Factors Driving Individuals' Behavioural Intention to Use Cryptocurrency in Saudi Arabia

BY

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Certificate of Original Authorship

I, Saad Alaklabi declare that this thesis, is submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the Faculty of Engineering and Information Technology at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution.

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List of Publications

The following research papers were published from work undertaken by the author during this PhD research study.

- Saad ALAKLABI and Kyeong KANG (2022), "The Extended TRA Model for the Assessment of Factors Driving Individuals' Behavioral Intention to Use Cryptocurrency." *Interdisciplinary Journal of Information, Knowledge, and Management 17 (2022):* 125-149.
- Saad ALAKLABI and Kyeong KANG (2021), "Perceptions towards Cryptocurrency Adoption: A case of Saudi Arabian Citizens ", *Journal of Electronic Banking Systems, Vol. 2021* (2021), Article ID 110411, DOI: 10.5171/2021.110411.
- Saad ALAKLABI and Kyeong KANG (2020), "Factors Influencing Intention to Adopt Cryptocurrency" Proceedings of the 36th International Business Information Management Association (IBIMA), ISBN: 978-0-9998551-5-7, 4-5 November 2020, Granada, Spain, pp. 1470-1479.
- Saad ALAKLABI and Kyeong KANG (2019), "Factors Driving Individuals' Behavioural Intention to Adopt Cryptocurrency" Proceedings of the 34th International Business Information Management Association (IBIMA), ISBN: 978-0-9998551-3-3, 13-14 November 2019, Madrid, Spain, pp. 2070-2078.
- Saad ALAKLABI and Kyeong KANG (2018), "Factors Influencing Behavioural Intention to Adopt Blockchain Technology," Proceedings of the 32nd International Business Information Management Association (IBIMA), ISBN: 978-0-9998551-1-9, 15-16 November 2018, Seville, Spain, pp. 5170-5174.
- Saad ALAKLABI and Kyeong KANG (2018), "The Impact of Social Influence on Individuals' Behavioural Intention to Adopt Blockchain Technology," Proceedings of the 32nd International Business Information Management Association (IBIMA), ISBN: 978-0-9998551-1-9, 15-16 November 2018, Seville, Spain, pp. 6428-6432.

Abstract

Although globalisation and new advanced technologies have brought numerous benefits to humankind in the last 30 years, they have also caused numerous concerns and corporate scandals, leading to the emergence of the first digital currency, Bitcoin, after the global crisis of 2008. Since then, cryptocurrency uses and uses cases have grown exponentially yet remain limited in scope and geographical dispersion. Also, despite the growing interest of the scientific community and both official and private stakeholders in the topic, scholarly research on the factors influencing individuals' intention to use cryptocurrency is still scarce and provides contradictory evidence regarding some factors. Also, several factors from the technology adoption field had never been tested in the cryptocurrency field. Moreover, several regions have been excluded from prior research, including Saudi Arabia, with no previous empirical research on this topic.

For these reasons, the purpose of this study was to explore the factors driving individuals' behavioural intention to use cryptocurrency in Saudi Arabia by employing a unique research model based on the theory of reasoned action and extending with several external factors which some have not yet been tested in the field of cryptocurrency use. Data are obtained from September to November 2019 by a quantitative research methodology – an online, self-administered survey and analysed by several statistical techniques. The study's final sample included 181 respondents, citizens of Saudi Arabia.

This study has confirmed some previous study results and came with new findings. The attitude was the most significant predictor of intention to use cryptocurrencies in Saudi Arabia, with a direct and positive effect. Subjective norm was also a significant predictor of Saudis' intention to use cryptocurrencies, having a positive direct effect. The additions to the original TRA model, namely perceived usefulness, perceived enjoyment, and

personal innovativeness, were found as statistically significant predictors of both attitude and intention to use cryptocurrencies with a positive effect. In contrast, privacy risk and financial risk were found as statistically significant predictors of attitude and intention to use cryptocurrencies with a negative effect. Security risk was not a significant predictor of the attitude and intention of Saudi residents to use cryptocurrencies.

This study contributes to both theory and practice by extending the TRA model with a range of external factors enabling the assessment of the factors affecting the intention to use cryptocurrency from human, financial and security perspectives and providing the first empirical data on this topic in Saudi Arabia. The study also enables further research on this topic and comparing study results, thus improving understanding of the phenomenon. It also provides various stakeholders with valuable information and recommendations regarding cryptocurrency use, enabling them to make better decisions in this area.

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List of Abbreviations

AT: Attitude

BI: Behavioural Intention

CFA: Confirmatory Factor Analysis

CMB: Common Method Bias

DTPB: Decomposed Theory of Planned Behaviour

EFA: Exploratory Factor Analysis

FR: Financial Risk

GCC: Gulf Cooperation Council

IUCC: Intention to Use Cryptocurrencies

IDT: Innovation Diffusion Theory

MAR: Missing at random

MCAR: Missing completely at random

NAATI: National Accreditation Authority for Translators and Interpreters of Australia

PPM: Push-Pull-Mooring theory

PE: Perceived Enjoyment

PI: Personal Innovativeness

PR: Privacy Risk

PU: Perceived Usefulness

SEM: Structural equation modelling

SN: Subjective Norm

SPSS: Statistical Package for Social Sciences

SR: Security Risk

TAM: Technology Adoption Model

TPB: Theory of Planned Behaviour

TRA: Theory of Reasoned Action

TRI: Technology Readiness Index

UTAUT: Unified Theory of Acceptance and Use of Technology

VIF: Variance Inflation Factor

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Chapter 1. Introduction

The present chapter overviews the research on the factors leading to using cryptocurrencies amongst Saudi citizens. The first part explores the research problem's background and describes the research's purpose and objectives. In the following sections, the research questions and the significance of the research are described, followed by an outline of the methodology employed. Finally, the chapter ends with an outline of this thesis.

1.1. Research Background

In the last 30 years, the world has gone through numerous changes leading to the adoption of new advanced technologies that have disrupted many industries and completely changed the way of life, business, and communication. One such state-of-art technology is a distributed, peer-to-peer blockchain network that emerged after the global financial crisis of 2008 in response to reduced trust in the conventional banking system (Nofer et al., 2017). Based on the complex cryptographic algorithms implemented within the underlying protocol (Nakamoto, 2008), the blockchain provides users with safe, speed and low-cost transactions of cryptocurrencies across the Internet with no need for any intermediaries (Hileman and Rauchs, 2017). As such, the cryptocurrency had been anticipated to disrupt the financial system and become a mainstream currency (Alharbi and Sohaib, 2021; Sohaib et al., 2019).

After the first digital currency, Bitcoin, emerged in 2008, over 1,600 cryptocurrencies have entered circulation, and their use around the world has been significantly augmenting in the last decade (Abbasi et al., 2021). Their number, value and use cases have increased dramatically in the same span (Rejeb et al., 2021), while their market value

reached almost $2 trillion in October 2021 (Coin Market Cap, 2021), and many multinational companies accepted cryptocurrency as a payment method, e.g. Microsoft, Dell, Tesla, AliExpress, and others (Abbasi et al., 2021). Despite that, cryptocurrency use remained limited in scope and geographical distribution (Al-Amri et al., 2019; Sohaib et al., 2019). Besides caution and apprehensiveness of the unknown among potential users (Sohaib et al., 2019), cryptocurrency has recorded significant price variations, from $15,000 in 2017 to $62,256 in October 2021 (Coin Market Cap, 2021). There is also a constant threat of theft and scams, tax evasion, economic structural problems (Nofer et al., 2017; Mangano, 2020), and possibly illegal activities (Shovkhalov and Idrisov, 2021), leading to restrictions or bans on their use in some countries (Pandya et al., 2019; Mangano, 2020; Rejeb et al., 2021).

Moreover, despite various economic implications of cryptocurrencies and the growing interest of scholars and practitioners in their use, scholarly research on this topic remained scarce, especially regarding the factors that influence individuals' behavioural intention to use cryptocurrency (Al-Amri et al., 2019; Mazambani and Mutambara, 2019; Arias-Oliva et al., 2021; Abbasi et al., 2021; Alharbi and Sohaib, 2021). Also, most previous research on cryptocurrency has used technology adoption models that do not consider financial, human and security risks that are immanent to a new technology involved with financial transactions such as cryptocurrency (Won-Jun, 2018; Zamzami, 2020). In addition, prior studies have provided contradictory evidence regarding some factors that affect the use of cryptocurrencies, while several factors related to technology adoption topics had never been tested in the field of cryptocurrency use (Noreen et al., 2021; Xiao, 2020; Zamzami, 2020; Al-Amri et al., 2019; Abramova and Böhme, 2016).

Finally, previous cryptocurrency research is mainly done from developed country's perspectives (Ter Ji-Xi et al., 2021) or in specific cultural contexts (Walton & Johnston,

2018; Zamzami, 2020; Shahzad et al., 2018), which limits the applicability of their results in other cultural contexts, especially the specific ones such as Saudi Arabian. On the other hand, Saudi Arabia is interesting for the research, as it has been recording the growing rate of cryptocurrency use (Al Bawaba, 2021) and has the high potential to increase it more, yet cryptocurrency use is still in the initial stage (Noreen et al., 2021; Alsubaei, 2019; TripleA, 2021). Despite these contradictions, no previous empirical research has investigated the factors affecting cryptocurrency use in Saudi Arabia so far. Therefore, given these significant gaps regarding cryptocurrency use, further research is required.

1.2. Purpose and Objectives of the Study

Given identified research gaps and increased traction for cryptocurrency, both as a subject of scientific inquiry and amongst the general population in the world, the present research was to explore factors that impact the behavioural intention of Saudi citizens to use cryptocurrencies. The aim of this study was to investigate what motivates and what deters individuals from using cryptocurrencies in Saudi Arabia, as well as to explore the relations between these factors.

As cryptocurrency implies using a new technology involved with financial transactions, the influencing factors need to be considered from human, financial and security risk perspectives of new technology acceptance (Al-Amri et al., 2019; Won-Jun, 2018). In this regard, the research had several objectives:

1. To explore factors influencing individuals' intention to use cryptocurrency in Saudi Arabia by developing a unique research model that combines the factors from attitudinal and technology adoption models.

2. To empirically test the model in the context of Saudi Arabia to find out which factors significantly influence the intention of Saudi citizens to use cryptocurrencies, which factors deter them from that intention, and which factors they are indifferent to.
3. To explore direct and indirect relations between factors selected and Saudi citizens' intention to use cryptocurrency, aiming to improve the theoretical and empirical knowledge on this topic and provide stakeholders with information on how to increase the use of cryptocurrency in Saudi Arabia and other similar contexts.

The main motive for the research was to provide a comprehensive insight into people's reasons, attitudes and motivations to use cryptocurrency by exploring this phenomenon from human, financial and security risk perspectives of new technology acceptance. Past studies have investigated this phenomenon mostly from one aspect, primarily regarding the acceptance of this new technology, and consequently, they mostly used technology adoption models and associated influencing factors. However, besides technological, financial, and security perspectives are equally important for this phenomenon, which was the primary motive for integrating the three perspectives.

Another motive for this research was the topicality of this phenomenon and the usefulness of cryptocurrencies in solving the problems of the modern financial system, such as user distrust, high transaction costs, various scams and scandals related to traditional financial transactions, etc. Also, past studies have provided contradictory findings about the influence of certain factors. In contrast, some factors have not been investigated at all, which was an additional motive for this research to discover which of these findings are applicable in the specific cultural context of Saudi Arabia and whether there is an influence of additional factors on the behavioural intention of Saudi residents to use cryptocurrencies that are directly related to the context and culture of this country.

Saudi Arabia has been selected for research on this topic for several reasons. First, the Saudi population comprises primarily young and technology-equipped people who are often keen to adopt any new technology early, which ranks Saudi Arabia among the 50 most technologically advanced countries in the world (Getzoff, 2020). Thus, Saudi Arabia has the potential to increase the volume of cryptocurrency use and take advantage of potentially high returns on investments in cryptocurrencies, cost savings in financial transactions, and opportunities for other use cases, such as using it as a payment method.

However, although the rate of cryptocurrency use is growing (Al Bawaba, 2021), it is still in the initial stage (Noreen et al., 2021; Alsubaei, 2019; TripleA, 2021). Given that Saudis are very engaged in social media (Saudi General Authority for Statistics, 2021), where they can acquire information on cryptocurrencies, most Saudis are already aware of cryptocurrency's existence and features, but only a minority use them (Abdeldayem and Aldulaimi, 2020; Noreen et al., 2021).

However, as the Saudi government has not yet approved Bitcoin as a currency for the general population and issued a warning against their use due to a lack of regulatory framework for their use, Saudi individuals may trade with cryptocurrency but with no official protection in case of losses (ICLG, 2022). On the other hand, the Saudi government has allowed its use for government-to-government payments with the UAE and domestic and cross-border commercial bank transactions (Saudi Central Bank & Central Bank of the UAE, 2020, p. 16), thus sending confusing signals to potential users. For instance, it created a joint cryptocurrency project with the UAE, called ABER, for government-to-government payments, while the Saudi Arabian Monetary Authority has joined the RippleNet allied blockchain banking network to enable faster and cheaper domestic and cross-border transactions between commercial banks (Reuters, 2018; Saudi Central Bank and Central Bank of the UAE, 2020 p. 16). Moreover, Saudi Arabia has

signed a partnership agreement with Elm, Maersk and IBM to develop blockchain-based supply chain management systems, such as TradeLens, at maritime ports (Alsubaei, 2019). In October 2021, the Ministry of Finance in Saudi Arabia announced that they would legalise cryptocurrency companies in Saudi Arabia, which will give this study even more value (ICLG, 2022; Abouelkheir, 2021).

Another reason that further reinforced motivation for this study is the lack of comprehensive empirical research on this topic in Saudi Arabia. Due to date, only two exploratory studies on cryptocurrencies in Saudi Arabia have been conducted - one about the public image of digital currency in Saudi Arabia (Noreen et al., 2021) and one about attitudes towards cryptocurrencies in the five GCC countries, including Saudi Arabia (Abdeldayem and Aldulaimi, 2020). On the other hand, as Saudi Arabia has a high potential to increase the volume of cryptocurrency use if critical stakeholders and the general population get the correct information, understanding the factors affecting cryptocurrency use in the Saudi Arabian context is pivotal.

1.3. Research Questions

This research has answered the following questions:

RQ1: What are the factors that influence individuals' intention to use cryptocurrency in Saudi Arabia?

RQ2: How do these factors influence individuals' intention to use cryptocurrency in Saudi Arabia?

The second research question has been divided into several sub-questions as below:

RQ2.1: How does subjective norm affect individuals' intention to use cryptocurrency in Saudi Arabia?

RQ2.2: How does attitude affect individuals' intention to use cryptocurrency in Saudi Arabia?

RQ2.3: How does perceived risk affect attitude towards cryptocurrency use in Saudi Arabia?

RQ2.4: How does perceived risk affect individuals' intention to use cryptocurrency in Saudi Arabia?

RQ2.5: How does perceived usefulness affect attitude towards cryptocurrency use in Saudi Arabia?

RQ2.6: How does perceived usefulness affect individuals' intention to use cryptocurrency in Saudi Arabia?

RQ2.7: How does perceived enjoyment affect attitude towards cryptocurrency use in Saudi Arabia?

RQ2.8: How does perceived enjoyment affect individuals' intention to use cryptocurrency in Saudi Arabia?

RQ2.9: How does personal innovativeness affect attitude towards cryptocurrency use in Saudi Arabia?

RQ2.10: How does personal innovativeness affect individuals' intention to use cryptocurrency in Saudi Arabia?

1.4. Significance of the Study

The study has several contributions to theory and practice. While the research improves the theoretical and empirical knowledge about cryptocurrency use, which is of particular importance given a lack of studies on this topic, it also enhances the real understanding of the phenomenon, thus stimulating further interest in cryptocurrency use.

Although the study is built on previous research about cryptocurrency use, it contributes theoretical knowledge in several ways. First, this study has developed a new unique research model that extends the attitudinal TRA model with various external factors. This study contributes to the extension of the TRA theory and its use in the new field while proving the TRA's validity when it is not used in its original form. Moreover, by combining factors from attitudinal and technology adoption models, this study evaluates the factors driving individuals' behavioural intention to use cryptocurrency from human, financial and technology perspectives of accepting new technology that involves financial transactions. This research fills the gap of primarily previous technology-based research.

Also, by exploring the three sub-factors of perceived risk, this study improves the current theoretical knowledge by providing empirical evidence on their impact on attitude and intention to use cryptocurrency, especially since this is the first research that explores privacy risk in this field. In contrast, there is a lack of studies that explored other risk sub-types. The study also enriches the theoretical knowledge on the influence of other factors included in this research. It enhances the comprehension of this phenomenon by exploring the relations between these factors since they either provided contradictory evidence in previous studies or were not explored at all. Moreover, this study is the first empirical research on the intention to use cryptocurrency in Saudi Arabia, providing the first empirical data on this topic in Saudi Arabia while presenting a sound basis for further research on this topic in both similar and different cultural contexts. This study enables a comparison of study results and confirms this research model in other contexts. This study also contributes to the further development of the IS body of knowledge and a better understanding of the topic and each factor's influence.

Finally, the present research provides valuable information and recommendations for various stakeholders and practitioners, such as the governments, investors, merchants,

developers, and the general population. By providing them with in-depth insights into the factors affecting intention to use cryptocurrency, this study enables them to predict and evaluate attitudes and intentions of potential cryptocurrency users, create appropriate policies, incentives and campaigns to stimulate further interest in cryptocurrency use and anticipate legal and economic effects of the greater extent of cryptocurrency use in both short and long term.

1.5. Methodological Overview

The present research has applied a quantitative methodology and a corresponding analysis method, structural equation modelling, to empirically test a developed research model in the context of Saudi Arabia.

An online, closed-ended, self-administered survey contained 5-point Likert-type items from previously validated instruments for the factors studied. They were first written in English and then translated into Arabic by a Professional NAATI-accredited translator (NAATI No. CPN5OQ23X) using customary practices for such procedures to avoid translation biases. The survey was conducted online through the Qualtrics platform. After deleting the incomplete surveys, the final sample was composed of 181 Saudi citizens in terms of residence in this country.

The quantitative analysis of the dataset included descriptive analysis and structural equation modelling, reinforced by confirmatory factor analysis and exploratory factor analysis. Those analyses were performed with statistical software SPSS (version 22) and Amos (version 22).

1.6. Research Outline

The present research is composed of six chapters. In the introduction chapter, the research is introduced by discussing the background of the research problem and presenting the purpose of this study. Then, the research questions and contributions were introduced, and a general description of methodological aspects was provided. Finally, the thesis structure and outline are explored in the present section.

The second chapter presents the literature discussion about cryptocurrencies and the scientific studies that explored their use. After introducing cryptocurrencies, a review of the relevant literature on cryptocurrency use was discussed, exposing several gaps and issues in the field. For instance, the absence of research on the topic in Saudi Arabia and a lack of studies that included several promising factors from other fields. The chapter continues by explaining the field's most relevant factors and their empirical and theoretical relationships.

The third chapter is devoted to the theoretical background and the development of the research model. Thus, the essential models employed in previous studies in the cryptocurrency and related technology fields were discussed, including the theory adopted in the present research, the theory of reasoned action. As a result, the research model was developed, and the hypotheses of the investigation were provided accordingly.

Chapter four presents and discusses the methodology employed in this research. The first part is devoted to explaining the research paradigm and design. After that, methods used for questionnaire design, sampling, data collection, and data analysis are presented. Finally, the ethics of the research are discussed.

The fifth chapter presents the quantitative data analyses, including descriptive results and data analyses to test the hypotheses. The chapter presents the participants' profiles and the

survey data screening. The statistical procedures performed are presented and explained: EFA, CFA, and SEM. Three models were tested by changing and controlling variables. Finally, the findings of the conceptual model and hypotheses were presented as results.

Finally, the sixth and last chapter summarises this study and discusses the present research findings. Both theoretical and practical research contributions and implications are explained, followed by the conclusion, limitations of the study and future research directions. Finally, a reference list and appendices are provided.

Chapter 2. Literature Review

This chapter reviews the existing literature on cryptocurrencies to establish the basis of the research model described in Chapter 3. The present chapter is organised into the following sections: an introduction to the concept of cryptocurrency, including its definition, main features, history, advantages and gaps; previous empirical research on cryptocurrency use in general and Saudi Arabia in particular; and the factors that have been employed in the present research to investigate intention to use cryptocurrency in Saudi Arabia.

2.1. Introduction to Cryptocurrencies

The coming sections introduce the concept of cryptocurrencies by describing their main characteristics, considering the reasons for their introduction and evaluating their positive and negative aspects.

2.1.1. History and Features of Cryptocurrencies

In the last 30 years, the world has gone through many changes. First, globalisation has created essential changes in the economic, social and political landscape and almost totally changed the way of life, business, and communication. However, due to its different effects worldwide, numerous economic crises and corporate scandals over recent decades, globalisation has also raised many concerns and provoked sharp criticism (Aysan et al., 2021; Liu et al., 2018; Gürses et al., 2016). At the same time, humankind has witnessed the highly rapid progress of advanced information technologies that allowed widespread connectedness and instant communication between any part of the globe for the first time in history (Boyd et al., 2013; Efremenko et al., 2018). However,

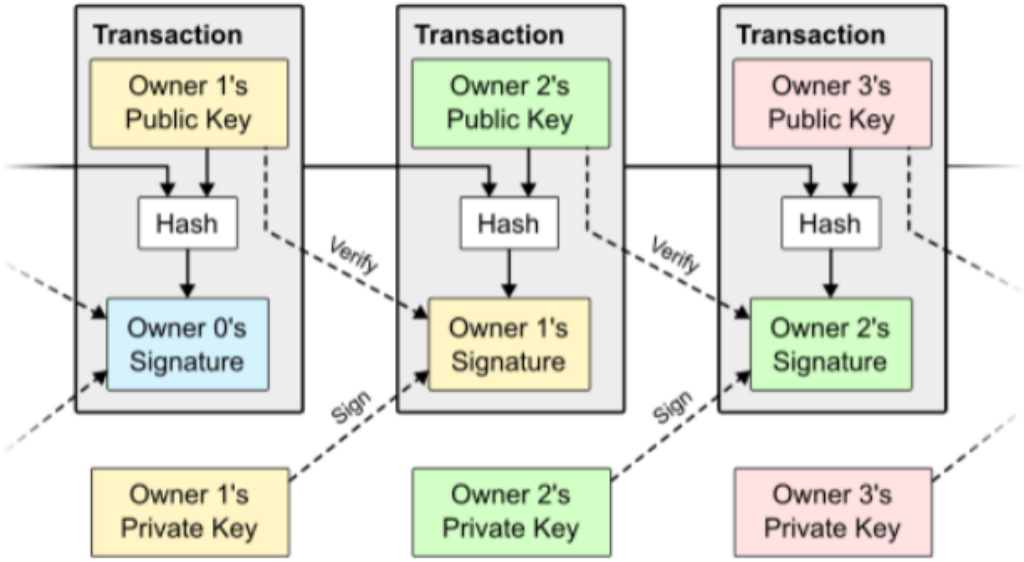
modern technology has also raised many concerns about data privacy and security around the globe due to the amount of information available and its usage for political and commercial purposes (Abbasi et al., 2021; Young and Quan-Haase, 2013). There were also examples of personal data compromised and exposed, whether deliberately, e.g. by Facebook and Instagram, or as the result of security breaches, like hacking or other forms of cyber-attack.

The result was increased regulatory control and a series of counter-surveillance measures focused on creating alternative means of communication and exchanging goods that could be disconnected from the usual institutional and government controls (Nofer et al., 2017; Gürses et al., 2016). One of them was the creation of the first cryptocurrency – Bitcoin, in 2008 in response to reduced trust in the official financial system after the global crisis of that year (Aysan et al., 2021; Nofer et al., 2017). Built on, at that time, an innovative blockchain technology by Satoshi Nakamoto, Bitcoin was intended to create a system where individuals can conduct transactions with digital tokens between pairs in a virtual environment with no need for third-party validation of these transactions due to a consensus mechanism based on cryptographic algorithms and the critical public infrastructure (Nakamoto, 2008).

Each transaction with cryptocurrency is triggered by the private key that proves the ownership of the cryptocurrency and closed by the public-key cryptography mechanisms implemented within the peer-to-peer, distributed blockchain network (Nakamoto, 2008). As presented in Figure 2.1., when a new transaction (a record) is created, the hash of the first block is forwarded to the miner (node), who records and verifies this transaction and creates the hash of the second block with a specific cryptographic algorithm that solves the mining puzzle and thus validates a transaction (Nakamoto, 2008). In this way, all validated transactions are grouped into blocks and cryptographically linked to previous

transactions up to the genesis block, thus creating a chain of blocks (Hileman and Rauchs, 2017, p. 13). Each new block is distributed among all the nodes to update with the last version of the blockchain.

Figure 2.1. Transactions in the Blockchain



Source: Adapted from Nakamoto, 2008, p. 2

Therefore, the key features of cryptocurrency as a system include (Hileman and Rauchs, 2017, p. 106):

1. The lack of a central authority, such as a central bank or other financial institution governing the infrastructure or creating its rules. Instead, its rules are enforced by all the participants in that specific network (or nodes). These rules include but are not limited to a valid transaction and the token's total supply.
2. The existence of a shared ledger that is constituted by a chain of blocks composed of transactions (blockchain), where the entire transaction history is available and can be verified by each participant (node) at any time.
3. The ledger is updated through mining this actualisation process, which results in the creation of the new units of the token (cryptocurrency).

4. The users have no identities attached to them and are free to enter or leave the network at any time.

2.1.2. Advantages and Opportunities of Cryptocurrencies

Given the critical features of cryptocurrency, the blockchain can be seen as a public ledger where everyone can add to and check the history of all transactions that have previously been passed through double-checking to avoid their falsification or duplication (Cai et al., 2018). In this way, cryptocurrency has become a way of enabling extraordinarily secure and private transactions to be conducted over the Internet, at the same time eliminating the need for governmental or central institutions to regulate these transactions due to the high level of security provided by cryptography (Hileman and Rauchs, 2017). Moreover, as transactions are performed via the public Internet with no intermediaries, their costs are lower, while speed, efficiency and resiliency are higher compared to traditional financial transactions (Rejeb et al., 2021).

Another advantage is the flexibility of blockchain technology, enabling a large number of use cases outside the sphere of the financial system, in fields such as human resources, the Internet of Things, gaming, music, the hospitality industry, and others (Nofer et al., 2017; Nuryyev et al., 2018). Also, after Bitcoin, several other cryptocurrencies have been created with different degrees of success, e.g. Bitcoin Gold, Ether and XRP. This has facilitated the formation of an extensive ecosystem where cryptocurrencies are exchanged both among themselves and with national currencies in a series of 'exchanges' that bridge the 'closed' cryptocurrency system and the broader financial system (Alzahrani and Daim, 2019). In this way, cryptocurrencies are allowed to have “value” in reference to national currencies.

In line with that, cryptocurrency use cases can be classified into four categories:

1. Speculative digital asset or investment
2. Medium of exchange
3. Payment rail
4. Non-monetary use

The use of cryptocurrency as an investment and/or digital asset means employing it to obtain more value for the money invested in the short or long term (Baur et al., 2018). Currently, this is the most common use of cryptocurrencies due to potentially high yield because of their high price fluctuations (Rejeb et al., 2021). Using cryptocurrency as a medium of exchange allows money to be moved between countries or platforms, utilising any kind of cryptocurrency or related services regardless of whether or not the transaction complies with national or regional regulations (Efremenko et al., 2018). Still, payment rails are one of the most promising cryptocurrency use categories as more and more companies worldwide accept cryptocurrency, especially Bitcoin, as a payment method, e.g. Microsoft, Dell, Tesla, and Ali-Express (Hileman and Rauchs, 2017; Abbasi et al., 2021). Finally, there is a considerable number of non-monetary use cases, such as intelligent contracts, decentralised accounting, and storage (Nofer et al., 2017).

Therefore, the cryptocurrency industry can be classified into four sectors:

1. Exchanges
2. Payments
3. Wallets
4. Mining

Exchanges include the companies that allow ordinary users to purchase and sell cryptocurrencies and other digital assets in exchange for national currencies and/or other

cryptocurrencies (Baur et al., 2018; Alzahrani and Daim, 2019). The cryptocurrency payment sector involves more than 18,000 businesses that already accept cryptocurrency payments (TripleA, 2021). Although the main areas in this sector are B2B, money transfer and merchant services, the entire sector shows promise due to constant growth (Al-Amri et al., 2019; Abbasi et al., 2021). Wallets refer to the storage of cryptocurrencies, while mining relates to the processing of the transactions and earning fees from the network, e.g. by computing large amounts of hashes to find a valid block that is added to the blockchain (Rejeb et al., 2021).

Therefore, with their undoubted advantages and opportunities, cryptocurrencies have introduced significant changes in how value and money are exchanged worldwide (Saiedi el at., 2021). Their economic relevance is also evident in their total market value of almost $2 trillion, with over 16,000 million units of Bitcoin in circulation and 80% of bitcoins mined (Coin Market Cap, 2021; Rejeb et al., 2021). Although it is difficult to collect precise data, given the network's anonymity, and all results need to be treated with some caution, studies report the impressive numbers of cryptocurrency use and transaction volume worldwide. For example, a cryptocurrency trade volume in 2020 in the US was $1,524m, in the UK $193m, India $64m, and Singapore $11m (Coincub, 2021). There are over 300 million cryptocurrency users worldwide, e.g. India has 100 million users, the USA has 27 million, and Nigeria has 13 million (TripleA, 2021). However, disparities between regions are still significant (Figure 2.2). Emerging markets have more cryptocurrency users than developed ones, as cryptocurrency enables them to overcome currency devaluation and barriers to international transactions, remittances, and trade (Chainalysis, 2021) and have better access to savings and credit facilities (Manyika et al., 2016).

Figure 2.2. Global Crypto Adoption Index 2021

Country	Index score	Overall index ranking	Ranking for individual weighted metrics feeding into Global Crypto Adoption Index		
			On-chain value received	On-chain retail value received	P2P exchange trade volume
Vietnam	1.00	1	4	2	3
India	0.37	2	2	3	72
Pakistan	0.36	3	11	12	8
Ukraine	0.29	4	6	5	40
Kenya	0.28	5	41	28	1
Nigeria	0.26	6	15	10	18
Venezuela	0.25	7	29	22	6
United States	0.22	8	3	4	109
Togo	0.19	9	47	42	2
Argentina	0.19	10	14	17	33
Colombia	0.19	11	27	23	12
Thailand	0.17	12	7	11	76
China	0.16	13	1	1	155
Brazil	0.16	14	5	7	113
Philippines	0.16	15	10	9	80
South Africa	0.14	16	18	16	62
Ghana	0.14	17	32	37	10
Russian Federation	0.14	18	8	6	122
Tanzania	0.13	19	60	45	4
Afghanistan	0.13	20	53	38	7

Note: On-chain cryptocurrency value received and on-chain retail value transferred are weighted by purchasing power parity (PPP) per capita, while peer-to-peer (P2P) exchange trade volume, is weighted by PPP per capita and the number of internet users.

Source: Chainalysis, 2021

Nevertheless, despite the rapid growth of interest in cryptocurrencies, the volume of their use and their use cases are still limited (Al-Amri et al., 2019; Sohaib et al., 2019), which can be explained by a number of problems related to cryptocurrency use identified by the literature.

2.1.3. Issues and Gaps of Cryptocurrencies

Despite many possibilities of blockchain technology and cryptocurrencies, there is an ongoing debate on the problems related to their use and their overall impact on society. First, there is a constant threat of theft or loss of cryptocurrencies due to malware attacks or accidental loss (Nofer et al., 2017). For instance, a faulty application built on the Ethereum protocol in 2016 resulted in the theft of Ether tokens worth almost $70 million

(Rejeb et al., 2021). Similarly, a lack of central authority that monitors this system leads to regulatory uncertainty causing several scams, e.g. Mt. Gox in Japan, BitGrail in Italy, and Cubits in the UK (Cai et al., 2018; Mangano, 2020).

Due to the anonymity of cryptocurrency users and a lack of central authority that monitors the system, there is also the possibility of creating a shadow economy leading to tax evasion and structural problems such as the deflationary spiral (Nofer et al., 2017). This also enables the creation of black markets for illegal operations, such as drug trafficking or the weapons trade, since participants involved in criminal and fraudulent transactions cannot be traced nor restricted (Rejeb et al., 2021; Aysan et al., 2021). Also, the loss or theft of the private key, which proves the ownership of cryptocurrencies, means losing control over the wallet and the inability of cryptocurrency users to recover their funds (Shovkhalov and Idrisov, 2021).

Moreover, cryptocurrency mining has a harmful environmental impact due to the vast energy consumption, while the high volatility of the exchange rate may cause unexpected price fluctuations (Saiedi et al., 2021). Also, it is becoming less accessible for individuals who do not have sophisticated high-tech equipment as significant players in the cryptocurrency market, such as state entities and corporations (Shovkhalov and Idrisov, 2021). Many potential users are also apprehensive of the unknown (Sohaib et al., 2019).

For these reasons, some countries discourage cryptocurrency use, e.g. Germany and the US (Rejeb et al., 2021), while some prohibit all crypto activity, like China, Bangladesh, Bolivia, Ecuador, Kyrgyzstan, Nigeria and some Muslim countries like Iran (Ajouz et al., 2019; Pandya et al., 2019). Also, some countries try to regulate this area or develop their own cryptocurrency (Nofer et al., 2017; Mangano, 2020). On the other hand, accurate data about cryptocurrency users is challenging to obtain due to their anonymity and the possibility of using several wallets from different providers and exchange accounts. As

estimated, there are between 5.8 million and 11.5 million currently active wallets, but only 52% of small exchanges and 35% of large ones hold a formal government licence to work (Hileman and Rauchs, 2017).

Despite these issues, the interest of both official and private stakeholders has continued to increase worldwide, showing a high potential for greater cryptocurrency use and their use cases expansion. However, the scope and geographical distribution of cryptocurrency use still are not sufficient to utilise all the potential of cryptocurrencies that can be achieved only if cryptocurrencies are widely accepted by users (Abbasi et al., 2021). For this reason, the scientific community has started to give more attention to cryptocurrency use. Nevertheless, the research on this topic remained scarce, especially regarding the factors that influence individuals' behavioural intention to use cryptocurrency (Al-Amri et al., 2019; Alharbi and Sohaib, 2021; Mazambani and Mutambara, 2019; Arias-Oliva et al., 2021; Abbasi et al., 2021).

In summary, cryptocurrencies and their underlying technologies have enabled the development of a series of networks around the globe that permit the private and highly secure exchange of value between users without the need for control or certification by a third party. On the other hand, the user anonymity and absence of a central authority that 'backs' or 'warrants' the value of cryptocurrencies have created the opportunity for various illegal activities to flourish without government control. In addition, the crypto world has not been free of scams, with instances of data leaking and speculation leading to the loss of millions of dollars in value. As a result, governments and researchers have expressed various criticisms about cryptocurrency use. Still, due to a high potential for greater cryptocurrency use and the expansion of their use cases, a growing literature has devoted considerable attention to this topic. Therefore, the following section examines cryptocurrency use from a more systematic perspective.

2.2. Empirical Research on Behavioural Intention to Use Cryptocurrency

In order to provide a comparative analysis of related work and results on this topic, the coming sections elaborate on studies that have investigated cryptocurrency use in general and Saudi Arabia in particular. Relevant studies have been found using electronic databases, such as Web of Knowledge, Scopus, Google Scholar, Science Direct and Emerald, as well as bibliometric studies on this topic (Al-Amri et al., 2019; Arias-Oliva et al., 2021; Aysan et al., 2021). To get in-depth insights into the topic, the coming sections include studies that cover different regions, contexts, and cultures. Another indicator for selecting related prior studies was the methodology used in their research. The goal was to find the appropriate theoretical and empirical basis for creating the research model for this study and identify the most relevant factors to investigate behavioural intention to use cryptocurrencies in Saudi Arabia.

2.2.1. Related Cryptocurrency Studies

The research into the creation of digital cash began in the 1980s and gained traction with the development of the blockchain for time-stamped documents in 1991 (Alzahrani and Daim, 2019). Yet, a significant increase in cryptocurrency use in the last years and the impressive number of currently active cryptocurrency users have raised the greater interest of researchers in dealing with this topic. Nevertheless, the scientific research on cryptocurrency use is still in the embryonic stage due to the novelty and specificity of this technology (Abramova and Böhme, 2016; Al-Amri et al., 2019; Alharbi and Sohaib, 2021; Sohaib et al., 2019; Abbasi et al., 2021).

Given that cryptocurrency is a new disruptive technology, most previous studies have used technology adoption models, such as the Technology Acceptance Model, Unified Theory of Acceptance and Use of Technology, Technology Readiness Index, Innovation Diffusion Theory, or their combinations. They have tried to explain why emerging technologies like cryptocurrencies are used by individuals and organisations and predict the rate of cryptocurrency acceptance by new users (Sohaib et al., 2019; Abramova and Böhme, 2016; Albayati et al., 2020; Mendoza-Tello et al., 2018; Nadeem et al., 2021; Gil-Cordero et al., 2020).

However, these models cannot fully explain the acceptance of new technology involved with financial transactions, such as cryptocurrency (Won-Jun, 2018; Zamzami, 2020). Thus, some scholars have tried to evaluate the behavioural intention of individuals towards their use by attitudinal models, such as the Theory of Reasoned Action and Theory of Planned Behaviour or by combining them with technology adoption models (Boxer and Thompson, 2020; Ostern, 2018; Kim, 2021; Gazali et al., 2019; Mazambani and Mutambara, 2019; Schaupp and Festa, 2018; Zamzami, 2020; Ullah et al., 2021).

Still, given the different methodology used, prior studies have also explored the different factors. Previous research has also provided contradictory evidence on some factors that influence cryptocurrency use (Table 2.1), while several factors related to technology adoption models had never been tested in the field of cryptocurrency use (Noreen et al., 2021; Al-Amri et al., 2019; Abramova and Böhme, 2016).

Most studies have found attitude as the most significant predictor of behavioural intention to use cryptocurrency (Zamzami, 2020; Mazambani and Mutambara, 2019; Schaupp and Festa, 2018; Albayati et al., 2020), yet they found different factors affecting this attitude. For instance, trust was found as one of the primary determinants of attitude toward Bitcoin use in South Africa (Jankeeparsad and Tewari, 2018), Korea (Lee et al., 2018), Malaysia

(Sas and Khairuddin, 2017), Cyprus (Zarifis et al., 2014), and China (Shahzad et al., 2018). However, by investigating cryptocurrency use among the generation Z in Malaysia, employing IDT, Alaeddin and Altounjy (2018) found both a high trust level and user satisfaction as the main predictors of attitude and intention to use cryptocurrency, meaning that individuals need to have trust in cryptocurrencies to start using them, but also need to be satisfied with their use to continue with their use. Albayati et al. (2020) also argue that potential users have a more positive attitude towards using cryptocurrency for financial transactions if they have trust in these transactions and perceive them as valuable and easy to use. According to Ostern (2018) and Sun et al. (2020), they also need to have some knowledge about cryptocurrencies, while Sohaib et al. (2019) argue that innovative and optimist individuals are more inclined to have a positive attitude towards disruptive technologies such as cryptocurrencies.

According to Al-Amri et al. (2019), cryptocurrency use depends on the rate of its use by other users. This is in line with the findings of Boxer and Thompson (2020), who found that individuals show herd behaviour by imitating others. Similarly, exploring perceptions towards Bitcoin use in South Africa, Walton and Johnston (2018) discovered that people instead invest in Bitcoin if their social group of family, friends and peers have a positive attitude towards cryptocurrency and invest in it. Similar findings had Kim (2021), who explored Bitcoin usage behaviour in the era of COVID-19 in the United States, as well as other studies exploring factors affecting intention to use cryptocurrency (Gazali et al., 2019; Jankeeparsad and Tewari, 2018; Schaupp and Festa, 2018; Gupta et al., 2020). Yet, Mazambani and Mutambara (2019) have not found subjective norm as a significant factor of intention to use cryptocurrency in South Africa, nor Zamzami (2020) in Indonesia, while Ullah et al. (2021) found its negligible impact on the behavioural intention to use cryptocurrencies in Pakistan. In their first study, Arias-Oliva et al. (2019) had not found

subjective norm as a significant factor of intention to use cryptocurrency in Spain, but later (2021) discovered it as an enabling factor with a positive influence on intention to use cryptocurrency.

This is in line with the study of Mendoza-Tello et al. (2018) that explored the intention to use cryptocurrencies for electronic payments in Spain, with the TAM and UTAUT, who found that social media indirectly affects the intention to use cryptocurrencies by increasing perceived trust and perceived usefulness and reducing the perceived risk of cryptocurrencies. Yet, as specialised information on disruptive technologies such as cryptocurrency is scarce, and people ask for recommendations due to curiosity yet do not share information with others, social media collaboration often does not generate sufficient trust to promote wider cryptocurrency use (Mendoza-Tello et al., 2018). Potential users may also have difficulties in distinguishing the perceived benefits and perceived risks of cryptocurrency use (Abramova and Böhme, 2016). For example, they highly appreciate the privacy and security of cryptocurrency transactions but still fear financial and data losses requiring protection from regulatory bodies, at the same time having concerns that these regulatory restrictions may limit their Bitcoin use.

Thus, the perceived risk usually has a significant adverse effect on the intention to use cryptocurrency (Abramova and Böhme, 2016; Sun et al., 2020) since the insecurity of cryptocurrencies acts as an inhibitor of their use (Sohaib et al., 2019). Still, using the TRA to explore Bitcoin investment behaviour, Gazali et al. (2019) found that the influence of perceived risk depends on financial risk-tolerance, meaning that risk-averse individuals are less likely to use cryptocurrency and vice versa. Gil-Cordero et al. (2020) found that perceived risk in Spain depends on performance expectancy and trust, while Al-Amri et al. (2019) found that it depends on consumers' attitudes towards the hazard of failure of technology. However, exploring factors affecting Bitcoin use in China, employing the

TAM, Nadeem et al. (2021) have not found the influence of perceived security risk. Similarly, Ter Ji-Xi et al. (2021) have not discovered perceived risk as a significant predictor of cryptocurrency use in Malaysia nor Nuryyev et al. (2018) in Taiwan, and Yoo et al. (2020) in Korea. On the other hand, Arias-Oliva et al. (2019) first found perceived risk as insignificant and later (2021) found its both positive and negative impact depending on specific circumstances and social influences.

Studies have also found a positive impact of perceived usefulness on intention to use cryptocurrencies but found different factors influencing it, namely trust (Nuryyev et al., 2018), expected return (Nadeem et al., 2021), subjective norm (Ullah et al., 2021), and perceived security (Won-Jun, 2018). Yet, Shahzad et al. (2018) found that perceived usefulness is just a partial mediator of intention to use Bitcoin in China, Walton and Johnston (2018) found its indirect effect on the intention to use Bitcoin in South Africa, while Janssen et al. (2015) found that perceived usefulness fluctuates in various consumer categories. Prior studies have also found a positive impact on perceived benefits (Gazali et al., 2019; Yoo et al., 2020), perceived behavioural control (Kim, 2021; Boxer and Thompson, 2020; Schaupp and Festa, 2018), performance expectancy (Arias-Oliva et al., 2019), effort expectancy and facilitating condition (Ter Ji-Xi et al., 2021; Jankeeparsad and Tewari, 2018), as well as visibility and compatibility (Wood et al., 2017; Yoo et al., 2020) of cryptocurrencies.

Given that discomfort acts as an inhibitor of cryptocurrency use (Sohaib et al., 2019), perceived enjoyment also has a significant favourable influence on the intention to use cryptocurrency and other digital systems (Nadeem et al., 2020; Mubuke et al., 2017). This is important as people often consider cryptocurrencies complicated, requiring a lot of effort and learning to understand the system and protect itself (Abramova and Böhme, 2016). Moreover, by exploring cryptocurrency use in Australia, employing the TRAM

(TRI and TAM) model, Sohaib et al. (2019) found that innovative and optimist people are more willing to try new disruptive technologies such as cryptocurrencies. Sun et al. (2020) confirmed a positive impact of personal innovativeness on intention to use cryptocurrency investment in South Korea and China, while Abbasi et al. (2021) have found personal innovativeness as a good moderator of individual intention to use cryptocurrency in Malaysia. On the other hand, Ullah et al. (2021) found only a negligible impact of innovativeness on the behavioural intention to use cryptocurrencies in Pakistan. Finally, Alzahrani and Daim (2019) have found that cryptocurrency use is affected by various economic, technical, social, and personal factors.

Table 2.1. Summary of Recent Empirical Studies on Cryptocurrency Use

Author	Purpose	Method	Findings	Limitations
Abramova and Böhme, 2016	The use of Bitcoin as an online payment system	Model: TAM, PR, PB Country: Online survey Sample: 6,395	Financial and security risk had a significant impact on perceived risk, which in turn had a statistically negative effect on the intention to use crypto.	Did not include hedonic benefits, social factors, and trust. Focused only on Bitcoin.
Alaeddin and Altounjy, 2018	Factors affecting the intention of Generation Z to use crypto in financial decisions	Model: IDT Country: Malaysia Sample: 230	A high trust level was the main predictor of cryptocurrency use. Customer satisfaction was another factor with a positive impact.	Did not consider other technology adoption models. Sample limited to university students.
Albay et al., 2020	Behavioural elements of intention to use cryptocurrency transactions	Model: TAM Country: Online survey Sample: 251	Trust, perceived ease of use and usefulness positively affected attitude and intention to use cryptocurrency.	Did not consider the impact of perceived risk.
Arias-Oliva et al., 2019	Factors influencing the use of	Model: UTAUT Country: Spain	Performance expectancy and perceived ease of use and usefulness were the most critical factors.	Focused only on college-educated adults with basic

	cryptocurrencies	Sample: 402	Social norms, perceived risk, and financial literacy were not significant.	knowledge of the Internet.
Boxer and Thompson, 2020	The role of herd behaviour in cryptocurrency investment markets	Model: Herd behaviour TPB, TRA Country: Online survey Sample: 130	Positive attitude, influenced by subjective norms, perceived behavioural control and propensity to imitate others, was a strong predictor of crypto investment.	Focused on crypto investment forums, which limits the generalisation of the findings.
Gazali et al., 2019	Bitcoin investment behaviour	Model: TRA Country: Online survey Sample: 45	Attitude, financial risk-tolerance, perceived benefits and subjective norms affected the intention to invest in Bitcoin.	Did not employ a mixed-method approach. Small sample size.
Gil-Cordero et al., 2020	Cryptocurrencies as a financial tool	Model: TAM Country: Spain Sample: 327	Trust and performance expectancy were the most influential factors, while perceived risk indirectly affected intention to use crypto.	Did not include volatility, ease of use, and facilitating conditions.
Jankeeparsad and Tewari, 2018	The determinants affecting end-user adoption of Bitcoin in South Africa	Model: DTPB Country: South Africa Sample: 119	Perceived usefulness and access to facilitating conditions were primary determinants of Bitcoin use, while lack of trust and social norms were the main factors of not using it.	Exploratory study. Did not use qualitative methods to enhance explanatory power.
Kim, 2021	Bitcoin usage behaviour in the era of COVID-19	Model: TPB Country: United States Sample: 395	Subjective norm and perceived behavioural control had a significant impact on intention towards crypto.	Focused only on dimensions of money attitudes.
Lee et al., 2018	The motivation to adopt Bitcoin as an asset and a currency	Model: A causal model Country: Korea Sample: 192	Key antecedents were currency attitude and asset attitude influenced by profitability expectancy and trust, showing Bitcoin's consideration as a target for speculation.	Only Bitcoin is analysed. Insufficient demographic information on respondents.
Mazambani and Mutambara, 2019	Predicting behavioural intention to	Model: TPB Country: South Africa	Consumer attitudes and perceived behavioural control were the main drivers of intention to	Lacked hedonic and personal factors. The sample included

	adopt cryptocurrency	Sample: 269	use cryptocurrency. Subjecti ve norms did not affect it.	only adult students at a single University.
Mendoza-Tello et al., 2018	The role of social media in increasing trust and intention to use crypto for electronic payments	Model: TAM, UTAUT Country: Spain Sample: 125	Social influences increase trust and perceived usefulness but do not directly reduce perceived risk and increase intention to use cryptocurrencies.	Did not include other social factors. Sample limited to a specific level of formal education.
Nadeem et al., 2021	The adoption factors of cryptocurrencie s - a case of Bitcoin	Model: TAM Country: China Sample: 385	Perceived ease of use and usefulness, affected by expected return, positively influenced intention to use Bitcoin, while the impact of perceived security was not confirmed.	Did not include trust, social factors, or risk. Data were collected in only one city.
Nureyev et al., 2018	Factors influencing the intention to use cryptocurrency payments	Model: TAM Country: Taiwan Sample: 101	Intent to use crypto payments was affected by perceived usefulness and ease of use, affected by trust, but not by risk.	Did not include attitudes. A relatively small sample size.
Ostern, 2018	Trust in blockchain technology	Model: Trust Model Country: Online survey Sample: 46	Trust and knowledge about cryptocurrency are the most influencing factors.	Focused only on trust. A small sample.
Sas and Khairuddin, 2017	The challenges and opportunities for Bitcoin users	Model: HCI theories on trust Country: Malaysia Sample: 20	Trust was the essential factor of crypto use, as it is considered a speculative investment or savings' protection.	Limited research scope and too small sample. Explored only Bitcoin.
Schaupp and Festa, 2018	Cryptocurrency adoption and the road to regulation	Model: TPB Country: United States Sample: 117	Attitude, subjective norms, and perceived behavioural control positively influenced the intention to use crypto.	The sample was limited to students from two universities. Personal factors are absent.
Shahzad et al., 2018	The factors influencing	Model: TAM	Awareness and perceived	Data from only one city. Lack

	Bitcoin adoption in China	Country: China Sample: 376	trustworthiness significantly affected intention to use Bitcoin, while perceived usefulness was a partial mediator.	of attention to cross-cultural aspects.
Sohaib et al., 2019	The relation between TR and TA dimensions and intention to use crypto	Model: TRAM (TRI and TAM) Country: Australia Sample: 160	Optimism and innovativeness act as motivators, during insecurity and discomfort act as inhibitors of cryptocurrency use.	Focused only on students and staff at one university.
Sun et al., 2020	Switching intention to the cryptocurrency investment market	Model: PPM and reinforcement Country: South Korea and China Sample: 244	Perceived risk, expected reward, personal innovativeness, and knowledge were critical factors for using crypto investment.	Limited cryptocurrencies' characteristics and situational factors.
Ter Ji-Xi et al., 2021	The factors influencing consumer cryptocurrency use as a medium of transaction	Model: UTAUT, PR Country: Malaysia Sample: 290	Performance expectancy, effort expectancy and facilitating condition are significant predictors, while the perceived risk is not a significant predictor.	Did not include attitudes and social influences.
Ullah et al., 2021	Predictors for using cryptocurrency in manufacturing and service operations	Model: TAM, TRI, TPB Country: Pakistan Sample: 211	Attitude, perceived usefulness and ease of use had a significant impact on intention to use crypto, while innovativeness and subjective norms show negligible effects.	Focused on manufacturing and service enterprises.
Won-Jun, 2018	Understanding the factors that influence Bitcoin acceptance	Model: TAM Country: Korea Sample: 224	The intention to use Bitcoin is affected by perceived usefulness and perceived security, while perceived ease of use was not significant.	Did not employ attitude or hedonic factors in the research model.
Wood et al., 2017	The diffusion and adoption of Bitcoin	Model: TAM, IDT Country: Global Sample: 121	Perceived ease of use, visibility, and compatibility positively affected the intention to use cryptocurrency.	Did not include attitudes and social influences. Small sample.

Yoo et al., 2020	Understanding the diffusion and adoption of Bitcoin transaction services	Model: IDT, TPB, TCT Country: Korea Sample: 1,339	Perceived benefits and service compatibility play notable roles in behavioural intent, while perceived risk, cost, and complexity had not a significant impact on crypto use.	Focused only on one cryptocurrency – Bitcoin.
Zamzami, 2020	The planning behaviour to adopt crypto as a transaction tool	Model: TPB Country: Indonesia Sample: 207	Only attitudes affected intention to use digital money, while subjective norms and behavioural control are not significant.	Hedonic and other personal factors were not explored.
Zarifis et al., 2014	Consumer trust in digital currency	Model: Trust Country: Cyprus Sample: 41	Trust is the most crucial factor influencing crypto use.	A too-small sample size focused only on one university.

Therefore, according to prior research, cryptocurrency is most likely to be used if it is perceived as useful, easy to use and enjoyable, and if perceived risk is lower and social influences and expected performance more extraordinary, thus creating a positive attitude and solid behavioural intention towards their use. Prior studies have also shown that a typical cryptocurrency owner is most likely a younger male with a higher income and education level (Alaeddin and Altounjy, 2018; Fujiki, 2020), expecting to gain profit from cryptocurrency use rather than using it as an alternative transaction mechanism (Glaser et al., 2014). Hence, according to previous studies, the extent of cryptocurrency use can be improved if news and social media provide information on their features, alternative uses, and value (Craggs and Rashid, 2016; Mai et al., 2015; Al Shehhi et al., 2014), as well as by their greater acceptance as a payment method by merchants and various government incentives that stimulate their use (Sas and Khairuddin, 2017; Al-Amri et al., 2019).

However, a literature review has also discovered different study results on the same factors, e.g. some studies found the risk as relevant for cryptocurrency use (Abramova and Böhme, 2016) while others have not found its significant influence (Nadeem et al., 2021; Nuryyev et al., 2018) or had not explored it at all (Albayati et al., 2020). Also, some studies explored this topic just from a technological perspective (Nadeem et al., 2021; Mendoza-Tello et al., 2018), neglecting its human and security risks nature. In line with that, prior studies used various factors and models, focused only on one cryptocurrency, mostly Bitcoin (Lee et al., 2018), or excluded some critical factors, such as social influences (Ter Ji-Xi et al., 2021; Wood et al., 2017), personal factors (Abramova and Böhme, 2016; Mazambani and Mutambara, 2019), and risk factors (Nadeem et al., 2021). Also, some prior studies had a too small sample (Gazali et al., 2019; Ostern, 2018), or they focused on particular user groups (Alaeddin and Altounjy, 2018; Arias-Oliva et al., 2019), which questions the generalisability of their findings.

Moreover, as prior research on cryptocurrency has mainly been conducted in western countries or specific cultural contexts (Ter Ji-Xi et al., 2021), their results might not be applicable to people in other contexts due to cultural and other differences. For example, entire regions are excluded from prior research or studies exploring countries that primarily differ from the Saudi context and culture (Won-Jun, 2018; Sohaib et al., 2019; Schaupp and Festa, 2018). Therefore, this research aimed to fill these gaps by integrating the three perspectives and exploring the influence of their associated factors in the specific cultural context of Saudi Arabia. The following section discusses the current situation of cryptocurrency use in Saudi Arabia.

2.2.2. Cryptocurrencies in Saudi Arabia

Saudi Arabia is a Middle East Country, a Gulf Council member and one of the world's leading petroleum exporters. According to the Saudi General Authority for Statistics (2021), it has a population of 34,218,169 people and the highest number of Internet users in comparison to any other Arabic country (Rampersad and Althiyabi, 2020). Saudi citizens are generally inclined to early adopt any new technology, which ranks Saudi Arabia among the 50 most technologically advanced countries in the world (Getzoff, 2020). It has also recently recorded a growth rate of cryptocurrency use (Al Bawaba, 2021). Yet, cryptocurrency use is still low (Alsubaei, 2019). As estimated, there were 452,778 users in 2020, which is just 1.30% of the entire population and a deficient level compared to 12.73% in Ukraine, which is ranked first, followed by Russia (11.91%), Kenya (8.52%), the US (8.31%), and India (7.30%) (TripleA, 2021).

However, some GCC countries have started to show greater interest in cryptocurrency use. For instance, UAE legalised blockchain technology and is employing it in their plans for smart cities. At the same time, Bahrain hosts a legalised cryptocurrency site, where citizens of five GCC countries, Bahrain, Saudi Arabia, UAE, Kuwait and Oman, can purchase and trade a few cryptocurrencies with their national currencies (Abdeldayem, and Aldulaimi, 2020; Noreen et al., 2021; Rain, 2021). On the other hand, some countries have banned cryptocurrencies or see them as risky, while others are still considering their position (Noreen et al., 2021; Ajouz et al., 2019; Islamic Economic Forum, 2018). For example, the Saudi Arabian Monetary Authority has declared Bitcoin an unapproved currency in the country, warning of the risks of trading in digital currencies in the absence of government supervision (Noreen et al., 2021; ICLG, 2022). Yet, it intends to pursue further investigation before taking a definitive position on this matter.

Still, the governments of Saudi Arabia and UAE have developed a joint cryptocurrency project named ABER, in partnership with IBM and with the participation of both central banks and six commercial banks. The project "sought to explore whether distributed ledger technology could enable cross-border payments between the two countries to be reimagined: using a new, dual-issued digital currency as a unit of settlement between commercial banks in the two countries and domestically" (Saudi Central Bank and Central Bank of the UAE, 2020, p. 6). It explored three use cases: payment between central banks, the domestic payment between commercial banks and cross-border payment between commercial banks (Saudi Central Bank and Central Bank of the UAE, 2020, p. 16). Saudi Arabia has also signed a partnership agreement with Maersk, Elm and IBM to develop blockchain-based supply chain management systems at maritime ports called TradeLens (Alsubaei, 2019).

Currently, individuals may trade with cryptocurrency with no financial protection from the official financial system or government in case of losses, while financial institutions like banks may trade with cryptocurrency only with the permission of the Saudi Central Bank (ICLG, 2022). In October 2021, the Saudi Ministry of Finance announced legalising cryptocurrency companies in Saudi Arabia (Abouelkheir, 2021).

Although cryptocurrency use in Saudi Arabia is still in the early stage, it has a high potential to improve since the country is mainly composed of young and tech-savvy people who are interested in trying and early-adopting new technologies (Saudi General Authority for Statistics, 2021). Since they are very engaged in social media, where they can acquire more information on cryptocurrencies, most Saudi citizens are already aware of their existence and features, but only a minority use them (Abdeldayem and Aldulaimi, 2020). On the other hand, the full potential of cryptocurrencies can be achieved only if it is widely accepted by users (Abbasi et al., 2021; Alharbi and Sohaib, 2021). In this regard,

it is essential to find out which factors affect cryptocurrency use in the Saudi Arabian context, especially since cryptocurrency use in Saudi Arabia has received limited academic attention, as only two exploratory studies have been conducted so far.

One of them, an exploratory study of attitudes towards cryptocurrencies (Abdeldayem and Aldulaimi, 2020), employed a survey (n=610) to measure respondents' opinions and attitudes towards cryptocurrency in the GCC (Bahrain, Kuwait, Oman, Saudi Arabia and UAE). The study found that 83.6% had at least heard about cryptocurrencies, but 85% of respondents still did not own any kind of cryptocurrency. The other study (Noreen et al., 2021) was a survey exploring the image of digital currency in Saudi Arabia. The number of respondents was not reported. Around two-thirds (67%) of respondents were aware of the existence of this virtual currency. Amongst the reasons listed for not owning Bitcoin, the most commonly reported were: lack of acceptance as a payment method; current payment method meets all their needs, and lack of trust in a private currency not backed up by any government.

Therefore, this study aimed to fill these gaps by integrating the three perspectives of cryptocurrency use and exploring the influence of their associated factors in the specific cultural context of Saudi Arabia to provide key stakeholders and the general population with information on factors influencing the behavioural intention of individuals to use cryptocurrencies. The study results also provide potential users with in-depth knowledge of cryptocurrencies' opportunities to serve various stakeholders as a basis for creating appropriate policies and incentives to increase cryptocurrency use in Saudi Arabia and other similar cultural contexts. The coming sections elaborate on the factors employed in the present research to investigate the intention to use cryptocurrency in Saudi Arabia.

2.3. Factors Influencing Behavioural Intention to Use Cryptocurrency

The previous sections identified a set of elements that have been theoretically and empirically tested to explain and understand how individuals decide to use innovative technology such as cryptocurrency in different contexts and industries. Previous research on cryptocurrency use and related fields is further examined below to identify and explore the factors that are most appropriate for examining the topic of the present research.

2.3.1. Subjective Norms (SN)

Subjective norm originates from sociology and psychology, accounting for a social component of attitudinal models that explains the effect of group or social pressure on individual attitude to engage - or not - in a particular behaviour (Kim, 2021; Schaupp and Festa, 2018). It can be divided into two parts: the perceived degree to which a reference group approve or disapprove of the performance of a behaviour (injunctive norm) and the degree to which a person believes that its reference group is engaging in a behaviour (descriptive norm) (Ajzen, 2020). In the present study, subjective norm refers to the subjective evaluation of the social pressure from a relevant reference group to use cryptocurrencies.

Subjective norm has been found as one of the critical factors in cryptocurrency use. For instance, Boxer and Thompson (2020), in an online survey (n=130), found a strong positive relationship between subjective norm and attitude towards cryptocurrency use, concluding that individuals imitate others and have a more positive attitude towards cryptocurrency when their social group of family, friends and peers consider it positively. The same findings had Walton and Johnston (2018) in South Africa, as well as Schaupp

and Festa (2018) in the US sample (n=117), who reported a significant positive correlation between cryptocurrency use and subjective norm. This was also confirmed by Kim (2021), who found that individuals in the US (n=395) are more likely to engage in cryptocurrency use if social expectations and perceptions about such behaviour are strong. Similarly, in an online survey (n=45) using the TRA, Gazali et al. (2019) found that subjective norms, together with attitudes, financial risk-tolerance and perceived benefits, positively affect the intention to invest in Bitcoin. Al-Amri et al. (2019), Gupta et al. (2020), and Jankeeparsad and Tewari (2018) also confirmed a positive impact of social norms.

In contrast, Zamzami (2020) in an Indonesian sample (n= 207) and Mazambani and Mutambara (2019) in a sample from South Africa (n=269) have not found a significant impact of subjective norms on intention to use cryptocurrency. Both studies were conducted in urban areas, and their authors hypothesised that there is a lower probability of expanding cryptocurrency use on the basis of social pressure in such contexts. Arias-Oliva et al. (2019, n=402) and Mendoza-Tello et al. (2018, n=125) have also found negative results regarding the influence of social influences on cryptocurrency use in Spain. Mendoza-Tello et al. (2018) found only its indirect impact through increased perceived trust, yet social media does not generate sufficient trust to make this impact significant. On the other hand, in their second study in Spain, Arias-Oliva et al. (2021) found social norm as an enable factor with a positive impact on the intention to use cryptocurrency.

In summary, the subjective norm has been used in several studies exploring cryptocurrency use, but they provided mixed results regarding its relationship with the intention to use cryptocurrency, which highlights the need for more research.

2.3.2. Attitude (AT)

Attitude is a central concept in social psychology, and, as such, it has been employed to explain behavioural change under varied circumstances and conditions in attitudinal models. Schaupp and Festa (2018) identify two main components of attitude: "[t]he combination of beliefs about a behaviour's consequences and the evaluation of those consequences" (p. 3). In terms of technology use, Yoo et al. (2020) define attitude as "a user's positive or negative evaluation of a specific technology (or service) when performing certain activities" (p. 6). Thus, the present research defines attitude (towards cryptocurrency use) as the sum of the subjective knowledge regarding cryptocurrency use plus a person's subjective evaluation of its use. Such evaluation has a dispositional nature that directly influences behavioural intention to use (or not) cryptocurrency.

In most studies dealing with cryptocurrency using attitudinal models or their combination with technology adoption models, the attitude was found as one of the most significant factors of behavioural intention to use cryptocurrency. For instance, Zamzami (2020) found attitude as the only significant predictor of digital money use in Indonesia (n=207). In an online survey (n=251), Albayati et al. (2020) found attitude as the most significant predictor of behavioural intention to use cryptocurrencies for financial transactions, while Schaupp and Festa (2018) found that a positive attitude towards cryptocurrencies was a good predictor of their use in the US, together with the subjective norm and perceived behavioural control.

From a study of the role of herd behaviour in cryptocurrency use, Boxer and Thompson (2020) reported that attitude towards cryptocurrency was strongly affected by perceived behavioural control, social norms and propensity to imitate others. Mazambani and Mutambara (2019) also found that attitude and intention to use cryptocurrency in South

Africa (n=269) were positively affected by perceived behavioural control. According to Albayati et al. (2020), attitude towards cryptocurrency use is influenced by perceived usefulness, enjoyment, trust and user experience. Still, Gil-Cordero et al. (2020) in Spain (n=327) and Yoo et al. (2020) in Korea (n=1339) found that attitude towards cryptocurrency use was influenced by perceived benefits, while Gazali et al. (2019) in addition found the influence of perceived financial risk. Trust has also been found as an essential factor that positively influences attitude towards cryptocurrency use in several studies (Alaeddin and Altounjy, 2018; Sas and Khairuddin, 2017; Zarifis et al., 2014; Ostern, 2018; Lee et al., 2018).

Therefore, not only is the attitude the central construct in research on cryptocurrency use, but researchers have also explored the effects and predictors of attitude. However, there is still a lack of clarity regarding which factors are better predictors and whether the attitude is the most significant or just an additional factor of behavioural intention to use cryptocurrency. Moreover, there is a lack of empirical research on this topic in Saudi Arabia.

2.3.3. Perceived Risk

Perceived risk refers to the person's evaluation of the attitudinal object's safety. Thus, it has a perceptual or subjective nature. Yoo et al. (2020) define perceived risk as "a user's belief in the potential uncertain negative outcomes of BTSs" (p. 7). Similarly, Mendoza-Tello et al. (2018) define perceived risk as "the feeling of uncertainty regarding the negative results of an event or situation, such as the use of a product or service" (p. 50742). In line with all these definitions, perceived risk is defined in this study as an individual's subjective evaluation of the amount of danger or possible negative consequences involved in cryptocurrency use.

Perceived risk is an essential part of the subjective drivers of people when it comes to dealing with new technologies that are considered risky, mainly if they include financial transactions like cryptocurrencies (Arias-Oliva et al., 2019; Nuryyev et al., 2018; Yoo et al., 2020). For instance, examining the intention to switch to the cryptocurrency investment market in South Korea and China (n=244), Sun et al. (2020) found that perceived risk, along with knowledge and reward sensitivity had a significant effect on switching intention in terms of that the higher the perceived risk, the lower the possibility of switching to cryptocurrency investment. They also concluded that perceived risk and personal innovativeness were the most important predictive factors. Also, a study by Gil-Cordero et al. (2020) in Spain (n=327) regarding using cryptocurrency as financial tools reported an inverse relationship between trust and risk; that is, the expectation of risk decreased with an increase in the trust values. Sohaib et al. (2019) also found that cryptocurrency insecurity act as an inhibitor of its use in Australia.

However, Mendoza-Tello et al. (2018) found no significant relationship between perceived risk and intention to use cryptocurrency in Spain, as social media usage only indirectly reduces the levels of perceived risk, yet not enough to improve the level of cryptocurrency use. Similarly, investigating the factors influencing the intention to use cryptocurrency as a payment method in Taiwanese hotels (n=101), Nuryyev et al. (2018) found that intent to use cryptocurrency payments was not significantly affected by different types of risk (financial, technological, social). Such findings were also confirmed by Yoo et al. (2020) regarding Bitcoin use in Korea (n=1339). Ter Ji-Xi et al. (2021) had the same results exploring the use of cryptocurrencies as mediums for transactions in Malaysia (n=290). Still, Arias-Oliva et al. (2021) found that perceived risk in Spain had both a positive and negative influence depending on the current circumstances and social influences from family, friends and peers.

In summary, the literature about the intention to use cryptocurrency views perceived risk as both influential and not an influential factor of the intention to use cryptocurrency, requiring further research on this issue. Moreover, perceived risk is considered a multidimensional concept that includes different kinds of risks. Three of these risk subtypes, privacy risk, security risk and financial risk, are discussed below.

2.3.3.1. Privacy Risk (PR)

The concept of privacy risk is related to the user's beliefs about a possible loss of privacy or data when using cryptocurrency (Abramova and Böhme, 2016; Nuryyev et al., 2018). Thakur and Srivastava (2014) defined perceived privacy risk as "the possibility that online businesses might misuse personal information hence invading a consumer's privacy" (p. 373). According to Johnson et al. (2018), "perceived privacy risk refers to the concern an individual would have regarding the potential compromise of their personal information" (p. 13). In this research, privacy risk is defined as the perceived possibility that users' private information may be leaked to unintended sources.

Although anonymity is one of the best-known features of cryptocurrencies, the literature review conducted for the present study failed to identify any previous research on cryptocurrency use that employed the construct of privacy risk. However, exploring the use of Bitcoin as an online payment system, Abramova and Böhme (2016) found that potential users highly appreciate the privacy of their personal data yet still fear possible data breaches in the case of technology failure. Thus, they often have a contradictory attitude towards cryptocurrency use, as a privacy risk is considered chiefly low, yet they still require protection from regulatory bodies. On the other hand, they also fear that such protection is most likely to limit their possibilities of using cryptocurrencies and expose their private information to others.

On the other hand, privacy risk has been examined in several related fields. For instance, a study on the usage intention across various customer groups for mobile payment services in India (n=774) found privacy risk as a good predictor of perceived risk, although perceived risk did not affect behavioural intention to adopt mobile payments (Thakur and Srivastava, 2014). Similarly, a study by Arora and Rahul (2018) has also found a positive impact of privacy risk on perceived risk, but this had no significant effect on women's attitude to online shopping in India. On the other hand, privacy risk was significantly and negatively associated with online shopping in Pakistan (n=100) (Bhatti et al., 2018). Similarly, de Cosmo et al. (2021) reported that privacy risk negatively moderated the relationship between attitude toward chatbots and behavioural intent to use them in a sample from Italy (n=846). The results of an online survey (n=270) examining the adoption of M-payment services found that concerns over privacy risks negatively influenced perceptions of security (Johnson et al., 2018), while Arif et al. (2016) reported a negative association between financial and privacy risks and attitude towards mobile banking technology in a Pakistani sample (n=389).

Therefore, given a lack of studies on the intention to use cryptocurrencies that used privacy risk as a construct, as well as varying results regarding this issue in other related fields, further research is needed to fill this critical gap in knowledge in the field.

2.3.3.2. Security Risk (SR)

Johnson et al. (2018) distinguish between perceived risk and security perception. They define perceived security "as the perception that the vendor/provider will take the appropriate action to ensure that using the technology is risk-free" (p. 13). According to Thakur and Srivastava (2014), "security risk in online environment refers to the perceptions about security regarding the means of payment and the mechanism for storing

and transmission of information" (p. 373). In relation to cryptocurrency, Nuryyev et al. (2018) define security risk as "the loss/hijack of a digital wallet, monetary loss due to privacy volatility, etc." (p. 6). In this thesis, the perceived security risk is defined as the subjective perception that cryptocurrencies are not technically secure.

According to Abramova and Böhme (2016), security risk has a significant negative impact on perceived risk, which in turn has a statistically negative effect on the intention to use Bitcoin as an online payment system. Al-Amri et al. (2019) have also found that the failure of technology adversely affects consumers' attitudes towards cryptocurrency and thus also their intention to use it. Won-Jun (2018) also found perceived security as a significant factor of intention to use Bitcoin in a Korean sample (n=224). On the other hand, Nadeem et al. (2021) have not found the impact of perceived security risk on intention to use Bitcoin in a China sample (n=385).

Security risk was also explored in other related fields. Investigating the adoption of M-Payment services, an online survey (n=270) of Johnson et al. (2018) found that privacy risk negatively influenced perceptions of security. Thakur and Srivastava (2014) found that security risk (and privacy risk) was a good predictor of perceived risk, although perceived risk did not have a significant effect on behavioural intention to adopt mobile payments in India (n=774). Similar results were reported in a study by Arora and Rahul (2018) on attitudes towards online shopping among women in India: as both security and privacy risks predicted perceived risk, but it, in turn, was not a good predictor of attitude.

Thus, while there is limited research in the field of cryptocurrency use that includes security risk as a variable, studies have also provided mixed results. However, as a new technology, security risk could have an important influence on cryptocurrency use, especially in countries like Saudi Arabia with low levels of knowledge about them. Thus,

further research employing security risk as a factor in the intention to use cryptocurrency is required.

2.3.3.3. Financial Risk (FR)

Financial risk has been defined as the perceived chance of financial losses or undesired results from the use of cryptocurrencies (Gazali et al., 2019) or as "potential money losses" related to cryptocurrency adoption (Abramova & Böhme, 2016, p. 7). For the purpose of the present study, financial risk is defined as the perceived risk of undesirable financial results associated with the use of cryptocurrencies.

Since cryptocurrencies have, amongst other things, financial value, financial risks have been investigated in several cryptocurrency adoption studies. In an online survey (n=45), Gazali et al. (2019) reported that financial risk tolerance had a strong relationship with the intention to invest in Bitcoin. In an online survey (n=6395), Abramova and Böhme (2016) found that financial risk had a significant impact on perceived risk, which had a statistically negative effect on intention towards cryptocurrency use. In contrast, examining cryptocurrency payment adoption in Taiwanese hotels, Nuryyev et al. (2018) found that perceived usefulness was not affected by any type of perceived risk associated with crypto (financial risk, technological risk, and social risk), as well as that financial risk was highly correlated with both technological and social risk. Similarly, Arias-Oliva et al. (2019) found that financial literacy did not have a significant impact. In related fields, financial risk was negatively related to attitude toward the use of Internet banking in a UK sample (n= 191) (Nasir et al., 2015) and mobile banking technology in Pakistan (n=389) (Arif et al., 2016), while Bhatti et al. (2018) found an insignificant impact of financial risk on online shopping in Pakistan (n=100).

In summary, previous research has reported both positive and negative results for financial risk as a predictor of other variables related to cryptocurrency use. However, the construct has been employed in only a small number of such studies, and none has examined its relationship with attitude in relation to cryptocurrency use. Hence, there is an important gap in the empirical evidence regarding the effect of financial risk on cryptocurrency use, especially in countries like Saudi Arabia, requiring further research on this issue.

2.3.4. Perceived Usefulness (PU)

Perceived usefulness is another factor that has been widely used to explore technology adoption and explain attitudinal evaluation since a practical component such as performance is always essential in such contexts (Jankeeparsad and Tewari, 2018; Nadeem et al., 2021). For instance, the seminal paper on the TAM model argues that "people tend to use or not use an application to the extent they believe it will help them perform their job better" (Davis, 1989, p. 320). Won-Jun (2018) defines perceived usefulness as "the extent to which a user believes that using the technology will enhance his job performance and is a significant factor affecting acceptance of an information system" (p. 34). Chotijah and Retrialisca (2020) define it as: "[a] level where someone believes that using the system can improve work performance" (p. 16).

Still, in the cryptocurrency field, performance improvement is not always relevant since it requires a comparison with the performance of other modalities, such as traditional banking systems, which does not always apply in the case of cryptocurrency use. Consequently, in this thesis, perceived usefulness is defined as the subjective evaluation of potential or current users of cryptocurrency's utility and performance. This is consistent

with the definition given by Shahzad et al. (2018), who include the performance element but also a degree of benefit to the user.

Perceived usefulness has been one of the leading research issues of several authors. In a study in Spain (n=125), Mendoza-Tello et al. (2018) found that perceived usefulness was the strongest predictor, with a medium-sized effect, of the intention to use cryptocurrencies for electronic payments. In China (n=385), Nadeem et al. (2021) found that perceived usefulness had a positive relationship with the intention to use Bitcoin. It also mediated the relationship between perceived ease of use and intention to use Bitcoin. Transaction processing and perceived ease of use had significant impacts on perceived usefulness, while security and control showed an insignificant effect on perceived usefulness. In a study of consumer acceptance of Bitcoin in Fintech services in South Korea (n=224), Won-Jun (2018) found that perceived usefulness and perceived security had a positive effect on the intention to use Bitcoin, while perceived ease of use was not a good predictor. This could indicate that users prioritise usefulness value over the easiness of using Bitcoin.

Exploring the factors influencing the intention to use cryptocurrency payments in Taiwanese hotels (n=101), Nuryyev et al. (2018) found that intent to use cryptocurrency payments was significantly influenced by perceived usefulness which, in turn, was affected by trust towards these payments. Still, they have not found that perceived usefulness was affected by different types of risk. Studies by Schaupp and Festa (2018) in the US and Arias-Oliva et al. (2019) in Spain confirmed the influence of perceived usefulness and perceived ease of use. Perceived usefulness also had a significant positive relationship with attitude towards cryptocurrency transactions supported by blockchain technology (Albayati et al., 2020) and intention to use Bitcoin in South Africa (Jankeeparsad and Tewari, 2018). On the other hand, a study in China (n=376) by

Shahzad et al. (2018) found that perceived usefulness was a partial mediator of the relationship between perceived ease of use and intention to use cryptocurrency but still had a positive association with intention to use Bitcoin. This is in line with the findings of Walton and Johnston (2018) about its indirect effect on the intention to use Bitcoin in South Africa. Moreover, Janssen et al. (2015) found that perceived usefulness fluctuated in various consumer categories.

In summary, perceived usefulness has been comprehensively researched and has mostly been found to positively predict cryptocurrency use through its influence on other variables like attitude or behavioural intention. Yet, besides the abovementioned opposing study results, this factor has not been examined in relation to cryptocurrency use in Saudi Arabia. These results reveal the existence of an essential gap in empirical research examining perceived usefulness in the context of cryptocurrency use in Saudi Arabia and culturally similar countries.

2.3.5. Perceived Enjoyment (PE)

Hedonic components, such as perceived enjoyment, have been an essential component of attitudinal models and have accordingly been employed in research on technology adoption to explain behavioural intention in relation to mass media, web shopping, and websites (Nadeem et al., 2020; Zhou and Feng. 2017). This hedonic component is independent of the risk and the usefulness of the attitudinal object since something can be risky (e.g., betting or investing in Bitcoin) or not necessarily useful (e.g., playing video games) but still be considered enjoyable (Mubuke et al., 2017). Hence, the present study defines perceived enjoyment as the degree to which a person believes that the behaviour of using cryptocurrency will provide an experience of happiness, fun, or satisfaction. Still, the sense of enjoyment depends on a person's goals and individual traits. While some

individuals may find cryptocurrency use exciting and satisfying for providing them with fun because of easy and fast virtual trade, transfer and exchange of money, others may experience happiness in their use for enabling them a potentially high yield from investment. Some people also enjoy cryptocurrency use due to its novelty, which enhances their sense of personal innovativeness.

Nadeem et al. (2020) found a positive relationship between perceived enjoyment and perceived ease of use in a study of repurchase intention of Bitcoin in a Chinese sample (n=143). Several positive and significant relationships were reported for perceived enjoyment: it was positively and significantly impacted by expectation and perceived ease of use and also had a significant impact on user satisfaction and repurchase intention. According to Sohaib et al. (2019), who explored the intention to use cryptocurrency in Australia (n=160), discomfort in their use acts as an inhibitor of cryptocurrency use, making perceived enjoyment a critical factor of attitude and intention to use cryptocurrencies. Abramova and Böhme (2016) also found similar results, as potential users often consider cryptocurrency use too complicated, so their high perceived enjoyment positively influences their intention to start using them.

Similar findings had been studied in other related fields. The construct of perceived enjoyment was found to be a reliable predictor of consumer adoption of mobile social network games in Saudi Arabia (Baabdullah, 2018, n=386) and mobile Internet in that country (Alalwan et al., 2018, n=357). Mubuke et al. (2017) also found a positive relationship between perceived enjoyment and intention to use mobile learning systems in Uganda (n=370). Perceived enjoyment was also a strong predictor of intention to use mobile video calls in a Chinese sample (n=186) and was significantly influenced by perceived usefulness (Zhou and Feng, 2017). Also, along with mobility and satisfaction,

perceived enjoyment predicted post-usage attitude towards mobile applications in a US sample (Lu et al., 2016, n=584).

In summary, personal enjoyment has been found as a significant predictor of intention to use cryptocurrency, as well as a strong predictor of technology adoption in Saudi Arabia and other countries. Still, more empirical research is needed to provide more robust empirical evidence of its effect on the intention to use cryptocurrency in Saudi Arabia.

2.3.6. Personal Innovativeness (PI)

Personality factors, such as personal innovativeness, have also been explored in the technology adoption field in relation to behavioural intention to adopt (or not) a particular technology or innovation. Rogers (2005) defines personal innovativeness as the extent to which individuals adopt new ideas relatively earlier than other social system members. In terms of cryptocurrency investment, Sun et al. (2020) define it as "individual investors' intention to regard CC as an optional investment tool" (p. 5). In this thesis, personal innovativeness is defined as the personal disposition towards using cryptocurrencies as new technologies. This is especially important in a country like Saudi Arabia, where the use of cryptocurrencies is still in an early stage, and the population has limited knowledge of them.

Exploring switching intentions to the cryptocurrency investment market in South Korea and China (n=244), Sun et al. (2020) found that personal innovativeness had a positive impact on the intention to use cryptocurrency investment. Sohaib et al. (2019) also found that innovative and optimist people in Australia are more willing to try new disruptive technologies, such as cryptocurrency, while Abbasi et al. (2021) found personal innovativeness as a good moderator of intention to use cryptocurrency in Malaysia.

However, Ullah et al. (2021) found that in Pakistan, personal innovativeness has a negligible impact on behavioural intention to use cryptocurrency.

The results of a study in Saudi Arabia showed that innovativeness was the most significant factor predicting customers' intention to adopt mobile Internet, having a significant impact on customers' perceived enjoyment of its use (Alalwan et al., 2018). Personal innovativeness also positively influenced intentions for technology acceptance in South Korea (n=220) (Jang and Lee,2018) and students' attitudes toward mobile app use in learning and teaching in Malaysia (n=233) (Ayub et al., 2018). However, it had both positive and negative effects on technology readiness in Indonesia (Chotijah and Retrialisca, 2020)

In summary, personal innovativeness has been found to be a good factor in explaining cryptocurrency use. However, some non-significant results have been reported, and only a small number of studies of cryptocurrency use have employed this construct.

2.4. Chapter Summary

This chapter has reviewed previous research on the adoption of cryptocurrencies and related technologies. It presented a brief history of cryptocurrency and identified the reasons for its emergence. This was followed by a discussion of cryptocurrency studies in general and in Saudi Arabia in particular. The critical factors applied in the cryptocurrency and related fields were described and discussed in detail, namely subjective norm, attitude, perceived risk, perceived usefulness, perceived enjoyment, and personal innovativeness.

The review of previous studies identified an important gap in the literature, namely, the limited research and contradictory evidence on the intention to use cryptocurrency and the lack of empirical research on this topic in Saudi Arabia. Except for one study that

explored attitudes towards cryptocurrencies in five countries of the GCC, one exploratory survey of the population's awareness of cryptocurrency has been conducted in Saudi Arabia so far. There is also contradictory evidence on some factors, while some factors have never been used in this area. Thus, the present study's findings are expected to help fill this gap by providing original and comprehensive data on individuals' intention to use cryptocurrency in Saudi Arabia.

Chapter 3. Theoretical Background and Research Model

This chapter discusses the theoretical background of the cryptocurrency use field putting the focus on the theoretical foundation of the TRA which is the basis of the research model in this study. It also introduces the research model applied in the present study to address the gaps in the literature identified in chapter 2. This chapter also states the hypotheses derived from the research model and presents the literature for each.

3.1. Theoretical Background

The introduction of new technologies to regular citizens is a common phenomenon in contemporary society. The technological changes that have taken place over the last hundred years have dramatically changed how human societies are organised at a pace never before witnessed. Consequently, the scientific study of how people decide to use new technologies has emerged as a 'hot topic' in many fields, including information technologies, psychology, and sociology.

As discussed in Chapter 2, the increasing use of cryptocurrencies around the world has met with different responses. While some governments have banned cryptocurrencies in general or Bitcoin in particular, others have encouraged their use and created government-backed cryptocurrency exchanges. Also, although cryptocurrency use has been increasing constantly over years worldwide, it is still in the infant stage and limited in both scope and use cases. For these reasons, cryptocurrencies and their use have become the subject of scientific inquiry, especially in the last decade. Still, the prior research is still scarce, has not included entire regions, and provided contradictory results on some factors (Al-Amri et al., 2019; Abbasi et al., 2021). Moreover, due to the novelty of this technology and a broad scope of the field, most research to date has employed models and factors

from the technology adoption field and only a few studies combined attitudinal and technology acceptance models.

Therefore, this section summarises the literature on the different theories and models in the field of personal acceptance of new technologies that have also been used in research on cryptocurrency use, namely: TRA, TPB, DIT, TRI, TAM and its extension TAM 2, and UTAUT. This analysis provides the basis for the development of the appropriate framework for the present research and the selection of the factors that have been identified in the literature as the most promising to explain intention to use cryptocurrency from the users` perspective.

3.1.1. Theory of Reasoned Action (TRA)

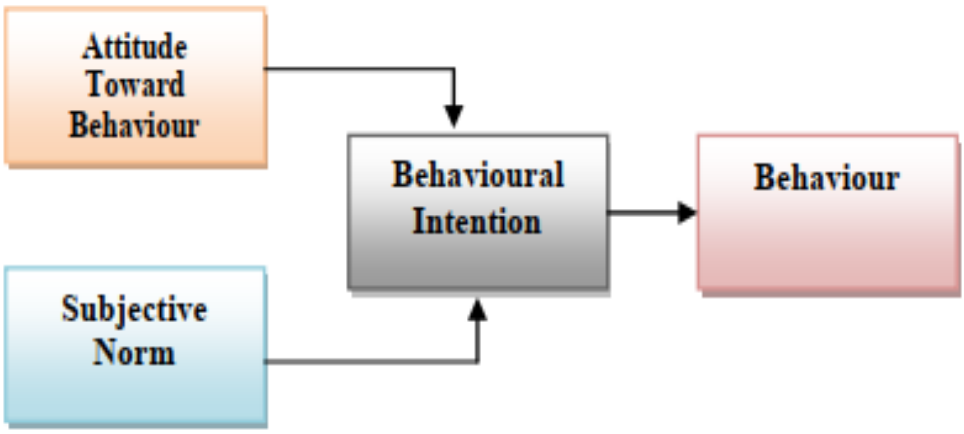
Originating in social psychology, the theory of reasoned action was developed by Ajzen and Fishbein in the 1980s. It is as a multi-attribute attitude model intended to integrate existing research on attitude by providing a systematic theoretical framework or orientation that allowed the explanation and prediction of human behaviour across a variety of domains and situations (Ajzen, 2020; Venkatesh et al., 2003). According to this model, the primary determinant of behaviour is the person's intention to perform that behaviour; the higher the intention, the more likely the behaviour will be performed. At the centre of this theory are the person's beliefs, which mediate the external influences and directly influence the behavioural intention (BI) and the actual behaviour. The main strength of TRA lies in its ability to employ an array of factors that work jointly in influencing an individual’s behaviours linearly and sequentially (Ajzen, 2020; Al Shehhi et al., 2014; Xiao, 2020).

The theory of reasoned action seeks to explain volitional behaviours by creating a model of the factors that lead to the performance of such behaviours. In other words, the theory

is employed to understand behaviours that are under the control of the individual. In its original form, the model identified three major factors that influence the occurrence of the behaviour: attitude, subjective norms, and intention to perform the behaviour which, in the case of the present research, is cryptocurrency use. The underlying idea is that the central element that predicts the behaviour (here, cryptocurrency use) is the intention to perform it which, in turn, is influenced by both the individual's personal attitude toward the behaviour and subjective norms. In a broad sense, these two dimensions represent individual and social/collective factors respectively.

The theory of reasoned action comprises four elements (Ajzen, 1991, 2000): antecedents, beliefs, attitudes, and intentions. Antecedents, such as subjective norms, influence beliefs, such as individual perceptions and innovativeness, which affect attitude and intention. The theory suggests a linear relationship in which attitude and subjective norms influence behavioural intentions, subsequently determining the actual behaviour. Figure 3.1. graphically presents the TRA elements: subjective norm, attitude toward behaviour and behavioural intention. Ajzen and Fishbein (1980) defined the first factor SN as an individual's perception of social pressure towards performing (or not) a certain behaviour. Attitude toward behaviour refers to the evaluation that a person has about performing that behaviour. Behavioural intention is the intention of a person to execute the behaviour and accounts for the degree to which a person is willing to execute that behaviour.

Figure 3.1. The TRA model



Source: Ajzen & Fishbein, 1980

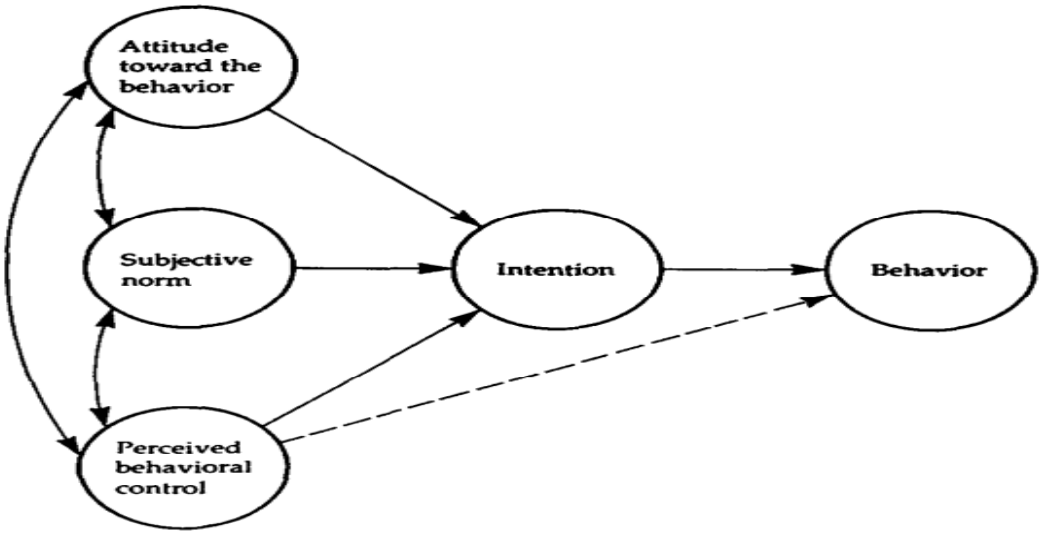
The TRA has been used in several studies about cryptocurrency use. For instance, Gazali et al. (2019) used the TRA to explain the relationship between variables and the intention to invest in Bitcoin, employing intention to invest in Bitcoin, attitude, subjective norm, financial risk tolerance, and perceived benefits. Their findings revealed that TRA had excellent explanatory power to predict the intention to use Bitcoin as investments. Boxer and Thompson (2020) also used the TRA, but in combination with the TPB to explain the role of herd behaviour in cryptocurrency investment markets. This theory has also been used in the field of technology adoption to explore the acceptance of internet banking services in Yemen (Al-Ajam and Nor, 2015), e-government systems (Alryalat et al., 2015), and green information technology (Mishra et al., 2014).

Besides the simplicity, the TRA has shown a good explanatory power. However, one of the critiques that this model has received is that it cannot explain those situations where the person does not have complete volitional control over the behaviour (Rejeb et al., 2021). For this reason, the TRA has been extended with perceived behavioural control evolving into a new theory – TPB explained below.

3.1.2. Theory of Planned Behaviour (TPB)

The theory of planned behaviour was proposed by Ajzen (1985, 1991) as an extension of the theory of reasoned action. It has been employed to predict and explain changes in behaviour, including those related to technology use while considering the role of the social system and the organisational level (Ajzen, 2020). The model's central idea is that behaviours, such as the adoption of technology, are a function of the beliefs (attitudes) relevant to that behaviour. These beliefs and the degree of control over the behaviour are the main factors that explain a person's actual behaviour. The three basic components of this theory are: attitudes toward the behaviour, subjective norms regarding the behaviour, and perceived control over the behaviour (Ajzen, 2020; Sussman and Gifford, 2019). The TPB assumes a directionality in the sense that the influence starts at the attitude and PBC level (base components) and goes from there to the intention and the actual behaviour, as shown in Figure 3.2.

Figure 3.2. Original TPB model



The arrows show the assumed direction of influence.

Source: Ajzen, 1991 p. 182

Consequently, the most significant difference between TRA and TPB is that TPB accounts for actual and perceived behavioural control as determinants of intentions and behaviour. However, if a person has perfect volitional control over a certain behaviour and firmly believes that he or she can perform it, behavioural control can be considered irrelevant, and the TPB reduces to the theory of reasoned action (Ajzen, 2000 p. 316).

Several studies on cryptocurrency used this model. Mazambani and Mutambara (2019) used the TPB to predict behavioural intention to use cryptocurrency in South Africa, and found that attitude and perceived behavioural control positively impacted this intention, while subjective norm had not a significant influence. Schaupp and Festa (2018) also used the TPB to explore cryptocurrency use in the United States, as well as Zamzami (2020) to examine the planning behaviour towards using cryptocurrency as a transaction tool in Indonesia. Kim (2021) used it to explore Bitcoin usage behaviour in the era of COVID-19 in the United States. Moreover, Ullah et al. (2021) combined the TPB with TRI and TAM to explore predictors for using cryptocurrency in manufacturing and service operations in Pakistan, while Yoo et al. (2020) combined it with the IDT, the benefit-risk concept and transaction cost theory to examine the diffusion and adoption of Bitcoin transaction services in Korea. As mentioned, Boxer and Thompson (2020) combined the TRA and TPB to investigate the role of herd behaviour in influencing positive attitudes and subsequent behaviour in cryptocurrency investment.

However, several shortcomings of the TPB have been identified. One is the difficulty of defining and measuring actual behavioural control. Consequently, most studies have relied on perceived behavioural control as a proxy for actual control (Ajzen, 2020). Concern has also been expressed about the linearity or direction of the relationships between the model's components.

3.1.3. Diffusion of Innovation Theory (DIT)

This model, proposed by Rogers (2003), describes how individuals and society accept new elements or innovations by identifying the underlying structure of adoption patterns. One of this model's central ideas is that innovations or new technologies are accepted through a communication process over time that reflects stakeholders' values and beliefs (Min et al., 2018; Sasaki, 2018). Diffusion is a process that occurs within society; as a collective process, while the adoption process occurs in the individual sphere when new information about a new technology travels through social channels to reach society, group or organisation (Rogers, 2003). After that, individuals in contact with the new information may choose to use it or not; that decision process is called adoption.

The DIT identifies five innovation characteristics that precede any adoption: relative advantages (possible economic gain or convenience); trialability (experimentation before adoption); complexity; observability (assessment of implications); and compatibility (consistency with existing values, needs, and past experiences of potential adopters) (Min et al., 2018 p. 2). The underlying idea is that technology or innovation with a high perceived degree of those characteristics also has a high chance of being accepted by users (Al Rahmi, 2018; Min et al., 2018). A distinctive feature of this model is its focus on the process, that is, the idea of technology adoption as a dynamic social process that includes a series of steps that end with the acceptance of a specific technology within a given context (Min et al., 2018; Al Rahmi, 2018).

Three recent studies on cryptocurrency use have employed this model. Using only the IDT, Alaeddin and Altounjy (2018) explored the factors affecting attitude and intention of Malaysian Generation Z to use cryptocurrency in their financial decisions. Using the IDT in combination with the TAM model, Wood et al. (2017) examined the diffusion and

adoption of Bitcoin, while Yoo et al. (2020) combined the IDT with the TPB, the benefit-risk concept and transaction cost theory to explore factors affecting the diffusion and adoption of Bitcoin transaction services in Korea.

3.1.4. Technology Readiness Index (TRI)

This model, proposed by Parasuraman (2000), seeks to explain the acceptance of new technologies at the individual level by identifying factors that influence the behavioural intention to adopt a specific technology or innovation. It focuses on the relationships of technology with employees and consumers in the workplace. The underlying idea is that each person has access to certain information about that technology and, consequently, develops a particular perception (or attitude) that leads to a probability of using that technology or innovation (Parasuraman, 2000; Acheampong et al., 2017). Four factors are integrated into the model: optimism, innovativeness, discomfort, and insecurity. Each factor works as a continuum, and every person is located (has a value) at a certain point on that continuum in relation to a specific innovation or technology. The first two factors are motivators, and the last two are inhibitors. Each factor's relative strength reflects a person`s openness to technology (Jarrar et al., 2000). One possible limitation of this theory is that it focuses on the intention to use technology but not on the competencies of the actual or potential users of that technology (Jarrar et al., 2020).

The initial model and instrument have been tested in several contexts, countries and sectors, and it is still being employed today (Acheampong et al., 2017; Chotijah and Retrialisca. 2020; Lai and Lee, 2020). For instance, Jarrar et al. (2020) investigated the intention to use smartphone apps for tourism in Dubai, the UAE, a country with the same language and religion and in the same region as Saudi Arabia. In the cryptocurrency field. Sohaib et al. (2019) combined the TRI with the TAM in the TRAM model to explore the

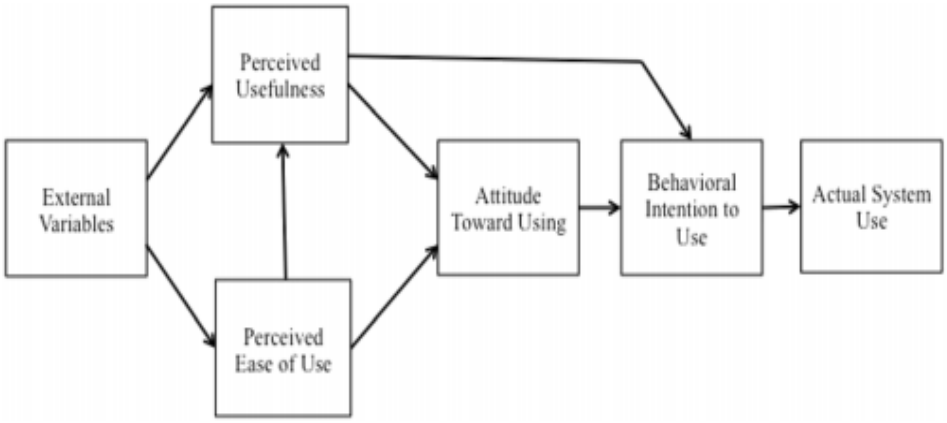
relationship between their dimensions and the intention to use cryptocurrencies in Australia. Also, Ullah et al. (2021) combined the TRI with the TAM and TPB to examine predictors for using cryptocurrency in manufacturing and service operations in Pakistan.

3.1.5. Technology Acceptance Model (TAM)

This model emerged as an adaptation of the theory of reasoned action and the theory of planned behaviour, and it is located into the cost-benefit paradigm from behavioural decision theory, meaning that it is interested in the relationship between the behaviour and its actual or possible consequences. Its purpose is to explain the personal factors that determine the use and acceptance of technology by ordinary people (Acheampong et al., 2017; Rahimi et al., 2018). Although the original aim was to account for computer acceptance, it has successfully predicted and explained usage for various systems and technologies (Dumpit and Fernández, 2017; Venkatesh and Davis, 2000).

A central idea behind the model is that two individual beliefs determine the intention to employ a system or technology: perceived usefulness, defined as the degree to which a person believes that technology or innovation will prove beneficial or functional; and perceived ease of use, which refers to the extent to which a person believes that technology can be easy to use or free of effort (Venkatesh and Davis, 2000). External factors, like training or system features, affect the attitude but are mediated by the two main factors (perceived usefulness and perceived ease of use). Perceived usefulness is also influenced by perceived ease of use because the more manageable the system is, the more useful it can be (Venkatesh and Davis, 2000; Dumpit and Fernández, 2017). The TAM model is represented in Figure 3.3.

Figure 3.3. TAM model



Source: Dumpit and Fernández, 2017, p. 3

A validated scale was developed in the original article, and the model is being used in several empirical research. Albayati et al. (2020) used the TAM to examine customers' intention towards blockchain-based cryptocurrency transactions, while Gil-Cordero et al. (2020) used it to explore the use of cryptocurrencies as financial tools in Spain. The TAM model was also used by Nadeem et al. (2021) and Shahzad et al. (2018) to explore factors of Bitcoin use in China. Nuryyev et al. (2018) used it to examine factors influencing intention toward cryptocurrency payments in Taiwan, and Won-Jun (2018) to investigate factors of Bitcoin acceptance in Korea. Abramova and Böhme (2016) combined the TAM with the concepts of perceived risk and perceived benefits to explore the use of Bitcoin as an online payment system, while Mendoza-Tello et al. (2018) combined it with the UTAUT to examine the role of social media in increasing trust and intention of cryptocurrency use for electronic payments in Spain. As mentioned, Sohaib et al. (2019) combined the TAM with TRI in Australia, Ullah et al. (2021) combined the TAM, TRI and TPB in Pakistan, while Wood et al. (2017) combined the TAM and IDT. They all explored cryptocurrency use, but from different perspectives.

The TAM model was also widely used in the technology adoption field to explore the use of social media in higher education institutions (Dumpit and Fernandez, 2017), students'

intention to use e-learning systems (Al-Rahmi et al., 2019), and mobile applications (Min et al., 2018). Of particular relevance to the present study is the research of Salloum et al. (2019) who explored students' acceptance of e-learning in five universities in the United Arab Emirates. The authors reviewed 120 papers published over a 12-year period that used the TAM model in empirical research on e-learning and discovered that the TAM factors showed great contextual sensitivity, which is why some factors were not supported in the UAE, whose cultural context is similar to that of the present study. Therefore, the authors called for a careful examination of specific national and cultural factors that influence the concepts of the model, and in line with that, employed the TAM model with additional factors that fit the UAE cultural context.

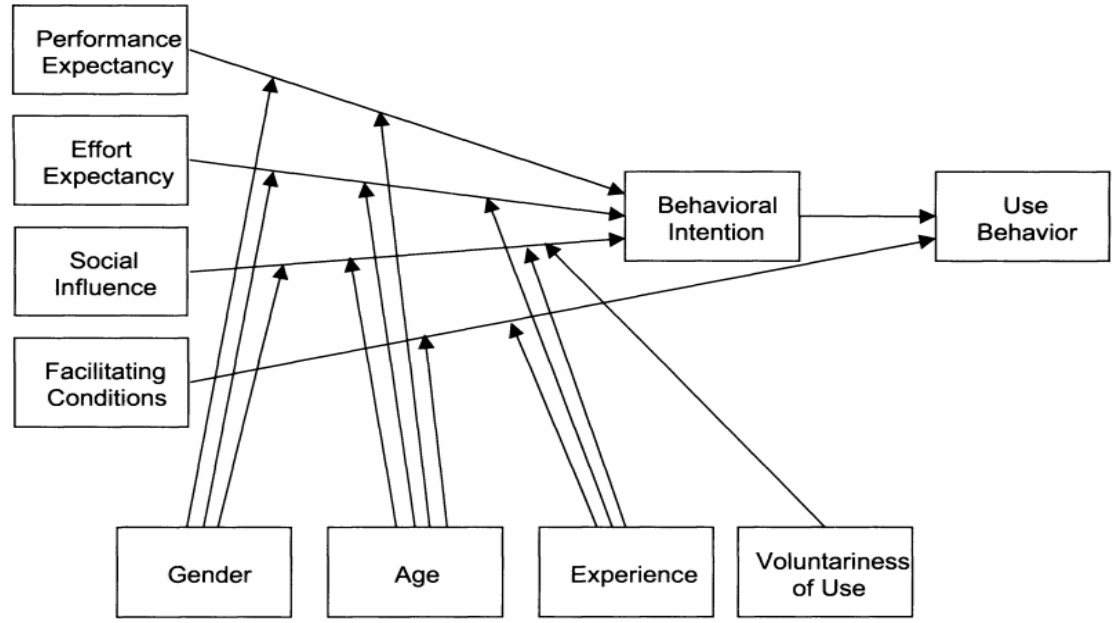
One limitation of the TAM model is that it is highly focused on work-related technologies and cannot accurately explain the adoption of different technology types (Min et al., 2018). It also ignores social and external influences (Rejeb et al., 2021). Since the model was created to explain computer adoption, some other features specifically related to different fields or technologies could be incorporated to improve its robustness (Dumpit and Fernández, 2017).

3.1.6. Unified Theory of Acceptance and Use of Technology (UTAUT)

Initially proposed by Venkatesh et al. (2003), this model emerged from empirical and theoretical research and was informed by the most important models that were available at the time, such as the theory of reasoned action, the technology acceptance model, the motivational model, the TPB, social cognitive theory, etc. The model identifies four determinants of intention and usage (performance expectancy, effort expectancy, social influence, and facilitating condition) and four key moderators (gender, age, voluntariness, and experience). The model is intended to "assess the likelihood of success for new

technology introductions and helps them understand the drivers of acceptance to proactively design interventions (including training, marketing, etc.) targeted at populations of users that may be less inclined to adopt and use new systems" (Venkatesh et al., 2003 p. 426). However, the model does not measure the actual usage of new technology (Rejeb et al., 2021). It is graphically represented in Figure 3.4.

Figure 3.4. The UTAUT model



Source: Venkatesh et al., 2003

In the cryptocurrency field, just a few studies used this model. For instance, Arias-Oliva et al. (2019) found performance expectancy, effort expectancy and facilitating conditions as the most significant factors of intention to use cryptocurrencies in Spain, while social influence, perceived risk and financial literacy were not significant. Mendoza-Tello et al. (2018) used a combination of the TAM and UTAUT and found that social influences had an indirect influence on intention to use cryptocurrencies for electronic payments, also in Spain, while trust and perceived usefulness of cryptocurrencies had a direct positive influence on this intention. Ter Ji-Xi et al. (2021) combined the UTAUT with perceived

risk and found that performance expectancy, effort expectancy and facilitating condition were significant predictors of behavioural intention to use cryptocurrency as a medium of transaction in Malaysia, while perceived risk was not a significant predictor. The model was also used in other related technology fields, such as the use of M-payment (Al-Saedi et al., 2020), intention to use mobile learning in Taiwan (Chao, 2019) and internet banking in Pakistan (Rahi et al., 2018). Actualisation of the model was also developed and used recently by Dwivedi et al. (2019).

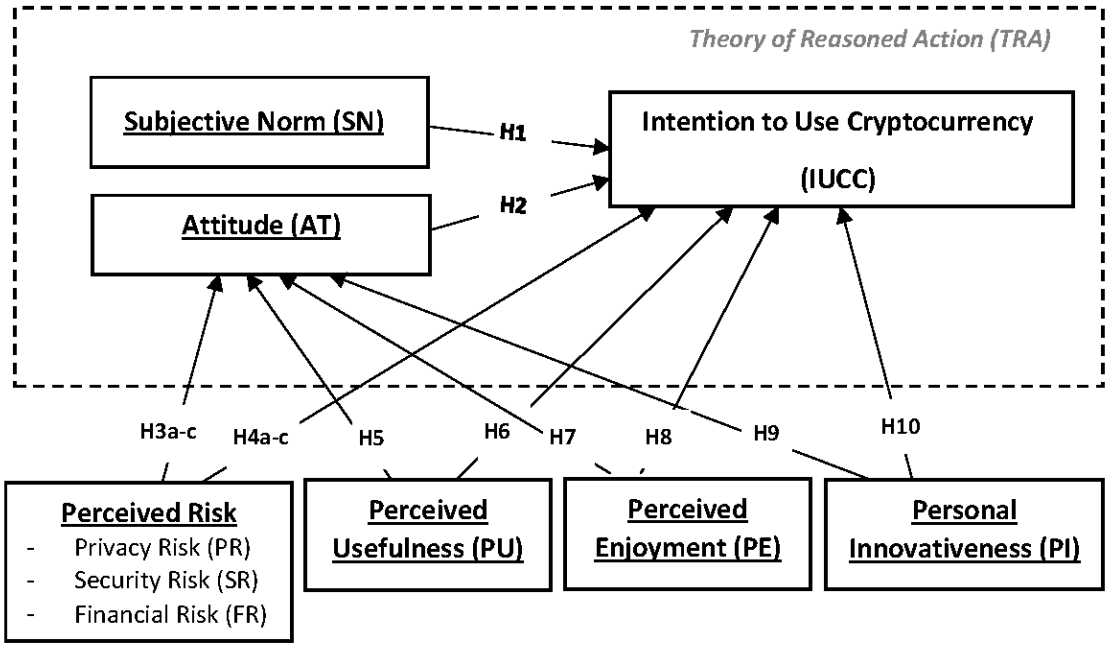
In summary, several models and theories have been developed to explain technology acceptance from the individual perspective and used in research about cryptocurrency use from various perspectives. The most important common elements of these models are the relevance of individual beliefs and attitudes and previous experience, and social or group influence on belief and behaviour. In terms of differences, some place more emphasis on the 'procedural' aspect of adoption (e.g., TAM), while others are more focused on the fixed component of the actual behaviour (TRA, TPB).

3.2. Research Model

The theory that the present research employs is the theory of reasoned action for several reasons. First, it is focused on explaining behaviours under individual control, as it is the case with cryptocurrency use. It has also received solid empirical support in both cryptocurrency and related technology adoption fields, allowing the inclusion of new variables and concepts to improve its explanatory power. Moreover, as it is used in a few studies about cryptocurrency use (Gazali et al., 2019; Boxer and Thompson, 2020), the present research helps confirm its validity in this field by testing it in a specific cultural context such as Saudi Arabia, thus extending both theoretical and empirical knowledge.

Accordingly, the present study explored the factors that affect behavioural intention (as a dependent variable) to use cryptocurrencies, as shown in Figure 3.5. Several external factors have been added to the TRA model to improve the explanatory power of this attitudinal model. These factors are perceived risk, with the three sub-factors (security, financial, and privacy risk), perceived usefulness, perceived enjoyment, and perceived innovativeness. Figure 3.5 is a graphic representation of the proposed model.

Figure 3.5. Research Model



Therefore, the foundational theory of the research model was the TRA model which states that attitude and subjective norm influence behavioural intention of an individuals. This model was extended with factors from several technology adoption models, namely perceived usefulness, as part of the TAM model, personal innovativeness, as part of the TRI model, perceived enjoyment that can be linked to the complexity of new technology, as part of the DIT, and discomfort in its use, as part of the TRI, as well as the three types of the risk of using cryptocurrencies – privacy, security and financial risks. Used together, these factors provide comprehensive results on the factors influencing intention to use

cryptocurrency from the three abovementioned perspectives – financial, security and technology. The financial perspective of cryptocurrency use has been examined through financial risk, the human perspective has been explored through attitude, subjective norm, and personal innovativeness, the security perspective has been examined through security and privacy risks, while the technology perspective has been explored through perceived usefulness and perceived enjoyment in cryptocurrency use.

The added external factors affect the initial factors of the TRA and were found to be relevant in the theoretical and empirical review. Moreover, the researcher has intended to use a unique research model that would be based on TRA that can explain the acceptance and use of technology such as cryptocurrencies, but to expand it with factors that have shown mixed results in previous studies or had not yet been tested in the cryptocurrency field. The aim was to provide comprehensive results on the factors influencing intention to use cryptocurrency in Saudi Arabia, which can also be applied in other similar cultures and contexts. Moreover, since technology involved with financial transactions such as cryptocurrency includes various financial, security, and human risks (Won-Jun, 2018), its acceptance by users can be better explained with attitudinal models such as TRA and TPB (Al-Amri et al., 2019). On the other hand, due to the novelty and disruptive nature of this technology, its acceptance by users also need to be assessed from the perspective of technology adoption factors (Sohaib et al., 2019). Hence, the best approach is to combine factors from these models as some previous studies have already done (Yoo et al., 2020; Ullah et al., 2021; Mendoza-Tello et al., 2018). The factors included in the research model are defined in Table 3.1.

Table 3.1. Definition of Factors included in the Research Model

Factors		

Main	Sub-Factors	Definition	Sources
Behavioural Intention		The willingness of the person to use cryptocurrencies	Ajzen (2020); Xiao (2020)
Subjective Norm		The subjective evaluation of social pressure from a relevant reference group to use cryptocurrencies	Ajzen, (2020); Schaupp & Festa (2018)
Attitude		The sum of the subjective knowledge regarding the use of cryptocurrency plus the subjective evaluation that the person makes of that adoption	Ajzen (2020); Boxer & Thompson (2020); Rodenrijs & Wokke (2018)
Perceived Risk	Privacy Risk	The perceived possibility that users' private information may be leaked to unintended sources when using cryptocurrencies	Abramova & Böhme (2016); Johnson et al. (2018); Nuryyev et al. (2018)
	Security Risk	The subjective perception that cryptocurrencies are not technically secure	Johnson et al. (2018); Nuryyev et al. (2018)
	Financial Risk	The perceived risk of undesirable financial results from using cryptocurrencies	Bhatti et al. (2018); Gazali et al. (2019)
Perceived Usefulness		The subjective evaluation by potential or current users of cryptocurrency`s utility and performance	Nadeem et al. (2021); Shahzad, et al. (2018)
Perceived Enjoyment		The degree to which a person believes that the behaviour of using cryptocurrencies will provide him or her with an experience of happiness, fun or satisfaction	Mubuke et al. (2017); Nadeem et al., (2020); Zhou & Feng. (2017)
Personal Innovativeness		The personal disposition towards using cryptocurrencies as a new technology	Rogers (2005); Sun et al. (2020)

3.3. Hypotheses

One of the main strengths of attitudinal models is that they can be adapted to different situations and include specific drivers or forces that affect each situation. Consequently, the study of intention to use cryptocurrency includes a number of factors that have proven to be influential in the field of cryptocurrency and for the Saudi Arabian context. These

were summarised in Chapter 2 and are elaborated on below. They have been incorporated into the research model and informed the development of the hypotheses.

3.3.1. Subjective Norms (SN)

Initially included in the TRA model, subjective norm accounts for the social/cultural influence on behavioural intention to use new technologies such as cryptocurrencies. The basic theoretical assumption is that when a person believes that a certain reference group (such as society or family) perceives a certain technology positively or is engaged in using that technology, the likelihood of its adoption by that person increases. There is ample empirical evidence in the literature, and it plays a central role in several theories, as discussed in Chapter 2. The summary below focuses on the specific relationship of this factor with attitude towards cryptocurrency use.

Boxer and Thompson (2020), from a survey of 130 active cryptocurrency investors, reported a positive relationship between subjective norm and attitude towards Bitcoin investment. A positive impact of subjective norm on attitude and intention towards the use of cryptocurrency has also been found in South Africa (Walton and Johnston, 2018; Jankeeparsad and Tewari, 2018) and the US (Schaupp and Festa, 2018; Kim, 2021). However, Mazambani and Mutambara (2019) in South Africa (n= 269) and Zamzami (2020) in Indonesia (n=207) found no significant relationship between subjective norm and intention to use cryptocurrency, while Mendoza-Tello et al. (2018) and Arias-Oliva et al. (2021), both in Spain, found its indirect effect.

In summary, both positive and negative results have been found regarding the relationship between subjective norm and cryptocurrency use in relation to both the actual intention to use it and the attitude towards cryptocurrency use. Accordingly, the present study tested the following hypothesis:

H1: *Subjective norm has a significant positive effect on intention to use cryptocurrency in Saudi Arabia.*

3.3.2. Attitude (AT)

Attitude is one of the central elements of the TRA model and one of the most important concepts in social psychology. Attitude towards cryptocurrency use is defined as the totality of beliefs (cognitive) regarding the intention to use and the evaluation of such using (emotional). According to the TRA model, this evaluation has a dispositional nature that directly affects the intention to use cryptocurrencies. Given its relevance in the TRA and other technology adoption models, this factor has been widely investigated in the field. The evidence presented in Chapter 2 regarding the influence of attitude on intention to use cryptocurrencies is summarised below.

Attitude was reported as the only significant predictor of the use of digital money in a sample (n=207) from Indonesia (Zamzami, 2020) and had the strongest predictive power for intention towards using Bitcoin transaction services in a sample (n=1339) from Korea (Yoo et al., 2020). Attitude was also a strong predictor of cryptocurrency use in the US sample (n=117) (Schaupp and Festa, 2018). Also, an online survey (n=251) on the use of cryptocurrency and blockchain technology for financial transactions found attitude as a good predictor of behavioural intention, while trust and perceived usefulness and ease of use were positively correlated with attitude (Albayati et al., 2020). A positive correlation between intention to use cryptocurrencies and attitude was also reported in South Africa (Mazambani and Mutambara, 2019), as well as in other studies (Boxer and Thompson, 2020; Gazali et al., 2019). These results indicate that attitude towards cryptocurrency use is an important predictor of intention to use cryptocurrencies. Accordingly, the following hypothesis was proposed:

H2: *Attitude has a significant positive effect on intention to use cryptocurrency in Saudi Arabia*.

Attitude is predicted to be affected by a series of antecedents of belief and evaluation that increase or decrease the influence of attitude on cryptocurrency use. These factors are examined below, along with their corresponding hypotheses.

3.3.3. Perceived Risk

The TRA model allows the inclusion of external variables that can be used to improve its explanatory power by providing a better understanding of the elements that increase or decrease the values of the initial factors (subjective norm, attitude and behavioural intention). It is important to note that perceived risk refers to the subjective evaluation of the technology and not the actual risk.

Perceived risk has been investigated in research on cryptocurrency use with mixed results regarding its effect on intention to use cryptocurrencies. For instance, Arias-Oliva et al. (2019) in Spain, Yoo et al. (2020) in Korea, Nuryyev et al. (2018) in Taiwan, and Ter Ji-Xi et al. (2021) in Malaysia found no significant effect of perceived risk on the intention. In contrast, Sun et al. (2020) concluded from an online survey (n=244) in South Korea and China that perceived risk was a strong and significant predictor of intention to switch to cryptocurrency investment, while Gil-Cordero et al. (2020) found its indirect effect in Spain. These mixed results and the complex nature of the relationship between risk and cryptocurrency use led to the development of a series of sub-factors of perceived risk that help to better explain its effect on cryptocurrency use. The three most widely employed sub-factors are elaborated below.

3.3.3.1. Privacy Risk (PR)

Privacy risk has been investigated as a factor associated with technology adoption since various new technologies entail the possibility of losing data or compromising personal information. Privacy risk has been associated with the perceived possibility of privacy or data loss that could occur as a consequence of adopting new technology.

Its relationship with the TRA model has been empirically tested several times in the technology adoption field, yet provided mixed results regarding its effect on attitude and intention to use these technologies. For instance, Thakur and Srivastava (2014) found that privacy risk predicted the level of perceived risk but did not significantly affect intention to use mobile payment services in India (n=774). Similar findings had Arora and Rahul (2018) regarding online shopping among women in India (n= 508). However, other studies found that privacy risk negatively moderated the relationship between attitude and intention to use M-payment services (Johnson et al., 2018), mobile banking (Arif et al., 2016), and chatbots (de Cosmo et al., 2021).

On the other hand, this construct has not yet been employed in the field of cryptocurrency use, probably due to the anonymity of cryptocurrency users. However, as shown in prior studies, potential users still have concerns about possible data breaches (Abramova and Böhme, 2016) due to malware attacks or theft or accidental loss of the private key (Nofer et al., 2017). Consequently, the present research tested these relationships in relation to cryptocurrency use via the following hypotheses:

H3a: *Privacy risk has a significant negative effect on attitude towards cryptocurrency use in Saudi Arabia*.

H4a: *Privacy risk has a significant negative effect on intention to use cryptocurrency in Saudi Arabia.*

3.3.3.2. Security Risk (SR)

Perceptions of privacy and security have been included in technology adoption models from the start of the debate since a new technology can always be perceived as dangerous or potentially harmful to the user, or to its job. In these models, this risk has always been linked to a superior-order factor, namely, perceived risk. Security risk can be understood as the subjective evaluation of the technical security of cryptocurrency.

In the context of technology use, security risk has been found as a negative predictor of attitude and behavioural intention to use M-payment services (Johnson et al., 2018), while it negatively affected perceived risk towards women's online shopping (Arora and Rahul, 2018) and mobile payment services (Thakur and Srivastava, 2014) in India, but perceived risk, in turn, was not a good predictor of attitude and intention to use these technologies. In the field of cryptocurrency use, Won-Jun (2018) found perceived security as a strong predictor of attitude and intention to use Bitcoin in Korea, as well as Sohaib et al. (2019) in Australia and Abramova and Böhme (2016) in an online survey. In contrast, Nadeem et al. (2021) had not found that perceived security affect intention to use Bitcoin in China.

Therefore, although there are concerns regarding possible failures of this technology, empirical evidence on the influence of perceived security risk on attitude and intention to use cryptocurrency is still scarce. Prior studies also provided mixed findings of prior studies (Abramova and Böhme, 2016). Hence, more research is needed to establish valid conclusions regarding the relationship between this factor and attitude and intention to use cryptocurrency. In order to test this, the following hypotheses were proposed:

H3b: *Security risk has a significant negative effect on attitude towards cryptocurrency use in Saudi Arabia*.

H4b: *Security risk has a significant negative effect on intention to use cryptocurrency in Saudi Arabia.*

3.3.3.3. Financial Risk (FR)

Since financial risk is of particular relevance for the technology involved in financial sectors, such as cryptocurrencies, it has also been used to explain or improve the explanatory power of perceived risk. Financial risk accounts for the subjective evaluation of possible monetary losses associated with using cryptocurrency. From a theoretical perspective, it implies that higher levels of perceived financial risk produce lower levels of attitude and intention to use cryptocurrency.

Empirically, the results of a large online survey (n=6395) indicated that financial risk had a significant impact on perceived risk, which in turn had a statistically negative impact on intention to use cryptocurrencies (Abramova and Böhme, 2016). However, Gazali et al. (2019) reported that the influence of financial risk depends on the financial risk-tolerance of an individual, while Arias-Oliva et al. (2019) argue that financial literacy does not have an impact on intention to use cryptocurrency in Spain. In related fields, studies have found a significant negative relationship between financial risk and attitude toward the adoption of internet banking (Nasir et al., 2015) and mobile banking (Arif et al., 2016), but also an insignificant impact on online shopping behaviour in Pakistan (Bhatti et al., 2018).

Therefore, due to a small number of studies in relation to cryptocurrency use and related fields and their mixed results leave an open question regarding the effect of financial risk

on attitude and intention to use cryptocurrency. Accordingly, the following hypotheses were tested:

H3c: *Financial risk has a significant negative effect on attitude towards cryptocurrency use in Saudi Arabia.*

H4c: *Financial risk has a significant negative effect on intention to use cryptocurrency in Saudi Arabia.*

3.3.4. Perceived Usefulness (PU)

Although initially related to work environments (Venkatesh and Davis, 2000), this construct has received great attention in relation to cryptocurrency use. PU is understood as the subjective evaluation of cryptocurrencies as potentially enhancing performance and having a degree of utility to their users. There is extensive empirical evidence that supports the claim that it can affect both attitude and intention to use cryptocurrencies.

For example, Albayati et al. (2020) and Won-Jun (2018) reported a significant effect of perceived usefulness on attitude towards cryptocurrency use, while Jankeeparsad and Tewari (2018) found a significant influence on both attitude and behavioural intention in South Africa (n=119). In Spain, Mendoza-Tello et al. (2018) confirmed that perceived usefulness is a strong predictor of intention to use cryptocurrencies as electronic payments (n=125), as well as Nuryyev et al. (2018) in Taiwan (n=101). Studies have also confirmed a significant positive influence of perceived usefulness on cryptocurrency use in China (Nadeem et al., 2021), the US (Schaupp and Festa, 2018), and Spain (Arias-Oliva et al., 2019). Alalwan et al. (2018) also found its significant positive effect on Saudi customers' intention to use mobile internet (n=357). On the other hand, Walton and Johnston (2018)

and Shahzad et al. (2018) found its indirect effect on intention to use cryptocurrency, and Janssen et al. (2015) found that it fluctuates within various consumer categories.

In summary, perceived usefulness has been found to be a strong predictor of the use of cryptocurrency in several countries and related technology in Saudi Arabia. However, there is still no evidence of its influence on intention to use cryptocurrency in Saudi Arabia. To test this, the following hypotheses were developed:

H5: *Perceived usefulness has a significant positive effect on attitude towards cryptocurrency use in Saudi Arabia*.

H6: *Perceived usefulness has a significant positive effect on intention to use cryptocurrency in Saudi Arabia.*

3.3.5. Perceived Enjoyment (PE)

Individual hedonic elements have also been included in the TRA model as a factor that affects attitude and behavioural intention to use cryptocurrency. Perceived enjoyment can be defined as the perception that the user will obtain happiness, fun or satisfaction from using cryptocurrency, independently of risks or other associated features. Theoretically, it is proposed that perceived enjoyment has a positive effect on both attitude and intention.

Empirical evidence of this factor is still scarce since only a few studies on cryptocurrency have employed it. For instance, Nadeem et al. (2020) found that perceived enjoyment positively influences perceived ease of use that in turn positively affects attitude and intention to use cryptocurrency. Sohaib et al. (2019) has found that discomfort in their use acts as an inhibitor of cryptocurrency use. Abramova and Böhme (2016) claim that individuals who consider their use complicated are less likely to use cryptocurrency, thus confirming a positive influence of perceived enjoyment. In related technology fields,

studies have also found its strong positive impact on intention to use mobile video calls (Zhou and Feng, 2017) and mobile applications (Lu et al., 2016), as well as mobile social network games (Baabdullah, 2018) and mobile Internet (Alalwan et al., 2018) in Saudi Arabia.

In summary, there is a limited number of studies that have found perceived enjoyment to predict intention to use cryptocurrency in other countries and related technologies in Saudi Arabia, but none has dealt with its impact on intention to use cryptocurrency in Saudi Arabia. Accordingly, the present study developed the following hypotheses:

H7: *Perceived enjoyment has a significant positive effect on attitude towards cryptocurrency use in Saudi Arabia.*

H8: *Perceived enjoyment has a significant positive effect on intention to use cryptocurrency in Saudi Arabia*.

3.3.6. Personal Innovativeness (PI)

A range of personality factors has been employed to increase the explanatory power of attitudinal models. One such factor, personal innovativeness, has been found to be a good predictor of behavioural intention and attitude towards using new technologies, such as cryptocurrency. Thus, innovativeness has been defined as a personal trait that explains individual tendencies to accept new technologies earlier than a reference group. As was previously noted, this is especially relevant given the early stage of cryptocurrency use in Saudi Arabia.

Nevertheless, just a few studies have explored this factor in relation to cryptocurrency use. For instance, Sohaib et al. (2019) found that innovative people in Australia are more likely to try new technologies, such as cryptocurrency, which was confirmed by Sun et

al. (2020) in South Korea and China, and Abbasi et al. (2021) in Malaysia. Yet, Ullah et al. (2021) found that personal innovativeness has a negligible impact on the behavioural intension to use cryptocurrencies in Pakistan. In other fields, personal innovativeness has been shown to predict intention to adopt mobile internet (Alalwan et al., 2018), attitudes towards the use of mobile apps in learning and teaching in Malaysia (Ayub et al., 2018), and technology acceptance in South Korea (Jang and Lee, 2018). However, Chotijah and Retrialisca (2020) found its both positive and negative influences on intention to accept new technologies.

Consistent with these results, the present study expected a significant positive relationship between personal innovativeness and both attitude and intention to use cryptocurrency, as expressed in the following hypotheses:

H9: *Personal innovativeness has a significant positive effect on attitude towards cryptocurrency use in Saudi Arabia.*

H10: *Personal innovativeness has a significant positive effect on intention to use cryptocurrency in Saudi Arabia*.

The study's hypotheses are summarised in Table 3.2.

Table 3.2. Summary of Hypotheses

Research Question 1	Research Question 2 Sub-questions 2.1.-2.10.	Hypotheses
What are the factors that influence individuals' intention to use cryptocurrency in Saudi	How does subjective norm affect individuals' intention to use cryptocurrency in Saudi Arabia?	**H1**: Subjective norm has a significant positive effect on intention to use cryptocurrency in Saudi Arabia.
	How does attitude affect individuals' intention to	**H2**: Attitude has a significant positive effect on intention to use cryptocurrency in Saudi Arabia.

	use cryptocurrency in Saudi Arabia?	
	How does perceived risk affect attitude towards cryptocurrency use in Saudi Arabia?	**H3a**: Privacy risk has a significant negative effect on attitude towards cryptocurrency use in Saudi Arabia. **H3b**: Security risk has a significant negative effect on attitude towards cryptocurrency use in Saudi Arabia. **H3c**: Financial risk has a significant negative effect on attitude towards cryptocurrency use in Saudi Arabia.
	How does perceived risk affect individuals' intention to use cryptocurrency in Saudi Arabia?	**H4a**: Privacy risk has a significant negative effect on intention to use cryptocurrency in Saudi Arabia. **H4b**: Security risk has a significant negative effect on intention to use cryptocurrency in Saudi Arabia. **H4c**: Financial risk has a significant negative effect on intention to use cryptocurrency in Saudi Arabia.
	How does perceived usefulness affect attitude towards cryptocurrency use in Saudi Arabia?	**H5**: Perceived usefulness has a significant positive effect on attitude towards cryptocurrency use in Saudi Arabia.
	How does perceived usefulness affect individuals' intention to use cryptocurrency in Saudi Arabia?	**H6**: Perceived usefulness has a significant positive effect on intention to use cryptocurrency in Saudi Arabia.
	How does perceived enjoyment affect attitude towards cryptocurrency use in Saudi Arabia?	**H7**: Perceived enjoyment has a significant positive effect on attitude towards cryptocurrency use in Saudi Arabia.
	How does perceived enjoyment affect individuals' intention to use cryptocurrency in Saudi Arabia?	**H8**: Perceived enjoyment has a significant positive effect on intention to use cryptocurrency in Saudi Arabia.
	How does personal innovativeness affect attitude towards cryptocurrency use in Saudi Arabia?	**H9**: Personal innovativeness has a significant positive effect on attitude towards cryptocurrency use in Saudi Arabia.

	How does personal innovativeness affect individuals' intention to use cryptocurrency in Saudi Arabia?	**H10**: Personal innovativeness has a significant positive effect on intention to use cryptocurrency in Saudi Arabia.

In summary, the research model (Figure 3.5.) includes the TRA model as a basis of the model and several external factors added to the initial TRA model to explore the factors affecting intention to use cryptocurrency in Saudi Arabia in more detail. As mentioned above, the TRA model implies that attitude and subjective norm affect intention for cryptocurrency use. In addition, this study assumes that all external factors added to the initial TRA model, namely perceived risk, perceived usefulness, perceived enjoyment, and personal innovativeness, have both direct relationships with intention to use cryptocurrency and indirect relation through a positive or negative attitude towards cryptocurrency use. While all other factors are assumed to positively influence attitude and intention, perceived risk is assumed to have a negative relationship with these constructs in terms of the higher the perceived risk (and its three sub-categories), the lower the attitude and intention to use cryptocurrencies. Moreover, all three risk sub-types, privacy risk, security risk and financial risk, have a positive relationship with perceived risk in terms of that perceived risk increases when these three risk sub-types increase. Thus, they have a negative influence on attitude and intention to use cryptocurrencies in terms of decreasing them when three risk sub-types increase.

3.4. Chapter Summary

This chapter has described the technology adoption and attitudinal models and related factors used in previous studies in the field of cryptocurrency use. It also explained the research model and presented and discussed the hypotheses that were tested in this

investigation. As mentioned above, the researcher has intended to use a unique research model based on TRA and extended with several external technology and risk factors that have been proven to be influential for cryptocurrency use and Saudi Arabia, but also have shown mixed results in previous studies or had not yet been tested in the field of cryptocurrency use.

The main motive was to provide a comprehensive insight into this topic by integrating the three perspectives – financial, security and technological, since prior studies explored mostly only one of these perspectives, primarily technological and used associated factors and research models. Another motive was to determine whether previous findings are applicable in the specific cultural context of Saudi Arabia or there are some additional influencing factors or a different effect of the previously used factors, especially as there is insufficient and contradictory literature on this topic and no empirical research on this topic in Saudi Arabia. Also, this topic is very trendy and helpful to overcome the issues related to the modern financial system, such as high transaction costs, low users' trust, scams, and scandals. The following chapter describes the methodology employed in the research.

Chapter 4. Methodology

The present chapter explains the methodological procedures employed in the present research to investigate the factors influencing the intention to use cryptocurrencies amongst people living in Saudi Arabia. In the first place, the research paradigm and design are explained. The following sections describe the quantitative methodology used in this research, including the questionnaire design, sampling, data collection and data analysis methods, and reliability, validity and ethics of the research.

4.1. Research Paradigm

The research paradigm is the organising framework that a specific investigation follows for its theory and research. It encompasses the way in which data can be collected and how it can be processed. Several classifications have been drawn when it comes to separating and understanding those frameworks; however, in the information systems field, positivist, interpretive and critical are considered the three main alternatives (Oates, 2006). Since those assumptions are sometimes not evident, but anyway guide the research process at every stage, it is important to establish clearly the position for every research and work in line with such principles. The following paragraphs explain the three options before proceeding to declare the selected paradigm.

A positivistic approach is based on the assumptions that reality exists with the independence of the observer and, consequently it can be directly described, measured and tested as long as the appropriate methods are available and correctly employed (Neuman, 2006). This paradigm relies mostly on quantitative measures and predictive models that try to discover the laws governing reality. More and more complex models are designed as scientific knowledge keeps growing up.

Interpretative paradigm comes from the social sciences and assumes that reality is socially constructed through the social interactions between people; culture and language are at the centre of the process since personal and cultural meanings are the basic blocks that allow the creation of scientific knowledge. Interpretivism is more focused on gaining a deeper understanding of the phenomena than explaining it through complex causal relationships (Neuman, 2006).

Finally, the critical paradigm is interested in comprehending the way in which people are able to impact a specific situation and the way in which situations and contexts interact. The underlying assumption of critical research is that the social reality is constituted, created and maintained historically, which gives people and culture a central role in the way in which the reality is and can be. It is usually associated with social and structural change and the way in which people and cultures can achieve such change. In line with this, generalisability and causal explanations are not the main concern of the research conducted under this paradigm, but rather achieving the social change and empowerment desired. (Neuman, 2006). A final consideration about paradigms is that they are most of the time a matter of degree than clearly differentiated options, especially when it comes to the pair positivism-interpretivism. They can be seen as opposed extremes in a line but with a lot of options in between that can include elements from both.

For the present research, a positivistic approach is selected with the intention of examining quantitatively a research model. As a result, this investigation used data-collection and data-analysis methods from one epistemic position (Creswell, 2003). Consequently, this study employs a mono-method approach using quantitative research approaches for general purposes of breadth and depth of understanding and corroboration (Schoonenboom and Johnson, 2017). A quantitative approach is the principal strategy of

data collection and analysis, which is performed through a survey and a series of statistical procedures, which will be explained in the next section in more detail.

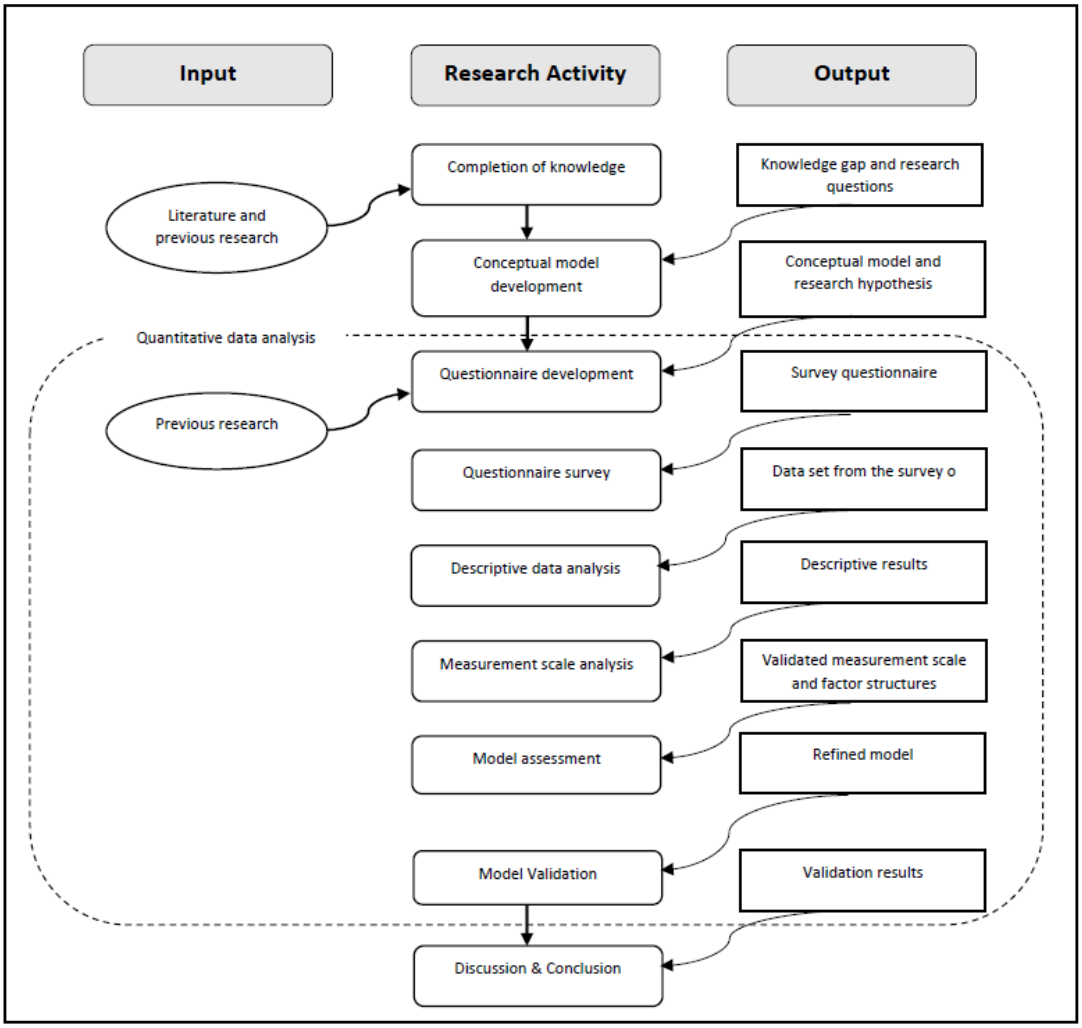
4.2. Research Design

The present investigation used a cross-sectional or transactional design because the information was collected in a single moment, that is, the participants of this investigation were evaluated on one occasion, being previously selected under the inclusion and exclusion criteria established in this investigation (Setia, 2016). The research design employed by this research is as follows:

After selecting the main topic (cryptocurrency) and the geographical area (Saudi Arabia), a literature review was conducted to identify the state of scientific knowledge regarding the use of cryptocurrencies in that country. This review allowed to develop a good understanding of the research gaps and contradictory findings available in the field of cryptocurrency use. After identifying those gaps and contradictory findings, the research questions were developed (RQ1: What are the factors that influence individuals' intention to use cryptocurrency in Saudi Arabia? and RQ2: How do these factors influence individuals' intention to use cryptocurrency in Saudi Arabia?). Consequently, the conceptual model was developed after reviewing the existing theories in the field of cryptocurrency use, as well as the most employed factors.

To answer the research questions, the factors included in the conceptual model were operationalised and transformed into a quantitative questionnaire. The questionnaire was composed of elements from previously validated instruments. Then statistical analysis was performed, consisting of descriptive statistics and measurement scale analysis in order to test the hypotheses developed from the research questions.

Figure 4.1. Research Design



4.3. Quantitative Design

The aim of the quantitative stage of the analysis is to statistically test the conceptual model of this study by conducting a survey and analysing its data employing a well-known statistical procedure called structural equations modelling (SEM); this procedure can provide a summary of the interrelationships between a set of variables and also test hypothesised relationships between constructs. All that requires a series of steps that were conducted in the present research: exploratory factor analysis, data conversions,

confirmatory factor analysis, validity checks for the final structural model, and effect investigation (Weston and Gore, 2006).

In the present study, a questionnaire was employed as the data collection process. It was composed of a series of sub-questionnaires for each one of the factors included in the conceptual model (e.g. security risk, attitude, etc.). Each questionnaire was composed of a number of items that were adapted from previously validated instruments in the cryptocurrency use, as shown in Table 4.1. All the items were Likert-type on the 1 to 5 scale (from Strongly Agree to Strongly Disagree). The survey also included a series of demographic questions, designed to obtain data from the participants, such as age, gender, nationality, and education. The items included in the survey are presented in the following Table and the full survey is presented as Appendix A.

Table 4.1. Survey Items

Factors	Code	Items	References
Subjective Norm	SN1	People who are important for me, influencing me, to use cryptocurrency in order to buy or sell products is a good way of trading.	Clemes et al. (2014); Alharbi (2016); Hsu and Lin (2016)
	SN2	People who are important for me, influencing me, to try cryptocurrency.	
	SN3	People who are important for me, influencing me depict a positive sentiment to engage in using cryptocurrency.	
	SN4	People who are important for me influenced my decision to make purchases through cryptocurrency.	
	SN5	People who are important for me encourages me whether to use cryptocurrency.	

Attitude		AT1	I think that buying cryptocurrency is a good idea.	Walton and Johnston (2018); Unnikrishnan and Jagannathan (2018); Arif et al. (2016); Hsu and Lin (2016), Qi et al. (2009); Ho et al. (2017)
		AT2	I think that using cryptocurrency for financial transactions would be a wise idea.	
		AT3	In my opinion, it is desirable to use cryptocurrency as a currency.	
		AT4	I feel good about using cryptocurrency.	
		AT5	I am excited about the idea of using cryptocurrency.	
Perceived Risk	Privacy Risk	PR1	Information containing my cryptocurrency payment transactions can be miss-utilised by others.	Liébana-Cabanillas et al. (2015); Unnikrishnan and Jagannathan (2018); Slade et al. (2015); Arif et al. (2016); Walton and Johnston (2018)
		PR2	I do not feel safe providing personal private information over cryptocurrency payments.	
		PR3	I do not trust in the ability of cryptocurrency payment service providers to protect my privacy.	
		PR4	I am concerned with the privacy security of using cryptocurrency.	
		PR5	I think that owning cryptocurrency has privacy risks.	
	Security Risk	SR1	Cryptocurrency enables to transfer money securely.	Slade et al. (2015); Unnikrishnan and Jagannathan (2018); Abramova and Böhme (2016); Akturan and Tezcan (2012)
		SR2	Cryptocurrency empowers me with the control of my money.	
		SR3	I am concerned with the security of using cryptocurrency.	
		SR4	I am worried about using cryptocurrency because other people may be able to access my account.	
		SR5	I do not trust cryptocurrency as I trust other currency.	

	Financial Risk	FR1	Cost of cryptocurrency is very high for me.	Koenig-Lewis et al. (2010); Unnikrishnan and Jagannathan (2018); Abramova and Böhme (2016); Akturan and Tezcan (2012)
		FR2	Inability to convert cryptocurrency to conventional currencies, or not at a reasonable price.	
		FR3	Losses due to counterparties failing to meet contractual payments or settlement obligations.	
		FR4	Losses due to security incidents (e.g.+ lost passwords, malware).	
		FR5	I think that there would be problems with my financial transactions while using cryptocurrency.	
Perceived Usefulness		PU1	I perceive that my purchase would be more quickly using cryptocurrency.	Pham and Ho (2015); Dohan and Tan (2013)
		PU2	I perceive that my purchasing tasks would be more easily using cryptocurrency.	
		PU3	Cryptocurrency would enhance my effectiveness in purchasing.	
		PU4	Cryptocurrency would enhance my efficiency in making a purchase.	
		PU5	Cryptocurrency would enable me to make better decisions in making a purchase.	
Perceived Enjoyment		PE1	Using cryptocurrency is fun for me.	Hsu and Lin (2016)
		PE2	Using cryptocurrency gives me pleasure.	
		PE3	I enjoy using cryptocurrency.	
		PE4	I am flexible when I use cryptocurrency.	
		PE5	I am uninventive when I use cryptocurrency.	
Personal Innova		PI1	If I heard about new cryptocurrency, I would look for ways to experiment with it.	

	PI2	Among my peers, I am usually the first to try out new cryptocurrency.	Pejic et al. (2018); Schillewaert et al. (2005)
	PI3	I find it stimulating to be original in my thinking and behaviour.	
	PI4	I like to experiment with new cryptocurrency.	
Intention to Use Cryptocurrency	IUCC1	I intend to use cryptocurrency as an alternative source of currency to buy or sell products in future.	Shahzad et al. (2018); Nadeem et al. (2021); Unnikrishnan and Jagannathan (2018)
	IUCC2	I believe using cryptocurrency is very helpful to timely fulfil my obligations.	
	IUCC3	I intend to use cryptocurrency on a regular basis.	
	IUCC4	I will encourage others to use cryptocurrency as a mode of exchange.	
	IUCC5	I prefer to use cryptocurrency for game purposes only.	

4.4. Instrument Translation

Since the survey items were originally written in English, a Professional NAATI-accredited translator (NAATI No. CPN5OQ23X) performed the translation to Arabic. The procedure employed was the one proposed by Brislin (1986) where the questionnaire was translated back from English to Arabic and back into English. Finally, the Arabic version (Appendix B) was checked by an expert in the Arabic language.

4.5. Sample and Sample Size

The population of this study was constituted by persons residing in Saudi Arabia. Consequently, the sampling tried to reflect that fact and included a certain number of non-

Saudi respondents, which is in line with the current composition of the Saudi population (Saudi General Authority for Statistics; 2021).

For structure equation modelling, several rules have been suggested to determine the sample size, for instance, fixed sample size between 200-400 participants, minimum sample size of 100 to 200 participants. (Hair et al., 2013; Wolf et al., 2013). However, there is no absolute consensus and the literature agrees that the selection criteria may vary depending on the explanatory power desired, number of indicators and factors, the magnitude of factor loadings and path coefficients, and amount of missing data (Wolf et al., 2013).

Consequently, the intended population sample for this study was set at approximately 200 respondents, in order to comply with the abovementioned rules and ensure a minimum of sampling bias. The sampling technique employed was a probability sampling that consists of employing random techniques to select the sample, which means that every member of the population has the same chance of being selected (Vehovar et al., 2016).

4.6. Data Collection

This investigation employed a survey as a data collection method. It was composed of a series of Likert-type questions and respondents had to answer the degree to which they agreed with the presented phrases. The data collection process lasted from September to November 2019. The link to the survey was posted on Twitter and the post was retweeted by several users. This was very effective in reaching more participants who live in Saudi Arabia, as they were the population and the sample of this study, given that, according to official statistics, most of the Saudi citizens are using Twitter (Saudi General Authority for Statistics, 2021). The survey was hosted in the Qualtrics platform to reach the targeted

number of participants, but only 181 were completed. The surveyed participants were Saudi citizens.

4.7. Data Analysis

For the analysis of the results, various statistical packages were used, such as IBM SPSS 22, Amos SPSS and Minitab 18. Firstly, the computation of descriptive statistics, such as relative and absolute frequencies, arithmetic mean, standard deviation and standard error of the mean, was carried out. The relative and absolute frequencies were calculated to describe sociodemographic variables; while the mean, standard deviation and standard error of the mean were used to describe the responses provided by the participants to the items of the instrument administered to them. Next, a series of statistical, parametric and non-parametric tests were used to evaluate a set of assumptions that must be met to apply a structural equation model to the data, which are set out below:

To evaluate the normality of the data, the non-parametric Kolmogorov-Smirnov test of a sample was used, whose objective is to contrast the distribution of the data collected with a theoretical distribution, which in this case is the normal distribution. It is expected that both distributions are statistically similar to affirm that the data collected behaves normally (Robinson, 2016).

To examine linearity, a multiple regression analysis was administered, where scatter graphs and the coefficient of determination R2 were analysed, which expresses the percentage of variability of the dependent variable that is capable of explaining the independent variable (Hair et al., 2013). Then the multicollinearity was evaluated through the values associated with the Variance Inflation Factor, which measures how much the variance of a regression coefficient increases due to the presence of collinearity (Thompson et al., 2017).

Once the aforementioned assumptions were examined, we proceeded with the evaluation of the psychometric properties of the instrument administered to the sample, specifically the properties of validity and reliability. For validity, multivariate statistical techniques, exploratory factor analysis and confirmatory factor analysis were used; for reliability, Cronbach's alpha was administered. The exploratory factor analysis was used in order to define the optimal number of factors of the instrument administered to the sample, while the confirmatory factor analysis was used to confirm the factor structure generated by the previous step, evaluating, in this sense, the construct validity of the instrument. Cronbach's Alpha was computed in order to evaluate the internal consistency of each of the instrument`s dimensions; this is the degree to which the items that comprise them are inter-correlated; there will be a high internal consistency if the coefficient shown for each dimension is close to 1, so the instrument will yield reliable scores (Bujang et al., 2018).

After the evaluation of the psychometric properties of the instrument, the analysis of the data was performed through SEM. SEM procedures allow the identification of potential models through hypothesis validation. That validation permits a better understanding of the correlations between several dependent and independent variables. Additionally, exploratory evaluations identify the relationships between variables and show them in a simple way that enables employing multivariate procedures to verify them (Hair et al., 2013).

4.8. Ethics of the Research

In accordance with the ethical procedures established by the University of Technology, Sydney (UTS), the consent, purpose of the study and the researchers and the university contact information were included in the first page of the survey. Thus, each participant has the chance to read the consent, the purpose of the survey, and being informed on how

their personal information will be protected by anonymising their names. The approval for the data collection process was obtained from the Human Research Ethics Committee in University of Technology Sydney UTS under the number (ETH19-3956).

4.9. Summary

This chapter described the methodological procedures employed to test the conceptual model that intends to answer the research questions related to intention to use cryptocurrency in Saudi Arabia. The study has used a positivistic mono-method approach with a cross-sectional or transactional design using a quantitative method (an Online, self-administered survey) as the data collection procedure. The questionnaire used Likert-type questions. The final sample of the study included 181 respondents who are Saudi citizens. Data was collected from September to November 2019. The analysis of the quantitative component was performed employing a number of statistical techniques such as SEM, EFA, CFA, etc. and required the utilisation of SPSS (Version 22.00) and Amos (Version 22.0) programs.

Chapter 5. Quantitative Data Analysis

5.1. Introduction

The research focus was an investigation of the intention to use cryptocurrency in Saudi Arabia. After the preliminary analysis of the data, the representation of the conceptual model was developed. The critical point of the conceptual model is the usage of the theory of reasoned action, which explains the relationships between attitudes and behaviours within human-made actions.

The TRA includes three factors: subjective norm, attitude, and intention to use. As an extension to the TRA, the impact of perceived risk -divided into privacy risk, security risk and financial risk, perceived usefulness, perceived enjoyment, and personal innovativeness were included. Quantitative data analysis was conducted to validate the model.

The chapter starts with a descriptive analysis of the survey and the demographic data of respondents. Further, the data was cleaned, tested, and validated for outliers, normality, representation, and so on. Following the procedure of the structural equations modelling and the conceptual model and hypotheses development. Then, data screening, exploratory factor analysis, data conversions, confirmatory factor analysis, validity checks for the final structural model, and effect investigation were conducted.

5.2. Descriptive Analysis

The questionnaire included items for all the factors and sub-factors of the model. In order to perform the structural equation modelling, first, the responses need to be analysed for missing data, and the most important constructs need to be derived from the list of items

(questions). Furthermore, it is important to test the validity and reliability of the questionnaire in order to examine the functioning of the items and the questionnaire as a whole. The survey contained 9 constructs, cryptocurrency usage statistics, respondents' demographic data profile.

5.2.1. Survey

The questionnaire was conducted online and filled by people who live in Saudi Arabia. The questionnaires were collected from September to November 2019. The link to the survey was posted on Twitter, one of the most popular social media platforms. Social media statistics published by Global Media Insight (GMI blogger, 2019) show that 56% of the population in Saudi Arabia has an active Twitter account (18.96 M people).

The post was retweeted by several users and this was very effective in reaching more participants live in Saudi Arabia as they are the population and the sample of this study (GMI blogger, 2019). The Qualtrics platform was used to survey participants embedded online, calling for participants to take part in the survey. In total, 181 participants completed the survey. The surveyed participants represent Saudi citizens.

5.2.2. Demographic Characteristics of Respondents

The following Table shows the demographic profile of the respondents.

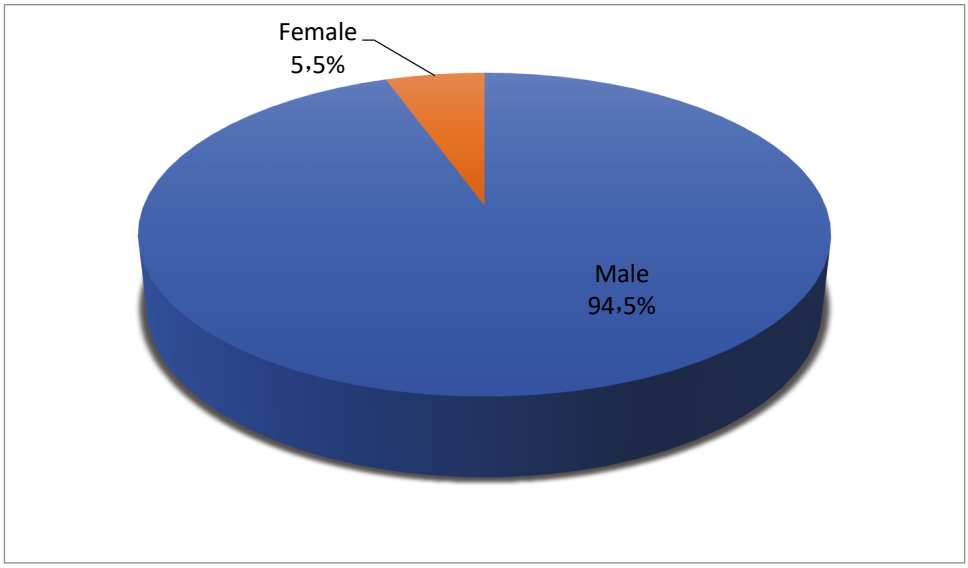
Table 5.1. Demographic characteristics of respondents

Category	Frequency (n)	Percentage (%)	Valid Percentage (%)	Cumulative Percentage (%)
Gender:				
Male	171	94.5	94.5	94.5
Female	10	5.5	5.5	100.0
Age:				
Less than 20 years	4	2.2	2.2	2.2
20-29 years	68	37.6	37.6	39.8
30-39 years	82	45.3	45.3	85.1
40-49 years	27	14.9	14.9	100.0
50 years and older	0	0	0	100.0
Nationality:				
Saudi	174	96.1	96.1	96.1
Non-Saudi	7	3.9	3.9	100.0
User Language				
English	22	87.8	87.8	87.8
Arabic	159	12.2	12.2	100
Education Level				
High School	6	3.3	3.3	3.3
College degree	22	12.2	12.2	15.5
Bachelor's degree	123	68.0	68.0	83.4
Postgraduate degree	30	16.6	16.6	100.0
Which part of Saudi you are from				
Centre	54	29.8	29.8	29.8
South	32	17.7	17.7	47.5
West	30	16.6	16.6	64.1
North	23	12.7	12.7	76.8
East	42	23.2	23.2	100.0

From Table 5.1., it can be observed that 94.5% of respondents were male. This proportion of respondents using cryptocurrencies is consistent with the average of people who use

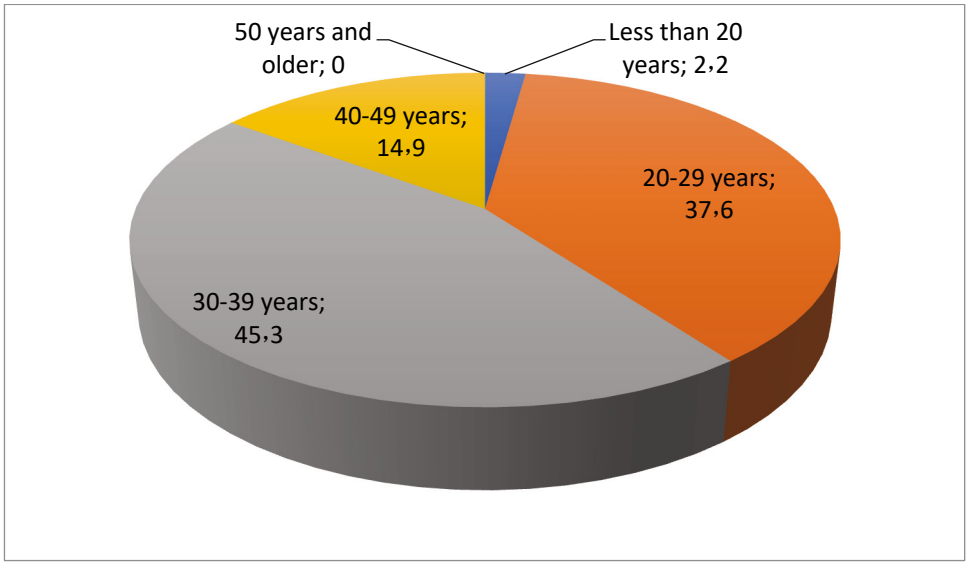
cryptocurrencies (e.g., GMI blogger, 2019) and with findings from the literature. For instance, Al Shehhi, Oudah, and Aung (2014) investigated the reasons behind choosing a cryptocurrency, and 95% of their sample were male. Alshamsi and Andras (2019) that studied the bitcoin usability, also included more man (75% of the sample) than women, confirming that man mainly dominates the cryptocurrency field. Even in trading cryptocurrencies, women are under-represented (Hasso et al., 2019). A study by Vejačka and Palová (2019) investigated the gender differences of Slovak citizens that impact their attitude towards cryptocurrencies. They reported that male respondents have more information on cryptocurrencies, they more frequently use cryptocurrencies for making payments and are significantly fonder of mining cryptocurrencies than females that are often more risk-averse than males. In general, it was concluded that males have a more positive attitude towards cryptocurrency than females (Vejačka and Palová, 2019), which can answer why women are generally under-represented and lack interest in cryptocurrencies. These results are also presented in Figure 5.1.

Figure 5.1. Gender of participants



Considering the age of respondents, Figure 5.2 shows that 45.3% of respondents were between 30 and 39 years old, followed by the respondents aged between 20 and 29 years old (37.6%), and those aged between 40 and 49 years old (14.9%). Only 2.2 % of the participants were younger than 20 years old. None of the respondents was 50 years old or older. Cryptocurrencies rely on the Internet, and the first cryptocurrency, the Bitcoin, was developed in 2009, thus making it more attractive to the younger population (Alaeddin and Altounjy, 2018; Fujiki, 2020).

Figure 5.2. Age of participants



In terms of nationality and language, 96.1% of respondents were Saudi (Figure 5.3), thus it was expected that 87.8% of respondents are Arabic speakers, while 3.9% were English speakers (Figure 5.4). All respondents were residents of Saudi Arabia.

Figure 5.3. Nationality of participants

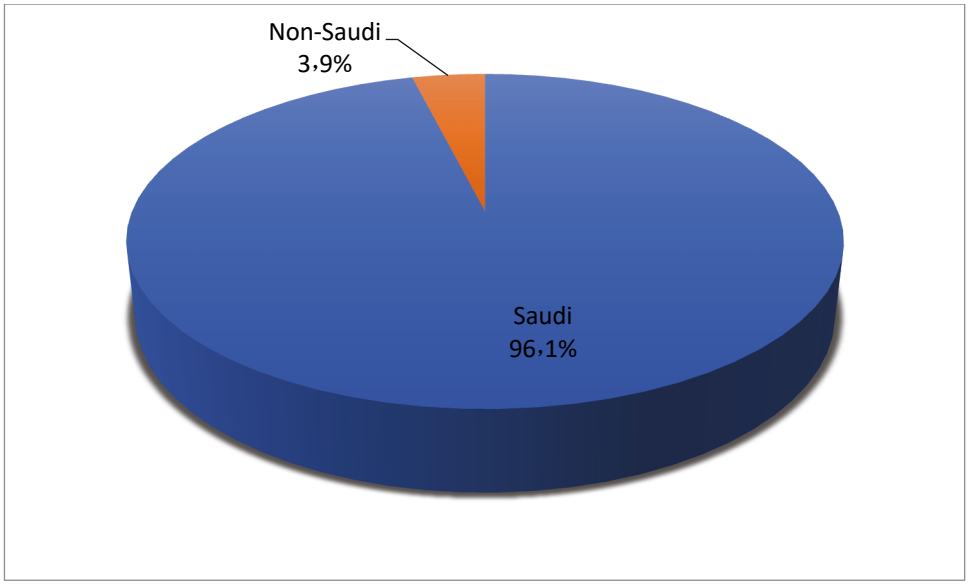
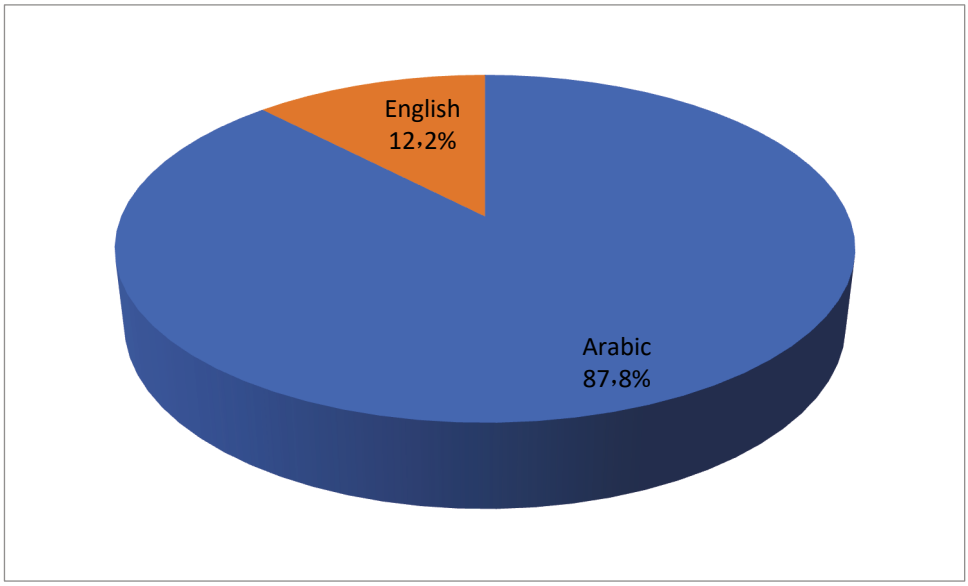


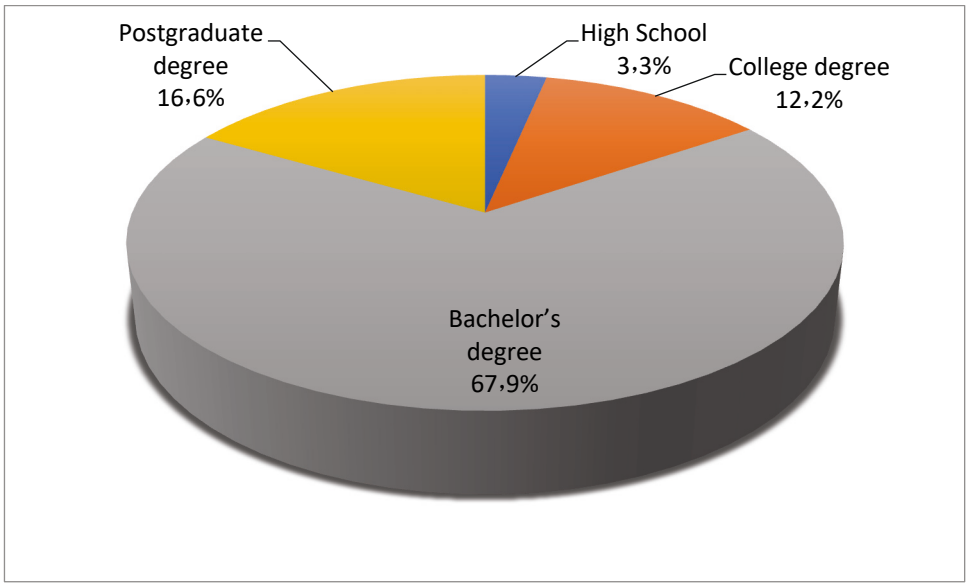
Figure 5.4. Language of participants



Furthermore, 67.9% of respondents hold a bachelor's degree, followed by 16.6% of those with a postgraduate degree and 12.2% of those holding a college degree. Only 3.3% of respondents have a high school degree. Comparing these proportions to the proportion of educated people in the age between 20-39, participants in this study have higher educational shifts, and respondents with high school degrees or college degrees have a

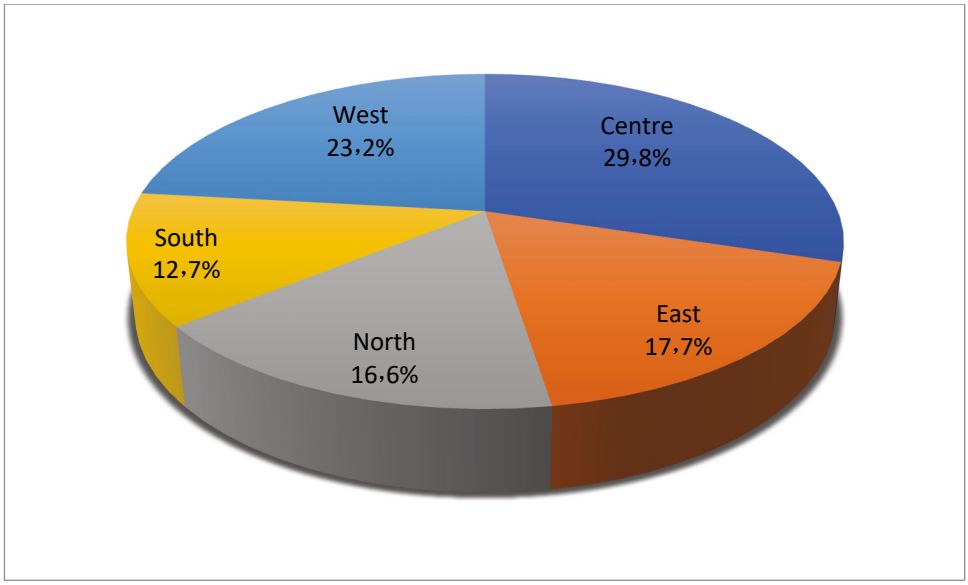
small representation in the sample compared to known data of General Authority for Statistics in Saudi Arabia (2020). This shows that people who know about cryptocurrency are well educated compared to the Saudi population. These results are visualised in Figure 5.5.

Figure 5.5. Education level of participants



The most significant number of participants involved and have knowledge about cryptocurrencies are located in the central (29.8%) and the west part of the country (23.2%). This is in line with the current development statistics, which state that the central region of Saudi Arabia has the highest human development index in the country, followed by the North and West region (GMI blogger, 2019). The Human Development Index (HDI) is a tool for accessing the country's population lifespan, education level and gross national income (GNI), thus showing how developed the country is based on its population. Furthermore, 17.7% of respondents are from the East of the country, 16.6% are from the North, while 12.7% are from the South of the country. These results are presented in Figure 5.6.

Figure 5.6. Participant's region in Saudi Arabia



5.3. Data Examination

Following the data analysis procedures before SEM, the data examination was performed. Data examination includes several steps: missing records elimination and missing values replacement, outlier review and treatment, answers representation, variance of variables inside constructs, cross relationships of respondents' characteristics, cryptocurrency usage profile, and construct's reliability and validity. Data examination is essential because the data needs to be adjusted before constructing the model. The methods and techniques used for modelling usually have several assumptions that our data needs to meet to apply these methods. To examine those assumptions, data examination needs to be performed. This step should give us the answer if the data meets all the requirements of SEM, thus allowing the creation of a set of constructs, each containing a certain number of variables.

5.3.1. Missing Data Analysis and Replacement

The first step includes missing value analysis and detection and handling of missing data. Missing data can be processed depending on the type; it can be missing at random or missing completely at random (Allison, 2003). The first case indicates that the data is missing because of the values of some other variable, i.e., there is a relationship between the missing data and the values of other observations. On the other hand, MCAR indicates that the data is missing entirely randomly, i.e., there is no relationship between the missing data point and any of the values from the set (Allison, 2003). Lost data can create many problems during analysis, such as reducing the statistical power, creating bias, reducing the representativeness of the sample, and complicating the analysis (Kang, 2013); thus, it needs to be handled before analysis and modelling. There are several ways to handle missing data. As its name suggests, listwise or case deletion is a method of deleting the cases with the missing data (Kang, 2013), and it represents the most frequent way of handling missing data. Pairwise deletion deletes only those missing data points needed to test an assumption (Kang, 2013). Two other methods are frequently used: mean substitution, which replaces the missing data point with the mean value of a variable that includes that particular data point, and regression imputation, which replaces the missing data point with the estimated value (Kang, 2013). The missing data analysis was performed using descriptive statistics. During this step, the rows with missing data were removed from the study for cases when more than two constructs and their items were not answered, or data were missing. Furthermore, for partially missing data, the mean substitution was applied using the possible mean value in the questionnaire derived using existing answers. If the whole construct was missing, then the answers were replaced by the mean values of the entire data.

5.3.2. Checking Multivariate Assumptions

The multivariate assumptions required to check are Outliers, Influentials, Linearity, Multicollinearity and Homoscedasticity. When the model is moderated with multi group moderators, like in this study, heteroscedasticity is expected. Linearity is the basic assumption for linear regression which assumes that the relationship between the independent variable and the mean of the dependent variable are linear. Multicollinearity is the basic assumption that proves the validity of the model without multivariate outliers. It implies that the input (independent) variables are not correlated with each other. The multicollinearity can be tested using the VIF, while the normality can be tested using the histogram, QQ Plot, or normality tests such as the Kolmogorov-Smirnov test.

5.3.2.1. Normality

Most models impose a normality assumption which needs to be confirmed in order for the obtained results to be valid. The parametric models usually imply the residuals to follow the normal distribution, while the non-parametric analytical models and techniques do not hold on to this assumption. In cases where the researcher uses the questionnaire to collect data, the obtained dataset may consist of an ordinal type of data (for example when using the Likert scale), which has to be processed and analysed in a different way than the interval and continuous data. One choice is to use the SEM and the non-parametric statistical techniques, while the second option is to apply transformations to data, in particular, to use rescaling techniques to transfer the original data to interval data (Harwell and Gatti, 2001). It is important to note that the SEM itself does not imply normality, but when using the SEM with the maximum likelihood estimator, the residuals are expected to follow the normality distribution. Furthermore, the normality assumption applies to the dependent variable only, thus the independent variables can follow any

distribution. This is rather easy to test when having continuous data, but with ordinal data, normality tests are frequently argued to be unnecessary. The theoretical background suggests that it is hard to have normally distributed variables when the questions in the questionnaire focus on the respondents' attitudes and opinions and are by nature ordinal. Some studies even suggest using the parametric tests with Likert data, and even non-normal distributions because most models do have some level of robustness (Norman, 2010). Different data manipulations can be helpful in transforming the data, but during this process, some information in the data might be lost, thus increasing the chance for invalid results.

This study focuses on non-parametric methods and methods that are more robust and less sensitive to the shape of the distribution. To evaluate the assumption of normality, the non-parametric Kolmogorov-Smirnov test was used for a sample, which was administered to the constructs shown in Table 5.3. This test contrasts the observed or real data distribution with a theoretical distribution, which in this case was the normal distribution. For the normality assumption to be fulfilled, the observed distribution must be statistically equal to the normal distribution (Robinson, 2016). Table 5.3. shows the critical values and p-values produced by the test in question for each of the constructs. It can be seen that there is enough evidence to refute the hypothesis of equality or null hypothesis in favour of the alternative hypothesis in all the constructs, so there are statistically significant differences, at the 0.05 level, between the observed distributions and the normal distribution. Consequently, the distributions of the variables behave in a non-normal way. However, if we rely on the Skewness and Kurtoses scores, presented in Tables 5.20 to 5.26, we can see that all scores can be placed between critical values of ±2.

Table 5.2. One-Sample Kolmogorov-Smirnov Test

Factor	Test Statistic	Asymp. Sig. (2-tailed)
Attitude	0,226	0,000[c]
Subjective Norm	0,089	0,000[c]
Privacy Risk	0,235	0,000[c]
Security Risk	0,126	0,000[c]
Financial Risk	0,074	0,000[c]
Perceived Usefulness	0,224	0,000[c]
Perceived Enjoyment	0,083	0,000[c]
Personal Innovativeness	0,152	0,000[c]
Intention to use Cryptocurrency	0,141	0,000[c]

Note: c. Lilliefors Significance Correction.

5.3.2.2. Linearity

For the linearity test, each relationship in mode must be tested. The relationship between the attitude and the privacy risk is presented in Table 5.3. For the linear model y = ax + b, where y is the attitude and x is the privacy risk, there is a moderate linear relationship (R2 = 0.534), which is significant F(1, 179) = 205.514, p = 0.000, as shown in Table 5.5. The quadratic equation obtained the similar R2 value (0.565), while the highest R2 value was obtained for the cubic equation (R2 = 0.567). As we are interested in linearity testing, we should focus on the results of the linear relationship. The independent variable (Privacy risk) contains non-positive values. The Logarithmic and Power models cannot be calculated.

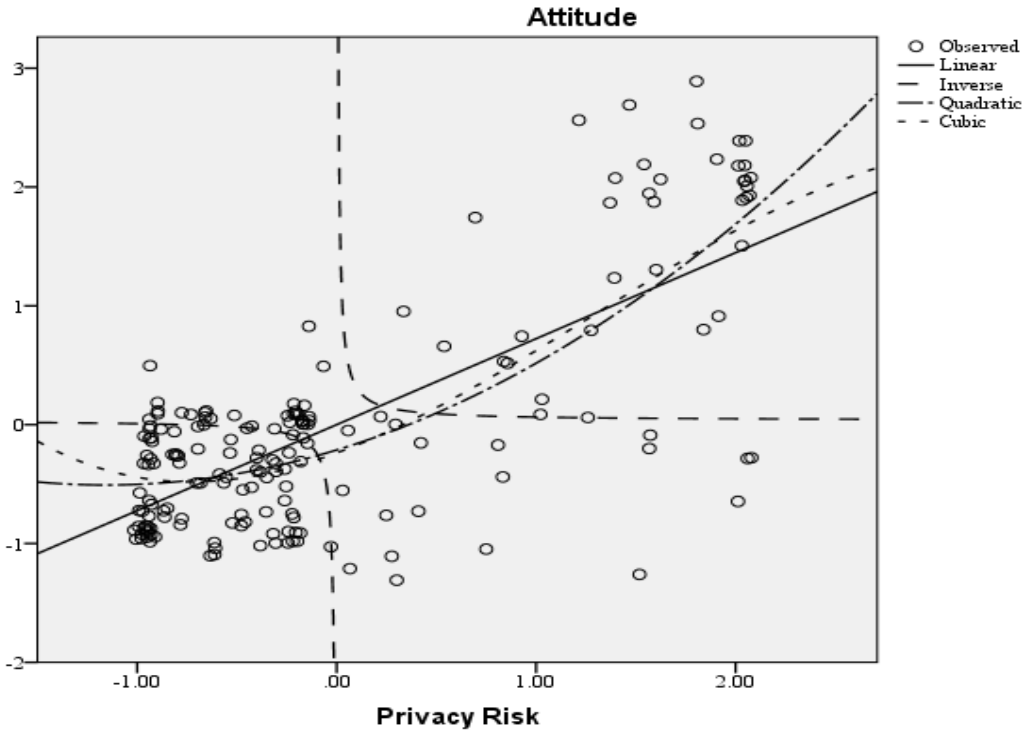
Table 5.3. Relationship between Attitude and Privacy Risk

Dependent Variable: Attitude									
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.534	205.514	1	179	.000	-1.109E-016	.724		
Inverse	.018	3.318	1	179	.070	.036	.028		
Quadratic	.565	115.383	2	178	.000	-.213	.510	.220	
Cubic	.567	77.410	3	177	.000	-.238	.618	.329	-.085

The independent variable is Privacy Risk.

The same can be observed from Figure 5.7, where it is shown that the linear function fits the data well, thus representing the relationship between attitude and the privacy risk as linear.

Figure 5.7. Distribution of attitude and privacy risk



The relationship between attitude and security risk is presented in Table 5.4. For the linear model, where y is attitude and x is Security Risk, there is a very weak linear relationship ($R2 = 0.016$), which is not significant $F(1, 179) = 2.890$, $p = 0.091$, as shown in Table 5.4.

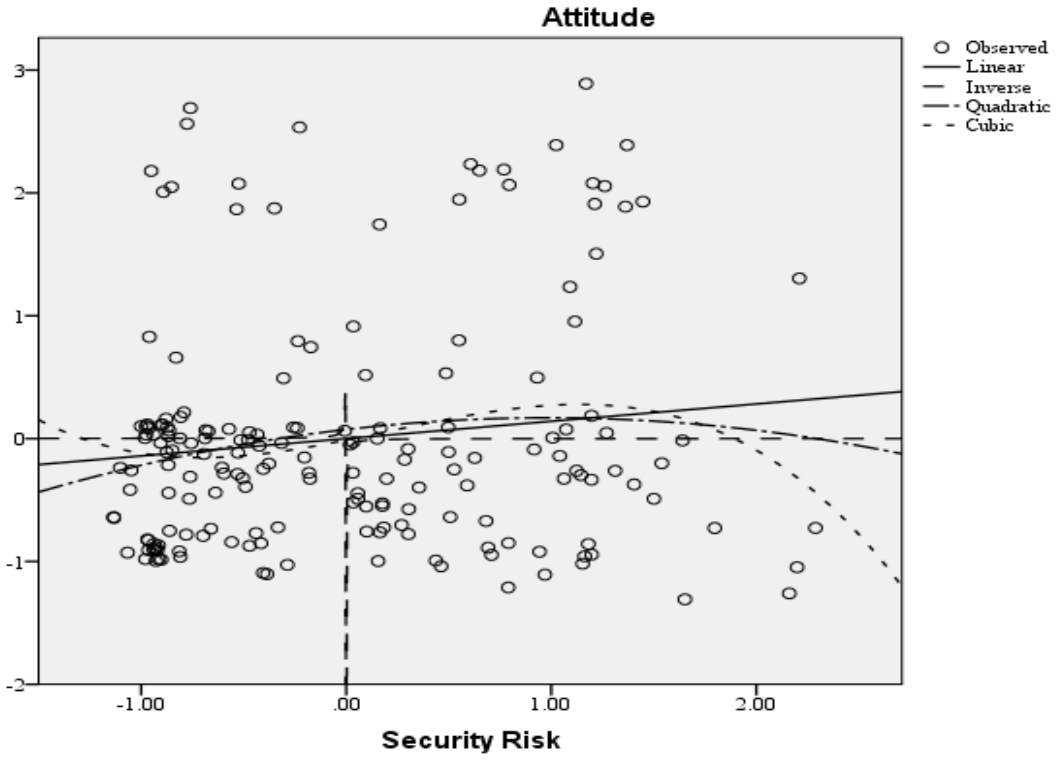
Table 5.4. Relationship between Attitude and Security Risk

Dependent Variable: Attitude									
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.016	2.890	1	179	.091	3.352E-017	.141		
Inverse	.000	.062	1	179	.804	.001	-.001		
Quadratic	.021	1.931	2	178	.148	.074	.193	-.098	
Cubic	.031	1.885	3	177	.134	-.012	.333	.088	-.138

The independent variable is Security Risk.

The independent variable (security risk) contains non-positive values. The Logarithmic and Power models cannot be calculated. This can also be observed in Figure 5.8, where it is visible that none of the equations fits the data the best. This is a limitation to this model, and we should be carefully observing this variable.

Figure 5.8. Distribution of attitude and security risk



The relationship between attitude and financial risk is presented in Table 5.5. For the linear model, there is a weak linear relationship (R2 = 0.352), which is significant F(1,179) = 97.035, p = 0.000, as shown in Table 5.7. It is interesting that the quadratic

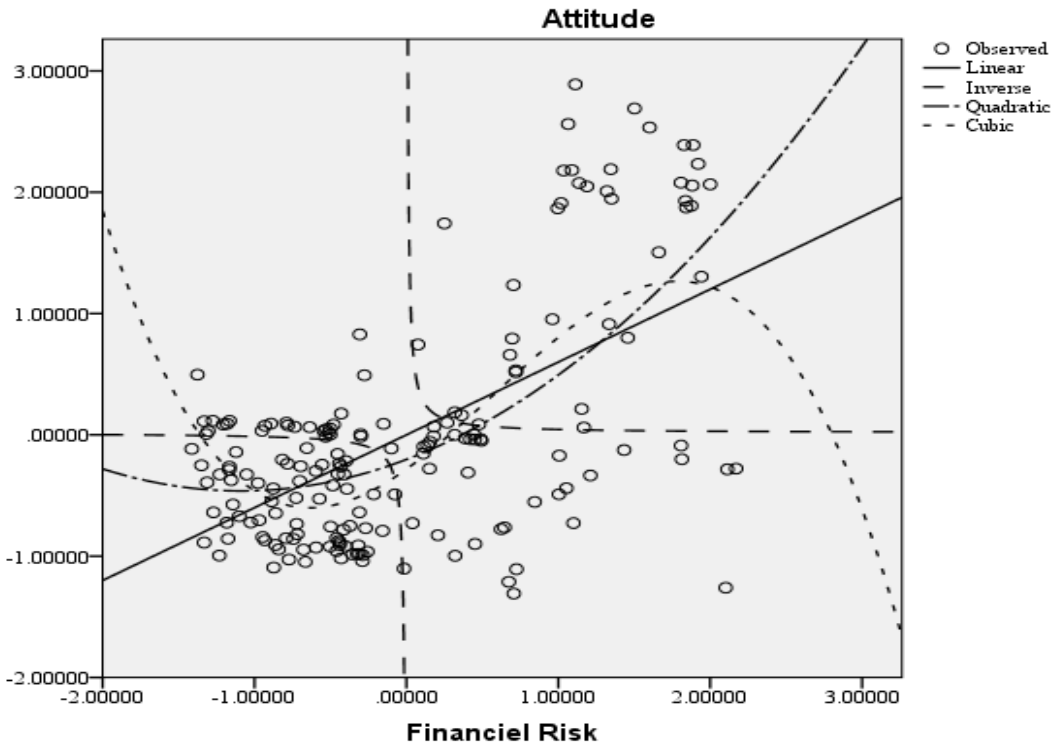
and cubic functions obtained higher values of the R2 – 0.392 and 0.444, respectively. These relationships are also presented in Figure 5.9. The independent variable (Financial risk) contains non-positive values. The Logarithmic and Power models cannot be calculated.

Table 5.5. Relationship between Attitude and Financial Risk

Dependent Variable: Attitude									
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.352	97.035	1	179	.000	-3.509E-017	.600		
Inverse	.031	5.688	1	179	.018	.016	.029		
Quadratic	.392	57.264	2	178	.000	-.202	.477	.219	
Cubic	.444	47.065	3	177	.000	-.283	.896	.454	-.263

The independent variable is Financial Risk.

Figure 5.9. Distribution of Attitude and Financial Risk



The relationship between attitude and perceived enjoyment is presented in Table 5.6. For the linear model, there is a weak linear relationship (R2 = 0.334), which is significant F(1,179) = 89.812, p = 0.000, as shown in Table 5.8. The results of different regressions

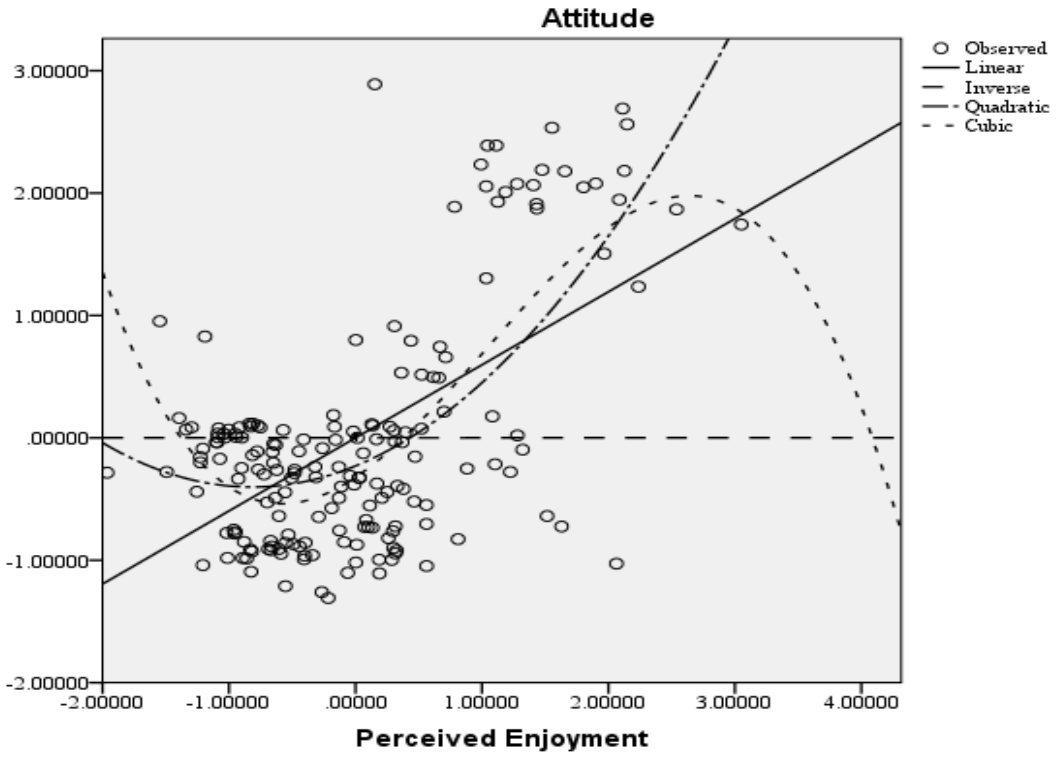
between attitude and perceived enjoyment are also presented in Figure 5.10. The independent variable (Perceived Enjoyment) contains non-positive values. The Logarithmic and Power models cannot be calculated.

Table 5.6. Relationship between Attitude and Perceived Enjoyment

Dependent Variable: Attitude									
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.334	89.812	1	179	.000	2.007E-017	.597		
Inverse	.000	.003	1	179	.957	.000	-9.276E-005		
Quadratic	.421	64.705	2	178	.000	-.229	.422	.258	
Cubic	.471	52.505	3	177	.000	-.322	.694	.464	-.150

The independent variable is Perceived Enjoyment

Figure 5.10. Distribution of Attitude and Enjoyment



The relationship between attitude and perceived usefulness is presented in Table 5.7. For the linear model, there is a moderate linear relationship (R2 = 0.591), which is significant

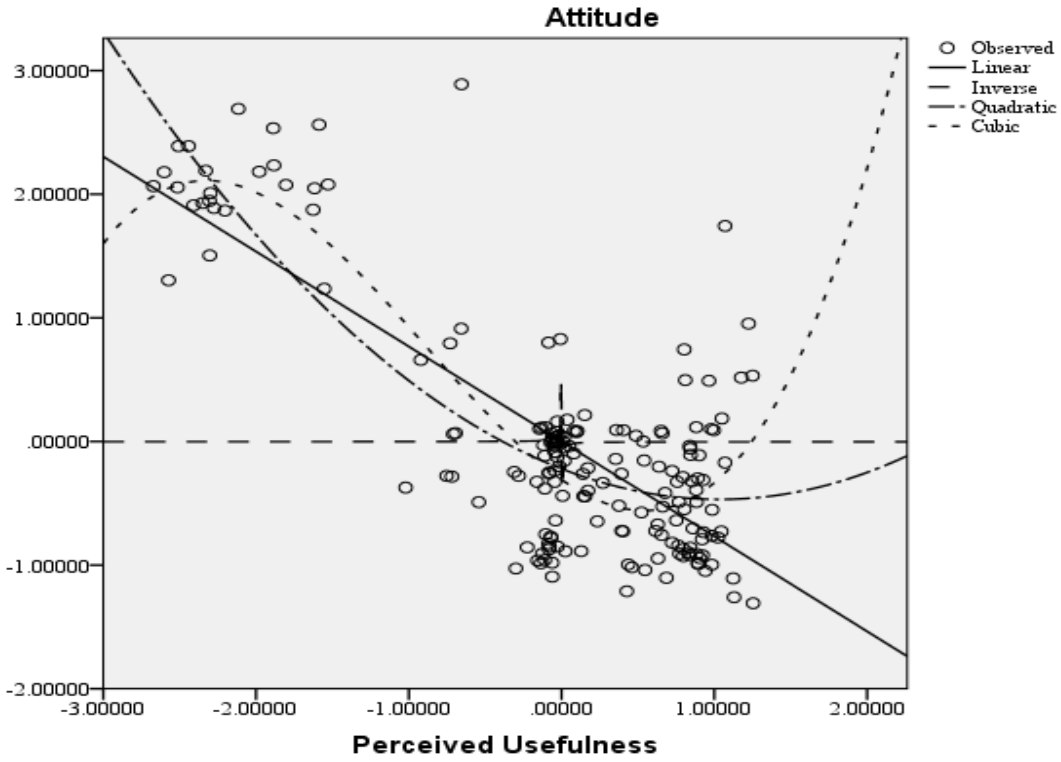
F (1,179) = 258.992, p = 0.000. The independent variable (Perceived Usefulness) contains non-positive values. The Logarithmic and Power models cannot be calculated.

Table 5.7. Relationship between Attitude and Perceived Usefulness

Dependent Variable: Attitude									
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.591	258.992	1	179	.000	2.489E-017	-.768		
Inverse	.001	.140	1	179	.709	-.002	-.001		
Quadratic	.658	170.873	2	178	.000	-.221	-.480	.233	
Cubic	.698	136.481	3	177	.000	-.309	-.856	.605	.226

The independent variable is Perceived Usefulness

Figure 5.11. Distribution of Attitude and Perceived Usefulness



The relationship between attitude and personal innovativeness is presented in Table 5.8. For the linear model, there is a very weak linear relationship (R2 = 0.352), which is significant F (1, 179) = 97.035, p = 0.000, as shown in Table 5.8. Figure 5.12 below

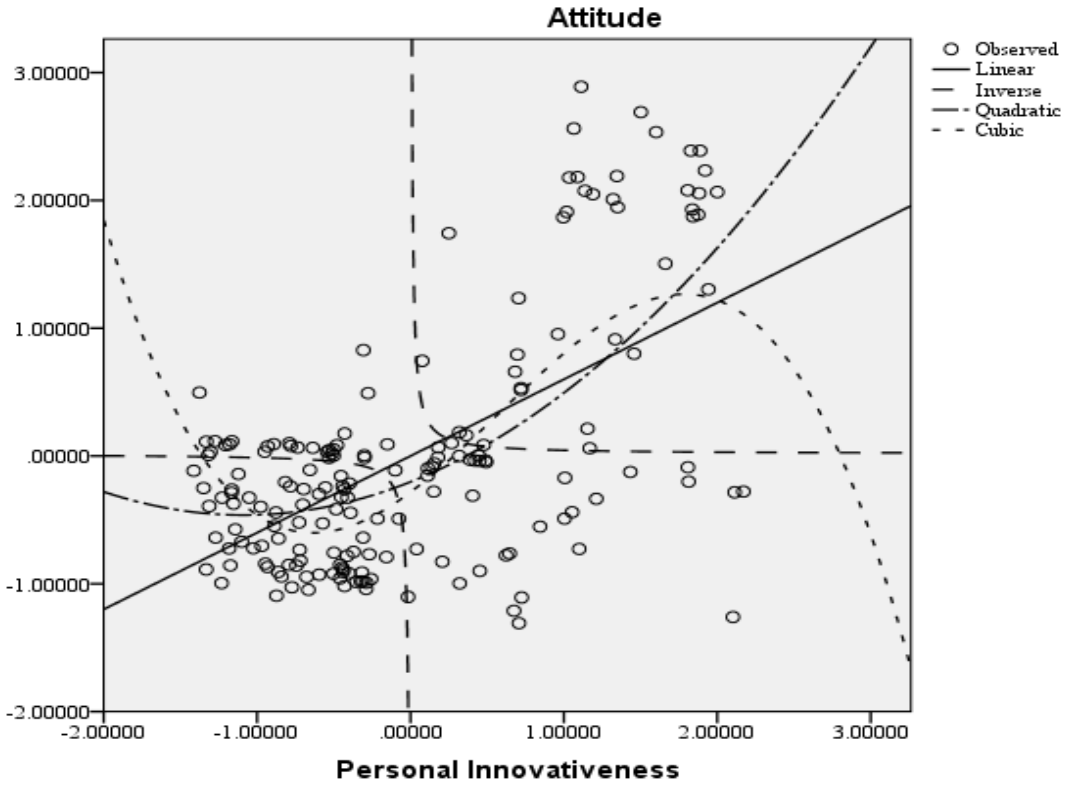
demonstrates these results. The independent variable (Personal Innovativeness) contains non-positive values. The Logarithmic and Power models cannot be calculated.

Table 5.8. Relationship between Attitude and Personal Innovativeness

Dependent Variable: Attitude									
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.352	97.035	1	179	.000	-3.509E-017	.600		
Inverse	.031	5.688	1	179	.018	.016	.029		
Quadratic	.392	57.264	2	178	.000	-.202	.477	.219	
Cubic	.444	47.065	3	177	.000	-.283	.896	.454	-.263

The independent variable is Personal Innovativeness.

Figure 5.12. Distribution of attitude and personal innovativeness



The relationship between intention to use and subjective norm is presented in Table 5.9. For the linear model, there is a very weak, almost non-existent linear relationship (R2 = 0.097), which is significant F(1,179) = 19.158, p = 0.000, as shown in Table 5.13. The

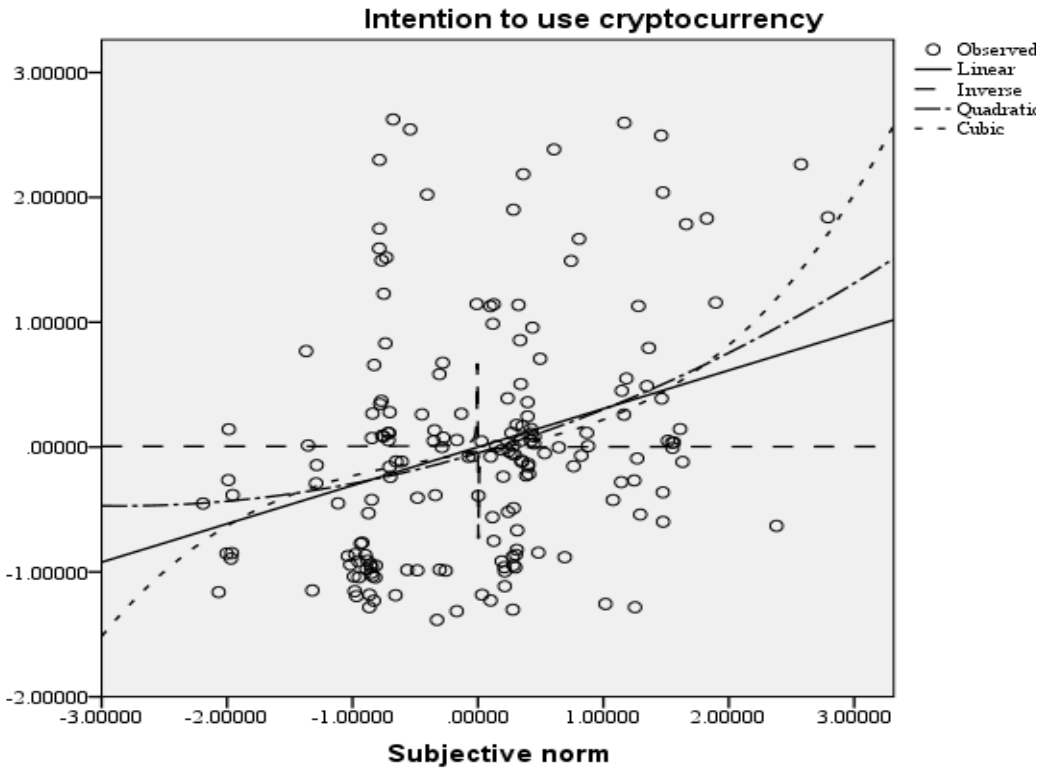
independent variable (Subjective Norm) contains non-positive values. The Logarithmic and Power models cannot be calculated. The fit of the regression line of different types of regression functions, between intention to use and subjective norm, is shown in Figure 5.13.

Table 5.9. Relationship between Intention to use and Subjective Norm

Dependent Variable: Intention to Use									
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.097	19.158	1	179	.000	-5.769E-017	.307		
Inverse	.004	.641	1	179	.424	.004	-.002		
Quadratic	.101	10.045	2	178	.000	-.047	.297	.052	
Cubic	.109	7.247	3	177	.000	-.038	.179	.033	.046

The independent variable is Subjective Norm.

Figure 5.13. Distribution of Intention to use and Subjective Norm



The relationship between intention to use and attitude is presented in Table 5.10. For the linear model, there is a moderate linear relationship (R2 = 0.412), which is significant F(1,179) = 125.365, p = 0.000, as shown in Table 5.10. The independent variable

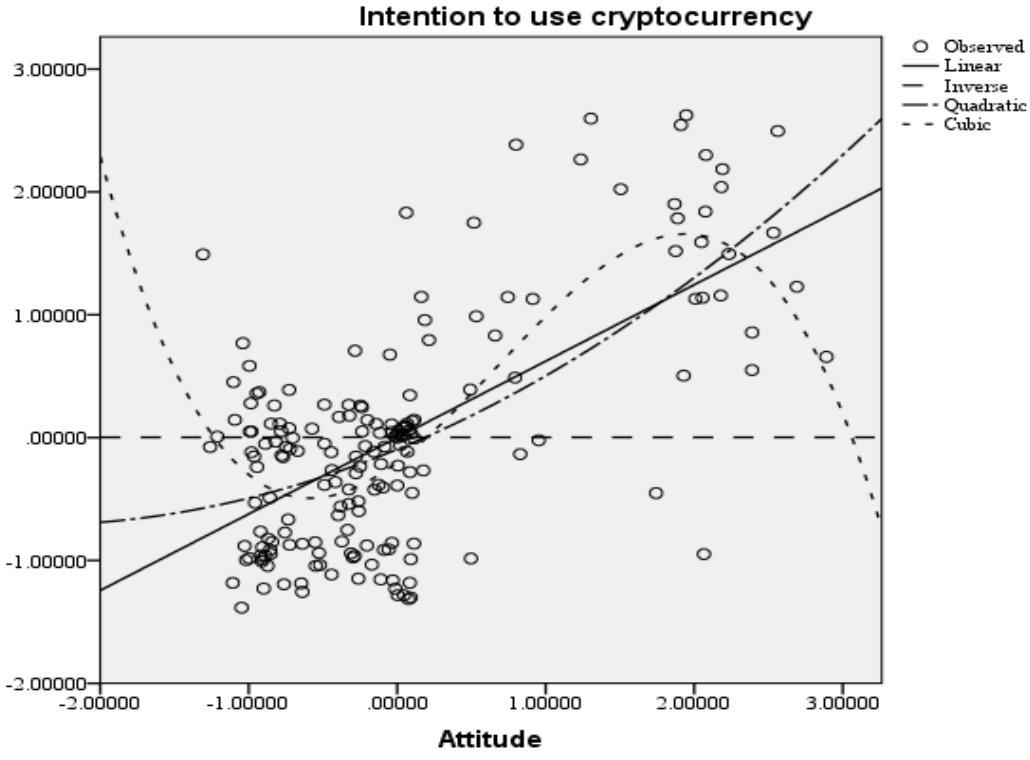
(Attitude) contains non-positive values. The Logarithmic and Power models cannot be calculated.

Table 5.10. Relationship between Intention to use and Attitude

Dependent Variable: Intention to Use									
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.412	125.365	1	179	.000	-8.462E-017	.622		
Inverse	.001	.206	1	179	.651	.003	-7.822E-005		
Quadratic	.424	65.458	2	178	.000	-.095	.498	.100	
Cubic	.503	59.621	3	177	.000	-.200	.911	.542	-.267

The independent variable is Attitude.

Figure 5.14. Distribution of Intention to use and Attitude



The relationship between intention and privacy risk is presented in Table 5.11. For the linear model, there is a weak linear relationship (R2 = 0.360), which is significant F(1,179) = 100.588, p = 0.000, as shown in Table 5.11. The independent variable (Privacy

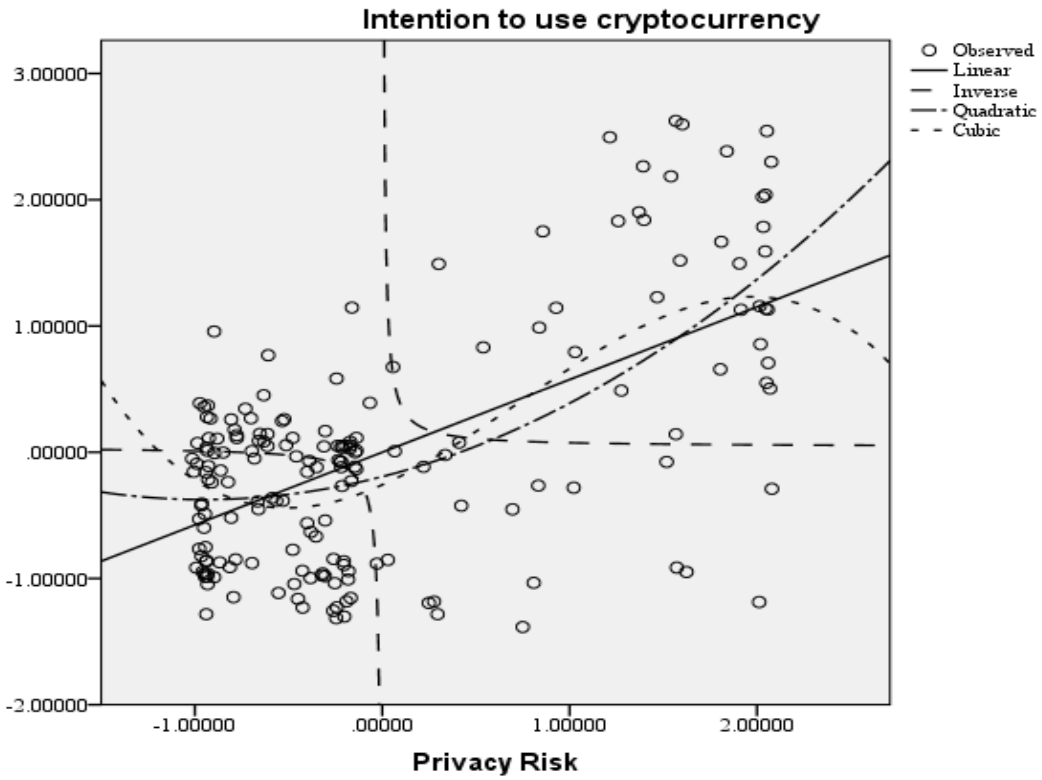
Risk) contains non-positive values. The Logarithmic and Power models cannot be calculated. Figure 5.15 presents the regression lines for different types of regression functions.

Table 5.11. Relationship between Intention to use and Privacy Risk

Dependent Variable: Intention to Use									
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.360	100.588	1	179	.000	-1.745E-016	.575		
Inverse	.027	4.991	1	179	.027	.042	.033		
Quadratic	.386	55.986	2	178	.000	-.193	.381	.200	
Cubic	.407	40.468	3	177	.000	-.258	.660	.479	-.218

The independent variable is Privacy Risk.

Figure 5.15. Distribution of Intention to use and Privacy Risk



The relationship between intention and security risk is presented in Table 5.12. For the linear model, there is a very weak linear relationship (R2 = 0.015), which is not significant F(1,179) = 2.791, p = 0.097, as shown in Table 5.12. This is a limitation to this model,

and should be carefully observing this variable. These results can be observed in Figure 5.16.

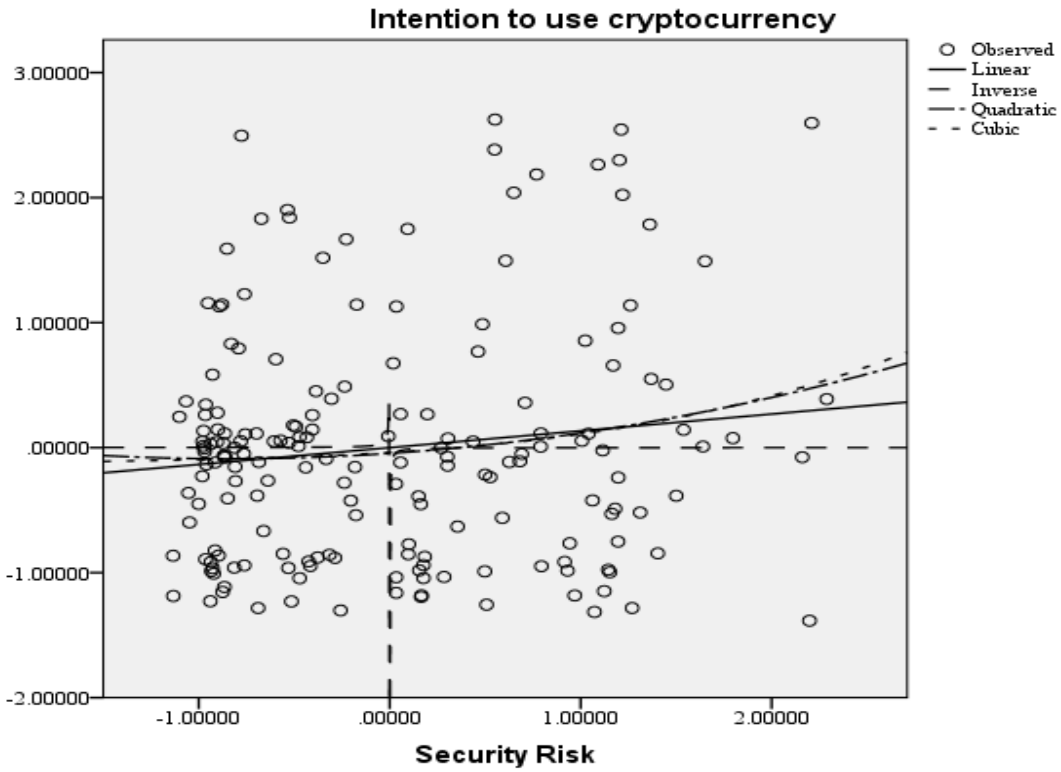
Table 5.12. Relationship between Intention to use and Security Risk

Dependent Variable: Intention to Use									
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.015	2.791	1	179	.097	-5.593E-017	.134		
Inverse	.000	.058	1	179	.809	.001	-.001		
Quadratic	.018	1.588	2	178	.207	-.046	.103	.061	
Cubic	.018	1.056	3	177	.369	-.039	.091	.046	.011

The independent variable is Security Risk.

The independent variable (security risk) contains non-positive values. The Logarithmic and Power models cannot be calculated.

Figure 5.16. Distribution of Intention to use and Security Risk



The relationship between intention to use and financial risk is presented in Table 5.13. For the linear model, there is a weak linear relationship (R2 = 0.121), which is significant F(1,179) = 24.744, p = 0.000, as shown in Table 5.13. Figure 5.17 demonstrates these

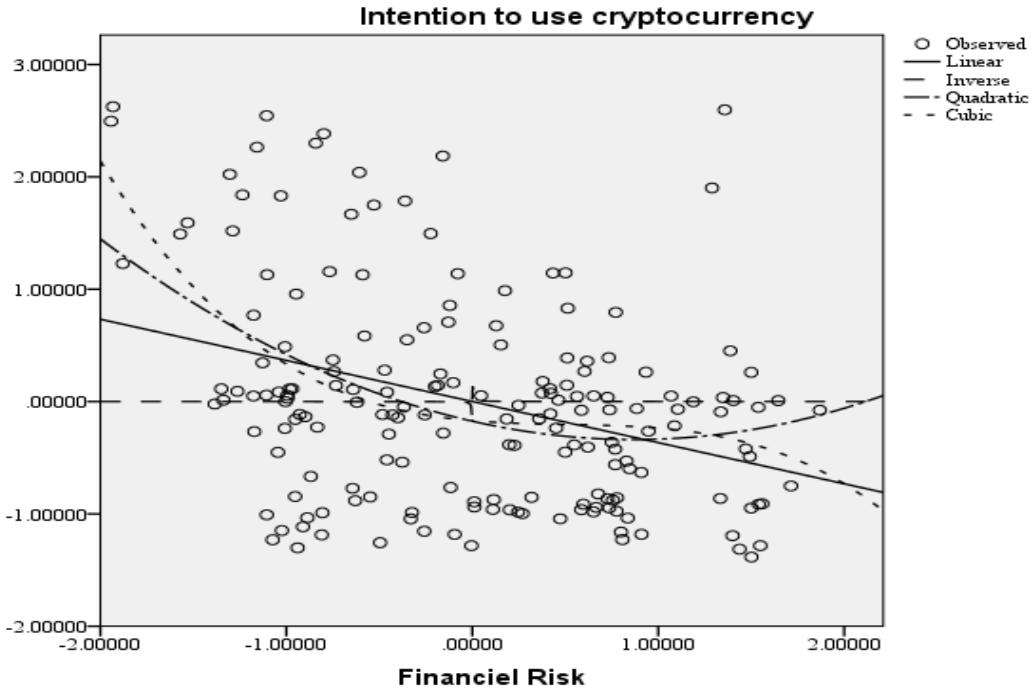
results further. The independent variable (Financial risk) contains non-positive values. The Logarithmic and Power models cannot be calculated.

Table 5.13. Relationship between Intention to use and Financial Risk

Dependent Variable: Intention to Use									
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.121	24.744	1	179	.000	-3.629E-017	-.366		
Inverse	.000	.005	1	179	.942	5.704E-005	.000		
Quadratic	.157	16.551	2	178	.000	-.175	-.377	.217	
Cubic	.175	12.482	3	177	.000	-.170	-.141	.219	-.144

The independent variable is Financial Risk.

Figure 5.17. Intention to use and Financial Risk

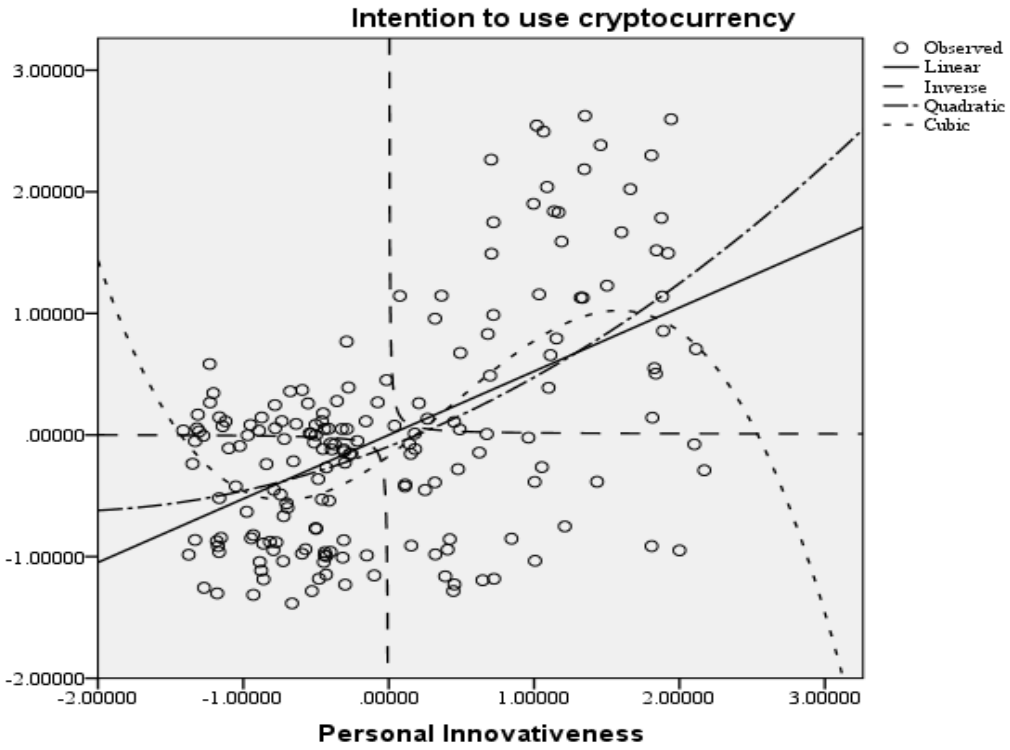


The relationship between intention and personal innovativeness is presented in Table 5.14. For the linear model, there is a weak linear relationship (R2 = 0.285), which is significant F(1,179) = 71.431, p = 0.000, as shown in figure 5.18. The independent variable (Perceived Innovativeness) contains non-positive values. The Logarithmic and Power models cannot be calculated.

Table 5.14. Relationship between Intention to use and Personal Innovativeness

Dependent Variable: Intention to use									
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.285	71.431	1	179	.000	-1.177E-016	.524		
Inverse	.005	.938	1	179	.334	.006	.012		
Quadratic	.294	37.144	2	178	.000	-.094	.467	.102	
Cubic	.346	31.265	3	177	.000	-.172	.871	.329	-.254
The independent variable is Personal Innovativeness.									

Figure 5.18. Distribution of Intention to use and Personal Innovativeness



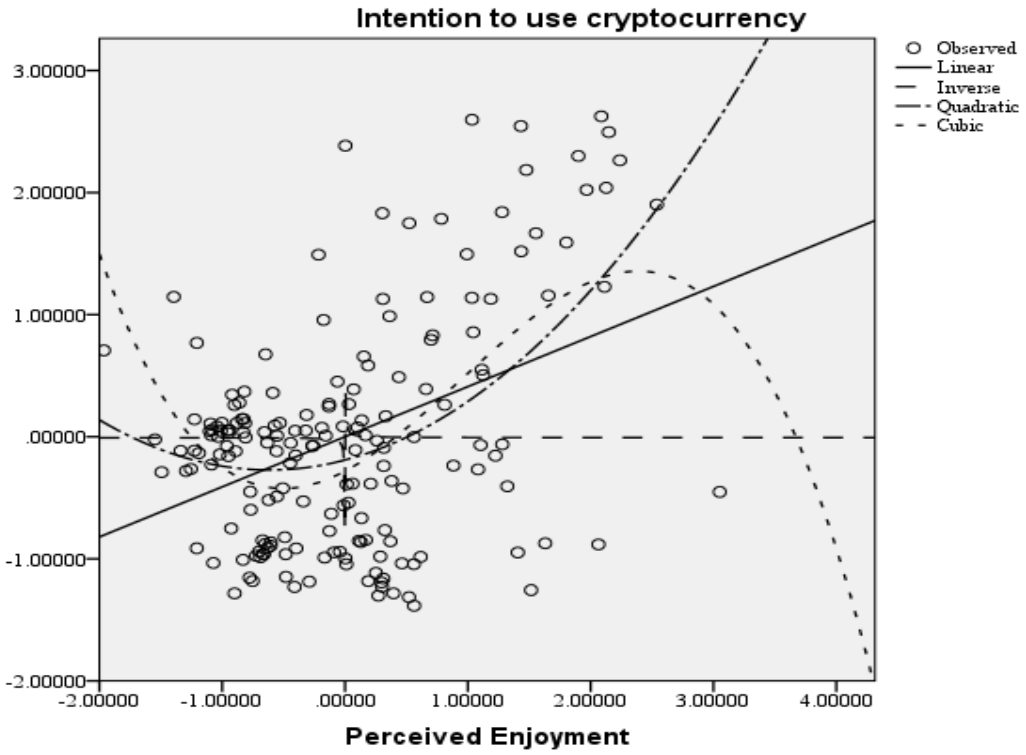
The relationship between intention to use and perceived enjoyment is presented in Table 5.15. For the linear model, there is a weak linear relationship (R2 = 0.168), which is significant F(1,179) = 36.176, p = 0.000 as seen in Figure 5.19. The independent variable (Perceived enjoyment) contains non-positive values. The Logarithmic and Power models cannot be calculated.

Table 5.15. Relationship between Intention to use and Perceived Enjoyment

Dependent Variable: Intention to use									
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.168	36.176	1	179	.000	-7.146E-017	.410		
Inverse	.006	1.029	1	179	.312	-.008	.002		
Quadratic	.232	26.877	2	178	.000	-.191	.265	.215	
Cubic	.283	23.257	3	177	.000	-.281	.531	.416	-.147

The independent variable is Perceived Enjoyment.

Figure 5.19. Distribution of Intention to use and Perceived Enjoyment



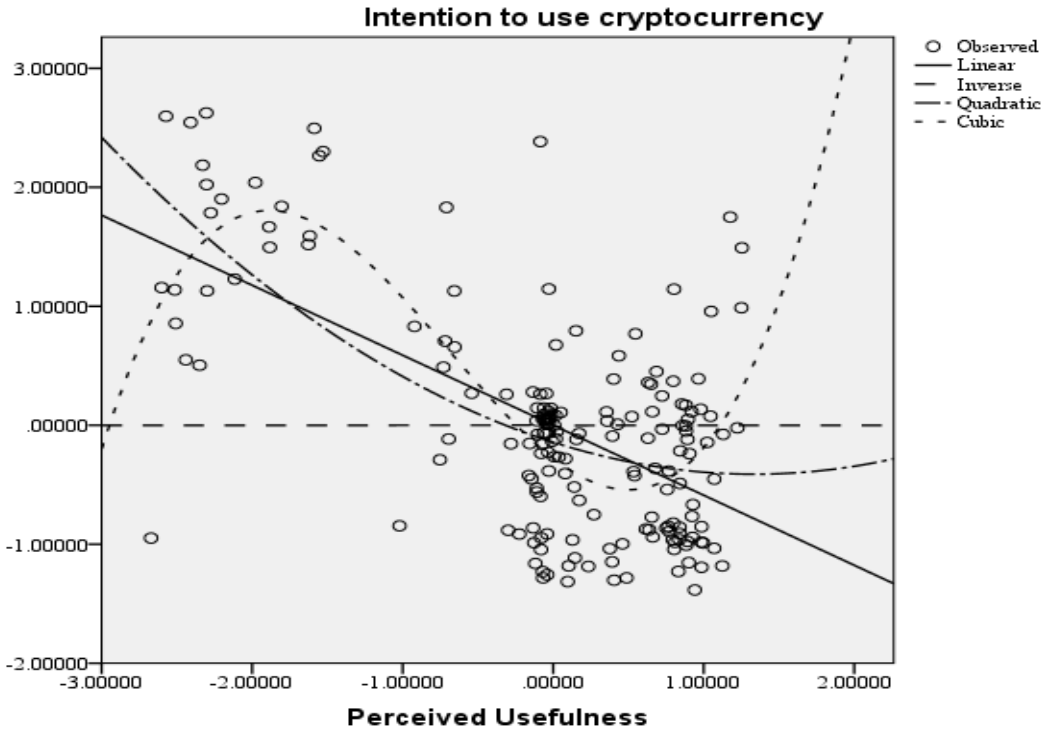
The relationship between intention to use and perceived usefulness is presented in Table 5.16. For the linear model, there is a weak linear relationship (R2 = 0.369), which is significant F(1,179) = 104.759, p = 0.000, as shown in Table 5.16. The independent variable (Perceived Usefulness) contains non-positive values. The Logarithmic and Power models cannot be calculated.

Table 5.16. Relationship between Intention to use and Perceived Usefulness

Dependent Variable: Intention to use									
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.369	104.759	1	179	.000	-6.697E-017	-.588		
Inverse	.000	.010	1	179	.919	-.001	.000		
Quadratic	.399	59.008	2	178	.000	-.143	-.402	.151	
Cubic	.500	58.898	3	177	.000	-.277	-.975	.719	.345

The independent variable is Perceived Usefulness.

Figure 5.20. Distribution of Intention to use and Perceived Usefulness



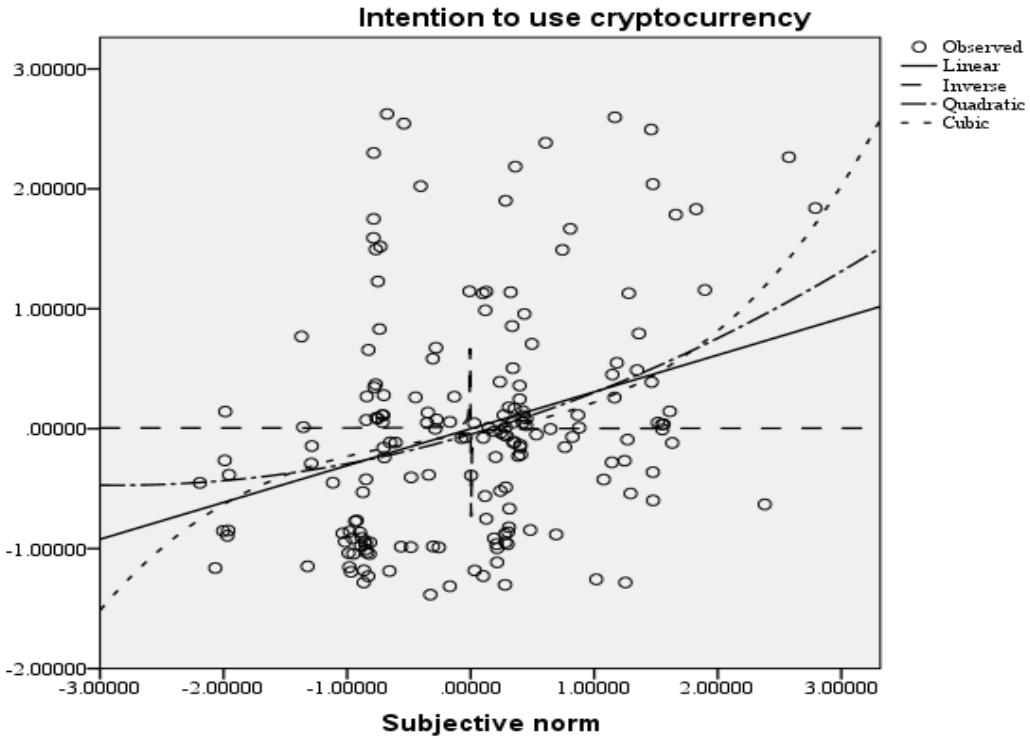
The relationship between intention to use and subjective norm is presented in Table 5.17. For the linear model, there is a very weak linear relationship (R2 = 0.097), which is significant F(1,179) = 19.158, p = 0.000, as shown in Table 5.17. The independent variable (Subjective Norm) contains non-positive values. The Logarithmic and Power models cannot be calculated.

Table 5.17. Relationship between Intention to use and Subjective Norm

Dependent Variable: Intention to use									
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.097	19.158	1	179	.000	-5.769E-017	.307		
Inverse	.004	.641	1	179	.424	.004	-.002		
Quadratic	.101	10.045	2	178	.000	-.047	.297	.052	
Cubic	.109	7.247	3	177	.000	-.038	.179	.033	.046

The independent variable is Subjective Norm.

Figure 5.21. Distribution of Intention to use and Subjective Norm



5.3.2.3. Multicollinearity

Multicollinearity can be detected by analysing the values of VIF and tolerance. The value of tolerance should be higher than 0.2, while the values of VIF should be lower than 10 in order to conclude that there is no multicollinearity present. From the table below, it can be observed that the tolerance values for each construct are above 0.2, while none of the VIF values reaches over 10, thus it can be concluded that multicollinearity is not

present. The same can be observed when attitude is the dependent variable (Table 5.19). In this case, as well the values of VIF are below 10, while the values of tolerance are above 0.2.

Table 5.18. Multicollinearity Intention to use

Dimension	Eigenvalue	Condition Index	(Constant)	AT	PR	SR	FR	PI	PE	PU	SN
1	3.580	1.000	.00	.02	.02	.01	.01	.02	.02	.02	.00
2	1.156	1.760	.00	.00	.00	.35	.34	.01	.01	.00	.01
3	1.106	1.799	.00	.00	.00	.07	.03	.03	.03	.01	.56
4	1.000	1.892	1.00	.00	.00	.00	.00	.00	.00	.00	.00
5	.717	2.235	.00	.00	.01	.45	.42	.06	.07	.01	.03
6	.678	2.297	.00	.01	.02	.05	.07	.04	.50	.00	.30
7	.381	3.066	.00	.06	.03	.07	.03	.17	.27	.43	.07
8	.204	4.192	.00	.87	.00	.00	.06	.03	.10	.52	.01
9	.177	4.498	.00	.04	.92	.00	.05	.64	.00	.01	.02
Tolerance				.279	.256	.886	.824	.356	.630	.361	.901
VIF				3.581	3.901	1.129	1.214	2.807	1.587	2.773	1.109

a Dependent Variable: IUCC

Table 5.19. Multicollinearity Attitude

Dimension	Eigenvalue	Condition Index	Constant	PR	SR	FR	PI	PE	PU
1	2.813	1.000	.00	.03	.01	.01	.03	.04	.04
2	1.134	1.575	.00	.00	.37	.38	.00	.00	.01
3	1.000	1.677	1.00	.00	.00	.00	.00	.00	.00
4	.780	1.899	.00	.00	.30	.29	.02	.33	.04
5	.712	1.988	.00	.02	.24	.24	.11	.34	.00
6	.382	2.715	.00	.01	.08	.00	.16	.27	.80
7	.180	3.955	.00	.93	.00	.07	.68	.02	.11

Tolerance				.273	.889	.878	.370	.714	.482
VIF				3.667	1.125	1.139	2.702	1.400	2.073

a Dependent Variable: Attitude

5.3.3. Outlier Review

Outliers represent values that are extreme and lie outside of the overall distribution of the variables (Kwak and Kim, 2017). Outliers are not naturally present in the data. In fact, they usually exist because of mistakes of the participants or data entry errors (Kwak and Kim, 2017). Because the existence of outliers in the dataset introduces bias in the analysis, they need to be handled prior to the main analysis and modelling. It is important to note that if the data is not normally distributed, then outlier detection is not essential. To identify outliers, different strategies can be employed, such as (i) finding the mean and then finding values that are more than 3 standard deviations away from the mean and removing them, (ii) finding the median and quartile range, or (iii) using box plots (Kwak and Kim, 2017). When the outliers are detected, they can be treated by using one of the following methods: trimming (i.e., deleting the outliers), winsorization (i.e., outlier weight or value modification), and robust estimation (producing estimators that are robust to outliers) (Kwak and Kim, 2017).

As Kwak and Kim (2017) state, variables with values of more than 3 standard deviations away from the mean, should be considered as outliers. In order to identify the outliers, all of the values from all of the tested variables were changed into standardized z-scores. In the next step in all cases an absolute value of z-scores ($|z|$) larger than 3.29 were searched (Tabachnick et al., 2007). The results show that, none of the variables contained cases with absolute z-scores larger than 3.29 (refer to Tables 5.20 to 5.26). Based on these

values we can conclude that the data is free of outliers. Following this process, all variables were progressed to the analysis stage.

5.3.4. Standard Deviations and Standard Errors of the Mean

The descriptive outcomes are required to see the actual values of variance to depict the homogeneity of variables within factors. The mean value and standard error of the mean show how accurately the sample reflects the wider population. These results are presented in Tables 5.20 to 5.26, for each construct separately.

In particular, Table 5.20 presents the mean, standard error and standard deviation for the privacy risk construct. Privacy risk construct is measured with 5 questions.

It can be found that the mean values for each question are above 3, indicating that on average participants agree that they will face privacy risk if they engage with cryptocurrency activities. Participants on average mostly agree that owning cryptocurrency has privacy risk (mean=3.80, sd=1.365).

It is also evident from the table that Skewness and Kurtoses scores, are between the critical values of ±2, so we can say the variables are normally distributed.

Table 5.20. Descriptive statistics for Perceived Risk

VAR	Description	N	Cases with *Z*>3.29	Mean	SE	SD	Skewness	Kurtosis
PR1	Information containing my cryptocurrency payment transactions can be mutualized by others.	181	0.0%	3.73	.106	1.422	-.966	-.461
PR2	I do not feel safe providing personal private information over cryptocurrency payments.	181	0.0%	3.72	.105	1.407	-.951	-.449

PR3	I do not trust in the ability of cryptocurrency payment service providers to protect my privacy.	181	0.0%	3.75	.104	1.399	-.928	-.468
PR4	I am concerned with the privacy security of using cryptocurrency.	181	0.0%	3.72	.101	1.359	-.898	-.469
PR5	I think that owning cryptocurrency has privacy risks.	181	0.0%	3.80	.101	1.365	-.975	-.362
SR1	Cryptocurrency enables to transfer money securely.	181	0.0%	2.12	.093	1.255	1.116	.200
SR2	Cryptocurrency empowers me with the control of my money.	181	0.0%	2.22	.090	1.214	.981	.009
SR3	I am concerned with the security of using cryptocurrency.	181	0.0%	3.25	.074	.995	-.803	-.947
SR4	I am worried about using cryptocurrency because other people may be able to access my account.	181	0.0%	3.15	.073	.982	-.529	-1.322
SR5	I do not trust cryptocurrency as I trust other currency.	181	0.0%	3.04	.075	1.016	-.314	-1.548
FR1	Cost of cryptocurrency is very high for me.	181	0.0%	3.18	.095	1.283	-.080	-1.263
FR2	Inability to convert cryptocurrency to conventional currencies, or not at a reasonable price.	181	0.0%	3.04	.099	1.333	-.039	-1.311
FR3	Losses due to counterparties failing to meet contractual payments or settlement obligations.	181	0.0%	2.29	.086	1.162	.839	.084
FR4	Losses due to security incidents (e.g., lost passwords, malware).	181	0.0%	3.28	.092	1.240	-.233	-1.166
FR5	I think that there would be problems with my financial transactions while using cryptocurrency.	181	0.0%	3.19	.128	1.726	.139	-1.727

Security risk construct is also consisted of 5 questions. In the further analyses, two of the questions were used in the reversed direction. Participants mostly disagree that cryptocurrency enables them to transfer money safely (mean=2.12, sd=1.255) and that cryptocurrency empowers them with the control of their money (mean=2.22, 1.214). All other questions, measuring the security risk show that on average participants have neutral behaviour regarding their security risk.

Financial risk is another construct that is represented by 5 questions. Four questions have mean value higher than 3, which indicate that participants on average agree that there is a financial risk related to the cryptocurrency activities. Results show that participants are on average mostly concerned that security incidents may happen, like lost password, malware and eats. (mean=3.28, sd=1.240). Lower mean value had only the third question, which was later removed because of the very low correlation with other items.

In Table 5.21, the descriptive statistics for the perceived usefulness construct are presented. Perceived usefulness construct is measured with 5 questions. All mean values are around 2, indicating that on average participants don't perceive usefulness in engaging in cryptocurrency activities. The values of SE are approximately 0.08 for each variable, and the values of SD are similar, indicating that these items have similar dispersion of the results. Skewness and Kurtoses scores are between the critical values of ±2, so we can conclude that the items, that measure Perceived Usefulness, are normally distributed.

Table 5.21. Descriptive statistics for Perceived Usefulness

VAR	Description	N	Cases with Z>3.29	Mean	SE	SD	Skewness	Kurtosis
PU1	I perceive that my purchase would be more quickly using cryptocurrency.	181	0.0%	2.03	.084	1.130	1.336	1.146
PU2	I perceive that my purchasing tasks would be more easily using cryptocurrency.	181	0.0%	2.00	.087	1.169	1.329	.990
PU3	Cryptocurrency would enhance my effectiveness in purchasing.	181	0.0%	2.05	.088	1.180	1.278	.842
PU4	Cryptocurrency would enhance my efficiency in making a purchase.	181	0.0%	2.02	.087	1.167	1.369	1.127
PU5	Cryptocurrency would enable me to make better decisions in making a purchase.	181	0.0%	2.12	.088	1.186	1.014	.194

When observing the perceived enjoyment construct, which is consisted of 5 questions, it can be noted that the mean values for each item except the PE5 are approximately 2, showing that on average participants do not perceive enjoyment related to the cryptocurrency activities. The mean value of PE5 is higher 3.25, which differs greatly from the rest of the items, because the question is stated in the reverse order, showing that participants mostly agree that they feel uninventive when they use cryptocurrency (mean=3.25, sd=1.207). Questions that measure Perceived Enjoyment have Skewness and Kurtoses scores that are between the critical values of ±2, so we can consider them as normally distributed.

Table 5.22. Descriptive statistics for Perceived Enjoyment

VAR	Description	N	Cases with Z>3.29	Mean	SE	SD	Skewness	Kurtosis
PE1	Perceived Enjoyment - Using cryptocurrency is fun for me.	181	0.0%	2.26	.083	1.122	1.141	.742
PE2	Perceived Enjoyment - Using cryptocurrency gives me pleasure.	181	0.0%	2.04	.094	1.262	1.100	.172
PE3	Perceived Enjoyment - I enjoy using the cryptocurrency.	181	0.0%	1.98	.089	1.202	1.111	.226
PE4	Perceived Enjoyment - I am flexible when I use cryptocurrency.	181	0.0%	2.05	.092	1.240	1.038	.071
PE5	Perceived Enjoyment - I am uninventive when I use cryptocurrency.	181	0.0%	3.25	.090	1.207	-.156	-1.024

Personal innovativeness contains 4 questions. Based on Table 5.23, where the descriptive statistics for each question is presented it can be observed that the mean values for each item is between 2.5 and 2.8, indicating that on average participants disagree with the statements. Put differently, on average participants don't have willingness to engage in cryptocurrency activities in an innovative way. Questions that measure Personal Innovativeness have also normally distributed data (Skewness and Kurtoses scores are between ±2).

Table 5.23. Descriptive statistics for Personal Innovativeness

VAR	Description	N	Cases with Z>3.29	Mean	SE	SD	Skewness	Kurtosis
PI1	If I heard about new cryptocurrency, I would look for ways to experiment with it.	181	0.0%	2.80	.094	1.259	.426	-.837
PI2	Among my peers, I am usually the first to try out new cryptocurrency.	181	0.0%	2.61	.096	1.289	.455	-.906
PI3	I find it stimulating to be original in my	181	0.0%	2.54	.095	1.276	.682	-.569

	thinking and behaviour.							
PI4	I like to experiment with a new cryptocurrency.	181	0.0%	2.56	.100	1.351	.602	-.860

In Table 5.24, the descriptive statistics for Attitude are presented. Attitude is measured by 5 questions. It can be observed that the mean, SE and SD values are approximately the same. The mean value for all items is around 2 indicating that on average participants disagree with the statements. Based on the results, we can say that participants' attitude towards the cryptocurrency is low. Skewness and Kurtoses scores are between the critical values of ±2, so we can conclude that the items, that measure the Attitude, are normally distributed.

Table 5.24. Descriptive statistics for Attitude

VAR	Description	N	Cases with Z>3.29	Mean	SE	SD	Skewness	Kurtosis
AT1	I think that buying a cryptocurrency is a good idea.	181	0.0%	2.04	.085	1.139	1.235	.815
AT2	I think that using cryptocurrency for financial transactions would be a wise idea.	181	0.0%	2.10	.089	1.202	1.184	.492
AT3	In my opinion, it is desirable to use cryptocurrency as a currency.	181	0.0%	2.02	.089	1.195	1.272	.712
AT4	I feel good about using cryptocurrency.	181	0.0%	2.08	.089	1.197	1.157	.443
AT5	I am excited about the idea of using cryptocurrency.	181	0.0%	1.97	.084	1.133	1.401	1.328

Table 5.25 presents the descriptive statistics for subjective norm. This construct is measured by 5 questions. It can be seen from the results that the mean values for each

item is between 2.5 and 2.8, showing that on average participants disagree with the statements. On average participants are not influenced from their surroundings. Regarding the distribution of the items, Skewness and Kurtoses scores show values between ±2, so we can conclude that the items, that measure Subjective Norm, are normally distributed.

Table 5.25. Descriptive statistics for Subjective Norm

VAR	Description	N	Cases with $Z>3.29$	Mean	SE	SD	Skewness	Kurtosis
SN1	People who are important for me, influencing me, to use cryptocurrency in order to buy or sell products is a good way of trading.	181	0.0%	2.72	.076	1.028	.452	-.723
SN2	People who are important for me, influencing me depict a positive sentiment to engage in using cryptocurrency.	181	0.0%	2.52	.065	.873	.481	-.694
SN3	People who are important for me, influencing me, to try cryptocurrency.	181	0.0%	2.70	.068	.914	.155	-.779
SN4	People who are important for me influenced my decision to make purchases through cryptocurrency.	181	0.0%	2.76	.069	.933	.202	-.697
SN5	People who are important for me encourages me whether to use cryptocurrency.	181	0.0%	2.74	.068	.915	.144	-.650

The descriptive statistics for Intention to use cryptocurrency are presented in Table 5.26. This construct is also presented by 5 questions. Based on the results it can be observed that the mean, SD and SE values for each item are approximately the same, except for the INT5, indicating that this item maybe does not belong to the Intention to use cryptocurrency construct, thus it needs to be checked and removed. The mean value for

all items is around 2 indicating that on average participants disagree with the statements. On average, participants show low intention to use cryptocurrency. Skewness and Kurtoses scores are between the critical values of ±2, so we can conclude that the items, that measure Intention to use cryptocurrency, are normally distributed.

Table 5.26. Descriptive statistics for Intention to use cryptocurrency.

VAR	Description	N	Cases with *Z*>3.29	Mean	SE	SD	Skewness	Kurtosis
IUCC1	I intend to use cryptocurrency as an alternative source of currency to buy or sell products in future.	181	0.0%	2.07	.087	1.172	1.273	.862
IUCC2	I believe using cryptocurrency is very helpful to timely fulfil my obligations.	181	0.0%	2.07	.082	1.101	1.070	.500
IUCC3	I intend to use cryptocurrency on a regular basis.	181	0.0%	2.09	.085	1.144	1.234	.876
IUCC4	I will encourage others to use cryptocurrency as a mode of exchange.	181	0.0%	2.08	.084	1.130	1.051	.376
IUCC5	I prefer to use cryptocurrency for game purposes only.	181	0.0%	2.49	.071	.958	-.391	.220

5.4. Measurement Scale Analysis

As the new structure of factors was detected, the reliability analysis and exploratory analysis for these factors with recoded variables was produced based on findings from the data analysis. This procedure was conducted several times, and as the result, the count of variables within new factors was changed. More details will be described in the next section 5.4.1.

5.4.1. Item-total Correlations

Item-total correlation is the composite score of the correlation in the construct (Saunders et al., 2016). Similar to the usual correlation scores, if the correlation is 0.3 then the item must be removed, for the correlations between 0.3-0.6 (moderate strength of correlation), a removal of variable or restructuring of the construct is suggested. In Table 5.27, the item-total correlations of the privacy risk construct are presented. The most important columns are *the Corrected Item – Total Correlation column*, and the *Cronbach's Alpha if the item is deleted*. It can be observed that all the values of correlation are above 0.7 indicating a strong correlation. Furthermore, as observed in the previous section, the Cronbach's alpha for this construct is 0.965, thus the removal of PR1 belonging to this construct increased the value of alpha and higher the reliability.

Table 5.27. Privacy Risk Item-total correlations

Variable	Description	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
PR1	Information containing my cryptocurrency payment transactions can be misutilised by others.	14.98	27.672	.873	.786	.965
PR2	I do not feel safe providing personal private information over cryptocurrency payments.	14.99	27.222	.923	.858	.957
PR3	I do not trust in the ability of cryptocurrency payment service providers to protect my privacy.	14.97	27.477	.908	.839	.959
PR4	I am concerned with the privacy security of using cryptocurrency.	14.99	27.706	.922	.870	.957
PR5	I think that owning cryptocurrency has privacy risks.	14.92	27.843	.905	.827	.960

The results regarding security risk showed that the reliability of this construct is acceptable, and it cannot be significantly improved by item removal. If we look at the results of the exploratory factor analysis (Table 5.28), we can find that two variables SR1R and SR2R are problematic due to their high loading to other factor. Both items were loaded into factor as they were not supposed to be, that is AT factor. Based on those results we have to exclude them from the analyses.

Table 5.28. Security Risk item-total correlations

Variable	Description	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
SR1R	Cryptocurrency enables to transfer money securely.	10.7680	8.013	.485	.750	.591
SR2R	Cryptocurrency empowers me with the control of my money.	10.6685	7.834	.548	.745	.557
SR3	I am concerned with the security of using cryptocurrency.	10.1436	9.457	.422	.312	.622
SR4	I am worried about using cryptocurrency because other people may be able to access my account.	10.0442	9.454	.433	.388	.618
SR5	I do not trust cryptocurrency as I trust other currency.	9.9337	10.373	.249	.223	.690

*Symbol “R” after variable means that variables were re-coded in reverse order.

Table 5.29 shows that financial risk has acceptable reliability value (alpha = 0.786). The removal of FR3 and FR5 produced significant improvement in reliability.

Table 5.29. Financial risk Item-total correlations

Variable	Description	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
FR1	Cost of cryptocurrency is very high for me.	11.42	10.678	.516	.403	.379
FR2	Inability to convert cryptocurrency to conventional currencies, or not at a reasonable price.	11.55	10.649	.486	.423	.393
FR3	Losses due to counterparties failing to meet contractual payments or settlement obligations.	12.31	13.282	.239	.066	.536
FR4	Losses due to security incidents (e.g., lost passwords, malware).	11.31	11.028	.497	.372	.396
FR5	I think that there would be problems with my financial transactions while using cryptocurrency.	11.79	13.611	.005	.011	.715

The next table presents perceived enjoyment and shows that if the PE1 and PE5 are removed, the reliability reaches an excellent level (0.940). As a result; perceived enjoyment is used as a 3-variable construct in the modelling. The corrected item-total correlation for PE1 and PE5 are 0.592 and 0.196, respectively. These are quite low; hence it justifies the removal of the item. Other items within this construct obtained the values of correlation above 0.7.

Table 5.30. Perceived Enjoyment Item-total correlations

Variable	Description	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
PE1	Using cryptocurrency is fun for me.	9.32	16.975	.765	.592	.860
PE2	Using cryptocurrency gives me pleasure.	9.54	15.461	.832	.796	.842
PE3	I enjoy using the cryptocurrency.	9.60	15.685	.860	.831	.836

PE4	I am flexible when I use cryptocurrency.	9.53	15.662	.827	.735	.843
PE5	I am uninventive when I use cryptocurrency.	8.33	19.443	.414	.196	.933

The correlations within perceived usefulness are presented in Table 5.31. The correlation values are above 0.7. Removal of two items PU1 and PU5 increases the reliability of the construct to the value to 960.

Table 5.31. Perceived Usefulness Item-total correlations

Variable	Description	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
PU1	I perceive that my purchase would be more quickly using cryptocurrency.	8.19	19.609	.878	.796	.958
PU2	I perceive that my purchasing tasks would be more easily using cryptocurrency.	8.22	18.962	.918	.857	.951
PU3	Cryptocurrency would enhance my effectiveness in purchasing.	8.17	18.909	.913	.854	.952
PU4	Cryptocurrency would enhance my efficiency in making a purchase.	8.20	18.875	.931	.882	.949
PU5	Cryptocurrency would enable me to make better decisions in making a purchase.	8.10	19.468	.840	.712	.964

Subjective norm consists of 5 items with correlation values between 0.5 and 0.75. In the next step SN1 is removed and the reliability reaches very good level (0.875). As a result; subjective norm is used as a 4-variable construct in the modelling.

Table 5.32. Subjective Norm Item-total correlations

Variable	Description	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
SN1	People who are important for me, influencing me, to use cryptocurrency in order to buy or sell products is a good way of trading.	10.72	9.612	.258	.201	.875
SN2	People who are important for me, influencing me, to try cryptocurrency.	10.92	8.194	.672	.457	.747
SN3	People who are important for me, influencing me depict a positive sentiment to engage in using cryptocurrency.	10.75	7.655	.757	.687	.719
SN4	People who are important for me influenced my decision to make purchases through cryptocurrency.	10.69	7.872	.682	.676	.742
SN5	People who are important for me encourages me whether to use cryptocurrency.	10.71	7.975	.678	.544	.744

Attitude consists of 5 items with a correlation above 0.80 indicating a strong relationship. The values of alpha demonstrate excellent reliability of the construct (0.967); thus, no items will be removed.

Table 5.33. Attitude Item-total correlations

Variable	Description	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
AT1	I think that buying a cryptocurrency is a good idea.	8.17	19.876	.914	.838	.958
AT2	I think that using cryptocurrency for financial transactions would be a wise idea.	8.12	19.403	.907	.827	.960
AT3	In my opinion, it is desirable to use cryptocurrency as a currency.	8.20	19.382	.917	.844	.958
AT4	I feel good about using cryptocurrency.	8.13	19.493	.902	.819	.960

AT5	I am excited about the idea of using cryptocurrency.	8.24	20.107	.893	.801	.962

The item-total correlations of Intention to use are shown in the next table. The first four items have correlation values higher than 0.7, while the last item obtained, very low correlation of 0.114, thus it needs to be removed from further modelling. This choice can also be justified by its alpha value; after the removal of this item, the alpha value increases to 0.952.

Table 5.34. Intention to use cryptocurrency Item-total correlations

Variable	Description	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
IUCC1	I intend to use cryptocurrency as an alternative source of currency to buy or sell products in future.	9.75	12.410	.837	.806	.827
IUCC2	I believe using cryptocurrency is very helpful to timely fulfil my obligations.	9.75	12.757	.855	.801	.824
IUCC3	I intend to use cryptocurrency on a regular basis.	9.72	12.334	.878	.814	.817
IUCC4	I will encourage others to use cryptocurrency as a mode of exchange.	9.73	12.574	.854	.752	.823
IUCC5	I prefer to use cryptocurrency for game purposes only.	8.31	18.095	.206	.116	.952

Correlations of personal innovativeness are presented in Table 5.35. This construct includes four items, with correlation values of above 0.55, showing moderate correlation. Chronbach's alpha values are all above 0.8 demonstrating excellent reliability.

Table 5.35. Personal Innovativeness Item-total correlations

Variable	Description	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
PI1	If I heard about new cryptocurrency, I would look for ways to experiment with it.	7.71	13.395	.738	.550	.927
PI2	Among my peers, I am usually the first to try out new cryptocurrency.	7.90	12.450	.844	.721	.893
PI3	In general, I am hesitant to try out new cryptocurrency.	7.97	12.294	.879	.790	.881
PI4	I like to experiment with a new cryptocurrency.	7.94	12.130	.832	.727	.897

5.4.2. Scale Reliability: Internal Consistency

To work with new factors, the reliability of scales must be confirmed. The exploratory analysis showed that some factors could have a sub-factor. Consequently, Cronbach's alpha was computed for both the sub-factors and factors respectively. The Cronbach's alpha was developed by Lee Cronbach as a measure of internal consistency of a test/scale (Tavakol and Dennick, 2011). It can take up values in the range of 0 to 1, with values closer to 1 indicating good reliability. However, the most preferred values of Cronbach's alpha are within a range of 0.70 to 0.95.

The Cronbach's alpha of the first construct, privacy risk, with 4 items resulted in a value of 0.965 which demonstrates the high reliability of items inside this construct. Security risk, after removing items SR1 and SR2, showed acceptable reliability of 0.671. The

financial risk construct includes 3 items and showed the acceptable alpha value of 0.786. The perceived usefulness included five items with an alpha value of 0.960. For the perceived enjoyment, the obtained alpha value was 0.940 (for 3 items). Considering attitude, the Cronbach's alpha based on the 5 items within the construct obtained a value of 0.967. Personal innovativeness included 4 items and obtained the value of alpha of 0.923, while subjective norm obtained the value of alpha of 0.875 (with four items). Intention to use cryptocurrency was consisted of 4 items that show excellent reliability (0.952).

Table 5.36. Construct Reliability and Internal consistency

Construct/ Factor	No of Items	Cronbach's Alpha	Result/ Correction
PR	4	0.965	Excellent
SR	3	0.671	Acceptable
FR	3	0.786	Acceptable
PU	3	0.960	Excellent
PE	3	0.940	Excellent
AT	5	0.967	Excellent
PI	4	0.923	Excellent
SN	4	0.875	Very Good
IUCC	4	0.952	Excellent

More details about the decision made are explained in the next section.

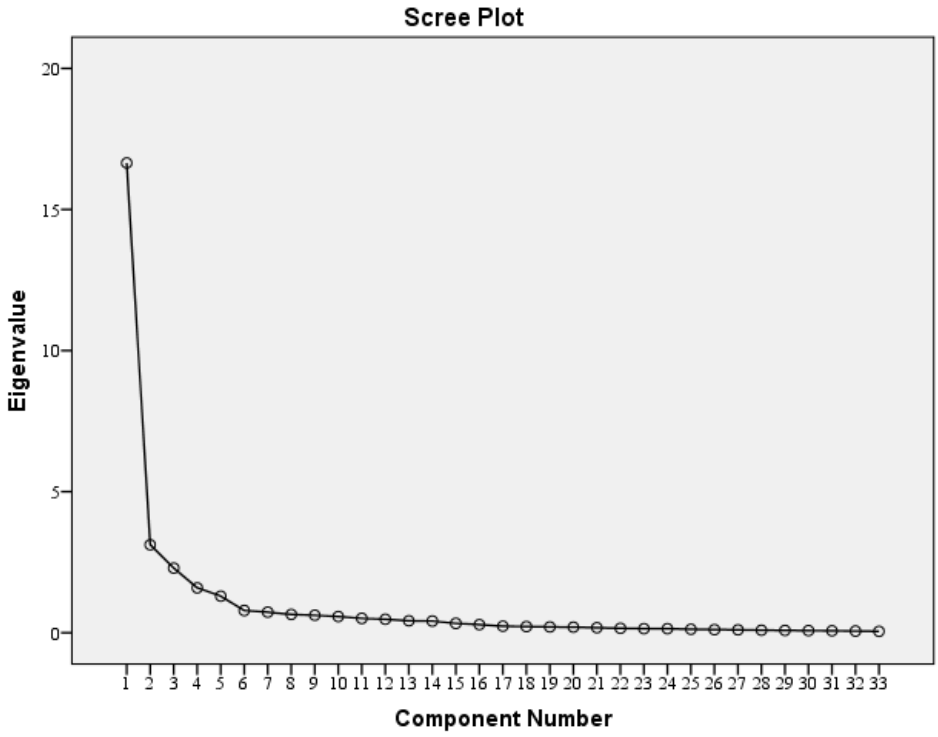
5.5. Exploratory Factor Analysis (EFA)

The exploratory factor analysis is performed in order to find the structure of the data factor. A set of constructs, each consisting of a number of items that together obtained good reliability, has been created. Following the procedure of SEM by Lowry and Gaskin

(2014), the exploratory factor analysis for the reliable constructs must be performed using Maximum Likelihood extraction to find the similarities in the data.

In Figure 5.22. the sedimentation graph is displayed, which allows selecting the optimal number of factors or components. For the selection, the Kaiser rule was used, which consists of choosing those components with eigenvalues greater than or equal to 1, so in this case, nine components were chosen.

Figure 5.22. Scree plot



Based on the Factor Correlation Matrix the theory findings are confirmed which state that the factors are correlated. Therefore, in the further analysis Maximum Likelihood extraction with oblique rotation (Oblimin) was used.

The result of this analysis presents a pattern matrix of factors and can be observed in the table below. The factor loadings lower than 0.3 were omitted. On the new set of constructs and items, the KMO test returned the value of 0.941. Furthermore, Bartlett's test of

sphericity is significant (p = 0.000), confirming the suitability of the factor analysis for modelling the relationships between the variables.

Table 5.37. shows the eigenvalues and the percentage of variability that each factor explains. In this table, it is observed that the nine selected components manage to explain 84.04% of the total variance.

Table 5.37. Total Variance Explained

Component	Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %
1	16.647	50.446	50.446
2	3.119	9.451	59.898
3	2.293	6.947	66.845
4	1.590	4.819	71.663
5	1.297	3.930	75.594
6	.788	2.388	77.981
7	.729	2.210	80.191
8	.649	1.967	82.158
9	.620	1.878	84.036

The results showed that FR3 and FR5 had very low Communalities of 0.112 and 0.124 and therefore were eliminated from the analysis. From the factor analyses were excluded the following items: SN1, IUCC5, PE1, PE5, SR1, SR2, PU1, PU5, PR1.

SN1 didn't have high correlation with any factor and had low communalities of 0.150 and therefore in the further analysis it was not taken into consideration. Several items (IUCC5 and PE1, SR1) were found to be loaded into different factors as they were not supposed to be. PE5 and SR2 were not loaded into any factor. On the other hand, PU5, PU1, PR1 had very low loading into the factors, were they belonged.

Table 5.38. Pattern matrix

Pattern Matrix

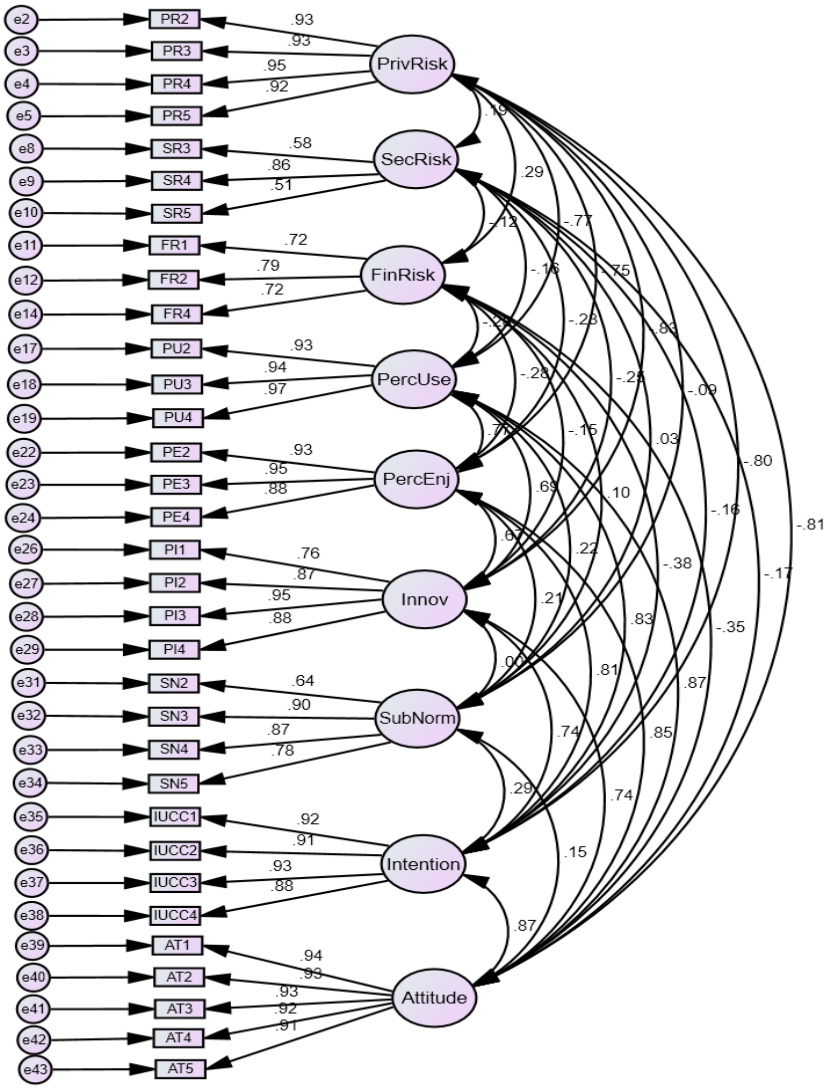
	Factor								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
AT4	.647								
AT2	.647								
AT3	.642								
AT5	.570								
AT1	.556								
SN3		.913							
SN4		.894							
SN5		.766							
SN2		.632							
PR4			.846						
PR3			.769						
PR5			.738						
PR2			.702						
PE3				-.696					
PE4				-.589					
PE2				-.586					
FR1					.776				
FR2					.756				
FR4					.665				
PI2						.798			
PI4						.719			
PI3						.707			
PI1						.664			
IUCC2							.841		
IUCC1							.801		
IUCC4							.753		
IUCC3							.687		
PU4								-.808	
PU3								-.777	
PU2								-.668	
SR4									.754
SR5									.600
SR3									.586

Table 5.38 represents the final pattern matrix for this model. From the table, the lowest factor loading can be observed for AT1 (0.556), indicating that this item needs additional attention during modelling. The rest of the loadings from the pattern matrix are higher, thus proving these items load significantly on the factors.

5.6. Confirmatory Factor Analysis (CFA)

Following the Pattern matrix from Table 5.38, the next preliminary initial CFA model was constructed (Figure 5.23). The path diagram presents the latent variables (oval-shaped) and the measured variables (rectangles), while the residuals (errors) are represented by a circle. The two-way arrows show the relationship between the variables, but it should be noted that these relationships do not imply causality. On the contrary, the model implies that there is a causality between the construct and the items within the construct, and this relationship is represented by the single-headed arrow. The items (measured variables) in the path diagram present the indicators of their latent variable. From Figure 5.23, we can see that between most of the factors the correlation values are small, except the following factors: Privacy Risk and Attitude (-0.81), Privacy Risk and Intention (-0.8), Privacy Risk and Innovativeness (0.83), Perceived Usefulness and Intention (0.83), Perceived Enjoyment and Intention (0.81), Perceived Usefulness and Attitude (0.87), Perceived enjoyment and Attitude (0.85). The regression weights between one parameter within each of the constructs have been set to 1, in order to scale the rest of the weights. The correlations between the latent and the measured variables are all from moderate to high.

Figure 5.23. Preliminary initial CFA model (standardized estimates)



5.6.1. Initial Model

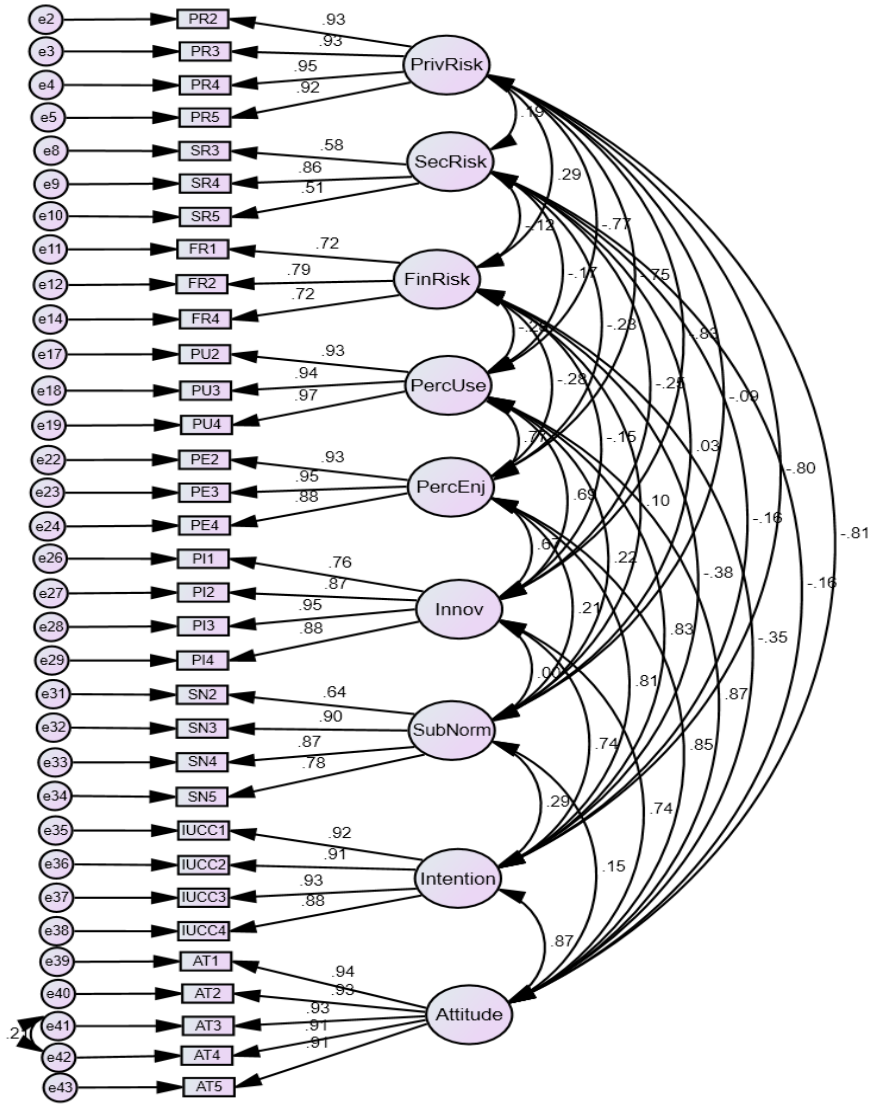
The above model produced the modification indexes which are required to balance the model. Working step by step, the next covariates were produced (Table 5.39). The table shows the pairs, the modification indices (M.I.) and the change in parameter values (Par Change). The modification indexes (M.I.) are an estimate that explains how much the chi-square value would be reduced if an observed parameter relationship would be modified or removed from the model. Stages 1 included the error reduction. The final initial CFA model is presented in Figure 5.24.

Table 5.39. Modification indexes and covariates produced

Pair	M.I.	Par Change	Description
e41<--> e42	4.659	0.038	Stage 1, was created to reduce the error

The initial CFA model presented in figure 5.28

Figure 5.24. Initial CFA model (standardized estimates)



The result for the default model includes the following metrics:

- The minimum discrepancy value divided by the degrees of freedom (CMIN/DF) is 1.332, indicating a good fit for the model.

- The comparative fit index (CFI) obtained a value of 0.976, indicating a good model fit.
- The root means square error of approximation (RMSEA) is the measure of fit that is widely used in the literature. The obtained value of 0.043 is statistically significant ($p < 0.05$), indicating a good fit.

5.6.2. Common Method Bias

The introduction of the CMB in the model shows that the intention to use cryptocurrency construct improves, while the attitude construct worsens. As the CMB does not improve the model, it means that there is no bias in the data. These results are presented in Table 5.40. During this step, it was found that all variables are not suffering from low regression weights values, and the latent factors can be produced without changes in the model.

Table 5.40. The regression estimates before and after the CMB

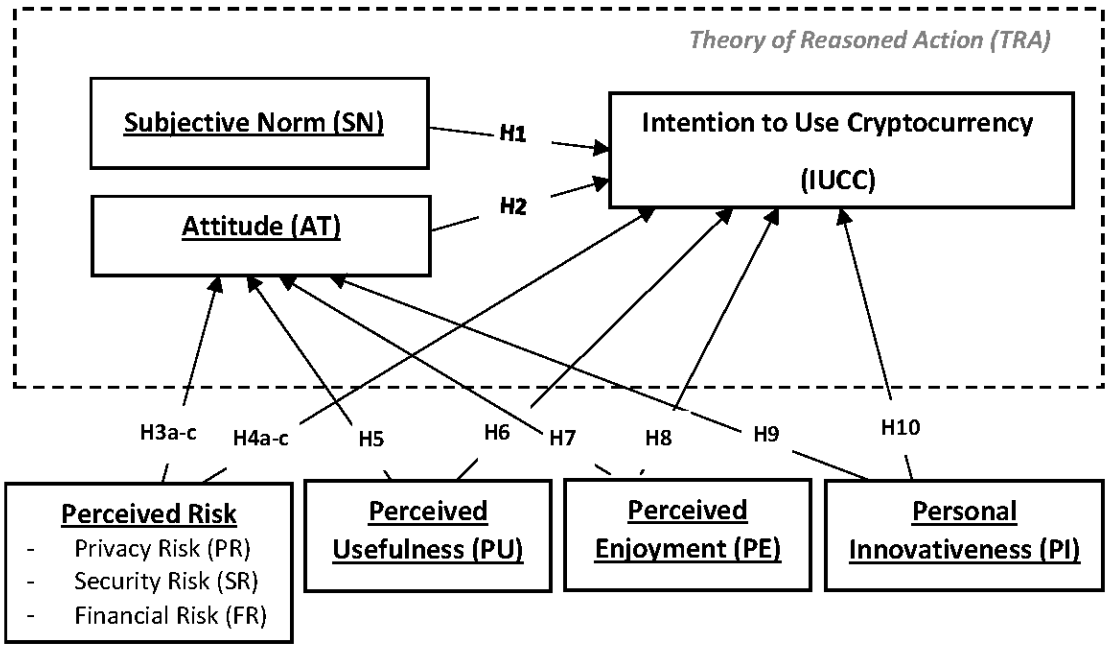
Constructs			Regression weights after CMB	Regression weights before CMB
			Estimate	Estimate
AT1	<---	ATTITUDE	1.000	1.000
AT2	<---	ATTITUDE	1.042	1.041
AT3	<---	ATTITUDE	1.034	1.034
AT4	<---	ATTITUDE	1.020	1.019
AT5	<---	ATTITUDE	0.968	0.968
PU2	<---	Perceived Usefulness	1.000	1.000
PU3	<---	Perceived Usefulness	1.024	1.024
PU4	<---	Perceived Usefulness	1.044	1.043
PR2	<---	Privacy Risk	1.000	1.000
PR3	<---	Privacy Risk	0.999	1.000
PR4	<---	Privacy Risk	0.991	0.992
PR5	<---	Privacy Risk	0.965	0.965
SN2	<---	Social Norm	1.000	1.000

SN3	<---	Social Norm	1.475	1.469
SN4	<---	Social Norm	1.453	1.451
SN5	<---	Social Norm	1.285	1.284
FR1	<---	Financial Risk	1.000	1.000
FR2	<---	Financial Risk	1.130	1.129
FR4	<---	Financial Risk	0.960	0.958
PE2	<---	Perceived enjoyment	1.000	1.000
PE3	<---	Perceived enjoyment	0.971	0.971
PE4	<---	Perceived enjoyment	0.930	0.929
IUCC1	<---	Intention	1.000	1.000
IUCC2	<---	Intention	0.933	0.932
IUCC3	<---	Intention	0.991	0.990
IUCC4	<---	Intention	0.923	0.923
SR3	<---	Security Risk	1.000	1.000
SR4	<---	Security Risk	1.445	1.466
SR5	<---	Security Risk	0.888	0.900
PI1	<---	Innovativeness	1.000	1.000
PI2	<---	Innovativeness	1.171	1.168
PI3	<---	Innovativeness	1.259	1.257
PI4	<---	Innovativeness	1.249	1.245

5.7. Structural models

Conceptual modelling can represent the relationships of constructs within the theory of reasoned action which describes the relationships between human attitudes. The conceptual model is presented in Figure 5.25, where all the constructs and the hypotheses are presented.

Figure 5.25. Research conceptual model



5.7.1. Hierarchical Models

The final structural model is presented in Figure 5.26, followed by the values of indices for three hierarchical models: the basic conceptual model, the model with no security factor, and the TRA model with risk factors. The basic conceptual model is the basic SEM model that was developed with all the observed factors. The second model is the model which uses all the factors observed so far, except the security risk factor which is neglected in this model. Lastly, TRA model with risk factors is the model which uses all the factors observed so far, except the Personal Innovativeness, Perceived Enjoyment and Perceived Usefulness.

Figure 5.26. Final structural model (unstandardized estimates)

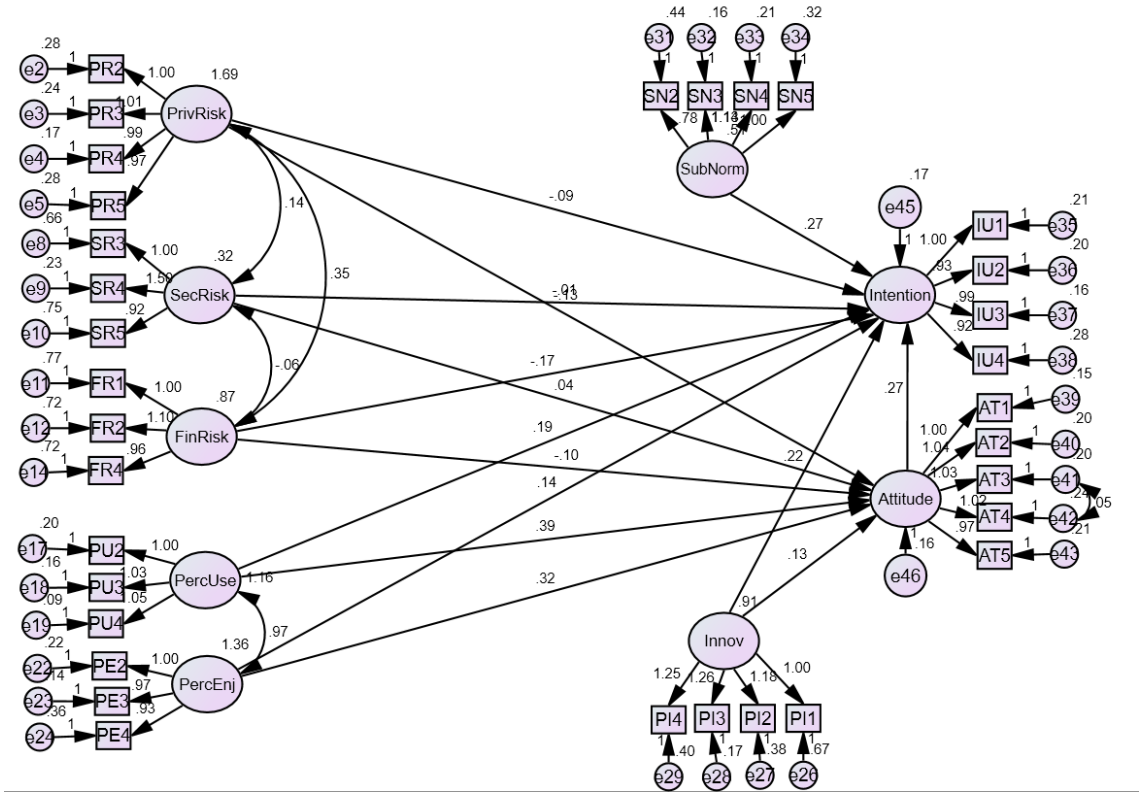


Table 5.41. Hierarchical models

Fit index	Hierarchical models		
	A	B	C
$\chi 2$	609.891	507.084	243.829
df	458	376	214
CMIN/DF	1.332	1.349	1.139
ANOVA p	0.000	0.000	0.079
GFI	0.843	0.854	0.900
TLI	0.972	0.976	0.991
CFI	0.976	0.979	0.992
IFI	0.976	0.979	0.992
PCFI	0.847	0.691	0.839
RMSEA	0.043	0.044	0.028
PCLOSE	0.906	0.844	0.993
AIC	815.891	685.084	367.829
Description	Basic Conceptual Model	No security factor	TRA model with risk factors

The table above shows the fit indices of the structural models. The Chi-Square value of the basic conceptual model is significant ($\chi 2 = 609.891$, $p = 0.000$), thus confirming a good model fit. The GFI value shows a satisfactory fit, with values for each model being above 0.8 (Hair et al.., 2013). The TLI, CFI, and IFI values should be close to 1 to indicate a good fit, which the results from Table 5.41 prove (Hair et al., 2013). The RMSEA shows a good fit in all four cases, as the value of the RMSEA is less than or equal to 0.05 (Hair et al., 2013), depending on the model. Considering only this measure, the best model is the TRA model (+ risk factors).as it has the highest GFI value of 0.900. According to the ANOVA values two models are statistically significant ($p<0.05$), with the values of all indices in ranges that imply a good model fit and only TRA model (+ risk factors) is not significant. One of the most important measures that need attention, especially when several models are compared, is the AIC or Akaike Information Criterion. Considering this value, model C obtained the lowest score of 367.829, thus the model TRA model (+ risk factors) represents the best fitting model, according to the AIC value. These models are also presented in the following figures with the standardized estimates shown on the path diagram.

Figure 5.27. SEM with All factors (standardized estimates)

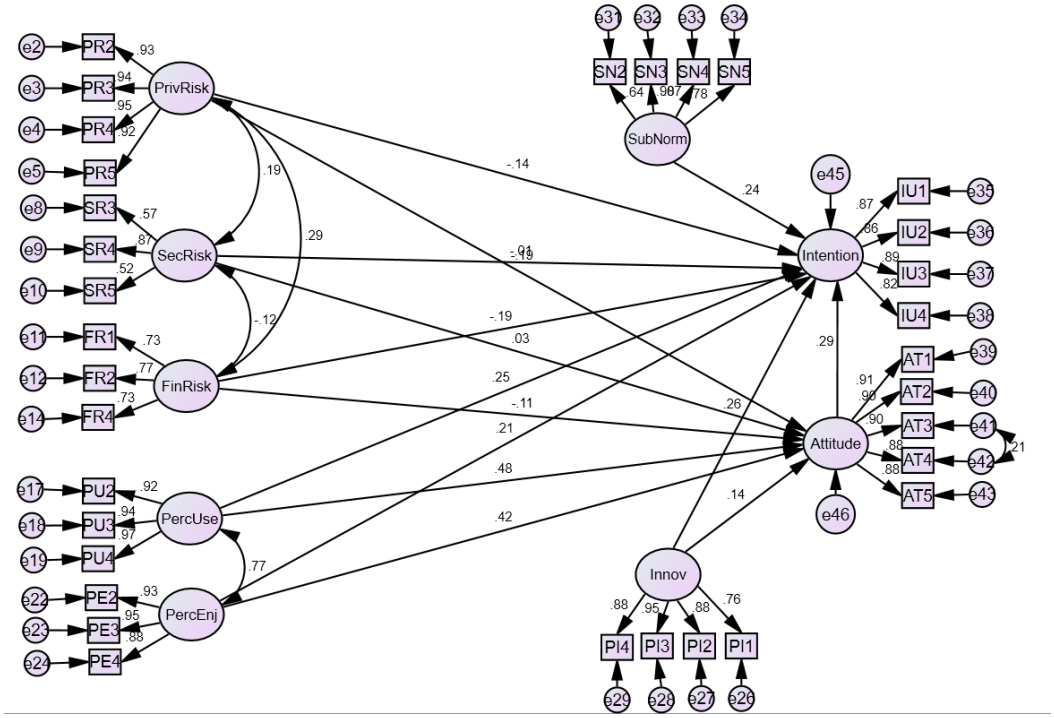


Figure 5.28. SEM with no security factor (standardized estimates)

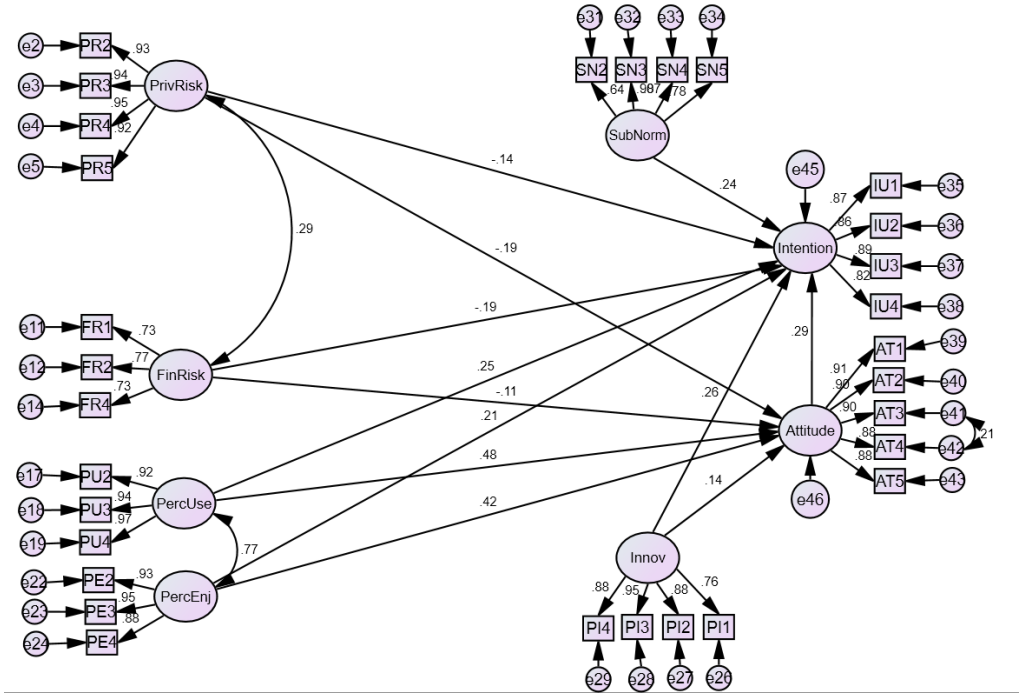
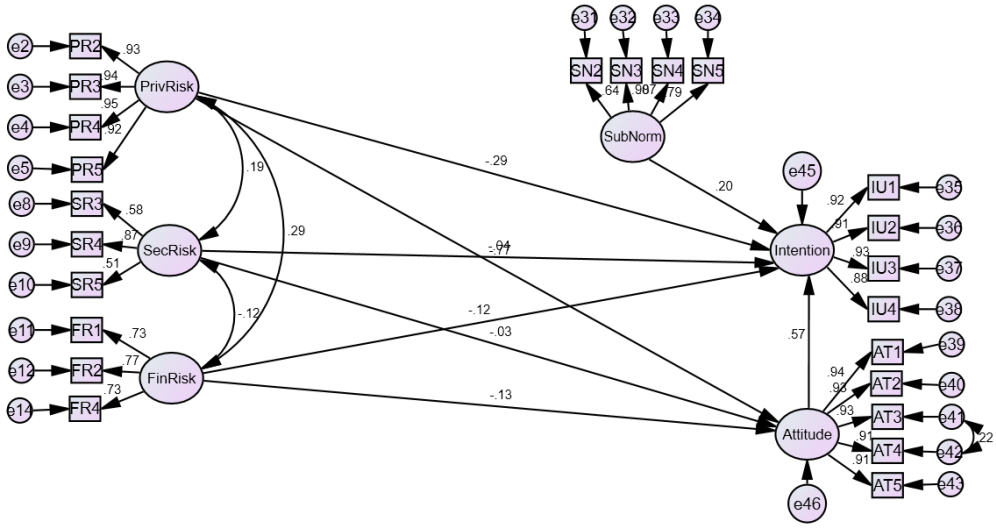


Figure 5.29. SEM with risk sub-types and without other perceived factors (standardized estimates)



5.8. Standard Model

To determine whether to accept or reject the hypotheses, a *standardized regression weights* and its corresponding significance (p-value) can be observed (Table 5.42). The first hypothesis, subjective norm has a significant positive effect on the intention to use cryptocurrency, is supported (Beta=0.235, p<0.001). The second hypothesis, attitude has a significant positive effect on intention to use cryptocurrency, is also supported based on the significant t-value (Beta=0.293, p=0.012).

There is enough evidence to support the hypothesis that privacy risk has a significant negative effect on Attitude (Beta=-0.190, p<0.001) and that financial risk has a significant negative effect on Attitude (Beta=-0.106, p=0.032). However, there are no evidence to support the hypothesis stating that the security risk has a significant negative effect on Attitude (Beta=0.028, p=0.547).

There was also enough evidence that privacy risk has a significant negative effect on Intention to use cryptocurrency (t=-0.141, p=0.011) and that financial risk has negative effect on Intention to use cryptocurrency (t=-0.192, p<0.01). Considering security risk, it cannot be concluded that it has a negative effect on Intention to use cryptocurrency, as the significance value is much above the 0.05 threshold (p=0.860), while the t-value is lower than ±2.

It was found that perceived usefulness has a significant positive effect on Attitude (Beta=476, p<0.001) and also on Intention to use cryptocurrency (Beta=.254, p=0.008). Perceived enjoyment was also found to positively impact Attitude (Beta=0.421, p<0.001) and Intention to use cryptocurrency (Beta=.205, p=0.027).

Lastly, a positive effect of personal innovativeness on the Attitude was supported at a 95% confidence interval (Beta=.143, p<0.001). The same effect was considered in the last hypothesis where the impact of personal innovativeness on Intention to use cryptocurrency was investigated. The results suggest that the hypothesis is also supported (Beta=0.259, p<0.001).

Table 5.42. The standard model

Hypothesis	Standardised coefficients	t-value	p-value	Hypothesis testing results
H1. Subjective norm has a significant positive effect on Intention to use cryptocurrency	.235	4.672	***	Supported
H2. Attitude has a significant positive effect on Intention to use cryptocurrency	.293	2.506	0.012	Supported
H3a Privacy Risk has a significant negative effect on Attitude	-0.190	-4.185	***	Supported
H3b Security Risk has a significant negative effect on Attitude	0.028	0.602	0.547	Not supported

H3c Financial Risk has a significant negative effect on Attitude	-0.106	-2.144	0.032	Supported
H4a Privacy Risk has a significant negative effect on Intention to use cryptocurrency	-0.141	-2.536	0.011	Supported
H4b Security Risk has a significant negative effect on Intention to use cryptocurrency	-0.009	-0.176	0.860	Not supported
H4c Financial Risk has a significant negative effect on Intention to use cryptocurrency	-0.192	-3.209	0.001	Supported
H5 Perceived Usefulness has a significant positive effect on Attitude	0.476	6.762	***	Supported
H6 Perceived Usefulness has a significant positive effect on Intention to use cryptocurrency	0.254	2.674	0.008	Supported
H7 Perceived Enjoyment has a significant positive effect on Attitude	0.421	6.004	***	Supported
H8 Perceived Enjoyment has a significant positive effect on Intention to use cryptocurrency	0.205	2.208	0.027	Supported
H9 Personal Innovativeness has a significant positive effect on Attitude	0.143	3.374	***	Supported
H10 Personal Innovativeness has a significant positive effect on Intention to use cryptocurrency	0.259	4.853	***	Supported

5.9. Mediation Analysis

The mediation analysis investigates the effect that one independent variable has on the dependent variable, not directly but rather through other variables. More precisely, we can say that the mediation analysis investigates an indirect effect of an independent variable on the dependent variable. Based on the results in Table 5.43, the following conclusions can be derived:

Table 5.43. Mediation analysis

Relationship	Direct without mediator	Direct with mediator	Indirect	Effect
SR	-0.001	-0.011	-0.012	Not Mediator
PR	-0.128***	-0.094	-0.035*	Mediator
FR	-0.193***	-0.168*	-0.028*	Partial Mediator
PU	0.305***	0.195	0.107*	Mediator
PE	0.227***	0.139*	0.087*	Partial Mediator
PI	0.253***	0.219**	0.036	Not Mediator
SN	0.264***	0.271**		Direct
AT		0.277*		

Security risk and personal innovativeness do not have a direct or indirect significant effect due to their high significance test values. The results for Privacy risk and Perceived usefulness prove that there is a statistically significant indirect effect and the direct effect with mediator is not significant. Thus, these constructs can be considered as mediators. Financial Risk and Perceived enjoyment have a statistically significant direct effect without a mediator, but it also has a statistically significant indirect effect; thus, it can be considered a partial mediator. Subjective norm has a statistically significant direct effect without a mediator.

Chapter 6. Discussion and Conclusion

The purpose of this chapter is to depict the research findings, employing the research questions as a guide. In the first place, the research purpose, research questions and hypotheses are shown and discussed. After that, quantitative research findings are examined. Next, the contributions of the study are stated. Finally, the chapter reviews the limitations of the research and provides directions and recommendations for future research.

6.1. Research Aim and Questions

Despite the many potentials of cryptocurrencies and the exponential growth of their use worldwide, there is still scarce scholarly research in this field and a lack of empirical research in Saudi Arabia. Previous studies have also provided a piece of contradictory evidence regarding many of the factors influencing the intention to use cryptocurrency. For these reasons, this study aimed to investigate the factors driving individuals' behavioural intention to use cryptocurrencies in Saudi Arabia. There were two research questions guiding the process:

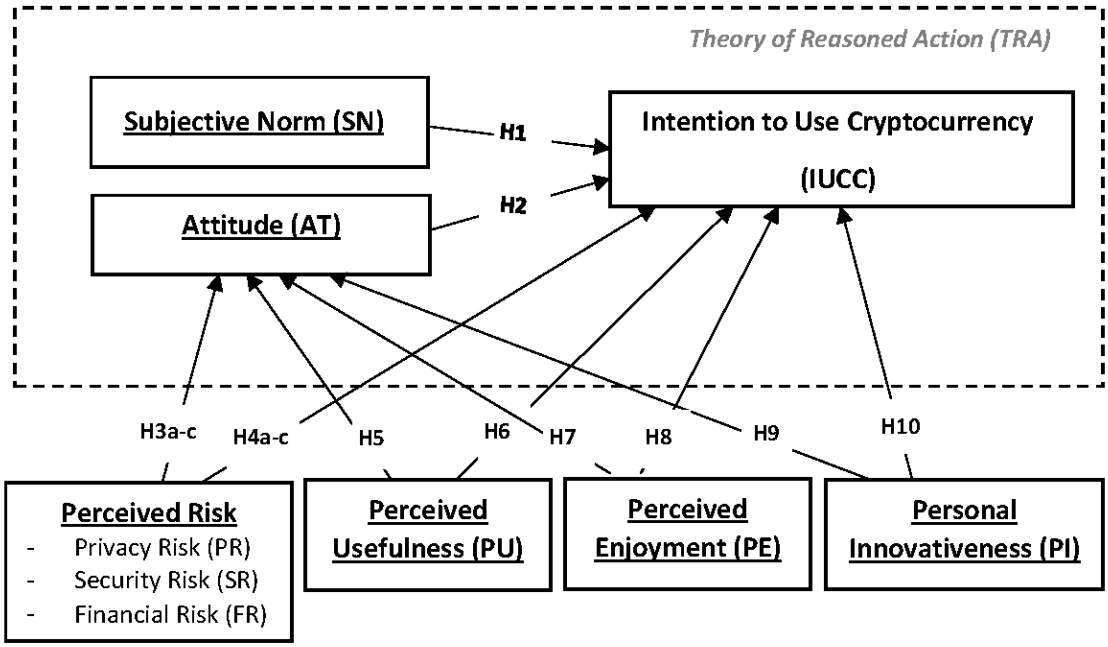
RQ1: What are the factors that influence individuals' intention to use cryptocurrency in Saudi Arabia?

RQ2: How do these factors influence individuals' intention to use cryptocurrency in Saudi Arabia?

In order to answer these guiding questions, a literature review was conducted to check the most recent and relevant literature in cryptocurrency use. The literature review resulted in the research model, and a series of secondary research sub-questions were

developed. The research model was based on the theory of reasoned action and extended with several external factors which have been found to influence cryptocurrency use enabling the assessment of factors affecting behavioural intention to use cryptocurrency from human, financial and technology perspectives of accepting new technology involved with financial transactions. The research model used in this study with the hypotheses' numbers is presented in the following Figure:

Figure 6.1. Research Structural Model



The secondary research questions, based on the research model and the second research question, were:

RQ2.1: How does subjective norm affect individuals' intention to use cryptocurrency in Saudi Arabia?

RQ2.2: How does attitude affect individuals' intention to use cryptocurrency in Saudi Arabia?

RQ2.3: How does perceived risk affect attitude towards cryptocurrency use in Saudi Arabia?

RQ2.4: How does perceived risk affect individuals' intention to use cryptocurrency in Saudi Arabia?

RQ2.5: How does perceived usefulness affect attitude towards cryptocurrency use in Saudi Arabia?

RQ2.6: How does perceived usefulness affect individuals' intention to use cryptocurrency in Saudi Arabia?

RQ2.7: How does perceived enjoyment affect attitude towards cryptocurrency use in Saudi Arabia?

RQ2.8: How does perceived enjoyment affect individuals' intention to use cryptocurrency in Saudi Arabia?

RQ2.9: How does personal innovativeness affect attitude towards cryptocurrency use in Saudi Arabia?

RQ2.10: How does personal innovativeness affect individuals' intention to use cryptocurrency in Saudi Arabia?

The main motive was to provide a comprehensive insight into this topic by integrating financial, security and technological perspectives of this phenomenon and determine whether prior findings are applicable in the specific cultural context of Saudi Arabia or if there are some additional influencing factors or a different effect of the previously used factors, due to insufficient and contradictory literature on this topic and no empirical research on this topic in Saudi Arabia. This topic is also trendy in overcoming the issues

related to the modern financial system, such as high transaction costs, low users' trust, scams, and scandals.

The next step involved developing hypotheses for each factor and research question, which were then quantitatively investigated to discover the relationships between the factors used in the research model. Using a positivistic approach and quantitative research method – an online, self-administered survey, the data were obtained from September to November 2019. The final sample included 181 respondents who are Saudi citizens. Data collected were examined by several statistical techniques using SPSS (Version 22.00) and Amos (Version 22.0) programs. The following section discusses the results of the study.

6.2. Findings

The present research findings were obtained from an online survey hosted on the Qualtrics platform. The study's final sample included 181 respondents, citizens of Saudi Arabia. The findings are discussed in the following subsections organised around each hypothesis and its respective findings.

6.2.1. Subjective Norm

This section discusses the results related to the subjective norm. As noted, the present research defines the subjective norm as the subjective evaluation of the social pressure from a relevant reference group to use cryptocurrencies. It is central to the TRA model, which is the basis of the research model employed in this study. The research question and hypothesis for this factor were:

RQ2.1: How does subjective norm affect individuals' intention to use cryptocurrency in Saudi Arabia?

H1: Subjective norm has a significant positive effect on the intention to use cryptocurrency in Saudi Arabia.

The survey results supported this hypothesis since the subjective norm was a strong and positive predictor of intention to use cryptocurrencies in Saudi Arabia (sc=0.235, t=4.672, $p<0.001$). Social influences from a reference group are important for Saudi citizens to engage with cryptocurrency. In other words, the influence of the social groups and other social factors is relevant to their attitudes towards cryptocurrency use.

Those results are consistent with the TRA model's literature (Ajzen, 2000) and previous studies on cryptocurrency use. For instance, Schaupp and Festa (2018) and Gazali et al. (2019) also reported a significant positive correlation between subjective norm and intention to use cryptocurrencies. Similarly, Sas and Khairuddin (2017), in an exploratory study with Bitcoin users, found subjective norm as one of the essential factors leading to cryptocurrency use, while Jankeeparsad and Tewari (2018) found that a lack of social influences was the primary reason for not using cryptocurrencies in South Africa. This means that a person is most likely to use cryptocurrency if the rate of its use by other people is high (Al-Amri et al., 2019), especially if their friends and family use it (Walton and Johnston, 2018), which stimulates that person to imitate others and start using cryptocurrency (Boxer and Thompson, 2020).

Still, it is worth noting that some studies have not found a significant relationship between these variables (Mazambani and Mutambara, 2019; Zamzami, 2020; Arias-Oliva et al., 2019), while Mendoza-Tello et al. (2018) and Arias-Oliva et al. (2021) found an indirect effect of subjective norm on intention to use cryptocurrencies in Spain. Moreover, prior studies found that social media and news reporting usually have a more significant impact on intention towards cryptocurrency use and their choice than friends and family who are

still reluctant to their use due to less information (Mai et al., 2015; Noreen et al., 2021; Al Shehhi et al., 2014; Abdeldayem and Aldulaimi, 2020). Studies in Saudi Arabia have shown similar results regarding Saudi citizens` intention to engage in new technologies (Alharbi, 2016).

Therefore, this study found subjective norm as a strong predictor of behavioural intention to use cryptocurrencies in Saudi Arabia, meaning that a person is most likely to use cryptocurrency if it experiences positive social influences towards its use. This is consistent with the TRA model and prior findings in the literature. Yet, it is still unclear which of the specific parts of subjective norm, namely social media, friends or family, has the greatest impact on Saudi citizens' intention to use cryptocurrency. Thus, further research should explore this issue in more detail, considering the country's context regarding the initial stage of cryptocurrency use in Saudi Arabia and the significant presence of Saudis on the Internet.

6.2.2. Perceived Risk

Perceived risk, as an individual's subjective evaluation of the amount of possible negative consequences, is an important part of the adoption of any new technology, including cryptocurrencies that are often considered risky (Albayati et al., 2020). Still, while some studies have confirmed its influence (Gazali et al., 2019; Sun et al., 2020; Lee et al., 2018; Gil-Cordero et al., 2020; Abramova and Böhme, 2016), others have not (Mendoza-Tello et al., 2018; Ter Ji-Xi et al., 2021; Nuryyev et al., 2018; Yoo et al., 2020). Depending on the circumstances, some have also found positive and negative influences (Arias-Oliva et al., 2021).

For this reason, perceived risk in the present research has included a total of three sub-factors – privacy, security and financial risk, each with its respective pair of hypotheses, as presented below. The research questions related to this factor were:

RQ2.3: How does perceived risk affect attitude towards cryptocurrency use in Saudi Arabia?

RQ2.4: How does perceived risk affect individuals' intention to use cryptocurrency in Saudi Arabia?

The following sections discuss the findings that lead to answering these questions.

6.2.2.1. Privacy Risk

Privacy risk is the perceived possibility that a user's private information may be leaked to unintended sources. It is considered a sub-factor that can predict the main factor – perceived risk. The hypotheses for this sub-factor were:

H3a Privacy risk significantly negatively affects attitude towards cryptocurrency use in Saudi Arabia.

H4a Privacy risk significantly negatively affects the intention to use cryptocurrency in Saudi Arabia.

Both hypotheses were supported, as the results of the SEM analysis revealed that privacy risk was a significant predictor of attitude toward cryptocurrency use (sc=–0.190, t=–4.185, $p<0.001$) and intention to use cryptocurrencies (sc=–0.141, t=–2.536, p=0.011), both with a negative effect. This implies that the risk of privacy loss is relevant for the Saudi population regarding their attitudes and intention towards cryptocurrency use in

terms of the higher the privacy risk, the lower the possibility of the positive attitude and intention towards cryptocurrency use.

The findings of this study are partially aligned with previous study results. As mentioned, there were no studies that explored privacy risk in terms of cryptocurrency use, as users' anonymity is one of its greatest advantages due to cryptography mechanisms (Hileman and Rauchs, 2017). Yet, in line with the findings of this study, Abramova and Böhme (2016) noticed that potential users still fear possible data breaches, especially if they have a lesser degree of knowledge about this technology and cryptocurrency.

In other related fields, privacy risk had a negative effect on perceptions of security of M-payment services (Johnson et al., 2018) and Pakistani's attitude towards mobile banking (Arif et al.,2016) and online shopping (Bhatti et al., 2018). Privacy risk was also found as a negative moderator of the relationship between attitude and behavioural intention towards using chatbots in Italy (de Cosmo et al., 2021). Still, privacy risk was a good predictor of perceived risk, but the perceived risk had no significant effect on attitude towards online shopping (Arora and Rahul, 2018) and intention to use mobile payments in India (Thakur and Srivastava, 2014).

Therefore, this study found perceived privacy risk as a significant and negative predictor of attitude and intention to use cryptocurrency, meaning that a person is less likely to have a positive attitude towards cryptocurrencies and intention to use them if it perceives that cryptocurrency use bears a high risk of the privacy data leak. However, the privacy risk impact requires more exploration in future studies due to a lack of studies on cryptocurrency that used it as a construct. There is also an unknown relationship between the strength of its impact and the scope of information and knowledge about cryptocurrencies.

6.2.2.2. Security Risk

Security risk was considered another sub-factor that can predict the main factor – perceived risk. Security risk is subjective perception that cryptocurrencies are not technically secure. The hypotheses for this factor were:

H3b Security risk has a significant negative effect on attitude towards cryptocurrency use in Saudi Arabia.

H4b Security risk has a significant negative effect on the intention to use cryptocurrency in Saudi Arabia.

The survey results did not support these hypotheses, finding a statistically insignificant relationship between security risk and attitude (sc=0.028, t=0.602, p=0.547) and intention (sc=–0.009, t=–0.176, p=0.860) to use cryptocurrencies. Those results reveal that Saudi citizens' attitudes towards cryptocurrencies and their intention to use cryptocurrencies were not influenced by the perceived security risk of cryptocurrencies.

Such findings are partially aligned with previous study findings. As for privacy risk, there were only a few studies that have dealt with the security risk as a construct, given that the use of cryptocurrencies is considered safe due to its cryptographic security (Nakamoto, 2008; Hileman and Rauchs, 2017). Thus, in line with the findings of this study, Nadeem et al. (2021) found no significant influence of perceived security risk on intention to use Bitcoin in China. Sohaib et al. (2019) also found that cryptocurrency insecurity act as an inhibitor of its use in Australia, while Nuryyev et al. (2018) found that attitude towards cryptocurrency use is rather affected by trust than by risk.

Still, as cryptocurrency use also implies financial transactions, Abramova and Böhme (2016) found that security risk has a significant negative impact on perceived risk, which

in turn negatively affects the intention to use Bitcoin as an online payment system. Al-Amri et al. (2019) and Won-Jun (2018) also found perceived security as a significant factor with a negative effect on attitude and intention to use Bitcoin. Prior studies also noted that the influence of security risk depends on the knowledge and information about cryptocurrency, especially as there is no regulatory body that enables users to recover funds if their private key is lost or stolen (Shovkhalov and Idrisov, 2021; Noreen et al., 2021).

In related fields, Johnson et al. (2018) found that security risk negatively influenced perceptions of security of M-Payment services, while Arora and Rahul (2018) found it a good predictor of perceived risk regarding women's online shopping. The same findings had Thakur and Srivastava (2014) regarding mobile payment services, but both studies found that perceived risk had no statistically significant influence on attitude and intention towards using these new technologies.

Therefore, this study has found that security risk is not a significant factor in attitude and intention to use cryptocurrencies in Saudi Arabia, meaning that Saudis do not consider cryptocurrency use risky in terms of technology failure, which is partially in line with prior research. Since 67% of Saudi citizens are aware of cryptocurrency's existence (Noreen et al., 2021) and they are also familiar with secure cryptography mechanisms and possess enough information and knowledge about the way of functioning of blockchain technology and cryptocurrency, they consider this technology secure despite its novelty. For these reasons, security risk does not affect their attitude and intention to use cryptocurrency. However, this study has not explored to what extent information and knowledge of potential users affects their consideration of the security of cryptocurrency use, nor whether other factors also affect this perception, e.g. social influences. There is also a lack of studies that explored security risk as a variable, and there is no single

dominant trend in previous studies about this construct. Hence, future studies should deal with this issue in more detail.

6.2.2.3. Financial Risk

Financial risk, as the perceived risk of undesirable financial results associated with the use of cryptocurrencies, was considered as a third and last sub-factor that can predict the main factor – perceived risk. The hypotheses for this factor were:

H3c Financial risk has a significant negative effect on attitude towards cryptocurrency use in Saudi Arabia.

H4c Financial risk has a significant negative effect on the intention to use cryptocurrency in Saudi Arabia.

The results from the survey supported both hypotheses showing that financial risk has a statistically significant negative impact on both attitude (sc =–0.106, t=–2.144, p=0.032) and intention (sc=–0.192, t=–3.209, p=0.001) to use cryptocurrencies in Saudi Arabia. These results imply that financial losses are relevant to the formation of Saudi citizens' attitudes towards using cryptocurrencies and their intention to start using them.

These findings are aligned with the findings of Gazali et al. (2019), who found a strong relationship between financial risk and intention to invest in Bitcoin, as well as with the findings of Abramova and Böhme (2016), who found that financial risk negatively impact perceived risk that had a negative effect on the intention to use cryptocurrencies. Financial risk has also been found as a significant predictor of Internet banking in the UK (Nasir et al., 2015) and mobile banking in Pakistan (Arif et al., 2016). In contrast, Arias-Oliva et al. (2019) did not find a significant impact of financial risk and literacy on the intention to use cryptocurrencies, while Nuryyev et al. (2018) found that financial risk was

correlated with technological and social risk but had no effect on attitude towards perceived usefulness of cryptocurrencies.

Therefore, this study has shown a significant negative effect of financial risk on both the attitude and intention to use cryptocurrency, meaning that a person is less likely to have a positive attitude towards cryptocurrencies and intention to use them if it perceives that cryptocurrency use bears a high risk of financial losses. However, there is a small number of studies that explored this construct, finding both positive and negative results for the impact of financial risk, and none has examined its relationship with the attitude towards cryptocurrency use. For these reasons, future studies should explore the influence of this factor in more detail. Also, the risk is immanent to speculative assets such as cryptocurrency (Baur et al., 2018), while profitability expectancy is one of the main factors affecting attitude towards speculative assets such as Bitcoin (Lee et al., 2018; Rejeb et al., 2021). Thus, future studies should also explore whether cryptocurrency use cases and herd behaviour (Boxer and Thompson, 2020) impact the perception of financial risk and thus attitude and intention to use cryptocurrencies.

6.2.3. Perceived Usefulness

The third factor investigated in the study was perceived usefulness, defined as the subjective evaluation of potential or current users of cryptocurrency's utility and performance. This section discusses findings that are related to the following research sub-questions and hypotheses:

RQ2.5: How does perceived usefulness affect attitude towards cryptocurrency use in Saudi Arabia?

RQ2.6: How does perceived usefulness affect individuals' intention to use cryptocurrency in Saudi Arabia?

H5 Perceived usefulness has a significant positive effect on attitude towards cryptocurrency use in Saudi Arabia.

H6 Perceived usefulness has a significant positive effect on the intention to use cryptocurrency in Saudi Arabia.

According to the SEM analysis of the quantitative results, both hypotheses are supported, as perceived usefulness was found to be a significant predictor of attitude towards using cryptocurrencies (sc=0.476, t=6.762, p<0.001), as well as a significant predictor of intention toward their use (sc=0.254, t= 2.674, p=0.008), both with positive effect. These results imply that perceived usefulness positively influences attitude and intention to use cryptocurrency among Saudi citizens. The greater the degree of perceived usefulness, the greater the possibility of a positive attitude and intention towards using cryptocurrencies.

Those results correspond to the findings of previous research, as most prior investigations reported positive and significant effects of perceived usefulness over attitude towards cryptocurrency use (Albayati et al., 2020; Won-Jun, 2018; Schaupp and Festa, 2018) and intention to engage in cryptocurrency use (Jankeeparsad and Tewari, 2018; Mendoza-Tello et al., 2018; Nuryyev et al., 2018; Arias-Oliva et al., 2019; Nadeem et al., 2021). Alalwan et al. (2018) also found perceived usefulness as an influential factor in Saudi customers' intention to adopt mobile Internet. In contrast, Shahzad et al. (2018) and Walton and Johnston (2018) found an indirect effect of perceived usefulness on intention to use Bitcoin, while Janssen et al. (2015) found that it fluctuated in consumer categories.

In conclusion, the results of this study showed that perceived usefulness has a significant and positive impact on both attitude and intention to use cryptocurrencies amongst Saudi

citizens. This means that individuals are more likely to have a positive attitude towards cryptocurrencies and engage in cryptocurrency use if they consider it useful in enabling them to be easy, fast and low-cost transactions or a high yield on investment. This is consistent with the majority of prior research. Still, as cryptocurrencies are mostly used as investments, where potential monetary gains increase their perceived usefulness (Baur et al., 2018), future studies should also explore whether other use cases would change the direction of this relationship. Moreover, given that cryptocurrency use is often seen as complicated by the general population (Abramova and Böhme, 2016), future studies should also examine the impact of information on the perceived usefulness of cryptocurrency.

6.2.4. Perceived Enjoyment

The fourth factor that has been investigated in the study was perceived enjoyment, defined as the degree to which a person believes that the behaviour of adopting cryptocurrency will provide an experience of happiness, fun and satisfaction. This section discusses findings related to the following research sub-questions and hypotheses:

RQ2.7: How does perceived enjoyment affect attitude towards cryptocurrency use in Saudi Arabia?

RQ2.8: How does perceived enjoyment affect individuals' intention to use cryptocurrency in Saudi Arabia?

H7 Perceived enjoyment has a significant positive effect on attitude towards cryptocurrency use in Saudi Arabia.

H8 Perceived enjoyment has a significant positive effect on the intention to use cryptocurrency in Saudi Arabia.

The SEM analysis supported both hypotheses, meaning that perceived enjoyment has a positive and significant influence on both attitudes towards cryptocurrency use (sc=0.421, t=6.004, p<0.001) and the intention of Saudi citizens to use cryptocurrencies (sc=0.205, t=2.208, p=0.027). This means that the more useful the cryptocurrencies are perceived, the greater the possibility of their use by Saudi citizens.

There are only a few studies that explored this factor in relation to cryptocurrency use, and the findings of this study are coherent with their findings. For instance, Nadeem et al. (2020) also found a positive relationship between perceived enjoyment and intention of Bitcoin repurchase, and Sohaib et al. (2019) discovered that discomfort in cryptocurrency use acts as an inhibitor of their use in Australia. Abramova and Böhme (2016) also found a positive influence on perceived enjoyment since potential users mostly consider the use of cryptocurrencies as complicated, so their enjoyment is one of the most influential factors in their attitude and intention to start using them. Perceived enjoyment was also found as a good predictor of using other related technologies, such as mobile Internet in Saudi Arabia (Alalwan et al., 2018), mobile systems in Uganda (Mubuke et al., 2017) and mobile applications in China (Zhou and Feng, 2017) and the US (Lu et al., 2016).

In conclusion, and in line with the previous literature, this study has found that the degree to which Saudi citizens perceive cryptocurrencies as enjoyable positively affects their attitude and intention to use cryptocurrencies. This means that they are more likely to use it if they perceive that cryptocurrency use will provide them with happiness, comfort, and joy. Still, due to a lack of studies on cryptocurrency use that explored this factor, further research needs to provide stronger empirical evidence on its effect in the field of cryptocurrency use. Future studies should also explore if perceived enjoyment changed if alternative uses of cryptocurrencies have been provided in Saudi Arabia.

6.2.5. Personal Innovativeness

The next factor investigated in the study in relation to the intention to adopt cryptocurrency was personal innovativeness, which was defined as the personal disposition towards using cryptocurrency as new technology. This section discusses findings that are related to the following research sub-questions and hypotheses:

RQ2.9: How does personal innovativeness affect attitude towards cryptocurrency use in Saudi Arabia?

RQ2.10: How does personal innovativeness affect individuals' intention to use cryptocurrency in Saudi Arabia?

H9 Personal innovativeness has a significant positive effect on attitude towards cryptocurrency use in Saudi Arabia.

H10 Personal innovativeness has a significant positive effect on the intention to use cryptocurrency in Saudi Arabia.

The SEM analysis performed supported both hypotheses and showed that personal innovativeness had a significant effect on attitude towards cryptocurrency use among the Saudi population surveyed (sc=0.143, t=3.374, $p<0.001$) and over their intention to use them (sc=0.259, t=4.853, $p<0.001$). In other words, self-evaluation of the personal innovativeness of Saudi citizens is related to their attitude and intention to use cryptocurrencies. The more they consider themselves innovative, the higher the probability of their cryptocurrency use.

Although there are not many studies that explored this factor and they provided mixed results, in line with the findings of this study, Sohaib et al. (2019) found that innovative people are more likely to use cryptocurrency in Australia. Sun et al. (2020) found that

personal innovativeness had a positive impact on the intention to use cryptocurrency investment in South Korea and China. Abbasi et al. (2021) found personal innovativeness as a good moderator of intention to use cryptocurrency in Malaysia, while Ullah et al. (2021) found its negligible impact on behavioural intention to use cryptocurrency in Pakistan. In Saudi Arabia, Alalwan et al. (2018) have reported a significant influence of customers' personal innovativeness on using mobile Internet.

Therefore, the present research has found personal innovativeness as a significant factor with a positive influence on attitude and intention to use cryptocurrencies in Saudi Arabia. Thus, if a person considers himself innovative and perceives cryptocurrency use as a way to enhance its innovativeness, it is more likely to have a positive attitude towards cryptocurrencies and engage in their use. Although such findings are in line with previous study results, there is a small number of studies that employed this construct in relation to cryptocurrency use, and some of them provided mixed results. Thus, more research is required on this matter. Future studies should also explore whether the impact of personal innovativeness would change with the extension of use cases of cryptocurrency, e.g. by accepting it as a regular payment method.

6.2.6. The Role of Attitude in the Intention to Use Cryptocurrency

The last factor that has been investigated in the study in relation to behavioural intention to use cryptocurrency was attitude. It is defined as the sum of the subjective knowledge regarding cryptocurrency use and the person's subjective evaluation of its use, which directly affects the person's behavioural intention to use cryptocurrencies. This section discusses findings related to the following research sub-question and hypotheses:

RQ2.2: How does attitude affect individuals' intention to use cryptocurrency in Saudi Arabia?

H2 Attitude has a significant positive effect on the intention to use cryptocurrency in Saudi Arabia.

As expected, survey results supported this hypothesis, reporting that attitude towards cryptocurrency use has a significant positive impact on intention to use cryptocurrencies (sc=0.293, t=2.506, p=0.012). It is important to state that attitude was the strongest predictor of the intention to use cryptocurrencies in the research model, with a significant and positive relationship between these variables.

While attitude is a central element of the TRA, it was also widely used to explore the intention to accept and use new technologies such as cryptocurrency, and most studies have found the same results as this study – that attitude positively influences behavioural intention to use cryptocurrency. For instance, Zamzami (2020) found attitude as the only significant predictor of using digital money use in Indonesia, while several studies found it as one of the most significant factors of behavioural intention to use cryptocurrencies (Albayati et al., 2020; Mazambani and Mutambara,2019; Schaupp and Festa, 2018; Gil-Cordero et al., 2020; Boxer and Thompson, 2020; Gazali et al., 2019). Yoo et al. (2020) found that attitude had the strongest predictive power of cryptocurrency use in Korea.

However, studies differ in the factors that mediate the relationship between attitude and intention to use cryptocurrency. For instance, in line with this study, Boxer and Thompson (2020) found that attitude towards cryptocurrency was influenced by social norms. Albayati et al. (2020) found the impact of perceived usefulness and enjoyment. Gazali et al. (2019) found the impact of perceived financial risk, while Sohaib et al. (2019) found the impact of personal innovativeness. Yet, other studies found other mediators, like trust (Alaeddin and Altounjy, 2018; Ostern, 2018; Lee et al., 2018), perceived behavioural

control (Mazambani and Mutambara, 2019) and perceived benefits (Yoo et al., 2020), for example.

Therefore, this study has found a significant and positive impact of attitude on intention to use cryptocurrencies in Saudi Arabia, meaning that if a person has a positive attitude towards cryptocurrency use, it is more likely to engage in its use. According to this study, attitude towards cryptocurrency use is positively influenced by perceived usefulness of cryptocurrencies (H5), perceived enjoyment in their use (H7), and a sense of personal innovativeness related to their use (H9). However, it is also negatively influenced by perceived privacy risk (H3a) and financial risk (H3c) of their use. The influence of perceived security risk on attitude towards cryptocurrency use was not found (H3b). However, previous studies provided mixed results on the influence of mediators in this relationship. Thus, future studies should explore whether the contents of attitude and the way in which those contents are evaluated depend on cultural and contextual factors, as well as how various combinations of those contents of the attitude influence the behavioural intention to use cryptocurrency.

6.3. Saudi Citizens' Intention to Use Cryptocurrency

In line with the key factors of the TRA model and the existing literature, this study has found attitude as the most significant factor of intention to use cryptocurrencies in Saudi Arabia. The study has shown subjective norm, perceived usefulness, perceived enjoyment and personal innovativeness as statistically significant predictors of intention to use cryptocurrencies with a positive effect. Privacy risk and financial risk have been found as statistically significant predictors of intention to use cryptocurrencies with a negative effect. Security risk was not found as a significant predictor of the intention of Saudi citizens to use cryptocurrencies.

The study has also provided mixed results regarding the factors that influence attitude towards cryptocurrencies in Saudi Arabia and, thus, consequently, their intention to use cryptocurrencies. All examined factors except security risk, namely perceived usefulness, perceived enjoyment, personal innovativeness, privacy risk and financial risk, performed as good predictors of attitude towards cryptocurrencies in Saudi Arabia. However, while perceived usefulness, perceived enjoyment and personal innovativeness had a positive effect on attitude, financial risk and privacy risk had a negative effect on attitude towards cryptocurrency. This means that the higher the degree of perceived usefulness, perceived enjoyment, and personal innovativeness and the lower the degree of perceived privacy risk and financial risk, the more favourable the attitude towards cryptocurrencies. On the other hand, security risk revealed no significant relationship with the attitude of Saudi citizens towards cryptocurrencies.

Therefore, attitude towards cryptocurrency had the most significant, direct and positive effect on Saudis' intention to use cryptocurrencies and subjective norm had a statistically significant direct and positive effect on intention without a mediator. Privacy risk and perceived usefulness had a statistically significant indirect effect but not a direct effect with a mediator, meaning that these constructs can be considered as mediators, with a negative effect for privacy risk and a positive effect for perceived usefulness. Financial risk and perceived enjoyment had a statistically significant direct effect without a mediator and a statistically significant indirect effect. Thus, they can be considered as partial mediators with a negative effect on financial risk and a positive effect on perceived enjoyment. Security risk and personal innovativeness were not found as mediators due to high significance test values.

In conclusion, attitude is revealed as the most important predictor of behavioural intention to use cryptocurrencies by Saudi citizens. Subjective norm, perceived usefulness,

perceived enjoyment, personal innovativeness, privacy risk and financial risk performed as good predictors of intention to use cryptocurrency in Saudi Arabia. Security risk was not found as significant for Saudi citizens' intention to use cryptocurrencies. As for the determinants of the attitude, perceived usefulness was the most significant factor, followed by perceived enjoyment, personal innovativeness, privacy risk and financial risk. Security risk was not found significant for this relationship. Such results mean that getting to know the way of influence of subjective norm and attitude, as well as their cognitive contents and the emotional evaluation of those contents, is pivotal when it comes to increasing intention to use cryptocurrencies in Saudi Arabia.

No significant influence of security risk on cryptocurrency use in Saudi Arabia means that Saudis do not consider cryptocurrency use risky in terms of technology failure, nor this possibility influences their attitude and intention to use cryptocurrencies. This can be explained by their familiarity with secure cryptography mechanisms since they are engaged in social media, where they can acquire enough information and knowledge about the way of functioning of blockchain technology and cryptocurrency. In regard to policy matters, this means that policymakers should provide information about the security of blockchain technology and possible security risks of cryptocurrency use, as well as guidance on how to develop strategies for protecting users from these risks. In this way, they are most likely to improve their knowledge and trust in the cryptocurrency system and reduce their potential concerns leading to a greater rate of cryptocurrency use.

However, as discussed above, further research is required to explore relationships within specific constructs. For example, which part of the subjective norm has a greater influence, whether increased information and knowledge reduce perceived risk, as well as how different combinations of the attitude’s contents influence behavioural intention to use cryptocurrency.

6.4. Research Contributions and Implications

Cryptocurrencies have been increasing their use worldwide and keep receiving more and more attention from governments, both positive and negative. This has led to their efforts to provide official channels to exchange cryptocurrencies, as is the case of Bahrain, or to completely ban its use, as in the cases of Bolivia and China, to a certain degree. Also, Bitcoin prices have been on the rise in the last couple of years, while a myriad of altcoins has appeared in the last decade.

All that being said, the relevance of cryptocurrencies has never been higher, and their use is supposed to be at its highest levels worldwide. This implies that the relevance for governments, developers and investors to support cryptocurrencies has never been higher, especially in a country like Saudi Arabia, where the use is still in its early stage despite the potential to increase. For these reasons, the results of this research have numerous theoretical and practical implications discussed in the sections below.

6.4.1. Theoretical Implications

The theoretical implications encompass all the consequences of such research that can be linked to the current theoretical and conceptual discussions on the field of investigation. For the present research, the theoretical implications are relevant for the cryptocurrency use field but also to the attitudinal models, especially the TRA, which was put to the test here.

- One of the most important contributions of the present research is a combination of the factors from attitudinal and technology adoption models, enabling the evaluation of factors affecting behavioural intention to use cryptocurrency from human, financial and technology perspectives. In this way, this study improves the current theoretical

knowledge on this topic and provides comprehensive results regarding the acceptance of technologies that include financial transactions and their related risks. Moreover, the research provides the basis for further research and comparisons of various study results, as well as testing this research model in other contexts, which contributes to further development of the IS theory and a better understanding of each factor's impact in similar and different cultural contexts.

- Given that most prior cryptocurrency research was done from developed countries' perspectives or in specific contexts (Ter Ji-Xi et al., 2021), their results cannot be generalised to all cultural contexts, especially specific ones such as Saudi Arabia. Therefore, another major theoretical contribution of this study is an investigation of this topic in the specific cultural context of Saudi Arabia, especially as there has been no previous empirical research in this field in this country so far. Hence, the results of this study provide the first empirical data on this topic for Saudi Arabia enabling further research on this topic in both similar and different contexts to determine whether these factors, especially subjective norms and security risks, have a country-specific influence, which will further expand the IS body of knowledge on this topic.
- As cryptocurrency use involves the acceptance of new disruptive technology involved with financial transactions, another theoretically significant contribution of this study is the use of one of the attitudinal models – the theory of reasoned action, thus filling the research gap of prior studies on this topic that mostly used technology-based research models neglecting the other perspectives of cryptocurrency use (Al-Amri et al., 2019). However, as the technology perspective is also important for this phenomenon, as well as financial and security perspectives, another contribution to the theory is the creation of a unique research model that extends the attitudinal TRA model with new external variables related to these perspectives that have also shown

contradictory evidence in previous studies or were not previously used in the field of cryptocurrency use (Ajzen, 2020; Noreen et al., 2021; Xiao, 2020). In this way, this study contributes to the extension of the TRA theory by pointing out possible directions of the extension of this theory in accordance with the subject of research. Also, by testing the extended TRA model in the new field of cryptocurrency use and providing empirical results coherent with the findings of prior studies, the present research has also confirmed the validity of this theory when it is not used in its original form. Moreover, this research model also enabled us to explore this topic from several important perspectives and thus provide comprehensive study results.

- Besides filling the gaps in prior studies, e.g., not including some factors or providing contradictory evidence on their influence on cryptocurrency use, the present research also enriches the theoretical knowledge by exploring the relations between the factors explored. While the privacy risk was explored for the first time in the field of cryptocurrency used in this study, there is a lack of studies where financial risk and security risk have been employed as constructs of intention to use cryptocurrency. The present research also provides empirical evidence on the influence of perceived enjoyment and personal innovativeness that were mostly explored in the technology adoption field and only in a few studies on cryptocurrency use, while the impact of perceived usefulness was now examined in relation to other factors explored. In this way, this study has covered a range of important factors for cryptocurrency use, explored their mutual impact and enabled the gradation of their impact on attitude and intention to use new technology involved with financial transactions, thus providing comprehensive study results on cryptocurrency use that enrich the current theory and enable further research on this trendy topic.

6.4.2. Practical Implications

This study has several practical implications. First, by showing which factors have the greatest influence and to what extent each of the factors influences the decision about cryptocurrency use, this research enhances the actual understanding of the phenomena. The study also provides practical contributions to various stakeholders, including the governments, investors, merchants, developers and the general population, providing them with an insight into the field of cryptocurrency use. Finally, the study results help various practitioners predict and evaluate the attitude and intention of potential cryptocurrency users, create appropriate policies, initiatives and campaigns to stimulate further interest in cryptocurrency use, as well as anticipate both legal and economic effects of greater cryptocurrency use in both short- and long-term.

Practical implications for the major stakeholders of cryptocurrency use in the country of Saudi Arabia, including recommendations, are discussed below.

- Governments benefit from the findings obtained in the present research through a better understanding of how citizens create attitudes towards cryptocurrencies and what influences their intention to use cryptocurrencies. Based on the results of this study, the government can predict the direction and extent of the wider acceptance of cryptocurrencies within the country, as well as modify the attitudes of Saudi citizens towards cryptocurrency use in the desired direction through appropriate policies and initiatives. An announcement from the Saudi Ministry of Finance about legalising cryptocurrency companies in Saudi Arabia gives this study an even greater value. For instance, if the government wants to increase cryptocurrency use, it may provide incentives for alternative use cases such as payment methods. It can also provide the population with information on the benefits of cryptocurrency use to

reduce the perceived risk of potential users and increase their perceived usefulness and enjoyment. Introducing alternative use cases of cryptocurrencies is most likely to enhance their sense of personal innovativeness leading to greater cryptocurrency use.

- Developers of exchanges or similar platforms devoted to cryptocurrency trade and integration with payment systems can also find this study beneficial. These parties need to include the usefulness and enjoyment aspects into the interface in order to improve the perception of potential users in the country. Also, the interface should be presented and designed in a way to transpire trust in cryptocurrency transactions, as well as in their usefulness and enjoyment of potential users.

- Merchants and associations interested in accepting cryptocurrencies as payment methods in their businesses may also use the results of this study to create appropriate campaigns to actively inform their customers on how to purchase, trade and exchange cryptocurrency and the potential advantages of doing so. Additionally, they should highlight the potential enjoyment and usefulness of cryptocurrencies as payment methods, as well as enhance the personal innovativeness of users by emphasising their role in creating new innovative solutions. Finally, establishing trust and staying away from risk perceptions -especially privacy and financial risks- from the clients is something to be considered to avoid creating negative attitudes the potential users. By providing information about cryptocurrencies, they may increase the knowledge among the general population, thus enhancing the impact of subjective norms.

- Banking and traditional financial systems should be aware that cryptocurrency users require a system that allows them fast and low-cost financial transactions. Thus, using the results of this study, official financial systems should create new use cases for

cryptocurrencies to further improve their usefulness. Thus, it can also engage in this new disruptive ecosystem which gains more and more attention in the world, acting as one of the main competitors of the current banking systems.

- Moreover, the study results provide various benefits for several fields in both the short term and long term. For example, the results of the present research enable the creation of an appropriate legal framework for cryptocurrency use that will enhance the factors with a significant positive impact, such as cryptocurrency usefulness and enjoyment, at the same time reducing the impact of the factors that are considered risky, such as financial risks or subject to manipulation, such as the loss of private data. The results of this research also help various stakeholders predict the possibilities of wider application of cryptocurrencies and blockchain technology in other fields, e.g. as payment methods, digital wallets and for various non-monetary uses. They can also predict the directions of development of new similar technologies and possible responses from their potential users. In line with that, this study also enables the assessment of the economic effects of the wider cryptocurrency use, as well as its environmental impact, especially regarding the mining of cryptocurrencies.

In conclusion, this chapter describes the most important contributions and implications of the findings of the present research. By applying a unique research model based on the attitudinal TRA model extended with several external factors, the present research has enriched the current theoretical knowledge in several ways. Also, by exploring this topic in Saudi Arabia, this research has provided valuable empirical evidence for this specific context. At the same time, the study enables further research on this topic as well as comparisons of results and a confirmation of this research model in other contexts, thus contributing to further development of theory and a better understanding of the topic and

each factor's influence. The study also provides evidence on how potential users in Saudi Arabia form their attitude towards cryptocurrencies and what influences their intention to use them. In this way, this research enables a better understanding of this phenomenon and helps various stakeholders to make better decisions regarding a way of increasing the extent of cryptocurrency use and introducing new use cases, as well as predicting the legal and economic effects of such decisions in both short and long term.

6.5. Conclusions

The first digital currency, Bitcoin, emerged after the global financial crisis of 2008 in response to reduced trust in the conventional banking system (Nofer et al., 2017). Based on cryptographic algorithms that enable anonymous, safe, fast, and low-cost financial transactions with no need for third-party authorisation (Nakamoto, 2008), the cryptocurrency had been anticipated to disrupt the financial system and become a mainstream currency (Sohaib et al., 2019). However, regardless of the exponential growth of cryptocurrency use worldwide, its use has remained limited in scope and geographical distribution (Al-Amri et al., 2019; Sohaib et al., 2019). The main reasons are concerns related to their use, such as the threat of theft, scams and data leaking, as well as due to the apprehensiveness of the unknown among potential users (Sohaib et al., 2019; Alharbi and Sohaib, 2021). On the other hand, their full potential can be achieved only if they are widely accepted by users (Abbasi et al., 2021).

Similarly, despite the rising interest of both scholars and practitioners, scholarly research on this topic remained scarce, especially regarding the factors that influence individuals' behavioural intention to use cryptocurrencies (Al-Amri et al., 2019; Arias-Oliva et al., 2021; Sohaib et al., 2019; Abbasi et al., 2021). Most prior cryptocurrency research is done from developed countries' perspectives (Ter Ji-Xi et al., 2021) or in a context different from the Saudi one (Won-Jun, 2018; Sohaib et al., 2019; Schaupp and Festa, 2018), using technology adoption models. Prior studies have also provided contradictory evidence on some factors, e.g. the risk (Abramova and Böhme, 2016; Nadeem et al., 2021; Nuryyev et al., 2018), while some important technology adoption factors have not yet been tested in the field of cryptocurrency use (Ajzen, 2020; Al-Amri et al., 2019; Noreen et al., 2021; Xiao, 2020; Zamzami, 2020). Moreover, there has been no comprehensive empirical

research on this topic in Saudi Arabia so far. Given these research gaps, the purpose of this study was to investigate the factors that influence the behavioural intention of Saudi citizens to use cryptocurrencies, aiming to discover what motivates and what deters individuals from cryptocurrency use in Saudi Arabia and the interrelations between these factors. In this way, this study filled the literature gaps by integrating three perspectives and exploring the influence of associated factors in the specific cultural context of Saudi Arabia.

Saudi Arabia has been selected for the research for several reasons. First, the majority of the population is composed of young, tech-savvy people who are early adopters of any new technology, while Saudi Arabia is ranked among the 50 most technologically advanced countries in the world (Getzoff, 2020). Yet, cryptocurrency use is still in the initial stage (Alsubaei, 2019). Although the majority of Saudis are aware of their existence and features, only a minority use them (Abdeldayem and Aldulaimi, 2020). Potential users also face confusing signals from the Saudi government regarding cryptocurrency since it has not officially allowed cryptocurrency use for the general population, yet uses it for government-to-government payments with the UAE and domestic and cross-border payments between commercial banks (Saudi Central Bank and Central Bank of the UAE, 2020). Nevertheless, individuals may still trade with cryptocurrency, although with no financial protection from the official banking system or government, while the Saudi Ministry of Finance has recently announced to legalise cryptocurrency companies in Saudi Arabia (ICLG, 2022; Abouelkheir, 2021). From the theoretical point of view, besides a few exploratory studies, there has been no empirical research on this topic in Saudi Arabia so far.

Thus, the main motives for this research were to provide a comprehensive insight into this topic by integrating the three perspectives of cryptocurrency use – financial, security

and technological, test the influence of factors explored in prior studies and add factors that have been found significant for the Saudi context and culture and provide the first empirical results on this trendy topic for Saudi Arabia.

The research questions of this research were: *What is the factors that influence individuals' intention to use cryptocurrency in Saudi Arabia*? (RQ1) and *How do these factors influence individuals' intention to use cryptocurrency in Saudi Arabia?* (RQ2). In order to answer these questions, a literature review in the fields of cryptocurrency use was conducted, resulting in a series of research sub-questions and hypotheses regarding:

- the impact of the subjective norm (H1) and attitude (H2) on individuals' intention to use cryptocurrency in Saudi Arabia,
- the influence of the three sub-types of perceived risk – privacy risk, security risk, and financial risk on both attitude (H3a, H3b, H3c, respectively) and intention to use cryptocurrencies in Saudi Arabia (H4a, H4b, H4c, respectively),
- the impact of perceived usefulness, perceived enjoyment and personal innovativeness on both attitude (H5, H7, H9, respectively) and intention (H6, H8, H10, respectively) to use cryptocurrencies in Saudi Arabia.

One of the novelties of this research is a unique research model based on TRA that was extended by several external factors that have proven to be influential in the field of cryptocurrency use and in the Saudi Arabian context. In this way, this study has enabled an investigation of this topic from human, financial and security perspectives of using new technology involved with financial transactions, which implies various types of risk (Al-Amri et al., 2019; Won-Jun, 2018). Moreover, the study provided comprehensive results on this topic, as some of the factors included had never been examined regarding this topic so far, while some of them have previously provided contradictory evidence.

To empirically test hypotheses developed to discover the relationships between the factors used in the research model, this study has used a positivistic mono-method approach with probability sampling and cross-sectional design. Using a quantitative method, an online, self-administered survey, data are collected from September to November 2019. The final sample of the study included 181 respondents residing in Saudi Arabia. The questionnaire used Likert-type questions on the 1 to 5 scale and has been translated from English to Arabic by a Professional NAATI-accredited translator (NAATI No. CPN5OQ23X). The data analysis was performed employing several statistical techniques, such as SEM, EFA, and CFA, requiring the use of SPSS (Version 22.00) and Amos (Version 22.0) programs.

The research has confirmed some previous study results and came to new findings, which resulted in several theoretical and practical contributions explained above. As expected from the TRA model, the attitude was found as the most significant predictor of intention to use cryptocurrencies in Saudi Arabia with a direct and positive effect. In line with the TRA model, the subjective norm was also found as a significant predictor of intention to use cryptocurrencies in Saudi Arabia, also with a direct and positive effect. The additions to the original TRA model -perceived usefulness, perceived enjoyment and personal innovativeness- have been shown in this study as significant predictors of both attitude and intention to use cryptocurrencies in Saudi Arabia, with a positive impact. However, while perceived usefulness was revealed as a mediator of the relationship between attitude and intention to use cryptocurrencies, perceived enjoyment was found as a partial mediator of this relationship, and personal innovativeness was not found as a mediator. These findings contribute to the IS theory by confirming previous findings and filling the research gap due to a lack of studies that explored perceived enjoyment and personal innovativeness in relation to cryptocurrency use.

The perceived risk received mixed support from the results of this study. Two of its three components -privacy risk and financial risk- were revealed as significant predictors of attitude and intention to use cryptocurrencies in Saudi Arabia, both with a negative influence, while one of the risk components -security risk- was not found as statistically important for attitude and intention to use cryptocurrencies in Saudi Arabia. Privacy risk was revealed as a mediator of the relationship between attitude and intention towards the use of cryptocurrencies, while financial risk was found as a partial mediator of this relationship. Both had a negative impact on the attitude and intention of Saudi citizens to use cryptocurrencies. These findings were among the most important contributions of the present research since the high risk is usually associated with new technologies involved with financial transactions, yet there was a lack of studies that explored this construct. In addition, this study has provided new insights into the impact of the perceived risk, given that cryptocurrency use implies safe and anonymous transactions (Hileman and Rauchs, 2017), yet potential users still fear privacy data leaking. Moreover, although the financial risk is imminent for speculative assets like cryptocurrencies, potential users still consider it important due to financial transactions related to cryptocurrency use, their large price variations, and the inability of cryptocurrency users to recover their funds in case of the loss or theft of the private key (Shovkhalov and Idrisov, 2021).

Therefore, according to this study, Saudi citizens are most likely to have a positive attitude towards cryptocurrencies if they perceive them as useful and perceive their use as enjoyable with a low perceived risk of financial loss and privacy data leak, at the same time enabling them to enhance their sense of personal innovativeness by using new disruptive technology. If they have a positive attitude towards cryptocurrencies and encounter positive subjective norm towards their use, they are most likely to exhibit a positive behavioural intention towards cryptocurrency use. No significant influence of

security risk on cryptocurrency use in Saudi Arabia could be related to their familiarity with secure cryptography mechanisms and acquired information about the way of functioning of blockchain technology and cryptocurrency.

In regard to policy matters, these findings imply that the extent of cryptocurrency use in Saudi Arabia can be increased if potential users are provided with enough information on the benefits of cryptocurrencies, such as their usefulness in conducting fast, low-cost financial transactions, gaining potentially high yield on investment and enjoyment in their use and low risk of data privacy leak and safety of financial transactions due to complex cryptographic technology. Although Saudis do not consider security risks relevant for cryptocurrency use, they should also be informed about the security of blockchain technology and possible security risks of cryptocurrency use and provided with guidance on how to develop strategies for protecting themselves from these risks.

In this way, they can improve their knowledge about cryptocurrencies and reduce their concerns enabling them to evaluate identified constructs of the attitude more favourably, thus consequently improving both their attitude and intention towards cryptocurrency use. By spreading the word about this, they are more likely to improve social norms towards cryptocurrency use, thus additionally increasing the rate of its use. Also, the expansion of cryptocurrency use cases, e.g. by accepting them as a payment method, is also most likely to enhance their sense of personal innovativeness, further improving their attitude towards cryptocurrency and their intention to use it. In this way, by further increasing the rate of cryptocurrency use, Saudis can utilise the full potential of cryptocurrencies.

As mentioned above, this research has several theoretical and practical contributions, including a new research model that combines attitudinal and external technology factors enabling the assessment of this topic from human, financial and security perspectives. It also tested the extended TRA model in a new field. The study also provided empirical

evidence for a specific cultural context such as Saudi Arabia and enabled further research based on its findings. Finally, it provides recommendations for various stakeholders, such as government sectors, private investors, web developers, and the traditional banking system.

6.6. Limitations and Future Research Directions

This section describes the shortcomings or limitations of the present research and, based on that, provides the directions in which future research could improve the findings of the present investigation.

Limitations:

- Regarding the sampling and sample size, several limitations were present in this research. First, a larger sample size would have improved the explanatory power of the model. Yet, when dealing with population sizes in Saudi Arabia, time and data processing limits forced the researcher to employ a smaller sample size. For the same reasons, the present research has used the general sample composition in terms of not dividing the participants into groups based on their knowledge or experience in cryptocurrency use. Still, this approach might have distorted the findings of this study since those with previous knowledge about this technology might have valued different factors or given them greater weight than those with no knowledge about cryptocurrencies. Finally, the cross-sectional nature of the research could have limited the ability of this study to analyse possible changes in attitudes and intention towards cryptocurrency use over time.
- There were also several limitations regarding the research model and methods. The focus of this study on the particular theory and specific factors has limited the ability

of the study to explore some other external factors that may have also been significant for the field of cryptocurrency use. This approach could have distorted the findings of the present research. Also, using the mono method for data collection -a survey- could have provided only the general findings on the topic, with no in-depth information about the factors explored. Employing the interviews as an additional method of data collection could have improved the strength of the conclusions and augmented the comprehension of the influence of the factors explored and their interrelationships. Another limitation of the present research was the focus on one country with a specific cultural context limiting the generalisability of the findings of this study.

Future research directions:

- Due to a limitation of this study regarding the small sample, future studies should include a larger number of respondents. Also, due to a limitation of this research regarding the general sample composition, future studies should explore the impact of these factors in relation to the knowledge of potential users about cryptocurrency in itself and its use. In this way, they can determine the similarities and differences among constructs of attitude and intention of potential users with and without knowledge. Moreover, due to the limitation of this study regarding the mono method, future research should adopt mixed methods, especially as interviews may provide in-depth information about the direction of the influence of the factors. They can also explore the relationships between various factors enabling a better understanding of why some factors are more important than others and what influences such gradation of their importance for cryptocurrency use.

- Given the cross-sectional time frame of this study, from September to November 2019, further research may investigate whether the impact of the variables explored

will remain the same within a longitudinal time frame. They can also examine how the preferences regarding cryptocurrency use of the target population would change if circumstances change in Saudi Arabia or if use cases expand. Since the most dominant use case and current consideration of cryptocurrency is as a speculative investment.

- Due to the limitation of this study regarding the general investigation of the factors influencing cryptocurrency use, but also the study results, future research should explore specific relationships among the constructs of the factors explored. For instance, further research may explore the influence of each part of subjective norm, namely social media, friends and family, to determine which of them has the greatest influence and if this influence is related to the country's context. In the case of Saudi Arabia, this is the initial stage of cryptocurrency use and a significant presence of Saudis on the Internet. Similarly, future studies should also investigate the impact of the scope of information and knowledge about cryptocurrencies on the perception of the risk, usefulness and enjoyment of potential users in terms of whether their perception would be more favourable if they had more information and knowledge about cryptocurrency. Future research may also examine whether the impact of personal innovativeness would change if alternative cryptocurrency use cases were introduced, e.g. accepting it as a regular payment method. They can also examine whether use cases of cryptocurrencies and herd behaviour impact the perception of the risk factors.

- Given study results and a lack of other studies on cryptocurrency use that explored perceived enjoyment, personal innovativeness and the three risk sub-types, future studies can explore these factors in more detail. Thus, they can determine whether their results match the findings of this study or the impact of these factors rather

depends on the cultural context. In line with that, future studies may also investigate whether the contents of attitude and the way in which those contents are evaluated depend on cultural and contextual factors, as well as how the different combinations of those contents of the attitude influence behavioural intention to use cryptocurrency.

- To further expand the theory and the knowledge on cryptocurrency use, future studies may also include different or additional variables that have been employed in related studies, e.g. trust, perceived behavioural control and facilitating conditions. Future studies can also employ a different research model, e.g. a combination of the TPB and the technology adoption models, to explore these or new factors. Further research may also put more focus on the technical side of cryptocurrency use and the factors associated with it, especially because cryptocurrency platforms are an important element in this field and need to get more information to better understand the long-term economic and environmental effects of cryptocurrency use.

- Finally, future studies should test this research model in similar and different contexts to determine whether its validity and study results depend on cultural and contextual factors. They may explore whether and to what extent factors identified in this study affect cryptocurrency use in other GCC countries or countries with similar cultures and contexts, as well as what are the reasons for possible differences in factors identified and their influence. Moreover, future studies on this topic should be conducted in different cultural contexts to enable a comparison of the results in terms of cultural and contextual differences, which will further enhance the theoretical knowledge and empirical evidence on the topic, at the same time providing additional information for various stakeholders.

In conclusion, two big areas could have been improved in the present research. First, the small sample size, the general sample composition and a cross-sectional time frame could have distorted the findings of the present research, while using the mono method could have provided only the general findings with no in-depth information on the topic. Thus, recommendations for further research are provided to improve those limitations and produce better study results in terms of statistically sound conclusions and a better understanding of the phenomena studied. Second, the focus on the particular cultural context and specific factors could have limited the generalisability of the findings of this study. In line with that, further research should test this research model in similar and different contexts or include the different or additional variables to enable comparisons of the findings on this topic, thus providing more empirical evidence, further expanding the current theoretical knowledge, and providing more information for stakeholders.

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Appendices

Appendix A. The English Survey Version

UTS UNIVERSITY OF TECHNOLOGY SYDNEY

English

Information Sheet

INFORMATION SHEET AND CONSENT FORM FOR ONLINE SURVEYS

ETH19-3956: FACTORS DRIVING INDIVIDUALS' BEHAVIOURAL INTENTION TO ADOPT CRYPTOCURRENCY IN SAUDI ARABIA.

What is the research study?

The purpose of this research/online survey is to find out about the factors that may influence the individuals' intention of adopting cryptocurrency in Saudi Arabia. You have been invited to participate because you are a Saudi citizen who has at least minimal knowledge about the cryptocurrency.

Who is conducting this research?

My name is Saad Alaklabi and I am a student at UTS. My supervisor is Kyeong Kang (kyeong.kang@uts.edu.au).

Inclusion/Exclusion Criteria

Before you decide to participate in this research study, we need to ensure that it is ok for you to take part. The research tries to identify the factors that may influence the individuals' intention of adopting cryptocurrency in Saudi Arabia. Therefore, the participant asked to be a Saudi citizen and to have at least a minimal knowledge about the cryptocurrency.

Do I have to take part in this research study?

Participation in this study is voluntary. It is completely up to you whether or not you decide to take part.

If you decide to participate, I will invite you to

• Read the information carefully.

• Complete an online questionnaire.

You can change your mind at any time and stop completing the surveys without consequences. Data cannot be withdrawn once the survey has been submitted.

Are there any risks/inconvenience?

We don't expect this questionnaire to cause any harm or discomfort, however, if you experience feelings of distress as a result of participation in this study you can let the researcher know and they will provide you with assistance (saad.alaklabi@student.uts.edu.au).

What will happen to information about me?

Access to the online questionnaire is via generic weblink. Submission of the online questionnaire/s is an indication of your consent. By clicking the weblink you consent to the research team collecting and using personal information about you for the research project. All this information will be treated confidentially. Your information will only be used for the purpose of this research project and it will only be disclosed with your permission, except as required by law. We also plan to publish the results of this research in the future.

What if I have concerns or a complaint?

If you have concerns about the research that you think my supervisor or I can help you with, please feel free to contact us on (saad.alaklabi@student.uts.edu.au) or (kyeong.kang@uts.edu.au).

If you would like to talk to someone who is not connected with the research, you may contact the Research Ethics Officer on 02 9514 9772 or +966501150193 or Research.ethics@uts.edu.au and quote this number ETH19-3956

Are you willing to participate in this survey?

- ○ Yes
- ○ No

Nationality:

- ○ Saudi
- ○ Non-Saudi

Gender:

- ○ Male
- ○ Female

Age:

- ○ Less than 20 years
- ○ 20 – 29 years
- ○ 30 – 39 years
- ○ 40 – 49 years
- ○ 50 years and older

Education Level

- ○ High School
- ○ College degree
- ○ Bachelor's degree
- ○ Postgraduate degree

Which part of Saudi you are from

- ○ Centre
- ○ East
- ○ West
- ○ North
- ○ South

How do you classify your knowledge about the cryptocurrency?

- ○ expert
- ○ somewhat knowledgeable
- ○ beginner with minimum knowledge
- ○ no knowledge
- ○ not sure what the question refiring to

Have you ever participated in cryptocurrency activities (e.g. trading, investing, Analysing...)?

- ○ Yes
- ○ No

Which cryptocurrency have you participated in? (you can write more than one cryptocurrency)

Do you have any technology background (e.g. you have bachelor's degree in computer sciences, you are IT specialist, you have diploma in programming, ...)?

- ○ Yes
- ○ No

Are you interested in having a discussion about your experience with cryptocurrency?

- ○ Yes, please provide your email
- ○ No

Attitude

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I think that buying a cryptocurrency is a good idea.	○	○	○	○	○

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I think that using cryptocurrency for financial transactions would be a wise idea.	○	○	○	○	○
In my opinion, it is desirable to use cryptocurrency as a currency.	○	○	○	○	○
I feel good about using cryptocurrency.	○	○	○	○	○
I am excited about the idea of using cryptocurrency.	○	○	○	○	○

Subjective Norm

	Strongly disagree	disagree	Neutral	Agree	Strongly agree
People who are important to me, influencing me, to use cryptocurrency in order to buy or sell products is a good way of trading.	○	○	○	○	○
People who are important to me, influencing me, to try cryptocurrency.	○	○	○	○	○
People who are important to me, influencing me to depict a positive sentiment to engage in using cryptocurrency.	○	○	○	○	○

	Strongly disagree	disagree	Neutral	Agree	Strongly agree
People who are important to me influenced my decision to make purchases through cryptocurrency.	○	○	○	○	○
People who are important to me encourages me whether to use cryptocurrency.	○	○	○	○	○

Privacy Risk

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Information containing my cryptocurrency payment transactions can be misutilised by others.	○	○	○	○	○
I do not feel safe providing personal private information over cryptocurrency payments.	○	○	○	○	○
I do not trust in the ability of cryptocurrency payment service providers to protect my privacy.	○	○	○	○	○
I am concerned with the privacy security of using cryptocurrency.	○	○	○	○	○
I think that owning cryptocurrency has privacy risks.	○	○	○	○	○

Security Risk

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Cryptocurrency enables to transfer money securely.	○	○	○	○	○
Cryptocurrency empowers me with the control of my money.	○	○	○	○	○
I am concerned with the security of using cryptocurrency.	○	○	○	○	○
I am worried about using cryptocurrency because other people may be able to access my account.	○	○	○	○	○
I do not trust cryptocurrency as I trust other currency.	○	○	○	○	○

Financial Risk

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Cost of cryptocurrency is very high for me.	○	○	○	○	○
Inability to convert cryptocurrency to conventional currencies, or not at a reasonable price.	○	○	○	○	○

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Losses due to counterparties failing to meet contractual payments or settlement obligations.	○	○	○	○	○
Losses due to security incidents (e.g., lost passwords, malware).	○	○	○	○	○
I think that there would be problems with my financial transactions while using cryptocurrency.	○	○	○	○	○

Perceived Usefulness

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I perceive that my purchase would be more quickly using cryptocurrency.	○	○	○	○	○
I perceive that my purchasing tasks would be more easily using cryptocurrency.	○	○	○	○	○
Cryptocurrency would enhance my effectiveness in purchasing.	○	○	○	○	○
Cryptocurrency would enhance my efficiency in making a purchase.	○	○	○	○	○

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Cryptocurrency would enable me to make better decisions in making a purchase.	○	○	○	○	○

Perceived Enjoyment

	Strongly disagree	Disagree	Neutral	Aagree	Strongly agree
Using cryptocurrency is fun for me.	○	○	○	○	○
Using cryptocurrency gives me pleasure.	○	○	○	○	○
I enjoy using the cryptocurrency.	○	○	○	○	○
I am flexible when I use cryptocurrency.	○	○	○	○	○
I am uninventive when I use cryptocurrency.	○	○	○	○	○

Personal Innovativeness

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
If I heard about new cryptocurrency, I would look for ways to experiment with it.	○	○	○	○	○

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Among my peers, I am usually the first to try out new cryptocurrency.	○	○	○	○	○
I find it stimulating to be original in my thinking and behaviour.	○	○	○	○	○
I like to experiment with a new cryptocurrency.	○	○	○	○	○

Intention to adopt Cryptocurrency

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I intend to use cryptocurrency as an alternative source of currency to buy or sell products in future.	○	○	○	○	○
I believe using cryptocurrency is very helpful to timely fulfil my obligations.	○	○	○	○	○
I intend to use cryptocurrency on a regular basis.	○	○	○	○	○
I will encourage others to use cryptocurrency as a mode of exchange.	○	○	○	○	○
I prefer to use cryptocurrency for game purposes only.	○	○	○	○	○

Appendix B. The Arabic Survey Version

UTS UNIVERSITY OF TECHNOLOGY SYDNEY

العربية

Information Sheet

معلومات للمشاركين في البحث

ETH19-3956: استقصاء العوامل المؤثرة على نية الأفراد لاستخدام العملات الرقمية في المملكة العربية السعودية.

عنوان البحث:

استقصاء العوامل المؤثرة على نية الأفراد لاستخدام العملات الرقمية في المملكة العربية السعودية.

ما الهدف من الدراسة؟

تهدف هذه الدراسة / الاستبانة إلى استقصاء العوامل المؤثرة على نية استخدام الأفراد للعملات الرقمية افي المملكة العربية السعودية. تم دعوتك للمشاركة في هذه الدراسة لان لديك الحد الأدنى من المعرفة بالعملات الرقمية.

من يقوم بعمل هذه الدراسة:

سعد بن فايز الأكلبي باحث دكتوراه في كلية الهندسة وتقنية المعلومات جامعة التكنولجيا في سدني، استراليا. مشرفتي الدكتورة كيونق كانق kyeong.kang@uts.edu.au

لمن ستوجه الدعوة ومن هو القائم على إجراء الدراسة؟

قبل ان تقرر المشاركة في هذه الدراسة نريد التأكد من أنه لايوجد لديك مانع في أن تكون جزءا من هذه الدراسة. سيتم دعوة السعوديين ممن لديهم الحد الأدنى من معرفة العملات الرقمية للمشاركة في هذه الدراسة.

هل يجب علي أن أشارك في هذه الدراسة؟

المشاركة في هذا البحث تطوعي ويعود القرار لك اذا اردت المشاركة ام لا. إذا قررت المشاركة سوف ادعوك لقراءة هذه المعلومات ولإكمال هذه الاستبانة. تستطيع تغيير رأيك في أي وقت وعدم اكمال الاستبانة بدون أي عواقب مترتبة عليك. الاستبانة لا يمكن سحبها بعد اكمالها وتسليمها.

هل هناك أي مخاطر؟

لا يوجد أي مخاطر مترتبة على مشاركتك في هذه الدراسة، ولكن ان احسست بالقلق حيال المشاركة في هذه الدراسة فإنك تستطيع التواصل مع الباحث على الايميل saad.alaklabi@student.uts.edu.au وسوف يقدم لك المساعدة.

ماذا سيحدث لبياناتي؟

هذه الاستبانة لاتتطلب منك تقديم أي معلومات شخصية وسوف يتم التعامل مع اجاباتك بكل سرية ومهنية. الإجابات التي ستقدمها في هذه الاستبانة سوف تستخدم للأغراض البحثية. وسوف يتم نشر نتائج البحث في المستقبل.

ماذا لو كان لدي أي شكوى او مخاوف؟

إذا كان لديك أي مخاوف بشأن هذه الدراسة وتظن انني استطيع مساعدتك انا او مشرفتي فارجو ان تتواصل معنا على saad.alaklabi@student.uts.edu.au او kyeong.kang@uts.edu.au

إذا كنت تريد التحدث الى احد ليس له علاقة بالبحث، فقد ترغب بمراسلة قسم اخلاقيات البحث على Research.ethics@uts.edu.au او +966501150193 02 9514 9772 واعطاءهم هذا المرجع ETH19-3956

هل أنت على استعداد للمشاركة في هذا الدراسه؟

- ○ نعم فعلا
- ○ لا

الجنسية:

- سعودي
- غير سعودي

الجنس:

- ذكر
- انثى

العمر :

- أقل من ٢٠ سنة
- من ٢٠ الى ٢٩ سنة
- من ٣٠ الى ٣٩ سنة
- من ٤٠ الى ٤٩ سنة
- أكبر من ٥٠ سنة

المستوى التعليمي

- الثانوية أو ما يعادلها
- دبلوم أو معهد
- بكالوريوس
- دراسات عليا

في أي منطقة تسكن؟

- المنطقة الوسطى
- المنطقة الشرقية
- المنطقة الغربية
- المنطقة الشمالية
- المنطقة الجنوبية

كيف تقيم معلوماتك عن العملات الرقمية؟

- خبير
- دراية إلى حد ما
- مبتدئ
- ليس لدي أي معلومات عنها
- لست متأكد ماذا يعني هذا السؤال

هل سبق لك استخدام العملات الرقمية (مثال: استثمار، تحليل، عملة للشراء والبيع ...)؟

- نعم
- لا

أي نوع من العملات الرقمية استخدمت؟ (تستطيع كتابة اكثر من عملة رقمية)

هل لديك أي خلفية تقنية؟ (مثال: حاصل على بكالوريوس في علوم الحاسب، أو تعمل في تقنية المعلومات، أو لديك دبلوم برمجة، أو أي شكل من أشكال الخلفية التقنية)

- نعم
- لا

هل أنت مهتم أن اتواصل معك أو اجري معك مقابلة حول خبرتك مع العملات الرقمية؟

- نعم (عنوان الايميل أو رقم الجوال ....)
- لا

التوجّه والسلوك

	لا أوافق بشدة	لا أوافق	محايد	أوافق	أوافق بشدة
أعتقد أن شراء العملات الرقمية تعد فكرة جيدة.	○	○	○	○	○
أعتقد أن استخدام العملات الرقمية في المعاملات المالية تعد فكرة سديدة.	○	○	○	○	○
حسب رأيي، من المفضل استخدام العملات الرقمية كعملة حقيقية قابلة للتداول.	○	○	○	○	○

	لا أوافق بشدة	لا أوافق	محايد	أوافق	أوافق بشدة
أشعر بالرضا تجاه استخدام العملات الرقمية.	○	○	○	○	○
أنا متحمس ومتفائل تجاه فكرة استخدام العملات الرقمية.	○	○	○	○	○

تأثير العائلة

	لا أوافق بشدة	لا أوافق	محايد	أوافق	أوافق بشدة
تعتقد عائلتي أنه ينبغي أن استخدم العملات الرقمية لشراء أو بيع المنتجات.	○	○	○	○	○
تعتقد عائلتي أنه ينبغي أن استخدم العملات الرقمية لشراء أو بيع المنتجات.	○	○	○	○	○
أثرت عائلتي على قراري بشأن استخدام العملات الرقمية.	○	○	○	○	○
قد تعتقد عائلتي أنني يجب أن استخدم العملات الرقمية.	○	○	○	○	○
تشجعني عائلتي على الشراء باستخدام العملات الرقمية.	○	○	○	○	○

مخاطر الخصوصية

	لا أوافق بشدة	لا أوافق	محايد	أوافق	أوافق بشدة
يمكن إساءة استخدام معلوماتي التي تشمل على معاملات الدفع باستخدام العملات الرقمية.	○	○	○	○	○

	لا أوافق بشدة	لا أوافق	محايد	أوافق	أوافق بشدة
لا أشعر بالأمان عند تقديم معلومات شخصية خاصة عند الدفع باستخدام العملات الرقمية.	○	○	○	○	○
لا أثق في قدرة مزودي خدمة الدفع باستخدام العملات الرقمية على حماية خصوصيتي.	○	○	○	○	○
أشعر بالقلق تجاه أمن خصوصية استخدام العملات الرقمية.	○	○	○	○	○
أعتقد أن امتلاك العملات الرقمية محفوف بمخاطر الخصوصية.	○	○	○	○	○

المخاطر الأمنية

	لا أوافق بشدة	لا أوافق	محايد	أوافق	أوافق بشدة
تمكنني العملات الرقمية من تحويل الأموال بشكل آمن.	○	○	○	○	○
تمكنني العملات الرقمية من التحكم بأموالي والسيطرة عليها.	○	○	○	○	○
أشعر بالقلق تجاه أمان استخدام العملات الرقمية.	○	○	○	○	○
أشعر بالقلق تجاه استخدام العملات الرقمية لأن الآخرين قد يتمكنون من الوصول إلى حسابي أو اختراقه.	○	○	○	○	○
لا أثق بالعملات الرقمية بقدر ما أثق بالعملات الأخرى.	○	○	○	○	○

المخاطر المالية

	لا أوافق بشدة	لا أوافق	محايد	أوافق	أوافق بشدة
تكلفة العملات الرقمية عالية جدا بالنسبة لي	○	○	○	○	○
عدم القدرة على تحويل العملات الرقمية إلى عملات تقليدية، أو تكلفة التحويل غير معقولة.	○	○	○	○	○
الخسائر الناجمة عن عدم مقدرة الأطراف على تلبية المدفوعات التعاقدية أو التزامات التسوية.	○	○	○	○	○
الخسائر الناجمة عن الأخطاء الأمنية (مثل فقدان كلمات المرور، البرامج الضارة، إلخ).	○	○	○	○	○
أعتقد أنه سيكون هناك مشاكل في معاملاتي المالية أثناء استخدام العملات الرقمية.	○	○	○	○	○

المنفعة المتوقعة

	لا أوافق بشدة	لا أوافق	محايد	أوافق	أوافق بشدة
أدرك أن عملية الشراء ستكون أسرع باستخدام العملات الرقمية.	○	○	○	○	○
أدرك أن مهام الشراء ستكون أكثر سهولة باستخدام العملات الرقمية.	○	○	○	○	○
ستعزز العملات الرقمية من فعاليتي في الشراء.	○	○	○	○	○
ستعزز العملات الرقمية من فعاليتي في إجراء عملية شراء.	○	○	○	○	○

	لا أوافق بشدة	لا أوافق	محايد	أوافق	أوافق بشدة
قد تمكنني العملات الرقمية من اتخاذ قرارات أفضل عند الشراء.	○	○	○	○	○

المتعة المتوقعة

	لا أوافق بشدة	لا أوافق	محايد	أوافق	أوافق بشدة
استخدام العملات الرقمية أمرٌ ممتع.	○	○	○	○	○
استخدام العملات الرقمية يشعرني بالسرور.	○	○	○	○	○
استمتع عند استخدام العملات الرقمية.	○	○	○	○	○
أنا مرن في التعاملات عندما أستخدم العملات الرقمية.	○	○	○	○	○
أنا غير مبدع أو لا أفكر ملياً عندما أستخدم العملات الرقمية.	○	○	○	○	○

الإبداع الشخصي

	لا أوافق بشدة	لا أوافق	محايد	أوافق	أوافق بشدة
عندما أعلم بوجود عملة رقمية جديدة، أبحث عن طرق لتجربتها.	○	○	○	○	○
أنا عادةً أول من يجرب العملات الرقمية الجديدة من بين زملائي.	○	○	○	○	○
أعتقد أنه من المشجع أن أكون مبدعاً في تفكيري وسلوكي.	○	○	○	○	○
أحب تجربة عملات رقمية جديدة.	○	○	○	○	○

نية لاعتماد Cryptocurrency

	لا أوافق بشدة	لا أوافق	محايد	أوافق	أوافق بشدة
أنوي استخدام العملات الرقمية كبديل للعملة التقليدية لشراء أو بيع المنتجات في المستقبل.	○	○	○	○	○
أعتقد أن استخدام العملات الرقمية سيساعدني على أداء التزاماتي في الوقت المناسب.	○	○	○	○	○
أنوي استخدام العملات الرقمية بشكل منتظم ومستمر.	○	○	○	○	○
سوف أشجع الآخرين على استخدام العملات الرقمية كطريقة للتبادل.	○	○	○	○	○
أفضل استخدام العملات الرقمية لدفع أو شراء ما يتعلق بالألعاب فقط.	○	○	○	○	○