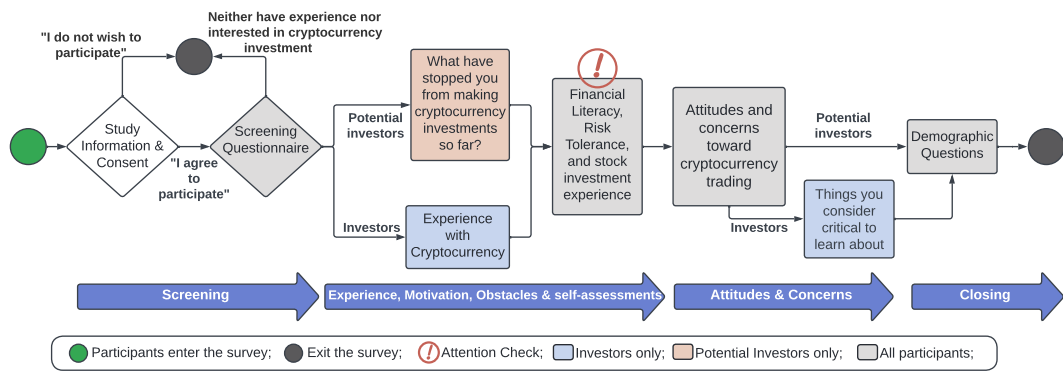


Figure 1. Flowchart of survey questions.

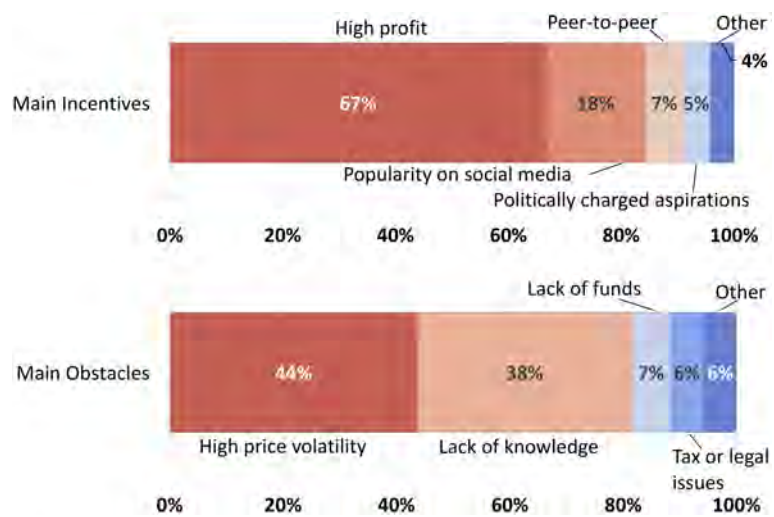


Figure 2. Distribution of primary incentives that have encouraged investors ($n = 255$) to start trading (Q1), and main obstacles that have stopped them from continuing trading cryptocurrency (Q4). Single-choice questions with open-ended space. See complete questions in Appendix.



Figure 3. Distribution of main reasons that have prevented potential investors ($n = 140$) from trading cryptocurrency (Q7). Open-ended question. Total percentage > 100%. See the complete question in Appendix.

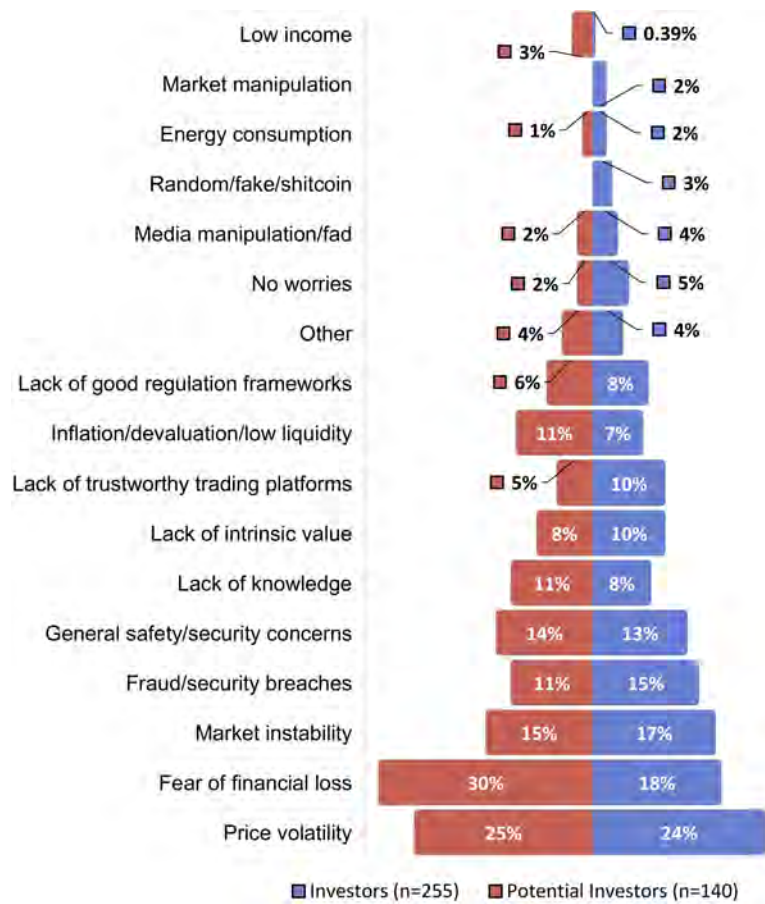


Figure 4. Investors' and Potential investors' responses to the question: "What aspects of cryptocurrency trading worry you?" (Q8) Open-ended question. Total percentage > 100%. See the complete question in Appendix.

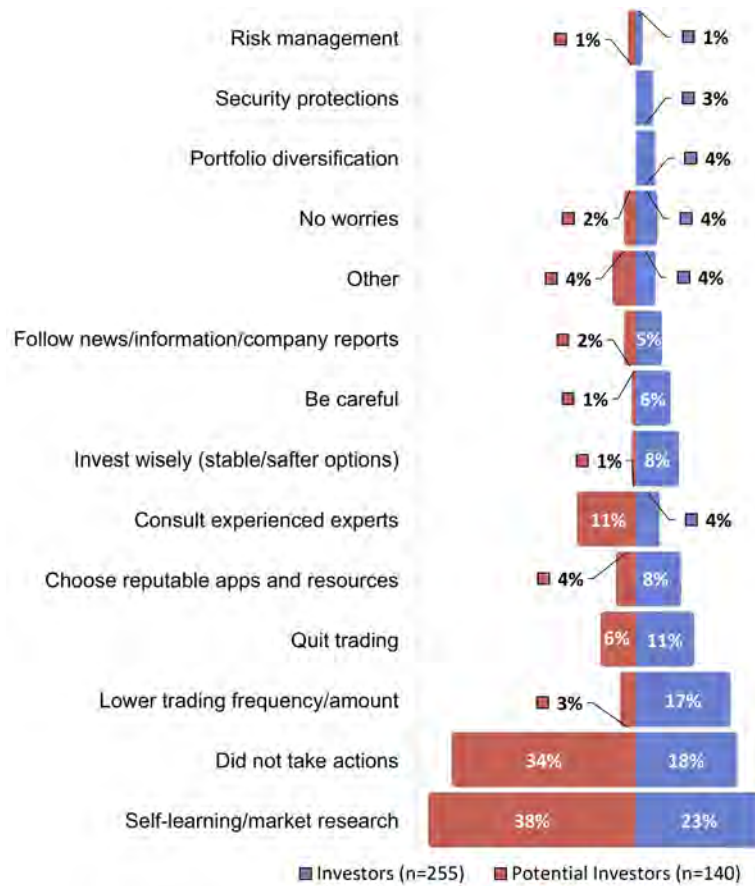


Figure 5. Investors' and Potential investors' responses to the question: "What did you do (if anything) to address those concerns?" (Q9) Open-ended question. Total percentage > 100%. See the complete question in Appendix.



Figure 6. Topics crucial to learn about for beginners (Q11), as viewed by investors ($n = 255$). The topics are broken down by new investors (≤ 1 year of experience, $n = 175$) and experienced investors (≥ 2 years of experience, $n = 80$). Multiple-choice question with open-ended space. Total percentage $> 100\%$. See the complete question in Appendix.

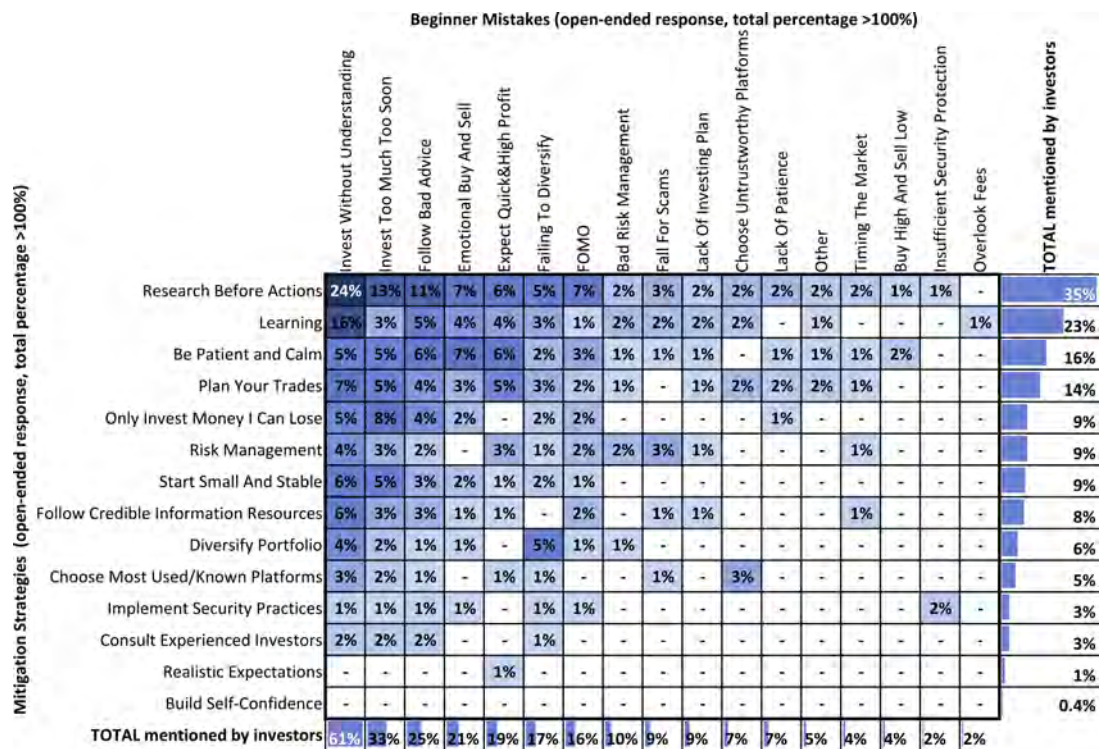


Figure 7. Mistakes (X-axis) investors made as a beginner in cryptocurrency investment, and Mitigation strategies (Y-axis) that could have been done to avoid the mistakes (Q12). Reported by Investors ($n = 255$). Open-ended question. Total percentage > 100%. See the complete question in Appendix.