



University of
Southern
Queensland

**AN ANALYSIS OF THE BARRIERS TO
CRYPTOCURRENCY ADOPTION USING THE
INNOVATION RESISTANCE THEORY AND A
SYSTEMATIC LITERATURE REVIEW OF
CRYPTOCURRENCY REGULATION**

A Thesis submitted by

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ABSTRACT

The main objective of this study is to investigate what the barriers to the adoption of cryptocurrencies are. The research initially looks at how the increase in the use of cryptocurrencies has influenced regulations in different countries. To achieve this a systematic literature review is conducted into research on cryptocurrency regulations. To investigate the barriers to adoption, a study model based on the Innovation Resistance Theory is used. A qualitative study is initially conducted using a survey with open-ended questions and completed by 20 respondents from different countries. The findings confirm that the study model is suitable for investigating barriers to the adoption of cryptocurrencies. A quantitative study is then further conducted with survey responses from 531 respondents from different countries. Of the respondents, 261 are current or previous users of cryptocurrencies, while 270 respondents have never used them. The analysis of cryptocurrency users found that psychological barriers have a negative and significant impact on user intention to adopt cryptocurrencies, while functional barriers have a negative but insignificant association with cryptocurrency adoption.

CERTIFICATION OF THESIS

I, Tawanda Chatora, declare that the Thesis entitled *An Analysis into the Barriers to Cryptocurrency Adoption Using the Innovation Resistance Theory and a Systematic Literature Review of Cryptocurrency Regulation* is not more than 100,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references, and footnotes. The thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work.

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CHAPTER 1: INTRODUCTION

1.1. Introduction

According to Pernice and Scott (2021), a cryptocurrency system is a system created for the issuance of tokens which are intended to be used as a general or limited-purpose medium of exchange and which are accounted for by using an often collectively maintained digital ledger, making use of cryptography to replace intermediaries. A singular cryptocurrency is the token used in this system. Cryptocurrencies have gained popularity over the last decade both as payment systems as well as investment assets.

Bitcoin was the first and is the most popular cryptocurrency with a market capitalisation of approximately AUD1.86 trillion as compared to the next most popular Ethereum with a market capitalisation of approximately AUD630 billion as of March 2024 (<https://coinmarketcap.com>, 2024). Bitcoin was created by a person or group of people going by the pseudonym Satoshi Nakamoto in 2009 (Ante, 2020).

Bitcoin was created after the global financial crisis as confidence in governments and financial institutions had hit a low. The proposers of Bitcoin at the time wanted an alternative currency, which among other things did not need financial institutions as intermediaries and was free from the manipulation of governments (Nakamoto, 2008). They also wanted a system that was secure and did not require users to provide their personal information to other parties to transact (Patterson, 2015). They wanted a system of facilitating payments where parties did not need to provide their name, address, or credit card number for example.

Due to the increase in identity fraud over the years keeping personal information safe has become more important. In Australia, fraud relating to debit and credit cards amounted to \$490 million for the period July 2020 - June 2021. This increased to \$500 million for the period July 2021 - June 2022 (AustralianPaymentsNetwork, 2023).

1.2. Background

1.2.1. Is Cryptocurrency needed?

Change in the financial and economic landscape is nothing new. Profit-seeking individuals and companies have the incentive to develop products and services that help fulfill the needs of individuals and institutions. We can think of ATM machines, drive-in banking, branches, online banking, daily or even continuous interest, credit scores, sweep accounts and so forth.

In many cases new technology has fostered the change. Technological changes guide the innovation in products and indeed enable them. As costs of using technology change, the process of application often speeds up. By the last decade of the twentieth century brokerage costs for trading securities fell and the amount of trading in securities markets increased. Brokerage commissions were deregulated so that market forces could push down the cost of trading. These market forces emanated from substantial and continuous declines in data processing costs. The big factor, then, in leading to lower costs of trading securities was technological (Petruzzi & Elston, 2014). With this in mind, we should expect to see technological factors behind the advent of cryptocurrency. Some of these technological devices or steps will be discussed in section 1.3.

Besides technological advances, basic economic factors set the stage for cryptocurrency. When the inventor of Bitcoin created the first block on the blockchain the following message was attached to it – “The Times 03/Jan/2009 Chancellor on brink of second bailout for banks”. In a post on 11 February 2009, Satoshi stated: “The root problem with conventional currency is all the trust that’s required to make it work. The central bank must be trusted not to debase the currency, but the history of fiat currencies is full of breaches of that trust” (Champagne, 2014). According to Swartz (2018), the unfolding of the global financial crisis undermined the popular trust in and the legitimacy of government institutions and the mainstream financial system.

Satoshi and others were concerned about the monetary history in the twentieth century of expansionary monetary policy which effectively debased the currency leading to inflation. The Reserve Bank of Australia officially attempts to use monetary policy to create an inflation rate between two and three per cent. The actual experience has been an inflation rate much closer to three per cent than to two per cent. Even with a so-called low or moderate inflation rate of 3%, a unit of money will lose half of its real value in less than 24 years. Accordingly, Satoshi did not trust fiat currency nor the central banks that control the fiat currency. Hence, there is a need for a type of money that does not require the blind trust given to the fiat money. So, the big picture with crypto seems to be the desire to develop a money-like asset that may be less exposed to inflation. Other motivations such as secrecy / confidentiality may exist as well.

1.2.2. History of Cypherpunks

Cypherpunk refers to social movements, individuals, institutions, technologies, and political actions that, with a decentralised approach, defend, support, offer, code, or rely on strong encryption systems in order to re-shape social, political, or economic asymmetries (Ramiro and Queiroz, 2022). The movement derived some of its foundations from ideas by David Chaum, a cryptographer, who in 1985 believed computerisation was taking away the ability for people to monitor and control the use of their personal information. He stated that computers could be used to infer individuals' lifestyles, habits, whereabouts, and associations from data collected in ordinary consumer transactions. He wanted the introduction of an electronic cash system that would have privacy and make "big brother obsolete" (Chaum, 1985).

Influenced by Chaum's ideas an electronic engineer Timothy May distributed flyers with a draft of what became known as the *Crypto Anarchist Manifesto* in 1988 and then was officially published in 1992. May and Eric Hughes then organised a meeting of cryptographers, engineers, hackers, and mathematicians to come up with ways they could use encryption to counter surveillance by the state. This group was subsequently nicknamed Cypherpunks (Ramiro and Queiroz, 2022).

In the Manifesto, May (1992) highlighted how advancement in computer technology was then on the verge of giving individuals the ability to communicate with each other completely anonymously. Using cryptography, people could communicate with each other, transact with each other and negotiate contracts electronically without ever disclosing their identities to each other. He did point out

that governments would be against this due to national security concerns and the use of the technology by criminals and tax evaders (May, 1992).

In 1993, Eric Hughes published his own manifesto titled *A Cypherpunk's Manifesto*. In it, he pointed out the difference between transacting in cash and transacting online. When transacting in cash a store clerk would not need to know any details about the purchaser while when one purchases something online personal details of the purchaser would be collected. Hence he highlighted the need for creating systems that would allow anonymous transactions to take place. The onus was put on the group to do this as he pointed out that it was not in the interests of institutions or governments to hand over this level of privacy to individuals (Hughes, 1993).

The cypherpunk mailing list was created in 1992. Though the group members did not necessarily have the same political philosophies, they were mainly bound by the need to preserve their privacy and a free society. Swartz (2018) highlights these differences in philosophies by making a distinction between a cypherpunk and a crypto-anarchist. A cypherpunk believed in the use of technology to cause political and social change as well as to weaken governments and established institutions. A crypto-anarchist did not recognise any laws except laws which could be explained by mathematics and enforced by code.

1.3. History of Digital Currencies

From the Crypto Anarchist Manifesto, being able to choose selectively what personal financial and transactional information one wanted to reveal was very

important to maintaining privacy. Thus, having a payment system that governments and institutions could not get access to a user's personal information was needed for a truly free society. Several attempts were made to achieve this over the years until the introduction of Bitcoin.

To better understand the history of digital currencies this section will be divided into two. The first section will provide brief explanations of some key concepts in cryptography that would be helpful in understanding the section that would follow. Though most of the concepts are scientific in nature and beyond the scope of this study, only simplified explanations that are relevant to the study will be used. The second section would be investigating some digital currencies that were proposed before the introduction of Bitcoin.

1.3.1. Terminology

Cryptography

Communication over the Internet can be non-secure and susceptible to hacking. When communicating, users require that their privacy is maintained and that there is integrity and authentication in the communication system. Data encryption, also known as cryptography, is one of the most efficient ways to maintain privacy and check the integrity of communication systems (Buchanan, 2022). According to Franco (2014), cryptography is the science of communicating securely in the presence of adversaries, who can listen in to and even control the communication channel.

A simple cryptography technique can be illustrated by two users wanting to communicate with each other. They both agree on a certain method of converting

text into a scrambled message that can then be converted back to the original text using that same agreed-upon method. The scrambled message would not make sense to a third party reading it. The conversion of a message from simple plaintext to a scrambled message is called ciphertext encryption. The opposite is known as decryption (Franco, 2014).

The agreed-upon method of converting the text back and forth is known in cryptography as an algorithm. There are two ways of using algorithms. Firstly, using a unique algorithm is when only the communicating parties know the algorithm which is used to encode and decode the message. This would be kept a secret from the public. Secondly, there can be use of a well-known algorithm with the parties involved having a unique key that would be used for the message to be encoded and decoded. Cryptographers recommend the second way. The basis of this is that when the algorithm is made public and subjected to scrutinization by the cryptographic community, it allows for testing and constructive feedback (Buchanan, 2022).

Public key cryptography

Diffie, Hellman and Merkle proposed public key cryptography in the 1970s (Franco, 2014). In the second communication method described above where the users required a secret key to encode and decode the message, a weakness was found. There had to be a way for the users to share the secret key in a secure way before they could start using the algorithm. This led to the introduction of public key cryptography which was proposed in order to try and deal with this weakness.

In using public key cryptography to encrypt a message the intended receiver of the message would first have to generate a pair of public and private keys with the use of a key generation algorithm. The private key and the public key are mathematically connected. The public key would then be sent to the intended sender of the message while the private key is kept secure. After receiving the public key, the intended sender then encrypts the message using this public key and can then send this encrypted message over a non-secure channel to the intended receiver. Even if someone has access to the encrypted message, they would not be able to decrypt it as only the intended receiver would have the private key which corresponds with the public key to decrypt the message (Franco, 2014).

Digital signature

The main focuses of cryptography are to provide privacy for users, prove the identity of the users behind the messages and show system integrity. A private key can be used to provide privacy, and a public key is used to communicate in conjunction with the private key. Using digital signatures is like that of a handwritten signature. It is there to confirm that a message was initiated by the one who signed and that no one had tampered with it. The signature should also be one that cannot be forged hence the person who signs a message must not be able to dispute having signed it (Franco, 2014).

In using digital signatures, firstly, the signer would generate a public-private keypair, with the use of a key generation algorithm. The public key would then be sent to the receiver through the communication channel. Next, they would use the private key that is never shared with anyone to digitally sign the message. The

signing is done using a combination of the private key and a signature algorithm. Thus, the receiver will see a confirmed signature that does not reveal the private key. The signature along with the message are then both sent to the receiver. In this example the actual message is not encrypted however the digital signature serves as proof that the message came from the sender (Franco, 2014).

Hashing

Hashing is used either to hide the original content of a message or to check data integrity. A hash function is an algorithm used to convert data of any random length to an output of a fixed length, which is called a hash value. The hash value will always be the same every time the same input data is used (Franco, 2014).

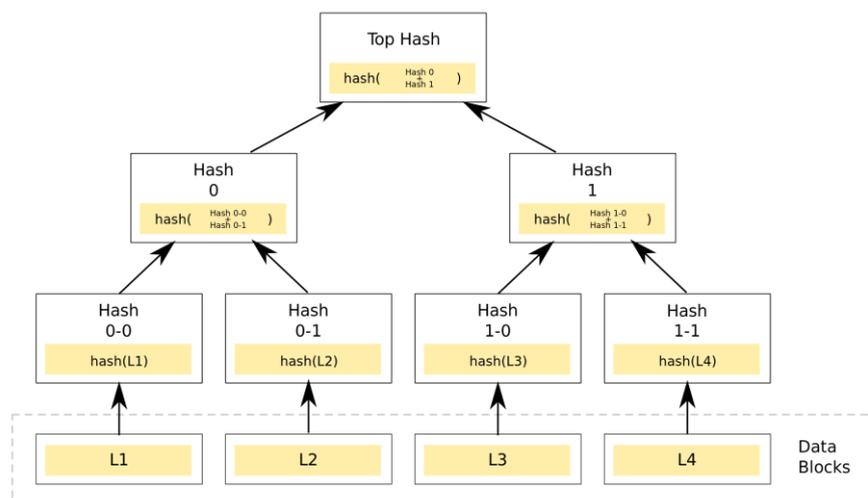
Given a hash value, should not then be able to find out what the input data was. An example of where this concept of hashing is used is in password storage. When a user sets a password for example with a bank, the bank stores the password as the hash value of the input data. This hash value is what the bank should store and compare every time an individual then logs on to their account. Neither the bank nor a hacker obtaining this hash value should be able to find out what the actual password is. When hashed, different inputs should always give different hash values. As such, when people create different passwords with a bank, the hash values stored by the bank should also be different (Franco, 2014).

Merkle tree

A Merkle tree, proposed by Ralph Merkle in 1979, is best described using the below diagram (Mrak, 2018). In the diagram, the letter L and a corresponding number represent different data sets. For storage and transmission purposes these

data sets are then hashed to give the different hash values corresponding to them. Merkle trees (see Figure 1.1) are created by repeatedly calculating hashing pairs until only one hash is left known as the root hash or Merkle root (Borde, 2022).

Figure 1.1: Merkle Tree



This concept is useful as it can be used to ensure that data sets received from users in a peer-to-peer network are received without being damaged or altered. It is also used to efficiently prove that a piece of data was used to generate a Merkle root without having to access all the data. Hence it saves on storage space (Borde, 2022).

1.3.2. Proposed Digital Currencies Proposed Before Bitcoin

Ecash

The concept of Ecash was proposed in a conference paper by Chaum et al. (1990). The system was based on using blind signatures. The concept put forward by Chaum et. al. was like that of a digital signature in which what is contained in a message is disguised before it is signed. As a result, the signer would not have

access to the contents of the message that they would be signing. The person who created the message would thus maintain anonymity (Franco, 2014).

In using Ecash, a user would first have to send to a bank a random serial number with some hidden information. This serial number which would be blinded would then be signed by the bank which would also debit the user's account. The Ecash user then receives a token with a serial number signed by a bank that can then be redeemed by any merchant from that bank. Before the token is signed by the bank, the bank would still have to confirm the user's identity, though it would not have access to the serial number on the token thereby preserving the user's wish not to be traced. No personal information is contained in this token to identify the user unless the user tries to double-spend the token. If the token is given to two different people as a payment, then these two tokens can be used to identify the user by combining them.

The main disadvantages of Ecash were that even though the identity of a double spender could be unmasked if they double spent a considerable amount then simply unmasking them could prove not to be a sufficient deterrent. Secondly, a trusted third party was still required for payments to be processed. That third party could be hacked or could mishandle user funds (Franco, 2014).

Hashcash

Hashcash was proposed by Adam Back in 1997 and described formally in a paper in 2002 (Back, 2002). Though it was not a payment system, Hashcash contained certain properties that were important to the development of Bitcoin.

Hashcash was created as a way of limiting spam emails. Back proposed the addition of hashcash, which is a token to the header of email messages. To create the token some computational power was required however it would be at a very low cost to verify.

Adding the token hashcash to an email header served to confirm that whoever sent the email had used some computational cost to calculate the stamp before the email was sent. As time and money would be required to do this then it would be unlikely that the sender would be a spammer as spammers rely on being able to send numerous emails at a very low cost per email. The receiver would then at a negligible cost to them, be able to confirm that the stamp was valid by computationally trying different numbers until there was a solution found. The hashcash concept was adopted in the bitcoin mining process which will be discussed in the next chapter (Back, 2002, Franco, 2014).

Bitgold

In 1998, Nick Szabo proposed the distributed digital money concept called Bitgold. Unlike Ecash, no central server was required, and a distributed database was used for the storage of the balances users had. The currency was created by using computational power to solve different difficult mathematical problems. This is known as the proof of work concept.

The proof of work of each subsequent problem was linked to the solution of the previous problem. This was done so as to provide the network the ability to change how difficult the proof-of-work problem was at times when money was being

created too quickly. This created a chain hence Szabo is considered the pioneer of the blockchain concept. The Bitgold concept also proposed the use of public keys to identify users instead of using actual personal details as a way of providing pseudo-anonymity to users on the decentralised network. Like Ecash, however, the Bitgold concept did not adequately address the issue of how to stop double-spending.

Though Bitgold was never implemented the ideas were important to the creation of Bitcoin almost a decade after (Franco, 2014).

B-Money

Also in 1998, Wei Dai proposed the distributed digital money concept called b-money (Franco, 2014, Dai, 1998). Also, unlike Ecash, no central server was required, a distributed database was also used to store the balances that users had. B-money was proposed as a pseudo-anonymous, electronic payment system that would be distributed. Each user on the network would have only their public key as their identifier. Like Bitgold however, the b-money concept was never implemented.

The currency was to be created by using computational power to calculate the solution to a complex mathematical problem. The more difficult the problem the more money could be generated with the network deciding on the difficulty of the problem through voting. Users would have to come to an agreement on how much b-money could be created in each period and an auction would be used to determine the cost of creating new money. Also like Bitgold the problem of double spending was not sufficiently addressed.

Dai also proposed in the paper contracts using b-money, where users would transfer funds that would be held in escrow by the network. If the terms of the contract were fulfilled, then the escrow money would be released. If the terms were not fulfilled, then users on the network would decide how to apportion the escrow funds (Franco, 2014).

Auditable, Anonymous Electronic Cash

In a paper in 1999, Tomas Sander and Amnon Ta-Shma put forward the idea of an anonymous digital payment system that did not require the use of blinded signatures (Franco, 2014). The system by not being signature-based would not have any user secret keys that a bank needs to hold and a user's privacy could never be compromised. All actions by the system's bank pertaining to it would be made public and publicly verifiable thereby being easily auditable. This included the issuing of new coins being made public hence being verifiable (Franco, 2014, Sander and Ta-Shma, 1999).

In the system, a hash of its serial number would represent a coin. With the use of a Merkle tree, a bank would hold a list of all the valid coins. The use of a Merkle tree makes it more efficient to store and transmit linked data that continues to grow. If a bank added a value to the Merkle tree it would be required to authenticate that the amount was valid for use for payments. The authentication, which they referred to as stamping is like signing. Any user with access to the data that would have been authenticated could validate a stamp. The validation could occur by using the hash chain which would lead to the root of the Merkle tree. To prove that a coin

belonged to a tree, only the hash chain from the leaf of the tree would be needed (Franco, 2014).

With new coins being added to the Merkle tree, its root would be updated, and the data would be broadcast to the system's participants. There would be several live trees updated periodically with the more frequent live roots being merged into less frequent trees and new trees being created (Franco, 2014, Sander and Tashma, 1999).

1.4. Bitcoin

Satoshi Nakamoto introduced Bitcoin in a whitepaper in 2008. The ideas in the whitepaper sparked interest on the Cryptography mailing list group with their discussions finally leading to the release of Bitcoin in 2009. Bitcoin was initially proposed as an electronic payment system which would be based on cryptographic proof rather than using an intermediary to process and validate transactions. Ten main ideas were discussed in the whitepaper detailing the new proposed digital payment system and how it would work (Nakamoto, 2008).

1.4.1. Transactions

All transactions on the system were proposed to be broadcast on a decentralised peer-to-peer network. No third party would be required to process and approve transactions. The validity of transactions would be confirmed by the consensus of nodes on the platform. Double spending would be deterred as acceptance by the majority of nodes on the platform of the first transaction would mean that trying to use a coin again would not be accepted by the system.

According to Nakamoto (2008), a particular electronic coin was defined as a chain of digital signatures. When the coin's owner wanted to transfer it to someone else, they could do so if they signed digitally the previous transaction's hash and the next owner's public key and then added them to the end of the original coin. The same process would occur if the new owner wanted to transfer that coin to someone else in future. The digital signatures could be used to verify the chain of ownership of the coin (Nakamoto, 2008).

1.4.2. *Timestamp Server*

Once nodes had agreed on processing a transaction, the payee would need confirmation that when the transaction occurred, most of the users would have been in agreement that it was the first to be received. It was proposed that a timestamp server would be used to provide this proof. Using this server, a block of data's hash would be timestamped and posted on the network. This timestamp served as a permanent record of proof that the data would have existed at a certain time. Each new timestamp would then include the previous timestamps in its hash, thereby forming a chain (Nakamoto, 2008).

1.4.3. *Proof of Work*

Adam Back's theories on Hashcash were proposed as the basis for the proof of work system used to implement timestamping on the decentralised network. A CPU would have to expend energy to find a solution to a complex mathematical question to satisfy the proof of work requirement. Once this is done then it would be possible to make any changes to the block without having to redo the work and

expending the CPU energy. As more blocks are chained to this block, the CPU power required to make any changes would include redoing all these other blocks as well.

As the system was to be based on the consensus of the majority, the longest chain being accepted would represent the proof of work accepted by the majority. The majority consensus was on the basis of one-CPU-one-vote as opposed to one-IP-one-vote as someone could easily use a different number of IP addresses to subvert the system. Using a CPU requires energy. With most of the CPU power on the system being in control of what were termed honest nodes, an honest chain would always grow at a rate that is faster than that of any chains competing against it. As computer speeds increased and the mathematical problems got solved faster the system would counter this by increasing the complexity of the mathematical problem (Nakamoto, 2008).

1.4.4. Network

Nodes on the network would show that they have accepted a block as being valid by starting work on extending that block using its hash to create the next block. In a scenario where two nodes come up with differing outputs for the next block at the same time, then some nodes could receive one and some the other. Nodes would have to continue working on the one they received initially while the other would be saved in case it ended up becoming the longer one. One of them would then become longer once the next proof of work is completed. Users working on the one that would now be shorter would discard it and switch to the longer one.

The broadcasting of blocks on the network would happen regularly and would be sensitive to nodes missing messages. Hence if a node missed a message, it would request it when it received the next block and the system would immediately realise there is data missing and add it to the node's files (Nakamoto, 2008).

1.4.5. Incentive

An incentive was proposed to not only get users to keep the system running but also to act as a disincentive to a user wanting to defraud the system and other users. By completing proof of work first, users would be rewarded with new coins. Each new coin would represent the first transaction in a block.

Another purpose of the incentive was to provide a way for which coins could initially be put into circulation systematically according to mathematical code. Once the limit in the protocol of new coins is reached then the incentive would move to transaction fees instead of new coins. The incentive of the new coins was likened to a gold miner using energy and other resources to mine gold while a digital coin miner would expend CPU power to add digital coins into circulation (Nakamoto, 2008).

1.4.6. Reclaiming disk space

Merkle trees were proposed as the solution to the problem of the size of the data to be stored growing as more transactions are recorded and added to blocks. Once a transaction in a coin was buried in a certain number of blocks, then to save disk space that transaction could then be discarded. Transactions would be hashed using a Merkle Tree, and only its root would be added to the block's hash (Nakamoto, 2008).

1.4.7. Simplified Payment Verification

For a user to verify payments, all they would need to have would be the longest proof-of-work chain block headers and the branch of the Merkle that would be linking that payment to its timestamped block. The longest proof-of-work chain's block header could be generated by querying the nodes on the network until satisfied that the longest chain has been obtained. Though an actual transaction might not be checkable, linking it to a particular place in the chain could allow users to see that a network user had received coins and the blocks added after that transaction would also confirm that the network had accepted the transaction (Nakamoto, 2008).

1.4.8. Combining and Splitting Values

To make it possible for values to be combined and separated, a transaction on the network could have different inputs and outputs. A large transaction could be represented in two different ways. Firstly, there could be one input from a bigger transaction previously and a maximum of two outputs representing what was the payment and what would be the change after the payment. Secondly, there could be several inputs combined from small amounts and again at most two outputs representing the payment and the change.

1.4.9. Privacy

Privacy on the network would be maintained by keeping public keys anonymous. With all transactions being broadcast on the network, the public would be able to see that someone's digital currency was transferred from one owner to another without being able to link the transaction to a particular individual.

To try and maintain this level of privacy, a new key pair was recommended for use for each new transaction to avoid transactions being used to link them to a particular user. It was noted, however, that for multi-input transactions linking was unavoidable (Nakamoto, 2008).

1.4.10. Calculations

Finally, using the laws of probability, Satoshi showed that the network was secure from attack by dishonest nodes. Attackers could attempt only to change one of their own transactions so they could try to reverse money they would have spent recently. Considering the CPU power required to go against the network the incentive point would then come into play. If the attacker had that much power available, then it could be better spent mining for coins than going against the network (Nakamoto, 2008).

1.5. Conclusion

The history of cryptocurrencies is based on pioneers wanting a payment system that governments and institutions could not have access to a user's personal information. They believed that this was what was needed for a truly free society. Several attempts were made to achieve this over the years and were not successful until the introduction of Bitcoin.

The main objective of this study is to investigate what the barriers to the adoption of cryptocurrencies are. To achieve this the research firstly aims to identify how Bitcoin has evolved from what its inventors intended it to be to what it and other

cryptocurrencies are in 2024. This information is vital in analysing if there are any barriers inherent in cryptocurrencies affecting their full embrace.

Secondly, the research looks at how the increase in the use of cryptocurrencies has influenced regulations in different countries. This assisted in highlighting if there are regulations, or the lack thereof, that are affecting the acceptance of cryptocurrencies. To achieve this a systematic literature review was conducted into research on cryptocurrency regulations.

Finally, using the innovation resistance theory proposed by Ram and Sheth (1989) an investigation was done into what individuals perceived to be barriers to their adoption of cryptocurrencies. This was done in two stages. Firstly, 20 respondents were requested to complete open-ended questionnaires that were then analysed. Following this, online surveys with Likert scale questions were then completed by 531 respondents, which were then also analysed.

The following chapter will be a two-part literature review of previous studies pertaining to cryptocurrencies. In the first part, there will be an analysis of the evolution of cryptocurrencies using previous literature. In the second part, there will then be an analysis of previous studies on technology adoption and how they relate to cryptocurrencies.

Chapter 3 will look into the research philosophy, methodology and methods used in the study. Chapter 4 is the systematic literature review of research on cryptocurrency regulations. Chapters 5 and 6 are the data analysis chapters for the

qualitative and quantitative aspects of the study respectively. Finally, Chapter 7 provides a discussion and conclusion of the study.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The first research papers containing Bitcoin as a topic started appearing in 2012 (Merediz-Solà and Bariviera, 2019). Over the years there has been growth in the number of research papers on cryptocurrencies and Bitcoin in particular. Due to the nature of cryptocurrencies the range of topics varies across disciplines like finance, economics, computer science, mathematics, and engineering. Topics have varied from looking at understanding how blockchain works (Zheng et al., 2018) to looking into the economics of Bitcoin price formation (Ciaian et al., 2016).

Bitcoin as a system has evolved since its creation in 2008. It was initially proposed as a version of peer-to-peer electronic money allowing for online payments without the need for intermediaries such as banks. Its design made sure transactions were irreversible; there was a limit to money creation and an online ledger providing public transaction history (Nakamoto, 2008, Böhme et al., 2015).

2.2 Features of Bitcoin

The major proportion of the cryptocurrency market is concentrated on bitcoins. The three foundational features of bitcoin such as money supply, mining and wallets are discussed below.

2.2.1 *Money Supply*

The creators of Bitcoin were against a system where a central issuing authority such as a reserve bank was in charge of the control of the money supply.

They believed such authorities continuously violated the trust of the public by irresponsible printing of money leading to inflation (Champagne, 2014). Bitcoin became the first way to provide complete scarcity of money supply (Böhme et al., 2015).

The issuing of coins was made part of the Bitcoin protocol and can only be changed by changing the protocol. Changing the protocol requires the consensus of the users on the network. All new coins are issued according to the protocol as rewards to those who use their computer power to validate transactions. This concept is known as mining. According to the protocol new coins are issued at a diminishing annual rate, with the number of coins in circulation set to max out at 21 million around the year 2140. At the end of 2021, about 19 million had been released (White, 2023).

In response to the Global Financial Crisis (GFC) and the COVID-19 pandemic, several governments implemented financial stimulus packages to save their economies from collapsing. The Australian government for example implemented measures at a cost of AUD90 billion in response to the GFC and AUD320 billion in response to the COVID-19 pandemic (Wilkins et al., 2020). These measures have been credited with keeping the Australian economy strong. However, these same measures are also now partly being blamed for the high inflation rates being experienced by the developed economies.

Though the proponents of taking stimulus measures away from governments may be correct regarding how these measures lead to inflation, I have not been able

to find any research supporting alternative options to deal with economic situations arising from events like the GFC and the COVID-19 pandemic. It can be argued that governments are to blame for events leading to the GFC however the COVID-19 pandemic was different. Governments still had to find ways of adding money to the healthcare sectors, keeping people safe and in jobs.

According to White (2023), the benefit of the method of Bitcoin money supply is that it avoids money supply shocks. However, the disadvantage is that it rules out any supply response to changes in demand for it. As a result, the changes in demand directly affect the market price of Bitcoin adding to its volatility.

2.2.2 Mining

Transaction verification on the Bitcoin system and controlled supply of bitcoins is done using what is called mining. Bitcoin mining refers to the situation whereby computers verify transactions by competing to solve mathematical equations. The user with the computer that solved the problem first is given bitcoins as a reward. There has been research into how the mining process has evolved over time.

Rose (2015) highlighted that the mining of Bitcoin was initially meant to be accessible to everyone on the Bitcoin network using ordinary personal computers. Over time the mathematical equations have become more complex and can now only be solved more efficiently by dedicated equipment. This equipment is expensive and uses a lot of power. According to Jones et al. (2022), it is estimated that in 2020 Bitcoin mining used 75.4 TWh of electricity. This energy was more than that used

during that time by countries like Austria and Portugal which used 69.9 TWh and 48.4 TWh respectively. This has led to concerns by climate change advocates.

Delgado-Mohatar et al (2019) studied the evolution of the production cost of bitcoins across time. They found, as of June 2018, that the mining of bitcoin was not profitable for miners whose cost of electricity was over 0.14 USD/kWh. This has led to Bitcoin mining being further centralised to countries with low energy costs. At the time of their research mining was mainly done in China. Subsequently, China cracked down on the mining of bitcoins in the country in 2021 leading to no mining at all in July and August 2021. New mining operations emerged in China with workarounds on the ban resulting in mining activity rising to 22% of world Bitcoin mining activity in September 2021. As of January 2022, data from Statista.com show that now the United States is the country where most of the mining is done: 38% in the USA and 21% in China.

2.2.3 Wallets

Creating a wallet for bitcoins did not require providing any personal information to any entity as is required when opening a bank account. Once an individual created a wallet, a public key and a private key would be assigned to that wallet. The public key is what everyone who has access to the Bitcoin software can view. The private key is what is used to authorise transactions in the same way a signature is used to authorise a cheque payment (Patterson, 2015). The original concept was to build a trustless system (Nakamoto, 2008).

Using public and private keys which do not have any identifying information of the users meant that there would be no chance of identity fraud because of hackers obtaining personal information of Bitcoin users. None of the keys are linked to a particular person's name and there would be no way to get other information such as a person's date of birth. This contrasts with payments made for example by a credit card. Pseudo-anonymity was another key concept to the original Bitcoin system (Nakamoto, 2008, Champagne, 2014).

2.3 Evolution of Cryptocurrencies

As Bitcoin evolved intermediaries became involved that promoted centralisation to its ecosystem. Examples are Digital wallets, Currency Exchanges, Mining pools and Mixers (Böhme et al., 2015). Decentralisation was a major motivation for the introduction of Bitcoin. However, due to limitations in the original ecosystem, there was a vacuum that could only be filled by intermediaries. This has led the system towards centralisation. Centralisation has exposed the Bitcoin ecosystem to the same issues present in the existing financial systems such as hacking leading to users having their money and personal information stolen (DeVries, 2016).

2.3.1 *Digital wallets*

The original Bitcoin wallet was set up in a way that it would be on the user's device. As such the user's bitcoins would also be on that device. When the user wanted to spend or transfer their bitcoins, they would use their private key to do so from that wallet. This led to issues for users whose devices either crashed or forgot their private keys. Either one of these issues would mean losing their bitcoins.

Digital wallets were introduced to combat these issues. Digital wallet services keep a user's data on a server that is shared, and the data can be accessed over the Internet. There are two types of digital wallet services. Firstly, some let a user keep control of their private keys so that the service or any potential hackers would not be able to spend the user's bitcoin. The user still, however, has the risk of losing their private key. The second service controls the user's private keys. This is ideal for the user who is afraid of the device crashing or losing their private key. However, they then have the risk of the wallet service misappropriating their funds or hackers getting access to them (Böhme et al., 2015).

2.3.2 Exchanges

The first Bitcoin currency exchange, Bitcoinmarket.com, was established in February 2010 (Pagliery, 2014). The proposer of the first exchange intended it to be a platform where people could buy and sell bitcoins using fiat currencies thereby giving some market value to bitcoins. Bitcoin currency exchanges have evolved now to also offer clients leveraged and non-leveraged investment opportunities. As currency exchanges hold individuals' personal information, they need an online infrastructure capable of withstanding attacks (Böhme et al., 2015).

Centralisation has also opened the door to users losing their bitcoins as some exchanges collapsed. Trace Mayer proposed an initiative called Proof of Keys. This initiative encourages all Bitcoin users who have their bitcoins with exchanges to withdraw their bitcoins on the 3rd of January each year, which is Bitcoin's anniversary. This initiative has resulted in some exchanges collapsing, as they were unable to fulfil the withdrawal requests by clients.

Mayer believes this initiative supports a key fundamental of Bitcoin, namely that it should be a trustless system. The inventors of Bitcoin used the term trustless system to signify that users should not have to trust other users, as the system would be inherently secure. It is believed that some exchanges could be accepting payments from their clients in exchange for bitcoins when in fact the exchange does not have the bitcoins. They will simply provide the client with an account balance showing that they are owners of some bitcoins. However, if all clients then decide to withdraw their account balances on the same day it then exposes the unscrupulous exchanges (Mayer, 2019).

Hoang and Baur (2022) found that bitcoin investors preferred holding their coins in private wallets as opposed to exchanges as they used the exchanges mainly for trading purposes. They argued that this is so mainly due to concerns about the risk of losing their coins due to risks of events like an exchange becoming insolvent or absconding with client funds. According to coinglass.com exchanges held 2.2 million bitcoins in August 2022. This amount fell to 1.9 million bitcoins in August 2023. To put the exchange holding of bitcoins in perspective, at the end of 2023, there were approximately 19.5 million bitcoins in existence.

2.3.3 Mining Pools

Mining pools were established because the cost of mining bitcoins increased over time, making it too expensive for individuals to mine. In mining pools, individuals combine their resources and share earnings. Pooled mining causes centralisation in the Bitcoin system by granting a lot of power to a few pool operators (Haghighat and Shajari, 2019). According to Tovanich et al. (2022), mining pools contributed to

approximately 99% of the total computational power on the Bitcoin network and individual miners have become very rare.

Centralisation caused by mining pools has also caused concerns for the integrity of the system that was built around decentralisation being an important aspect (Beikverdi and Song, 2015, Corradi and Pagliaro, 2021). The inherent security was partly attributed to the numerous participants in the mining process. However, due to the increase in the cost of mining, individuals are forced to join the mining pools and form mining server farms leaving the control of the majority of the blockchain operations to a group of individual nodes (Praveen et al., 2022).

2.3.4 Mixers

Mixers are used to combine user transactions on the Bitcoin network to make it harder for a transaction to be traced back to the users. Mixers allow users to pool sets of transactions in different unpredictable combinations, thereby preventing someone from using a particular transaction to track a user (Böhme et al., 2015).

The use of mixers has however been linked to money laundering. According to See (2023), the United States of America Financial Action Task Force released a report highlighting that mixers were a key risk for the money laundering of virtual assets. The US authorities sanctioned Tornado Cash, a provider of mixing services, for allegedly facilitating the laundering of approximately US\$7bn worth of virtual currency.

2.3.5 ATMs

Bitcoin ATMs are now also in use in several countries. There are two types of Bitcoin ATMs, one which allows users to buy bitcoins and the other which allows users to both buy and sell bitcoins. According to Statista.com, there were approximately 39,000 Bitcoin ATMs globally. The first Bitcoin ATM in Australia was installed in Sydney in 2014. No physical bitcoins can be withdrawn from the ATMs, as they are digital currency. However, the fiat currency converted equivalent can be withdrawn. The use of zero-confirmation transactions such as ATM transactions has led to the possibility of double spending (Pérez-Solà et al., 2019). When a withdrawal of fiat currency is made at a Bitcoin ATM, the transaction will be pending on the Bitcoin system for a short period of time until verified by the mining process. This creates the possibility of double spending occurring.

2.4 General Barriers to Adoption of Cryptocurrency

Due to the emergence of cryptocurrencies, the financial landscape has been revolutionised as they offer a decentralised and secure method of transacting as opposed to traditional fiat currencies. However, there are multiple barriers to the widespread adoption of cryptocurrencies (O'Dair, 2018; Kaur, Dhir, Singh, Sahu, & Almotairi, 2020). We will now discuss the types of barriers.

2.4.1 Technical Barriers

The inherent complexity of underlying technology is the major obstacle to the adoption of cryptocurrencies. For instance, individuals with a non-technical background or no technical expertise often find blockchain technology challenging to grasp. As such, it results in misconceptions, confusion and resistance to getting

involved with cryptocurrencies (Lee & Low, 2018). Similarly, technical infrastructures such as exchanges and digital wallets within the cryptocurrency ecosystem, or the process of navigating exchanges and securing private keys can be confusing and intimidating for new users which hinders their adoption potential (Christensen, McDonald, Altan, & Palmer, 2016).

2.4.2 Usability Barriers

The transactions in cryptocurrencies involve a complex understanding of blockchain technology and cryptography, which might not be perceived as being user-friendly to many people. The user interface of cryptocurrency platforms lacks perceived usability as reported in the literature and the design of usable applications is not understood well (Alshamsi & Andras, 2019). High usability barriers can hinder the potential benefits for people with low technology affinity. The poor design of the applications contributes to low adoption, as an application not being user-friendly would generate a negative impression on users such as they would get frustrated and discouraged (Frohlich, 2022).

2.4.3 Regulatory Barriers

Governmental and regulatory bodies also contribute to determining the widespread adoption of cryptocurrencies and implementation of blockchain, as the cryptocurrency regulatory landscape is in the nascent stage (Christopher, 2014). Regulatory uncertainties in terms of legal and compliance risks create apprehension among individuals that prevent them from adoption. In addition, blockchain technology can reduce the extent of reliance on trusted intermediaries, who constitute the regulatory framework (Risius & Spohrer, 2017). Though pioneers of Bitcoin may not have supported this, regulating this decentralised technology is

crucial to safeguarding consumer rights and ensuring compliance with the law by technology stakeholders (O'Dair, 2018).

2.4.4 Economic Barriers

The underlying volatility of cryptocurrency markets shows an association with economic barriers due to the unpredictable nature of cryptocurrency prices, which increases the risk of loss and prevents user adoption of cryptocurrencies for investment or transactions (Auer & Tercero-Lucas, 2022). Furthermore, these barriers can be explained through the concept of the bandwagon effect and herd behaviour, common in economics (O'Dair, 2018). Many sectors are seeking to align with the trend of "blockchain" and adopt it, regardless of its fit with their context. There is a widespread inclination to use blockchain for every issue or disrupt stable systems. However, experts have argued for a discerning approach, emphasising the importance of identifying specific problems that align with the technology's unique attributes (O'Dair, 2018).

2.4.5 Social Barriers

Social perceptions can be viewed as strong factors in determining the adoption of new technologies (Pena De Carrillo, Rosa, Carrillo Pena, & Pharrow, 2018). The common negative connotations and association of cryptocurrencies with fraudulent or illicit activities also affect user inclination towards its adoption. In addition, a lack of awareness and public understanding about the potential and the benefits of cryptocurrencies results in distrust and suspicion among the people. The success of businesses is intricately tied to social traditions, deeply ingrained in society. Any challenge to these traditions can lead to consumer criticism, exhibited through boycotts, negative publicity and word-of-mouth (Kaur, Dhir, Singh, Sahu, &

Almotairi, 2020). Social barriers arise when innovations disrupt users' routines, culture, and behaviour, negatively impacting adoption intentions for new innovations (Antioco & Kleijnen, 2010).

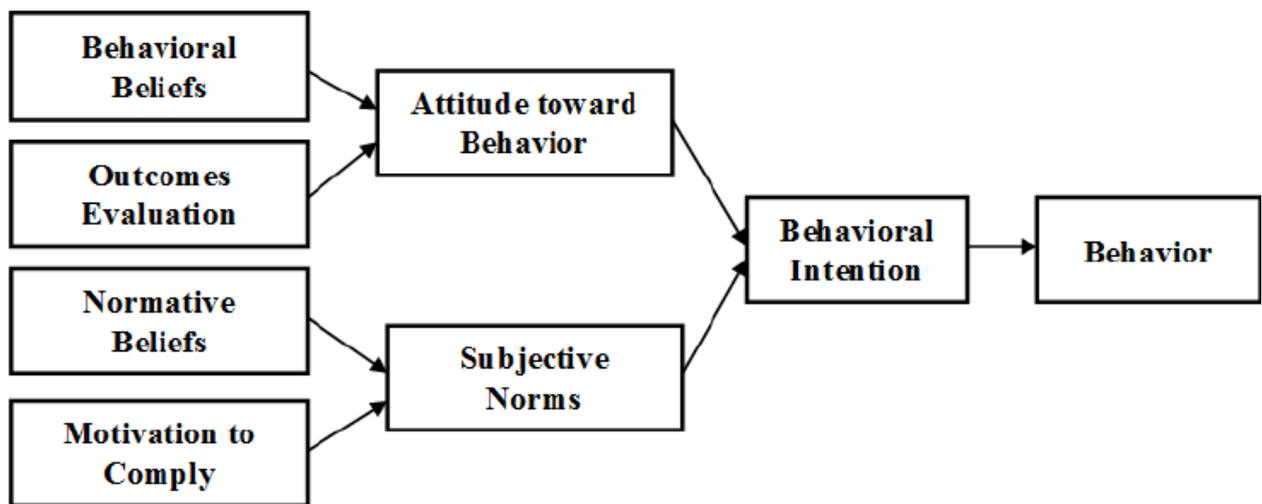
2.5 Theoretical Frameworks

Several models have been proposed over time in an attempt to explain how individuals accept or reject new technologies. These models or theories have been referred to as technology acceptance models. Like with other technological innovations, researchers have used technology adoption theories to find out how cryptocurrencies have been adopted since their inception. An analysis of these models is provided in this section.

2.5.1 Theory of Reasoned Action (TRA)

It is the first technology adoption model and was developed by Fishbein and Azjen in 1975. According to the theory, behaviour is determined by behavioural intention. Behavioural intentions in turn are determined by personal and social factors. Personal factors were proposed to be the function of beliefs of the consequences perceived to be the result of performing a behaviour and a person's view of these consequences. Social factors on the other hand were a function of a person's beliefs regarding their reference groups (Vallerand et al., 1992). The theory is depicted in Figure 2.1 (Octav-Ionut, 2015).

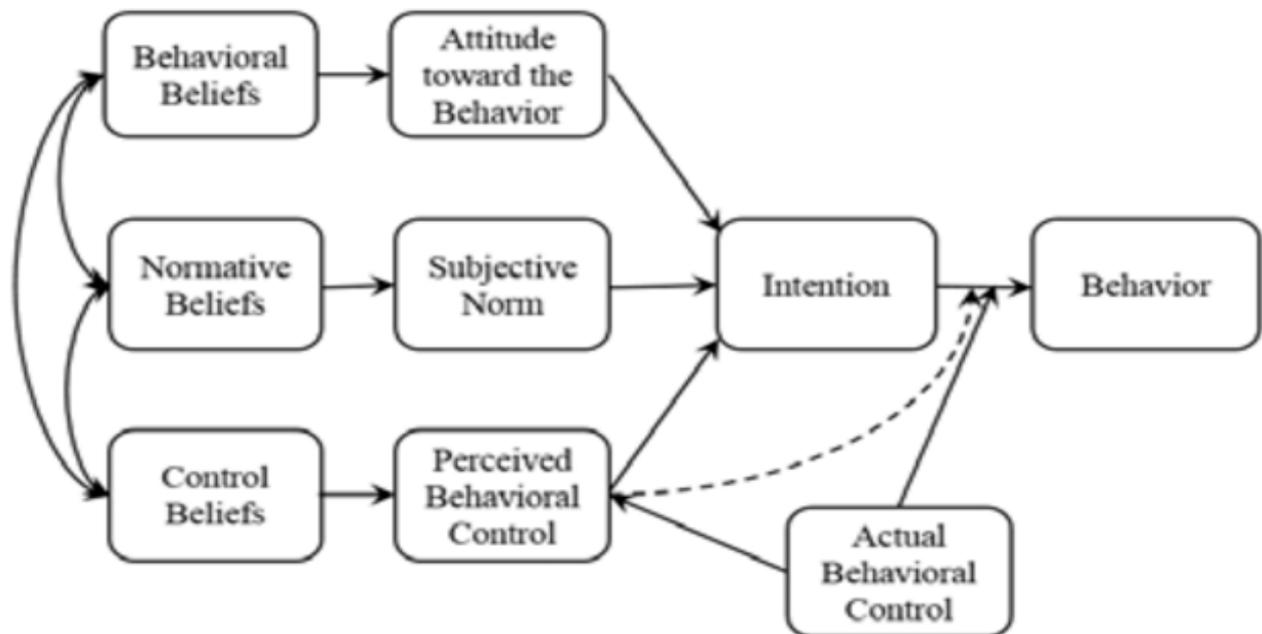
Figure 2.1: Theory of Reasoned Action (Ajzen and Fishbein, 1980)



2.5.2 Theory of Planned Behaviour (TPB)

The theory of planned behaviour is an extension of Ajzen & Fishbein's theory of reasoned action. According to TPB adoption of cryptocurrency can be determined by three factors, namely: attitudes such as perception and beliefs, subjective norms such as the influence of friends, family and social groups and perceived behavioural control such as individual access to cryptocurrency exchanges and wallets. The original model had limitations of not considering behaviours which people had incomplete control over. Figure 2.2 is a depiction of the model. In TPB behaviour depends on motivation (intention) and ability (behavioural control). Perceived behavioural control refers to the perception a person has of how easy or difficult performing the behaviour would be. This is different from actual behavioural control where resources and opportunities available to a person will to an extent dictate the likelihood of behavioural achievement (Ajzen, 2015).

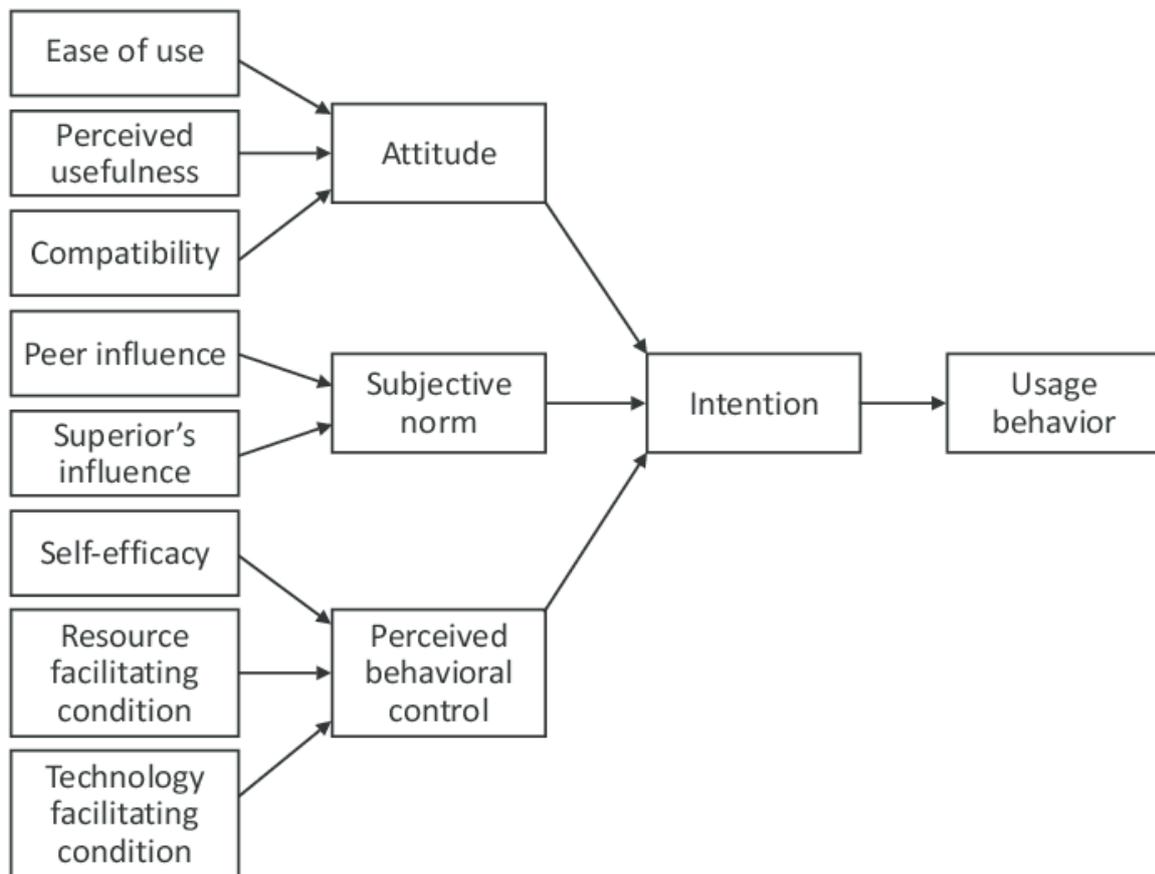
Figure 2.2: Theory of Planned Behaviour (Ajzen, 1991)



2.5.3 Decomposed Theory of Planned Behaviour (DTPB)

The DTPB is an extension of the TPB and was proposed by Taylor and Todd in 1995 (Taylor and Todd, 1995). It expands from the TPB by including relative advantage, compatibility, and complexity. These factors were obtained from the theory of Innovation Diffusion. The model also expanded on the dimensions of social influence and perceived behavioural control by decomposing them into specific belief dimensions. Taylor and Todd (1995) proposed that the advantages of the model were that it identified specific salient beliefs that could influence IT usage because it incorporated additional factors, such as the influence of significant others, perceived ability and control. It is depicted in Figure 2.3 (Chawinga and Zinn, 2016).

Figure 2.3: Decomposed Theory of Planned Behaviour (Taylor and Todd, 1995)

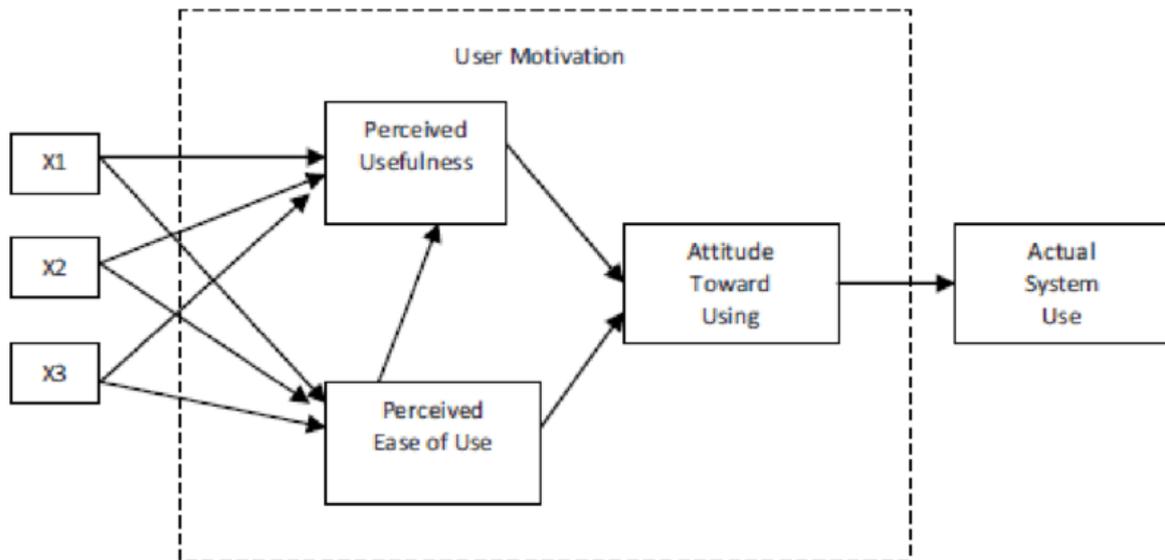


2.5.4 Technology Acceptance Model (TAM)

Davis proposed the TAM in 1986 in his PhD thesis. Unlike in the TRA, the perceived usefulness and the perceived ease of use were used instead of the attitude towards a behaviour. According to perceived usefulness, a person tends to use something based on their belief of whether it would help them perform a task better or not. Perceived usefulness is defined as the degree to which a person believes that using a particular system would enhance job performance. Perceived ease of use on the other hand represents the extent to which a person believes the use of something would not require effort. If potential users believe that an application is useful, they might also believe that the system is too hard to use and

that the performance benefits of usage are out-weighed by the effort of using the application (Davis, 1986). The model is represented in Figure 2.4 below (Lai, 2017).

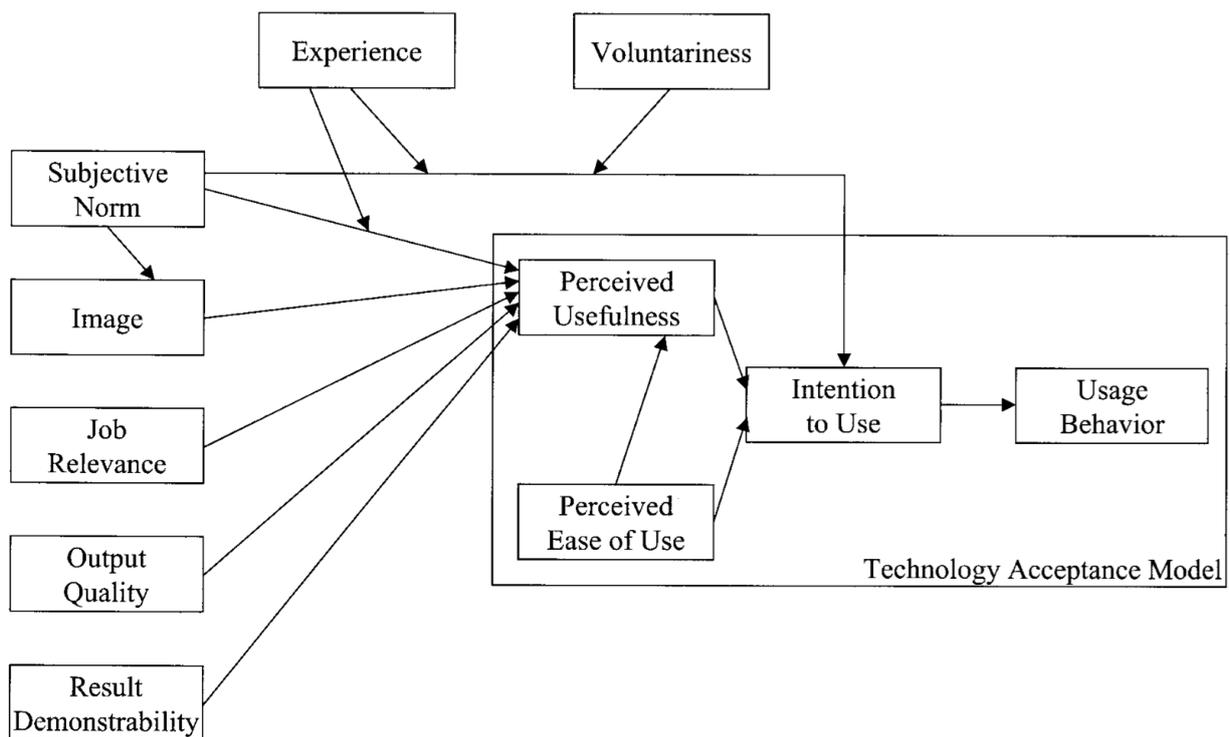
Figure 2.4: Technology Acceptance Model (Davis, 1986)



2.5.5 Extended Technology Acceptance Model (TAM2)

Venkatash and Davis extended the TAM in 2000 to incorporate additional theoretical constructs. The constructs added were: subjective norm, voluntariness, image, job relevance, output quality and result demonstrability. Their research found that both these constructs significantly influenced a user's acceptance of technology. The model is shown in Figure 2.5 below (Venkatash and Davis, 2000).

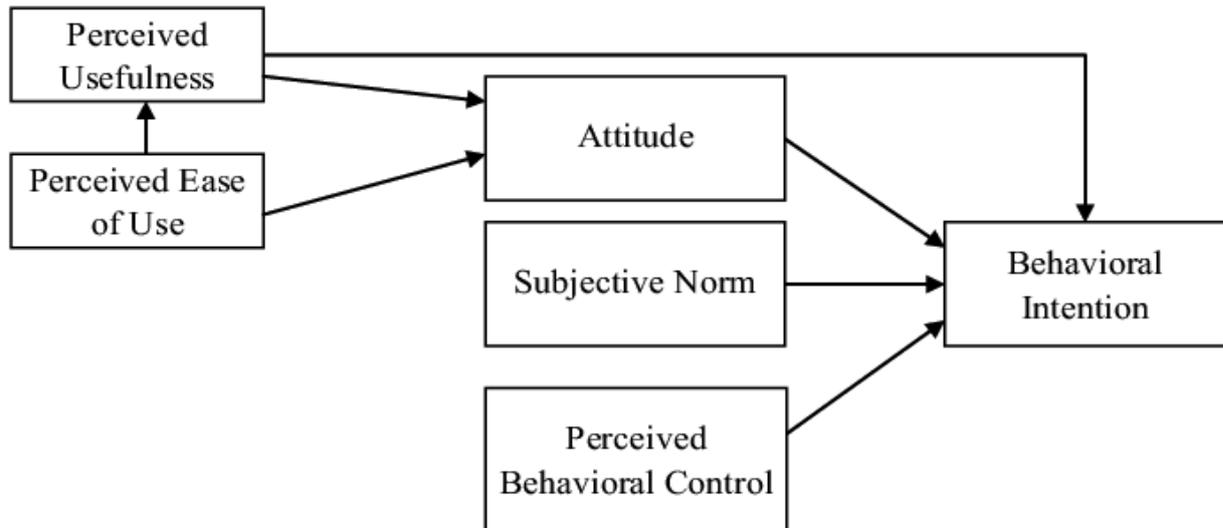
Figure 2.5: Extended Technology Acceptance Model (Venkatesh and Davis, 2000)



2.5.6 Combined TAM and TPB (C-TAM-TPB)

Taylor and Todd developed this theory by combining the TPB and the TAM models in 1995. They combine the TPB with perceived usefulness from TAM. This is represented by Figure 2.6 below (Tan, 2013).

Figure 2.6: Combined TAM and TPB (Taylor and Todd, 1995)



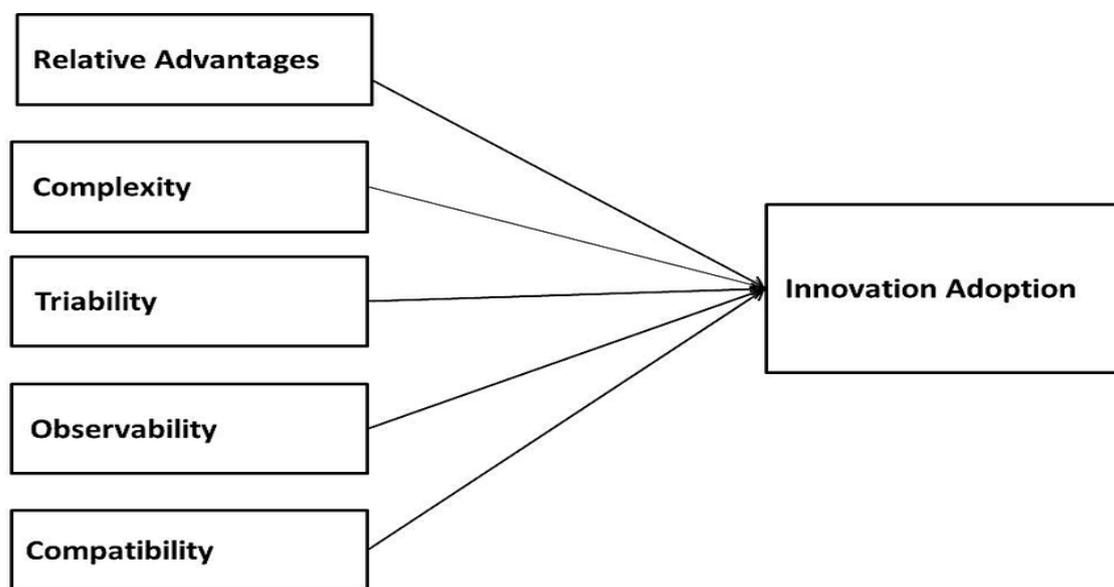
2.5.7 Innovation Diffusion Theory (IDT)

Initially proposed by Rogers in 1962, IDT was further explained by Rogers (2003). Four main items were proposed to determine behaviour namely, innovation, communication, time, and social system. For instance, innovation would present an idea perceived as being new by someone. Communication refers to how people would share information with each other so they could come to an agreement. Time was included as time is relevant throughout the whole process of innovation diffusion. Lastly, the social system is a combination of all related units involved in the goal of solving a problem.

According to Rogers, the process of innovation to decision was one that involved seeking information as well as processing that information. The motivation is trying to lower the uncertainties about the pros and cons of an innovation. According to the model five constructs affected adoption intention. First, a relative advantage is the degree to which a new technology is viewed as being better than what it aims to replace. Second, compatibility is the degree to which the technology is looked at as being aligned with the values, experiences, and needs of the potential

users. Third, complexity is the users' perception of how relatively difficult to understand and use an innovation is. Fourth, trialability is the degree to which the technology can be used on a limited or trial basis. Fifth, observability refers to the extent to which the results of an innovation can be seen by others (Tan, 2013). The process is represented in Figure 2.7 below.

Figure 2.7: Innovation Diffusion Theory (IDT) (Rogers, 1995)

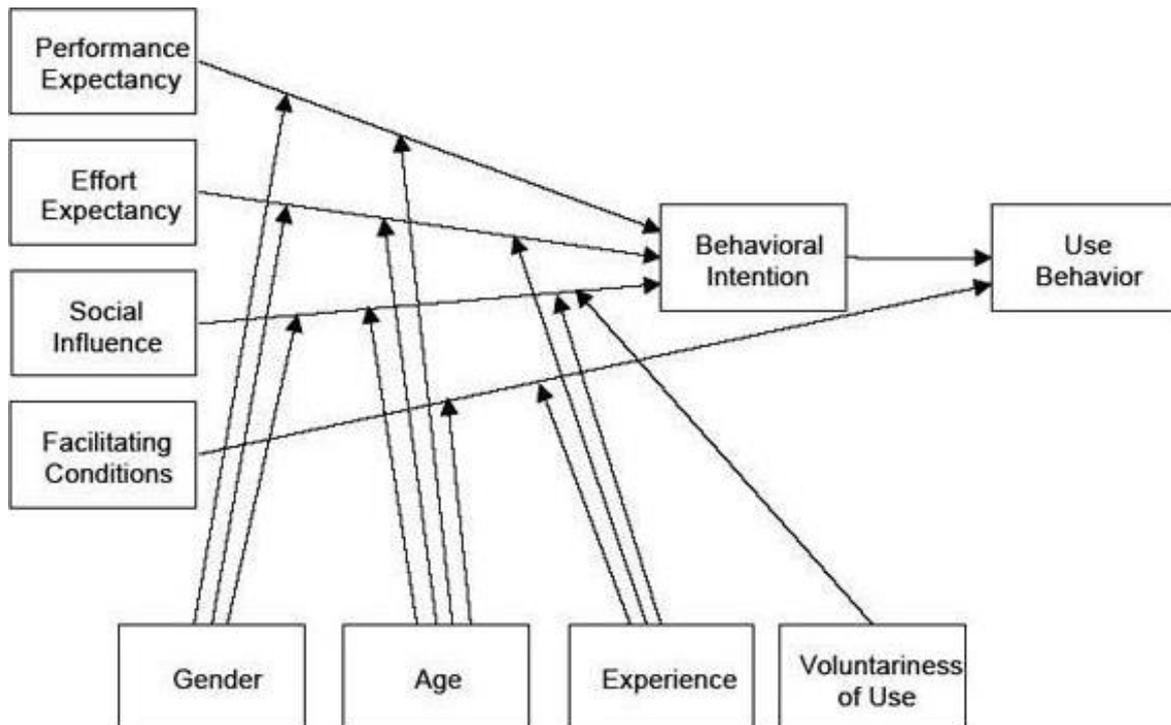


2.5.8 Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh et al (2003) used an analysis of eight adoption models to come up with the UTAUT. The models were the Technology Acceptance Model, the Theory of Reasoned Action, the combined TAM and TPB, the Theory of Planned Behaviour, the Model of PC Utilisation, the Diffusion of Innovation, the Motivational Model, and the Social Cognitive Theory. They identified fourteen constructs from the eight theories. These were then grouped into four, namely: performance expectancy, effort expectancy, facilitating conditions and social influence. A further four variables were

identified and added to the model, namely: age experience, gender, and voluntariness of use. Figure 2.8 below shows the model (Venkatesh et al., 2003).

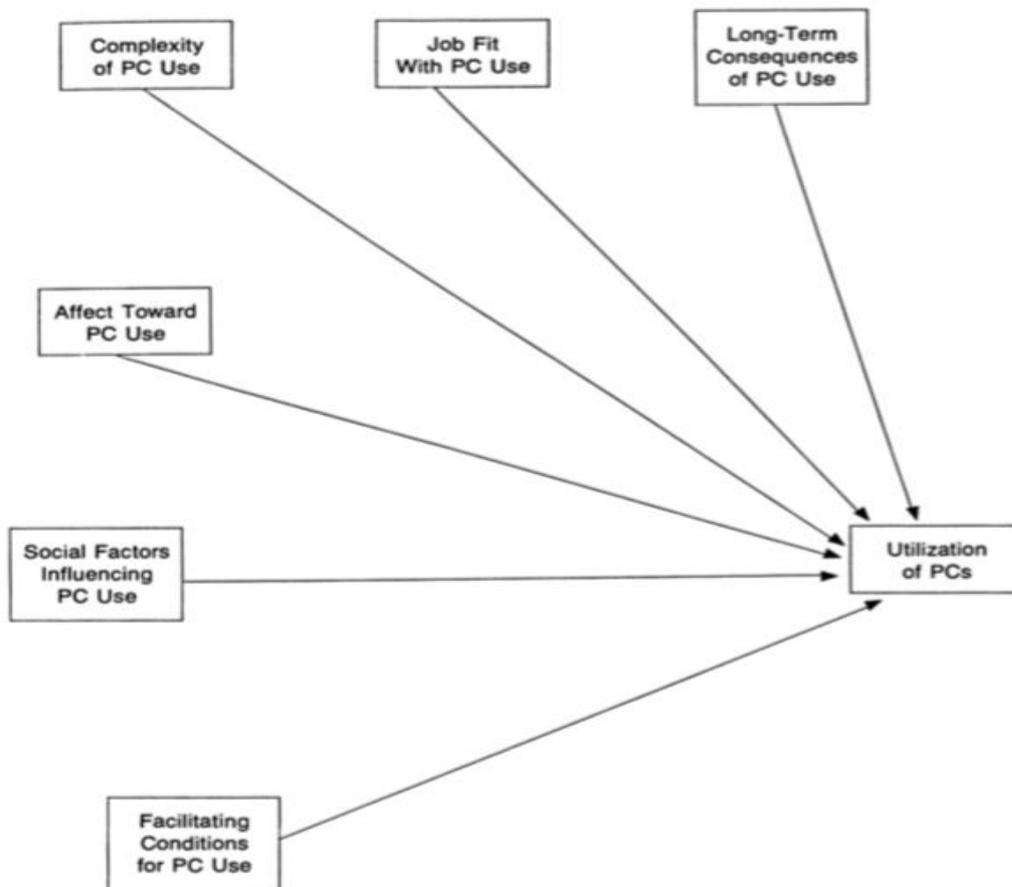
Figure 2.8: Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003)



2.5.9 Model of PC Utilisation

This model was proposed by Thompson et al (1991). They proposed that social factors, perceived consequences, effects, and facilitating conditions were responsible for determining behaviour. The intention of usage was not part of their model while complexity and job fit were added to it. The model assumed that the users had experience using computers voluntarily in their jobs. The model is shown in Figure 2.9 below (Thompson et al., 1991).

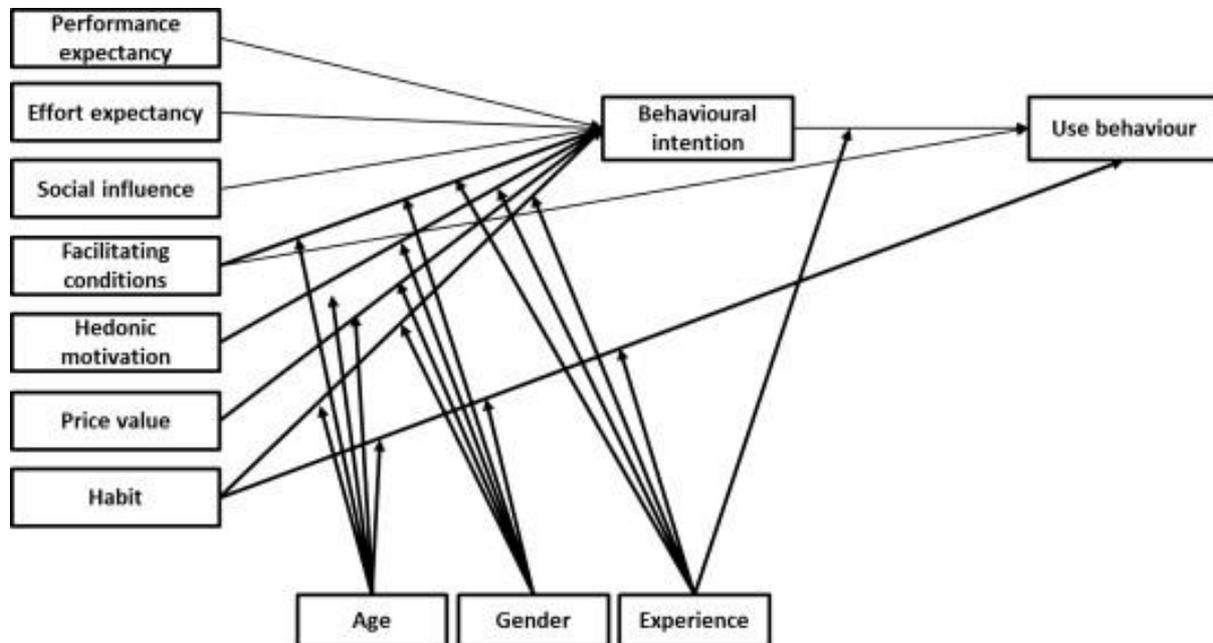
Figure 2.9: Model of PC Utilisation (Thompson et al., 1991)



2.5.10 Unified Theory of Acceptance and Use of Technology 2 (UTAUT2)

Venkatesh et.al. incorporated three other constructs into UTAUT: price value, hedonic motivation, and habit which extended UTAUT into UTAUT 2 (Venkatesh et al., 2016). Hedonic motivation shows the extent of individual belief about the benefits of technology, that is, people would be more likely to adopt innovation if using it was enjoyable. Price value refers to the perceived cost and benefit trade-off. Habit demonstrates the ingrained behaviour of using technology as a consequence of repeated behaviour. In this model, gender, age and experience play as moderating variables.

Figure 2.10: Unified Theory of Acceptance and Use of Technology 2 (Venkatesh et al., 2016)



2.6 Summary of Research Studies

Previous research into the adoption of cryptocurrencies has looked mainly into enablers of the adoption of cryptocurrencies. Previous research has used several theories to investigate users' adoption of cryptocurrencies. Nadeem et al (2021) and Abramova & Böhme (2016) used the Technology Acceptance Model in their research. Sohaib et al (2019) used a combination of the Technology Readiness Index (TRI) and the Technology Acceptance Model (TAM) to predict the use intention of cryptocurrencies.

The table below shows a summary of some of the research that has been carried out on cryptocurrency adoption. The main theories used by researchers have been the TAM, IDT, TRA, TPB, UTUAT and UTAUT. Findings were not consistent

over the years, and this could also have been due to the countries where the research was carried out. Below in Table 2.1 is a summary of some previous research done into the adoption of cryptocurrencies.

Table 2.1 Summary of Research Studies

AUTHORS	TITLE	DATA COLLECTION AND ANALYSIS SUMMARY	THEORETICAL MODELS/BASIS	KEY FINDINGS
Abramova & Böhme (2016)	Perceived Benefit and Risk as Multidimensional Determinants of Bitcoin Use: A Quantitative Exploratory Study	Using the Technology Acceptance Model and a literature review to integrate different risks and benefits of Bitcoin use.	Technology Acceptance Model is used as the basis for the research.	Bitcoin is not able to draw a broader range of users due to its high volatility, risk of financial losses and the lack of consumer protection. Users considered Bitcoin as a complicated technology which required significant effort to understand especially at the start of adoption. Among the determinants of the perceived benefits of Bitcoin, decentralisation had the weakest effect contrary to previous beliefs that it was one of primary reasons for Bitcoin adoption.
Folkinshtey & Lennon (2017)	Braving Bitcoin: A technology acceptance model (TAM) analysis	Qualitative analysis of data drawn largely from documents and archival records about Bitcoin posted on the internet.	Technology Acceptance Model	For both developers and end users, Bitcoin had two main significant positive factors in perceived ease of use and perceived usability: putting the user in control and increasing the efficiency of transactions. These positive factors stemmed from Bitcoin's free open-source nature. Use of Bitcoin, however, carried significant risks, namely, the requirement of competent control, irreversibility of errors and security breaches.
Wood et al (2017)	The Diffusion and Adoption of Bitcoin: A Practical Survey for Business	A research model was developed and tested using an international study that surveyed 121 global cryptocurrency members.	Technology Acceptance Model and the Innovation Diffusion Theory.	Relative advantage and ease of use had significant positive effects on the use of Bitcoin. Visibility and compatibility also had minor statistically positive effects.

AUTHORS	TITLE	DATA COLLECTION AND ANALYSIS SUMMARY	THEORETICAL MODELS/BASIS	KEY FINDINGS
Gazali et al (2019)	Exploring the Intention to Invest in Cryptocurrency: The Case of Bitcoin	Conceptual paper. No empirical support.	Theory of Reasoned Action modified by adding perceived risk and perceived benefit.	What led individuals to invest in cryptocurrencies were generally their attitude towards them, subjective norm, the individual's financial risk-tolerance, and the perceived benefits of investing in them.
Mazambani and Mutambara (2019)	Predicting FinTech innovation adoption in South Africa: the case of cryptocurrency	Quantitative analysis of 334 online survey questionnaires from adult distance students at the Mancosa, Cape Town campus.	Theory of Planned Behaviour	The perceived behavioural control and an individual's attitude positively impacted their intention to adopt cryptocurrencies. Subjective norm showed a negative non-significant influence.
Anser et al (2019)	Social media usage and individuals' intentions toward adopting Bitcoin: The role of the theory of planned behaviour and perceived risk	Quantitative analysis of 443 online survey questionnaires in China to investigate the relationship between the usage of social media and the intentions of individuals toward adopting Bitcoin.	Theory of Planned Behaviour modified by adding social media usage.	The usage of social media positively impacted users' intentions to adopt Bitcoin through their attitudes, subjective norms, and perceived behavioural control.
Mendoza-Tello (2019)	Disruptive innovation of cryptocurrencies in consumer acceptance and trust	Quantitative analysis of 186 survey questionnaires mainly from the University of Alicante community and to businesses around the city.	Technology Acceptance Model modified by adding trust.	Perceived trust, risk, and ease of use were all weak as predictors of an individual's intention to use cryptocurrencies with the strength of their effects being determined by perceived usefulness.

AUTHORS	TITLE	DATA COLLECTION AND ANALYSIS SUMMARY	THEORETICAL MODELS/BASIS	KEY FINDINGS
Sohaib et al (2019)	A PLS-SEM Neural Network Approach for Understanding Cryptocurrency Adoption	Testing hypotheses using data collected via a survey questionnaire from 160 graduate and undergraduate students and staff at the University of Technology Sydney.	The study combines Technology Readiness (TR) and the Technology Acceptance Model (TAM) to predict the use intention of cryptocurrency such as Bitcoin.	Technology readiness has a significant relationship with user adoption of cryptocurrency such as Bitcoin. Technology readiness has a significant relationship with technology acceptance (perceived ease of use and perceived usefulness).
Arias-Oliva et al (2019)	Variables Influencing Cryptocurrency Use: A Technology Acceptance Model in Spain	Quantitative analysis of 402 survey questionnaires in Spain	UTAUT modified by adding financial literacy and perceived risk.	Performance expectancy, facilitating conditions and effort expectancy had significant explanatory power to adoption intention. Social influence, perceived risk, and financial literacy had no significant influence on adoption intention.
Albayati et al (2020)	Accepting financial transactions using blockchain technology and cryptocurrency: A customer perspective approach	Quantitative analysis of 251 online survey questionnaires international respondents.	The Technology Acceptance Model modified by adding blockchain adoption variables (trust, regulatory support, social influence, design, and experience.)	Trust was the major determinant of acceptance. Regulatory support and experience also influenced the trust level. There was more trust for Blockchain-based applications that were regulated and insured by governments. Perceived usefulness and perceived ease of use also had positive effects on attitude toward blockchain-based applications.
Soomro et al (2021)	Intention to adopt cryptocurrency: a robust contribution of trust and the theory of planned behaviour	Quantitative analysis of 269 online survey questionnaires in Pakistan.	Theory of Planned Behaviour modified by adding trust.	There was a significant positive effect of attitude, subjective norms, perceived behavioural control and trust on intention to adopt cryptocurrency.

AUTHORS	TITLE	DATA COLLECTION AND ANALYSIS SUMMARY	THEORETICAL MODELS/BASIS	KEY FINDINGS
Pham et al (2021)	Examining the Intention to Invest in Cryptocurrencies: An Extended Application of the Theory of Planned Behaviour on Italian Independent Investors	Quantitative analysis of 275 online survey questionnaires from Italian Investors to investigate the push to invest in cryptocurrencies.	Theory of Planned Behaviour modified by adding financial behaviour determinants (illegal attitude, herding behaviour, perceived risk, perceived benefit, and financial literacy).	Attitude, illegal attitude, subjective norms, perceived behavioural control, herding behaviour, and perceived risk had a positive impact on intention to invest in cryptocurrencies. Financial literacy and socio-demographic factors had no influence on an individual's intention to invest in cryptocurrencies.
Nadeem et al (2021)	Investigating the Adoption Factors of Cryptocurrencies - A Case of Bitcoin: Empirical Evidence from China	Testing hypotheses using data collected via a survey questionnaire from 385 Chinese respondents.	The Technology Acceptance Model (TAM) was used. Transaction processing, security and control were added to the model as the adoption factors of Bitcoin in investigating the intention of individuals to use Bitcoin in the Mainland China.	The perceived ease of use and the perceived usefulness had a positive relationship with an individual's intention to use Bitcoin. The transaction processing and the perceived ease of use had significant impacts on the perceived usefulness. Security and control did not show a significant effect on the perceived usefulness of Bitcoin.

AUTHORS	TITLE	DATA COLLECTION AND ANALYSIS SUMMARY	THEORETICAL MODELS/BASIS	KEY FINDINGS
Abbasi et al (2021)	The adoption of cryptocurrency as a disruptive force: Deep learning-based dual stage structural equation modelling and artificial neural network analysis	Quantitative analysis of 314 survey questionnaires in Malaysia	The UTAUT2 model was modified with the inclusion of trust and personnel innovativeness and excluding the construct habit.	Users' behavioural intention to use cryptocurrencies was positively influenced by performance expectancy. Users believed cryptocurrencies were a beneficial technology positively impacting their everyday lives and they believed that adopting cryptocurrency was more valuable using a cost benefit analysis. Expected effort showed a positive and significant relationship with users' behavioural intention. This was contrary to previous studies which showed that in Malaysia there an insignificant relationships between social influence and behavioural intention.
Mensah et al (2022)	The Drivers of the Behavioural Adoption Intention of BITCOIN Payment from the Perspective of Chinese Citizens	Quantitative analysis of 458 survey questionnaires from students at Jiangxi University of Science and Technology	The UTAUT model was modified by removing social influence and facilitation conditions and then adding infrastructure support, Internet security, and government regulations along with the performance expectancy and effort expectancy.	The results demonstrated that government regulation moderates the influence of both performance expectancy and infrastructure support on the behavioural acceptance of bitcoin payments. It was not however significant in moderating the influence of effort expectancy. The results also showed that performance expectancy, security, effort expectancy, and infrastructure support significantly impacted bitcoin behavioural adoption.

2.7 Discussion and Conclusion

The main constructs of models such as the Technology Acceptance model and the UTAUT do not explain probable barriers to adoption as they focus on enablers as opposed to barriers. Ram (1987) identified that research on innovations was mainly restricted to adoption and diffusion. There is a general pro-innovation bias in previous research, whereby writers assume that all innovations are in the best interest of consumers and view late adopters as laggards. Yet, research makes clear that as innovations impose a change to the way an individual does things, resistance to this change represents normal human behaviour.

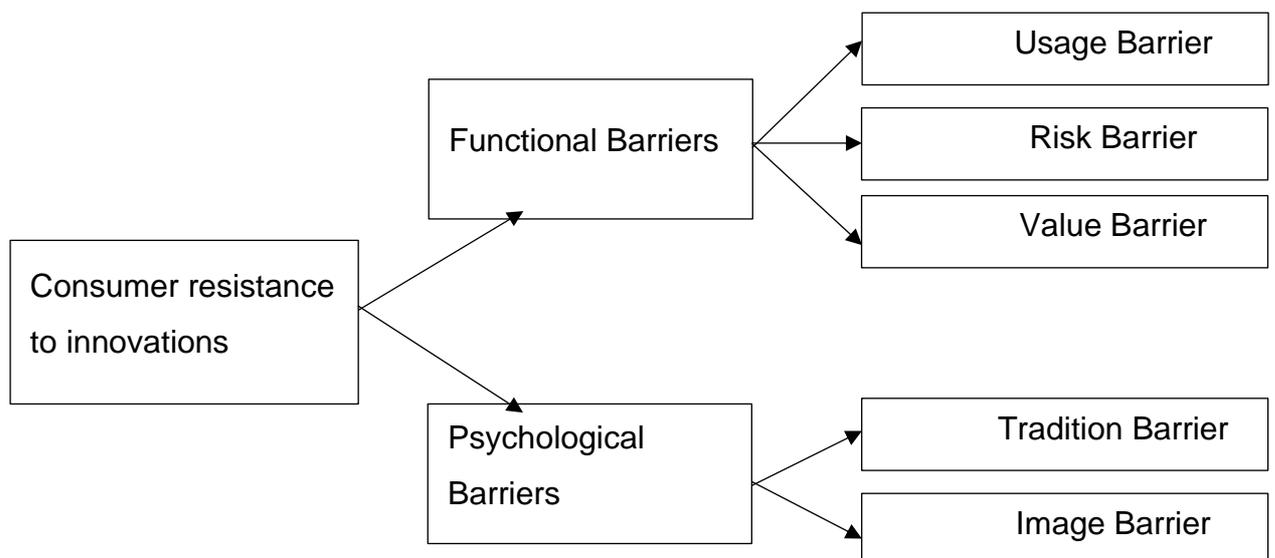
Since in many cases the number of individuals resisting innovations exceed those who adopting innovations, the psychology of those resisting should be understood in order to develop and promote innovations. Ram and Sheth proposed the innovation resistance theory in 1989. This theory assists in understanding the resistance-oriented behaviour of individuals. It classifies barriers into two main types, namely, functional and psychological barriers. The functional barriers, which are also referred to as active resistance, are further divided into usage, value, and risk of the innovation. The psychological barriers, which are also referred to as passive resistance, are divided into image and tradition (Kaur et al., 2020a, Sadiq et al., 2021).

Usage barriers refer to those arising from an individual having to change their normal routine. This could also be related to the effort required to learn new skills in order to use the new technology. Value barriers refer to

how the new technology fares against existing or substitute technologies on a performance-to-price basis. Risk barriers refer to those that arise from uncertainty or the unknown because of using the new technology. These can further be split into physical risk, economic risk and performance risk. (Kaur et al., 2020a, Sadiq et al., 2021, Ram and Sheth, 1989).

Traditional barriers are those that arise from an individual not wanting to deviate from their customs or beliefs. If technology is likely to require an individual to deviate from their traditions, then it will normally be rejected. Image barriers refer to those that arise from the associations a technology may have with something else (Ram and Sheth, 1989). The theory is represented in Figure 2.11 below.

Figure 2.11: Innovation Resistance Theory (Ram and Sheth, 1989)



Though no research has been identified yet using IRT to research cryptocurrency adoption, Kaur et al. (2020) found that it was widely used in research of innovation resistance toward different Internet-based services and products such as online shopping, mobile gaming, mobile banking, and mobile commerce. In their research on 13 empirical studies that were conducted between 2012 and 2018, they found that 8 studies utilised the IRT as the only theoretical framework while 5 used other theories together with the IRT. This research used the IRT model to construct questionnaires to generate information on what can be looked at as barriers to the adoption of cryptocurrencies.

CHAPTER 3: RESEARCH PHILOSOPHY, METHODOLOGY AND METHODS

3.1 Introduction

Although there has been some research into the enablers of the adoption of Bitcoin and altcoins over the years, there however has been decidedly less research into the barriers to their adoption. Because previous research has shown that enablers and barriers to the adoption of innovation are not necessarily complete opposites, it is important to identify barriers separately (Cenfetelli and Schwarz, 2011, Sadhya and Sadhya, 2018).

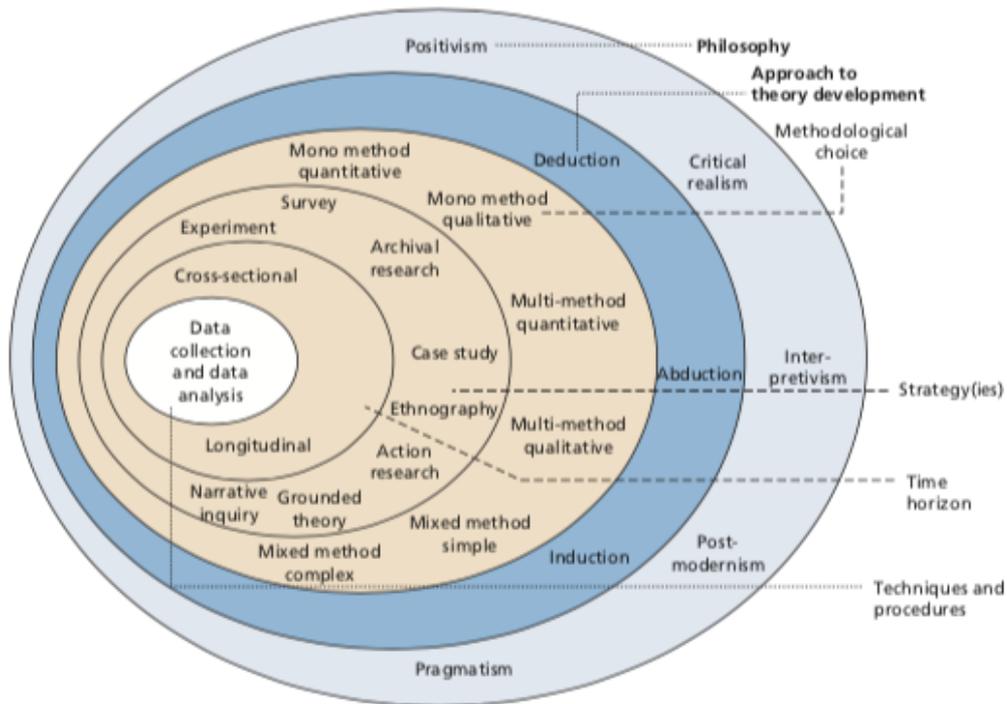
Ram (1987) argued that innovation resistance is not the opposite of innovation adoption. Adoption only starts after users overcome the initial resistance. If the resistance to the innovation is high then there is no adoption. Ram (1987) also noted that resistance and adoption can coexist during the life of an innovation. This chapter will consider the philosophy, methodology and methods used to investigate what individuals view as barriers to cryptocurrency adoption.

3.2 Research Background

Saunders et al (2016) proposed what they called the research onion to identify steps a researcher goes through before they can collect data required to answer research questions. The research onion is depicted in Figure 3.1 below. The research onion points out that particular research is first

influenced by how the researcher views the world. This viewpoint will then impact what the researcher views as knowledge and how they will go about obtaining this knowledge.

Figure 3.1: Research Onion – Saunders et al (2016)



3.3 Research Philosophies

Research philosophy and research paradigm are important concepts as they form the basis of any research study. They are important as they give an indication of how researchers view the world, the research and how answers to research questions can be obtained. Table 3.1 below shows some definitions of both concepts. There are three main research philosophies which are namely Positivism, Interpretivism and Pragmatism. Each philosophy consists of three elements, namely, epistemology, ontology, and methodology.

According to Saunders et al. (2016), epistemology is concerned with what constitutes acceptable knowledge in a field of study. Ontology is concerned with a researcher's view of reality. Healy et al. (2000) defined ontology as the reality that researchers investigate, epistemology being the relationship between that reality and the researcher, and methodology being the technique used by the researcher to investigate that reality.

There are two main viewpoints in ontology, namely, realism and nominalism. Realists assume that the world exists independently of people and their interpretations of it. Nominalists assume that reality is subjective. They believe that subjective cultural beliefs influence what an individual sees and their reality (Neuman, 2014).

Epistemology has two main approaches, namely, objectivism and subjectivism. Objectivists believe that observable things provide data and facts while Subjectivists focus on the details of a situation and reality (Al-Ababneh, 2020).

Table 3.1 Research Philosophy and Paradigm Definitions

Author	Definition of Research Philosophy	Author	Definition of Research Paradigm
Saunders et al (2016)	The development of knowledge and the nature of that knowledge.	Gliner & Morgan (2000)	A system of ideas or a systematic set of beliefs, together with their accompanying methods. It is a way of thinking about and conducting research. A <i>philosophy</i> that guides how the research might be conducted.
Burke (2007)	The questioning of basic fundamental concepts according to a need to embrace a meaningful understanding of a particular field.	Schwandt (2001)	The shared worldview that represents the beliefs and values in a discipline and that guides how problems are solved.
Collis and Hussey (2013)	A framework that guides how research should be conducted based on ideas about reality and the nature of knowledge.	Neuman (2014)	The general organising framework for theory and research that includes basic assumptions, key issues, models of quality research, and methods for seeking answer.
Žukauskas et al (2017)	The basis of the research, which involves the choice of research strategy, formulation of the problem, data collection, processing, and analysis.	Žukauskas et al (2017)	The wide structure encompassing perception, beliefs, and awareness of different theories and practices used to carry out scientific research. It consists of ontology, epistemology methodology, and methods.

Realists adopt the objective approach, as they believe that knowledge can be produced and reality learnt by making careful observations of it. Nominalists adopt the subjective approach, as they do not believe observations of reality will lead to knowledge about reality as interpretations and subjective views influence all observations (Neuman, 2014).

Methodology can be defined as the strategy, plan of action, process or design lying behind the choice and use of a specific method while linking that choice with the use of methods to the desired outcome. This differs from methods which are the techniques or procedures used to gather and collect data related to some research question or hypothesis (Crotty, 1998). Methodology is broader than methods as it involves the entire strategy taken by a researcher considering their ontology and epistemology. The different methodologies that can be used by a researcher are the qualitative, quantitative and mixed methods approaches.

3.3.1 *Positivism*

Positivist social science is an organised method for combining deductive logic with precise empirical observations of individual behaviour to discover and confirm a set of probabilistic causal laws that can be used to predict general patterns of human activity (Neuman, 2014). Positivists view the world from a scientific perspective where research questions are answered by testing theories using observable data. According to O'Leary (2017), positivists aim to test a theory or describe an experience through observation and measurement in order to predict and control the forces that surround us. Thus, positivists identify with the realist ontology and the

objective epistemology. They also use quantitative methodologies to answer research questions.

3.3.2 Interpretivism

The Interpretative social sciences emphasise social action, socially constructed meanings, and value relativism. The approach is sensitive to context and more concerned with achieving an empathic understanding as opposed to testing theories of human behaviour (Neuman, 2014). Thus, Interpretivists identify with the nominalist ontology and the subjective epistemology. They also use qualitative methodologies to answer research questions.

3.3.3 Pragmatism

Pragmatism is a philosophy not committed to one type of ontology, epistemology, or methodology. Pragmatists do not see the world as one thing giving the researcher freedom of choice. Researchers focus on the research problem instead of focusing on methods and use any relevant approach to find the answers to research questions. Thus, depending on the research question the researcher can adopt either the realist or nominalist ontology or a combination of both. They would also, depending on the question, adopt a subjective or objective epistemology or a combination of both. The methodology used by a pragmatist would depend on the research question. The different methodologies are quantitative, qualitative and mixed methods.

3.3.4 Choice of Research Philosophy

This research was guided by the pragmatic paradigm. Pragmatism as a paradigm is based on the strategy that researchers should use the philosophical and methodological approach that works best for the particular research problem being investigated (Kaushik and Walsh, 2019). In answering the question of finding barriers to the adoption of cryptocurrencies the view of the research was that it is important to scientifically test theories while also trying to be sensitive to context and achieving an empathic understanding of respondents.

As a result of the pragmatic paradigm guiding the research, the ontological approach was a combination of realism and nominalism. Pragmatists believe that there is no one way of viewing the world. The epistemology of this research was guided by a combination of objectivism and subjectivism. This research used both depending on the theories being tested or information that was being sought.

3.4 Research Methodology

This research was guided by the mixed methods methodology. The mixed methods methodology uses an integration of both quantitative and qualitative data to answer the research questions. It is a problem-centred approach to research. Methods and theories are used based on their applicability to conduct the research (Leavy, 2017). This followed from the pragmatic paradigm guiding the research.

Identifying barriers to the adoption of cryptocurrencies by users and non-users requires using a combination of in-depth interviews, surveys and hypothesis testing, which are a combination of qualitative and quantitative techniques. Hence the mixed

methods approach was the ideal methodology for the research. Figure 3.2 below shows a summary of how the research was conducted.

Figure 3.2: Research Flow Chart



3.4.1 Data Collection

Data collection for identifying barriers to the adoption of cryptocurrencies users and non-users occurred in 2 stages. The first stage was qualitative in nature with data being collected using open-ended questionnaires with 20 participants. The data obtained from the questionnaires was not only used in the initial testing of the hypotheses but to also confirm whether the questionnaire had captured all the relevant questions to be asked to fully test the hypotheses. Different occupations, genders and age groups were sought. Participants were recruited via social media and word of mouth.

Following from this the second stage was to collect data from respondents using online questionnaires. Participants for the second stage will be recruited in three main ways:

1. Targeted social media recruitment through platforms such as Facebook and Instagram.
2. Recruitment via websites such as Amazon Mechanical Turks.

3. Distribution of flyers with links to the survey through personal networks. Chain-referral or snowball sampling will be used as well. In this method participants who complete the survey will be asked to share the survey link with their peers.

Appendix A contains a copy of the questions used in the questionnaire which was adapted from one used by Moorthy et al (2017). Survey participants were asked to respond to questions using a five-point Likert scale (strongly agree = 1; strongly disagree = 5). This scale was used to indicate their level of agreement or disagreement with statements on whether something is a barrier to the adoption of cryptocurrencies.

3.5 Research Theory, Conceptual Framework, Hypothesis and Data Analysis

The innovation resistance theory, proposed by Ram and Sheth (1989), was used to test the barriers to the adoption of cryptocurrencies. Unlike other theories of adoption such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), which focus on enablers, the IRT helps in understanding the resistance-oriented behaviour of individuals. The theory classifies barriers into two main categories, namely, functional and psychological barriers. The functional barriers, which are also referred to as active resistance, are further divided into usage, value, and risk of the innovation. The psychological barriers, which are also referred to as passive resistance, are divided into image and tradition (Kaur et al., 2020a, Sadiq et al., 2021).

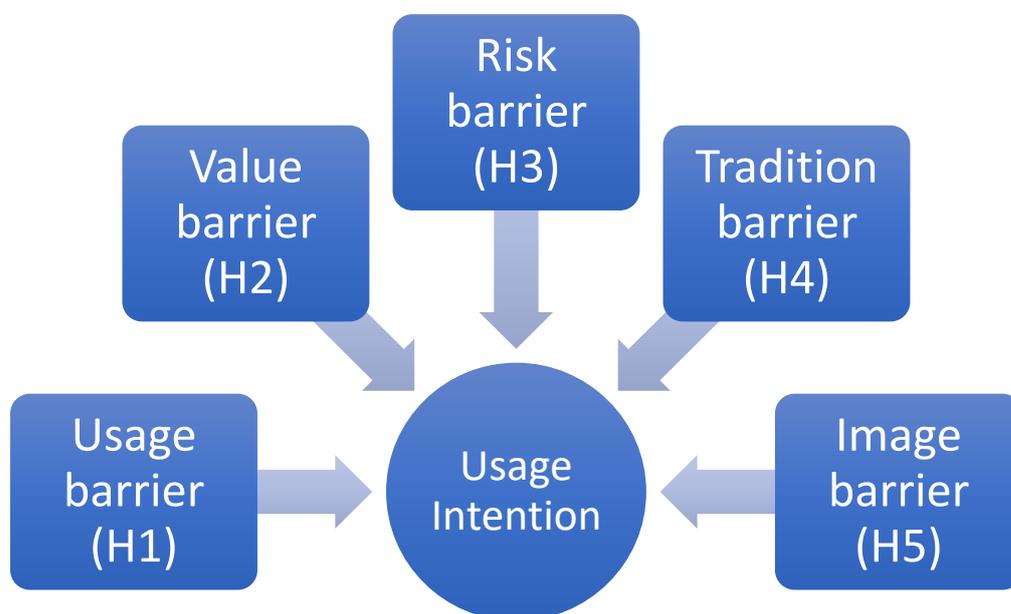
Usage barriers refer to those arising from an individual having to change their normal routine. This could also be related to the effort required to learn new skills so as to be able to use the new technology. Value barriers refer to how the new technology fares against existing or substitute technologies on a performance-to-price basis. Risk barriers refer to those that arise from uncertainty or the unknown as a result of using the new technology. These risk barriers can be split into physical risk, economic risk and performance risk. For the purpose of this research, physical risk is unlikely to be a concern (Kaur et al., 2020a, Sadiq et al., 2021, Ram and Sheth, 1989).

Tradition barriers are those that arise from an individual not wanting to deviate from their customs or beliefs. If technology is likely to require an individual to deviate from their traditions then it will normally be rejected. Image barriers refer to those that arise from the associations a technology may have with something else (Ram and Sheth, 1989). For example, if cryptocurrencies are generally associated with criminal behaviour, then there will likely be resistance by most people to using them. The theory is comprehensive and ideal for examining the barriers to the adoption of cryptocurrencies. According to Kaur et al. (2020), IRT has been the preferred choice among scholars of late in examining innovation resistance to technology.

The IRT was used to create a research model for measuring how the pre-adoption functional and psychological barriers impact the behaviour of cryptocurrency users in terms of their intentions to use (see Figure 3.3). The independent variables in the model were the five IRT barriers while the dependent

variable was the intention to use. The model was used to examine the relationship between different functional and psychological barriers and users' intentions to use cryptocurrencies. The below hypotheses were tested using data obtained from respondents online and analysed using multiple regression analysis.

Figure 3.3: Innovation Resistance Theory Model



H1: There is a negative relationship between usage barriers and the adoption of cryptocurrencies.

H2: There is a negative relationship between value barriers and the adoption of cryptocurrencies.

H3: There is a negative relationship between risk barriers and the adoption of cryptocurrencies.

H4: There is a negative relationship between traditional barriers and the adoption of cryptocurrencies.

H5: There is a negative relationship between image barriers and the adoption of cryptocurrencies.

3.5.1 Data analysis

Deploying questionnaires is a useful way to collect data, but the data collected need to be further analysed in order to provide useful information. Statistical packages like SPSS and JASP, which were used for this study, are useful in conducting quantitative analysis. In analysing the output from the open-ended questionnaires, a technique called content analysis was used.

Multiple regression models were used to test the significance of the stated five hypotheses of the study by examining the causal relationship between variables (Bryman & Cramer, 2004). The regression models were used to find the relationship between the adoption of cryptocurrency and its inhibiting factors or barriers to adoption.

The reliability of the questionnaire design was verified using Cronbach's alpha. Cronbach's alpha is used in checking the internal consistency of scales in surveys (Saunders et al., 2016). Cronbach's alpha was used to test the model's reliability and consistency. With Cronbach's alpha the research uses a bootstrapping technique, a non-parametric method for testing the coefficients. The structural model was

assessed by the path coefficients significance and the R square variance of the dependent variable (Sohaib et al., 2020). The T-test was used to assess the path coefficients significance at a significance level of 5%.

3.6 Conclusion

This research served to provide an understanding of barriers to cryptocurrency adoption not only to academics but also to current and potential cryptocurrency users, investors, regulators and businesses. Previous studies into the adoption of cryptocurrencies have focused on the enablers of adoption while neglecting the barriers to adoption. Previous research has identified that enablers and barriers to the adoption of innovation are not necessarily complete opposites. Hence it is essential to identify barriers separately.

This study will also add to the body of knowledge by providing empirical findings on motivations behind the choice not to use cryptocurrencies by those who have heard of them but have made a decision not to use them. It will also differ from other previous research in that apart from getting information from people who are primarily technically savvy, or people in universities, a greater cross section of the population would be sought.

CHAPTER 4: A SYSTEMATIC LITERATURE REVIEW - EVOLUTION OF CRYPTOCURRENCY REGULATIONS

4.1 Introduction

This chapter is a systematic literature review (SLR) on the evolution of cryptocurrency regulations. According to the Collins dictionary, regulations are rules made by a government or other authority in order to control the way something is done or the way people behave. Due to the decentralised nature of cryptocurrencies, it is impossible to regulate them in a similar way to fiat currencies or investment assets.

Laws set in a particular country are used to regulate fiat currencies and investments. Different regulators such as central banks, taxation offices and investment product regulators are used by governments to oversee and regulate these assets. Centralisation of information makes this all possible. Centralisation results in jurisdictions being clearly separate from each other. Cryptocurrencies and other blockchain-related products are decentralised and cross jurisdictions as users are connected across different countries by being part of a network. Apart from the decentralised nature of cryptocurrencies, they mostly also provide pseudo-anonymity, that is, they do not provide complete anonymity. However, it is very difficult to identify users on the different networks.

Centralisation, as a result of the need for intermediaries, created a path for regulators to identify ways to regulate cryptocurrencies. For example, digital currency exchanges are mostly required to follow Know Your Client protocols by confirming the identity of their clients.

This chapter looks to go through previous papers to answer the following research questions:

1. Why should cryptocurrencies be regulated?
2. What were the steps taken by regulators since the introduction of cryptocurrencies?
3. What were the key recommendations made to regulators by academics?
4. What have been the challenges faced by regulators?

4.2 Background

As interest in cryptocurrencies and blockchain has increased since 2009, regulating them has become an increasingly important topic. This topic has not only become increasingly important for governments but also for individuals, businesses and researchers. Governments have struggled with how best to regulate the innovation largely due to its decentralised nature and also due to the need to get a clear understanding of the technology, its benefits and its risks.

Individuals have to a greater extent been interested in cryptocurrencies due to the potential of making significant returns as a result of speculating. This has led to some investors losing money due to fraud and unscrupulous digital currency exchanges. Investors would be interested in having these exchanges regulated and held to account for their protection. Individuals would also want clarity in regard to the taxation implications of using cryptocurrencies.

Apart from taxation implications, businesses have been keener on having clarity on the accounting practices to be used as a result of transacting in cryptocurrencies. Uniform accounting practices are important so that business can correctly report

their financial activities and position, allowing them and investors as well to make informed decisions.

Researchers have taken an increasing interest in cryptocurrencies and their regulation as well. They have been able to look into the changes or lack thereof of regulations in different countries as well as make recommendations to governments. Though there has been an increase in research, there has not been a systematic literature review published on cryptocurrency regulations. A systematic literature review (SLR) is important as it can be used to answer specific research questions using a large base of quality research papers and also to identify any gaps in research that can then be used by future researchers.

4.3 Research method

This SLR will be conducted using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method. It contains a 27-item checklist used to improve the quality and objectivity in conducting systematic reviews. This checklist contains information guiding the presentation and explanation of information contained in the title, abstract, introduction, methods, results, discussion, and conclusion of an SLR. A copy of the checklist can be found at https://prisma-statement.org/documents/PRISMA_2020_checklist.docx.

The methods section contains the following:

- A. Research questions
- B. Search strategy
- C. Inclusion criteria
- D. Exclusion criteria
- E. Quality assessment criteria
- F. Study selection results

A. Research Questions

In this SLR, the aim is to explore the evolution of cryptocurrency regulation.

The research addresses the following research questions:

1. Why should cryptocurrencies be regulated?
2. What were the steps taken by regulators since the introduction of cryptocurrencies?
3. What were the key recommendations made to regulators by academics?
4. What have been the challenges faced by regulators?

B. Search Strategy

The search strategy was developed using the main topics or concepts that are related to the research questions. The University of Southern Queensland library database was used to search for articles. The first is the topic of cryptocurrency and the terms and synonyms related to it. Keywords like the most popular cryptocurrency Bitcoin were added to the search query. The second concept refers to regulations. The terms taxation and accounting were added to the search query. Only peer-reviewed articles were selected from the search query results.

C. Inclusion Criteria

The search query was comprehensive and included popular topics and synonyms related to cryptocurrency regulations. However, it is possible that some papers may have been missed. To overcome this, the backward snowballing strategy was also used. This is a strategy whereby other research papers are added after finding them referenced in the papers collected as a result of the initial search.

D. Exclusion Criteria

Exclusion criteria refer to the factors that would make a paper not eligible to be included in the SLR. Articles that were not peer-reviewed were excluded as well as conference papers. Research in languages other than English was also excluded.

E. Quality Assessment Criteria

Using quality assessment criteria for selecting research papers adds to the use of the inclusion and exclusion criteria. The method of quality assessment used for the qualitative studies followed the strategy used by Lorenc et al. (2014), which drew from the tool used in Appendix D of Hawker et al. Nine questions are contained in this tool, each of which can be answered 'good', 'fair', 'poor' or 'very poor'. Lorenc et al converted the answers into a numerical score by assigning the answers from one point (very poor) to four points (good). The nine questions in the tool are as follows:

- *Abstract and title.* Did they provide a clear description of the study?
- *Introduction and aims.* Was there a good background section and a clear statement of the aims of the research?
- *Method and data.* Is the method appropriate and clearly explained?
- *Sampling.* Was the sampling strategy appropriate to address the aims?
- *Data analysis.* Was the description of the data analysis sufficiently rigorous?
- *Ethics and bias.* Have ethical issues been addressed and has necessary ethical approval been gained?
- *Results.* Is there a clear statement of the findings?
- *Transferability or generalisability.* Are the findings of this study transferable (generalisable) to a wider population?
- *Implications and usefulness.* How important are these findings to policy and practice?

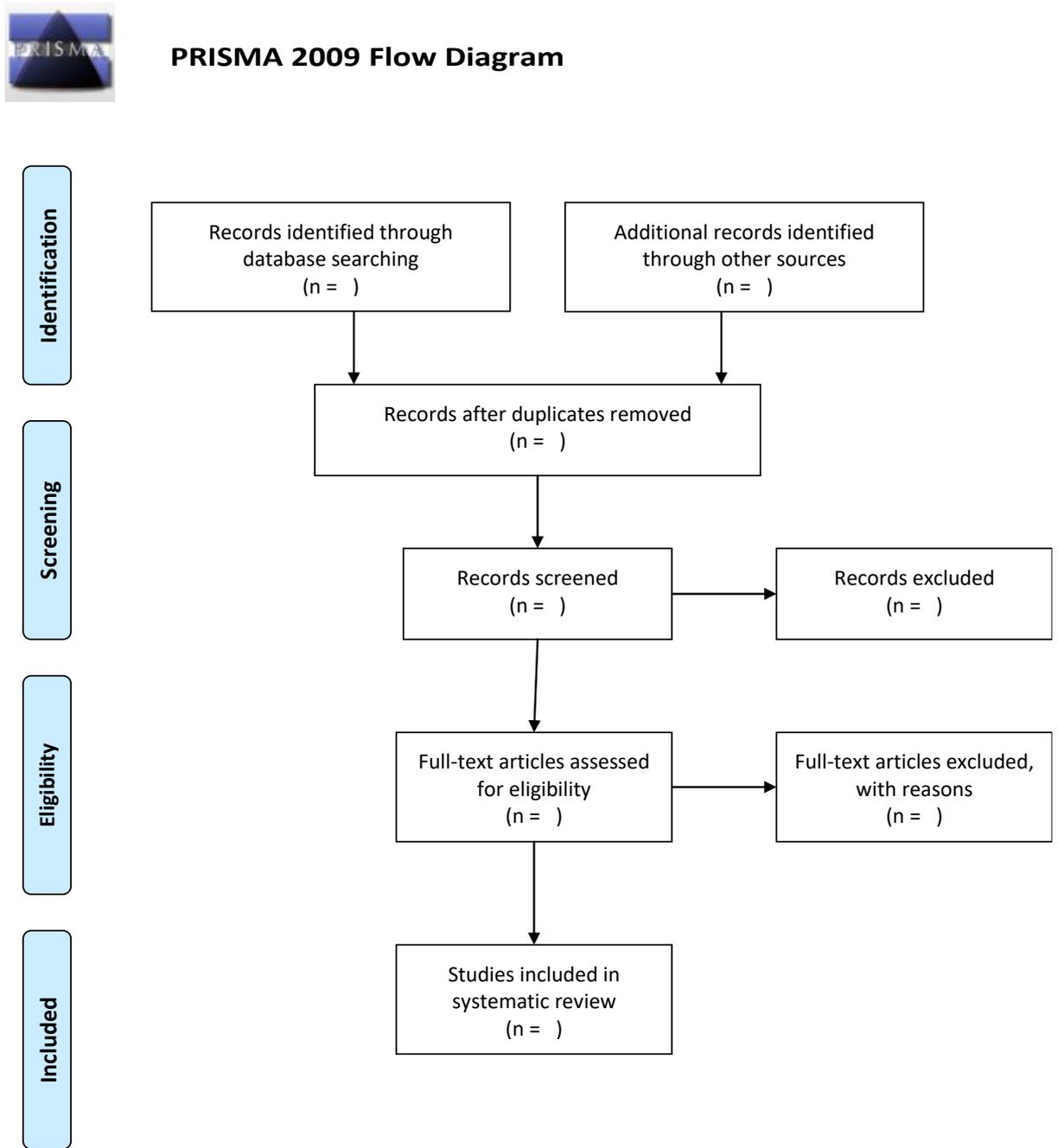
For this study, three of the questions were left as they had little significance to the choice of papers for this particular SLR. These had to do with sampling, data analysis and ethics. The minimum score for each study was 6 points with the maximum being 24 points. In rating how well a paper fits with the required criteria the following grading was used: high quality, 20–24 points; medium quality, 14–19 points and low quality, 6–13 points. Only the high-quality papers were used in the study.

F. Study Selection Results

The diagram below shows the recommended flow of the SLR process. The primary search resulted in 404 unique research papers. The number was reduced to 176 after a manual screening process which was based on reading the titles and abstracts of the papers. This was then also brought down to 84 papers after reading the full articles. Lastly, 12 articles were added using the backward snowballing technique, resulting in a total of 96 papers used in the SLR. The following information was manually collected from the papers for analysis:

- The regulations discussed.
- The country or countries researched.
- The cryptocurrency in the study.
- The year of the study.

Figure 4.1 PRISMA FLOW DIAGRAM



4.4 Data results

Appendix B shows the number of articles according to the year they were published. It also shows the main topics that were being analysed in each paper each year. Of the total 96 papers analysed, 16 papers were in 2018, 30 in 2019, 20 in 2020 and 15 in 2021.

Table 4.1: 2014

Research Question	Findings
1. Why should cryptocurrencies be regulated?	<ul style="list-style-type: none">• To guard against their use for illegal activities (De Filippi, 2014, Yee, 2014).• To manage their impact on the economic and financial policies of governments (De Filippi, 2014).
2. What were the steps taken by regulators since the introduction of cryptocurrencies?	<ul style="list-style-type: none">• Brazil passed a law in October 2013 to regulate the creation and exchange of electronic currencies (De Filippi, 2014).• The Chinese national bank declared in December 2013 that bitcoin was a virtual commodity. As a result, financial institutions were not allowed to exchange bitcoin however individuals continued to be allowed to trade it amongst themselves (De Filippi, 2014).• The Russian Central Bank in 2014 declared institutions which were providing services facilitating trade of virtual currencies would be considered to be involved in activities that were potentially suspicious (De Filippi, 2014).• In 2013 the Bank of Thailand at first ruled that bitcoin was not a currency and forbade citizens of the country to use it. The Bank however then changed this view in 2014 and declared that bitcoins could be traded in Thailand only if they were changed to or from the Thai baht (De Filippi, 2014).

Research Question	Findings
<p>2. What were the steps taken by regulators since the introduction of cryptocurrencies?</p>	<ul style="list-style-type: none"> • The Reserve Banks of India and Indonesia highlighted their concern regarding bitcoin's validity as a currency. Both banks did not however take any steps against its use in their respective countries (De Filippi, 2014). • The Icelandic Central Bank in 2013 prohibited foreign exchange trading with bitcoin (De Filippi, 2014). • Countries like Singapore, Germany, Malaysia, Canada, and Finland considered bitcoin as not being legal tender hence it was considered a commodity that could be used for barter or exchange instead of being a currency (De Filippi, 2014).
<p>3. What were the key recommendations made to regulators by academics?</p>	<ul style="list-style-type: none"> • The position of intermediaries in the cryptocurrency ecosystem allows them to collect important information that can be used by regulators. Hence, intermediaries are the most appropriate targets of regulation (Yee, 2014). • Cryptocurrencies' viability and long-term sustainability are dependent on public trust. Public trust on the other hand is greatly dependent on how cryptocurrencies will be regulated by the law (Yee, 2014). This has been shown by how the value of cryptocurrencies was affected by announcements such as those made by the Chinese government to tighten cryptocurrency regulation (Angel and McCabe, 2015).
<p>4. What have been the challenges faced by regulators?</p>	<ul style="list-style-type: none"> • Cryptocurrencies by their nature are impossible to fully regulate as there is no central issuing authority. The pseudo-anonymity inherent in most cryptocurrencies also makes it challenging for regulators to guard against their illicit use (Dostov and Shust, 2014, Yee, 2014).

Table 4.2: 2015

Research Question	Findings
<p>1. Why should cryptocurrencies be regulated?</p>	<ul style="list-style-type: none"> • As the number of cryptocurrency transactions increased and the number of organisations accepting them, there was the need for more detailed accounting processes and disclosures (Raiborn and Sivitanides, 2015). • Standardised accounting practices result in clarity in showing the financial effects of transactions in cryptocurrencies, the related tax implications of these transactions, as well as economic ramifications of these transactions (Raiborn and Sivitanides, 2015).
<p>2. What were the steps taken by regulators since the introduction of cryptocurrencies?</p>	<ul style="list-style-type: none"> • The Russian Central Bank initially warned Russians from using cryptocurrencies stating that those using them would be associated with whitewashing and terrorist financing. However, the Central Bank then softened its stance to admonishing Russians to exercise care in the use of cryptocurrency (Taran et al., 2015). • The South African Reserve Bank through position papers emphasised that it does not oversee, supervise or regulate virtual currencies. As a result, all activities related to the buying and selling of cryptocurrencies were to be done at the user’s risk. The Reserve Bank would not offer any recourse to users (Nieman, 2015).
<p>3. What were the key recommendations made to regulators by academics?</p>	<ul style="list-style-type: none"> • To protect the taxpayers there was a need to obtain more individual tax interpretations (Kowalski, 2015). Taxpayers and their agents require clarity and simplicity to avoid making mistakes when paying taxes.

Research Question	Findings
<p>3. What were the key recommendations made to regulators by academics?</p>	<ul style="list-style-type: none"> • Antonikova (2015) recommended that due to their differing natures, the different types of cryptocurrencies should not be regulated in the same way. The research proposed that cryptocurrencies be separated into three types, namely, closed-flow, hybrid, and open-flow systems. It was proposed that the three should be treated differently for tax purposes. Closed-flow cryptocurrencies would generally not be taxable. Open-flow cryptocurrencies would be treated in the same way as foreign currency transactions. The paper suggested hybrid cryptocurrencies be treated similarly to items like casino chips which can be converted legally to cash.
<p>4. What have been the challenges faced by regulators?</p>	<ul style="list-style-type: none"> • The information reporting requirements in the United States were difficult to enforce as the nature of cryptocurrencies provides a user with high levels of privacy and anonymity (Antonikova, 2015).

Table 4.3: 2016

Research Question	Findings
<p>1. Why should cryptocurrencies be regulated?</p>	<ul style="list-style-type: none"> • Cross-border terrorism financing was made much easier as normal KYC regulations were not followed by new exchanges (Hendrickson et al., 2016). • To manage their impact on money supply control by central banks as well as loss of seigniorage (Hendrickson et al., 2016). (Seigniorage refers to governments making a profit as a result of issuing currencies.)
<p>2. What were the steps taken by regulators since the introduction of cryptocurrencies?</p>	<ul style="list-style-type: none"> • Using data from BitLegal (2014), Hendrickson et al showed a table tracking the legal status of cryptocurrencies in different countries denoting their legal treatment in each country as “Permissive”, “Contentious”, or “Hostile.” From the list of 63 countries, the legal status was contentious in seven nations and hostile in two. The remaining were classified as permissive to the use of cryptocurrencies. The table is shown in Appendix C (Hendrickson et al., 2016).
<p>3. What were the key recommendations made to regulators by academics?</p>	<ul style="list-style-type: none"> • Central banks needed to at least adapt to the introduction of cryptocurrencies as they became more accepted as mediums of exchange as well as investment assets with significant market capitalisation. At the time there was no data available showing the effect of cryptocurrencies on financial markets. However, central banks needed to find ways to gather this information so as to figure out if changes to monetary policy were required in order for them to fulfil their important function of managing inflation targets (Sauer et al., 2016).

Research Question	Findings
4. What have been the challenges faced by regulators?	<ul style="list-style-type: none"> • Governments had to be of a certain size to be able to have an influence on the circulation of cryptocurrencies. Even if a government proactively discouraged the use of cryptocurrencies, as long as people are committed to using them, they would continue to exist as niche money (Hendrickson et al., 2016).

Table 4.4: 2017

Research Question	Findings
1. Why should cryptocurrencies be regulated?	<ul style="list-style-type: none"> • To guard against their use for illegal activities (Kethineni et al., 2017, Yeoh, 2017). • To limit their use in tax avoidance (Yeoh, 2017). • Allowing cryptocurrencies to develop without checks introduced a lot of risks that with the potential to threaten the stability of financial systems (Ducas and Wilner, 2017). • To protect cryptocurrency users from scams and other fraudulent activities (Ducas and Wilner, 2017). • To provide central banks with the ability to effectively implement monetary and macroeconomic policies. Also due to how connected financial systems are, a greater adoption of cryptocurrencies could have effects on financial markets, such as foreign currency and stock markets (Ducas and Wilner, 2017).

Research Question	Findings
<p>2. What were the steps taken by regulators since the introduction of cryptocurrencies?</p>	<ul style="list-style-type: none"> • Cryptocurrency exchange regulation in the USA was the responsibility of the Financial Crimes Enforcement Network (FinCEN), however different states had the power to adopt tougher measures. In March 2013, exchanges were classified by FinCEN as money-transmitting businesses, hence they were required to implement anti-money laundering (AML) and KYC policies (Kethineni et al., 2017). • The Internal Revenue Service in the United States declared bitcoins as taxable property in 2014 (Internal Revenue Service, 2014). However, there have been different rulings and guidelines which have given cryptocurrencies different descriptions in the country (Kethineni et al., 2017, Yeoh, 2017): <ul style="list-style-type: none"> ➤ In the case of <i>Securities and Exchange Commission v. Trendon T. Shavers and Bitcoin Savings and Trust</i> (2013), the judge highlighted that as bitcoins could be used to purchase goods and services and could also be exchanged for fiat currencies, bitcoin was, therefore, a currency or a form of money. ➤ The Federal Election Commission released guidelines in 2014 where they regulated how bitcoin could be accepted as donations during political campaigns. ➤ In <i>State of Florida v. Mitchell Abner Espinoza</i> (2016) money laundering charges were dismissed as the judge ruled that as bitcoin was not considered as a currency it could not be laundered.

Research Question	Findings
<p>2. What were the steps taken by regulators since the introduction of cryptocurrencies? (continued)</p>	<ul style="list-style-type: none"> ➤ The state of California introduced a draft for a new digital currency Blockchain technology bill stating permission would be needed to innovate, develop, code or network blockchain technology. • Canada attempted to use existing legislation and regulatory bodies to regulate the introduction of cryptocurrencies. Due to the complex nature of cryptocurrencies, this led to different acts and regulators being required to cover different things (Ducas and Wilner, 2017): <ul style="list-style-type: none"> ➤ Cryptocurrencies were considered commodities by the Canadian Revenue Agency. As such they were subjected to the Income Tax Act’s barter rules. ➤ In 2014 amendments were made to the Canadian federal AML legislation with the passing of the Proceeds of Crime (Money Laundering) and Terrorist Financing Act. These amendments gave FINTRAC the power to disclose to its federal partners any threats to the country’s security considered to be linked to cryptocurrency transactions. • The European Parliament voted in favour of an approach that was not stringent in regulating blockchain technology. This led to only the setting up of a Virtual Currency Task Force and cryptocurrency exchanges were required to adhere to European Anti-Money Laundering Directives (Yeoh, 2017).

Research Question	Findings
<p>3. What were the key recommendations made to regulators by academics?</p>	<ul style="list-style-type: none"> • Regulatory approaches needed to balance between not wanting to stifle innovation while also taking into consideration the risks that would come from the introduction of blockchain technology to the financial system. A multi-stakeholder governance model would be a good alternative to cryptocurrency and blockchain regulation as it would involve the participation of stakeholders from different sectors (Yeoh, 2017). • Overburdening new technology with tight and complex regulations risked undermining the potential benefits the innovation had to offer. (Ducas and Wilner, 2017). • The use of regulatory sandbox models, in regulations was temporarily relaxed in certain circumstances in order to facilitate a favourable environment for the innovation. This provides regulatory guidance and clarity. It also provides regulators the chance to interact with stakeholders and acquire a better knowledge of the pros and cons of the innovation. (Ducas and Wilner, 2017). • Regulators should view cryptocurrencies as property. Property rights over cryptocurrencies could represent a unique form of intangible property whereby the legal right is inseparable from its registration on the blockchain (Low and Teo, 2017). Cryptocurrencies count as property since they satisfy both the exclusivity and the separability criterion (Ishmaev, 2017).

Research Question	Findings
<p>4. What have been the challenges faced by regulators?</p>	<ul style="list-style-type: none"> • Investigating crimes relating to the use of cryptocurrencies is very difficult and requires a considerable amount of training for investigators (Kethineni et al., 2017). • Court judgments were inconsistent as there was a lack of uniform and clear regulations making the legal deterrence of crimes related to cryptocurrencies a challenge (Kethineni et al., 2017). • Most countries attempted to regulate cryptocurrencies using regulations that already existed. This was seen to give the problem as the nature of cryptocurrencies would result in the overlapping of regulations between federal and state governments, with different entities being responsible for different components of the financial system (Ducas and Wilner, 2017). This can result in complex and conflicting requirements for users. • Regulators were faced with a dilemma. On the one hand, regulations can be seen as hindering innovation while on the other hand lack of regulations could encourage criminal activity and undermine the fight against money laundering and funding of terrorism (Ducas and Wilner, 2017).

Table 4.5: 2018

Research Question	Findings
1. Why should cryptocurrencies be regulated?	<ul style="list-style-type: none">• To reduce the threats and risks coming from the use of cryptocurrencies for illegal transactions (Campbell-Verduyn, 2018).• To minimise the threats and risks arising from the use of cryptocurrencies to finance terrorism (Ashimbayev and Tashenova, 2018, Salami, 2018, Teichmann, 2018).• To manage their impact on money supply control by central banks as well as loss of seigniorage and the contagion risk of interconnected cryptocurrencies (Hendrickson et al., 2016, Krivoruchko et al., 2018).• Digital currency exchanges hold cryptocurrency on behalf of their customers. This leads to custody problems such as how investors can ensure the exchanges do not misuse assets and the recourse available to customers should the exchange enter bankruptcy. Regulators must consider how to protect their citizens (Chu, 2018, Herian, 2018, Azarenkova et al., 2018).• To provide clarity to accountants, investors and auditors on how cryptocurrency transactions and holdings and transactions should be recorded (Procházka, 2018).

Research Question	Findings
<p>2. What were the steps taken by regulators since the introduction of cryptocurrencies?</p>	<ul style="list-style-type: none"> • Lansky (2018) used Hansen’s (2016) list to classify regulators’ approaches to cryptocurrencies in different countries. The classification comprises 6 levels with some of the levels containing sub-levels: <ul style="list-style-type: none"> ➤ Level 0 – ignoring - refers to regulators ignoring the existence of cryptocurrencies. This could be because of the negligible activity of cryptocurrencies in the country. ➤ Level 1 – monitoring - refers to regulators issuing a statement confirming they were aware cryptocurrencies existed but would look into dealing with them later. There would be no recommendations made regarding the treatment of cryptocurrencies. ➤ Level 2 – recommendation – refers to regulators recognising cryptocurrencies and issuing recommendations to their citizens. ➤ Level 3 – guidance – refers to regulators issuing guidance to govern the way cryptocurrencies are used. This is usually accompanied by a warning of the risks of cryptocurrencies. ➤ Level 4 – regulation – refers to the requirement for an explicit authorisation by a relevant regulator in order to provide cryptocurrency-related services. Conditions would have to be met to obtain the authorisation such as in the case of the BitLicense issued by the Financial Services Department in New York in 2015. ➤ Level 5 – ban or integration refers to either refusal or the full adoption of cryptocurrencies by regulators.

Research Question	Findings
<p>3. What were the key recommendations made to regulators by academics?</p>	<ul style="list-style-type: none"> • Cryptocurrencies should be supported by relevant regulations that are not just to meet national and international priorities but also support the building of a new global financial system (Azarenkova et al., 2018, Veerpalu, 2018). A global regulatory framework is ideal due to the nature of cryptocurrencies (Salami, 2018). • If regulating cryptocurrencies, governments should review their regulatory frameworks to consider the interests of the state and citizens. The main areas of focus are anti-money laundering, loss recovery for victims of criminal activity, insurance of cryptocurrency investments for investors, and minimum disclosure requirements of transactions for tax purposes (Salawu and Moloji, 2018). • Law enforcement should be proactive instead of reactive when dealing with cryptocurrencies. A system should be created that in real time collects and analyses data from blockchains and other relevant sources that can be used to identify suspicious behaviours. This system would be less manpower intensive and would provide law enforcement agencies with information in a way that is easy to understand (Irwin and Turner, 2018). • It is more prudent to regulate the intermediaries and providers of cryptocurrencies rather than the actual cryptocurrencies (Nikam, 2018).

Research Question	Findings
<p>3. What were the key recommendations made to regulators by academics?</p>	<ul style="list-style-type: none"> • Hacker & Thomale (2018) proposed a framework for identifying the three different main types of cryptocurrencies, namely: currency, utility, and investment tokens. The distinction gives regulators the ability to differentiate between the different types of cryptocurrencies so regulations would be set considering their key differences and not use one size fits all types of regulations which may end up being inadequate.
<p>4. What have been the challenges faced by regulators?</p>	<ul style="list-style-type: none"> • As cryptocurrencies have evolved, their features have evolved as well leading to differing types in the market. This is a problem for regulators as the different types must be regulated differently (Hacker and Thomale, 2018). • International money laundering has mainly involved multinational banks which specialise in international transactions. The fight against international money laundering has traditionally used multinational banks to report suspicious transactions. Cryptocurrency transactions are however undertaken between decentralised networks of users spread across the world where no entity can be called on to impose AML requirements. The pseudo-anonymity provided by cryptocurrencies makes it difficult for traditional global AML efforts to be effective as they are centred on revealing the identities of those involved in money laundering (Campbell-Verduyn, 2018). • Law enforcement agencies were not very familiar with cryptocurrencies making it a challenge to investigate crimes that involved them. (Teichmann, 2018). • The volatility of cryptocurrencies is problematic to regulators when considering how businesses should account for cryptocurrencies (Volosovych and Baraniuk, 2018).

Table 4.6: 2019

Research Question	Findings
<p>1. Why should cryptocurrencies be regulated?</p>	<ul style="list-style-type: none"> • The main reasons why cryptocurrencies should be regulated are these: the threat to monetary policy effectiveness by central banks, the threat posed to financial system stability, how pseudo-anonymity can support illegal activities and tax evasion, the need for accounting standards to recognise cryptocurrencies and the need for consumer protection (Lastra and Allen, 2019, Limba et al., 2019, Fomina et al., 2019, Bachynskyy and Radeiko, 2019, Haffke and Fromberger, 2019, Tkachenko et al., 2019, Albrecht et al., 2019, Cumming et al., 2019, Nabilou, 2019, Şanlısoy and Çiloğlu, 2019, Lovell, 2019). • The emergence and widespread adoption of cryptocurrencies raised questions to regulators about how they could manage risks to the public and the economy through laws related to investments while also looking at how those conducting transactions could contribute in the way of taxes (Christians, 2019). • Though some argue that cryptocurrency ecosystems are self-governing and organisations behind the blockchain networks enforce improvements in incentives and good governance, these organisations also need to be regulated and supervised (Spithoven, 2019). • Though the market capitalisation of cryptocurrencies has increased significantly since their inception, the markets are still susceptible to manipulation by big players. Avoidance of market manipulation is another main reason in support of regulations (Lastra and Allen, 2019).

Research Question	Findings
<p>1. Why should cryptocurrencies be regulated?</p>	<ul style="list-style-type: none"> • Not having a clear difference between the definition of cryptocurrency and virtual money is a loophole in the legal regulation which also increases money laundering risks (Limba et al, 2019, Tkachenko et al., 2019). • Regulations defining the legal status of Blockchain technologies are required. This relates to storage, possession, use, its responsible entities' legal status, how information in the system is accessed and how the information systems are managed (Bachynskyy and Radeiko, 2019). • The Chicago Board Options Exchange began bitcoin futures trading on 10 December 2017. Futures generally contribute to systemic risk in economies, and cryptocurrency futures would be considered to have a higher risk than other futures. The cryptocurrency futures markets require regulation in areas such as position limits and stress testing (Ryznar, 2019). • Initial Coin Offerings (ICOs) have been used by software developers to finance creating their online applications. Between 2014 and 2018 USD 13 billion was raised using ICOs. The market is however prone to abuse and investors have been victims of scams. Out of the approximately 80,000 blockchain projects initiated globally in that period, allegedly only 8 per cent were still operating in 2019 (Burilov, 2019). • As hedge and other managed funds continued to invest in cryptocurrencies, there was a need for custodial services to adapt to the changes (Schaefer, 2019).

Research Question	Findings
<p>2. What were the steps taken by regulators since the introduction of cryptocurrencies?</p>	<ul style="list-style-type: none"> • In the United States, the Securities and Exchange Commission (SEC) started several proceedings against those who initiated ICOs. The tokens used in ICOs were considered to be like securities and were thus subjected to the registration and prospectus requirements regulated by the SEC. In the EU, regulators also warned that regulation of ICOs was also coming they would also be looked at as securities (Barone and Masciandaro, 2019). • In the Baltic States (Estonia, Latvia, and Lithuania) there were no clear regulatory positions on cryptocurrencies. There were however declarative initiatives and the use of AML/CTF regulations to indirectly identify the nature of cryptocurrencies (Limba et al., 2019). • BRICS countries comprise Brazil, Russia, India, China and South Africa. Apart from China, the rest did not have regulations that directly prohibit cryptocurrency use. Like the Baltic States, there was still no direct regulation of cryptocurrencies in BRICS countries (Sarnakov, 2019). • Five papers published in 2019 dealt with the regulation of cryptocurrencies in Ukraine. At the time Ukraine was in the top 10 countries in the world looking at the number of Bitcoin users in the country. A draft bill was submitted in 2017 for consideration by the Verkhovna Rada (Ukrainian Parliament) but was yet to be passed. The purpose of the bill was to provide regulations for cryptocurrency circulation, storage, possession, use and transactions in Ukraine. One of the recommendations was for the National Bank of Ukraine to be the main regulator of cryptocurrencies (Chornous et al., 2019, Santiago et al., 2019, Bachynskyy and Radeiko, 2019, Fomina et al., 2019). Drobyazko (2019) however argued that instead of a new law, existing legislation should be amended to deal with the introduction of cryptocurrencies.

Research Question	Findings
<p>3. What were the key recommendations made to regulators by academics?</p>	<ul style="list-style-type: none"> • The cryptocurrency space should adopt a middle-ground regulatory model, which would consist of a private ordering model and an incentive-based model. The private ordering model provides an environment for insiders to address problems with technical solutions, which is consistent with the values of decentralised enforcement mechanisms. The incentive-based system encourages prudentially regulated innovation (Davidson, 2019). • Parveen & Alajmi (2019) supported previous researchers in that regulations should target cryptocurrency exchanges as they are operated by identifiable organisations which can be the target of regulators Nabilou (2019) recommended that regulations should be implemented by directing the edicts towards the intermediaries, and these can also be enforced by other existing financial intermediaries such as banks and new institutions such a large miners. • Alterations to the custody rule should be made to keep the client’s digital assets held by exchanges and in the client’s custody instead of in the exchange’s custody, provided certain requirements are met. This would reduce some of the abuse and misappropriations of investor funds that have occurred. Where this cannot be done then regulators should encourage the use of insurance (Schaefer, 2019).

Research Question	Findings
<p>3. What were the key recommendations made to regulators by academics?</p>	<ul style="list-style-type: none"> • Due to the nature of cryptocurrencies, Battalova et al (2019) recommended that regulation be set on three different levels. First, the main international organisations such as FAFT needed to come up with intergovernmental guidelines with the aim of reducing the legal and financial risks caused by the misuse of cryptocurrencies. Second, the legal regulation of cryptocurrencies should be done the regional regulations, for example, by regional groups with the aim of protecting the economic interests of a particular region. Third, there would also be the need for domestic regulations created through a country’s legislature. Chyzhmar et al (2019) noted that though each state regulates cryptocurrencies in its own way, due to the borderless nature of cryptocurrencies, it is important to have common regulations on an international level. This is also supported by Haffke et al (2019) in recommending the EU regional block to have clear definitions in regulations such as AMLD5, which can be helpful in individual states addressing their own regulations using clear and agreed-upon definitions. • Greeff (2019) made two main recommendations to stop the double taxation of cryptocurrency. First, the treatment of the receipt of cryptocurrencies in exchange for goods and services and the exchange of bitcoins for South African rand be subjected to tax at 14%. Alternatively, the receipt of bitcoins for goods or rendering of services could be taxed at 14%, but exchanging bitcoins for fiat currency would be exempted. • Chason (2019) examined whether the receipt of new coins as a result of the Bitcoin hard fork resulted in a taxable event for the new Bitcoin Cash owners in August 2017 or it would be at some later stage(for example, upon sale). The paper recommended that the I.R.S. in the USA

	should tax recipients of Bitcoin Cash but defer the taxation.
Research Question	Findings
3. What were the key recommendations made to regulators by academics? (continued)	<ul style="list-style-type: none"> • Chason (2019) in a separate paper then analysed a ruling released by the IRS later the same year. The research argued that the ruling had several inconsistencies making enforcement difficult for the IRS. The ruling did not provide clarity on whether the Bitcoin Cash hard fork should have resulted in an immediate tax event for those who were affected by it. If it did, there would be several problems. Chason pointed out the issue with how the ruling treated the new cryptocurrency as being stated to have been created at a precise date and time. The argument against this scenario is that firstly it could have been looked at as having occurred at 13:20 GMT on August 1, 2017, when Bitcoin and Bitcoin Cash ceased to have a common transaction history. This could also be looked at as happening almost five hours after this when the first blocks on the Bitcoin Cash blockchain were validated by miners. This distinction is relevant due to the wild price fluctuations of the cryptocurrencies during those five hours. • In the paper by Lovell (2019), there were two proposals to the United States regulators. First, they could completely make it illegal to use cryptocurrencies. This is however difficult to enforce due to the nature of cryptocurrencies. Second, regulators could reclassify cryptocurrencies from property to foreign currency. The recommendation was for the regulations to try and be in line with the Japanese government's model of regulating cryptocurrency exchanges, which places responsibility not just on the consumers but also on the businesses facilitating transacting in cryptocurrency.

Research Question	Findings
<p>4. What have been the challenges faced by regulators?</p>	<ul style="list-style-type: none"> • The creation of the first cryptocurrency Bitcoin was partly motivated by creating a form of money with no connection to a sovereign power. Other cryptocurrencies have been created along this line which makes it difficult for regulators, and they are created in a way to avoid regulation from governments (Carruthers and Arslan, 2019). • Though cryptocurrencies are also traded as investments, it is difficult for regulators to apply laws that are applied to other investments (Chason, 2019b) • Limitations of competence of regulators (Nabilou, 2019) • Certain cryptocurrencies do not have a specific organisation at which edicts of regulation would be directed (Nabilou, 2019). • Regulatory arbitrage could be used as a way around regulations in one country due to the cross-border characteristics of the cryptocurrency industry (Nabilou, 2019). • Lovell (2019) highlighted a problem the regulator IRS faced in the USA due to classifying cryptocurrencies as property for tax purposes. In September 2014 money laundering charges were brought against Pascal Reid and Michell Abner Espinoza alleging they had laundered an estimated \$30,000 using bitcoins. The two defendants argued that as cryptocurrencies were classified as property money laundering charges could not be brought against them as bitcoin was not a currency.

Table 4.7: 2020

Research Question	Findings
<p>1. Why should cryptocurrencies be regulated?</p>	<ul style="list-style-type: none"> • Risks related to the possible insolvency of crypto custodians as well as abuse of investor funds. By February 2018, 59% of the cryptocurrency ICOs from 2017 had failed, with a cost to investors USD233 million. This is a significant difference from the general first-year failure rate of start-ups of 20% (Nelson, 2020). • Setters of accounting standards and tax regulators should make it a priority to define how bitcoins are treated so there are no uncertainties among investors, businesses and other users about the accounting practices and tax treatment (Pelucio-Grecco et al., 2020). • The use of digital currencies in online transactions has also increased the risk of tax evasion (Strauss et al., 2020). • Auditors increasingly now have to handle financial statements containing transactions in cryptocurrency. The lack of standards and regulations for designing audit plans and procedures for cryptocurrency transactions increases the risk that material information is not being disclosed or overlooked (Vincent and Wilkins, 2020). Bennett et al (2020) however recommend that there needs to be a balance between actions to improve reporting versus the costs of developing and implementing the new procedures as crypto assets, their environment and regulations are evolving.

Research Question	Findings
<p>1. Why should cryptocurrencies be regulated?</p>	<ul style="list-style-type: none"> • The launch of Libra has led to a new focus by authorities on the regulatory challenges that arise from stablecoins. It also led to concerns about competition, innovation, and regulatory balance (Walker, 2020, Brühl, 2020, Kethineni and Cao, 2020, Read and Schäfer, 2020).
<p>2. What were the steps taken by regulators since the introduction of cryptocurrencies?</p>	<ul style="list-style-type: none"> • In the EU cryptocurrency transactions were not liable for VAT (Reznik and Horobets, 2020). • European authorities determined the legal treatment of cryptocurrencies by classifying them into three different categories, namely - payment, investment, and utility – using an analysis of their different functions (Ferrari, 2020). • As of 2018, the U.S. SEC did not consider bitcoin to be a security. Of the 2,247 different cryptocurrencies that existed at the time, only bitcoin and ether were classified in that manner. The U.S. Commodity Futures Trading Commission (CFTC) has been significantly more active. It declared bitcoin to be a commodity (Halsey and Halsey, 2020, Subramanian et al., 2020). • In Romania, people who regularly earned money from cryptocurrencies (over 600 lei per year; approx. AUD180) were required to report their income annually and pay income tax and health insurance contributions. Capital gains from cryptocurrency transactions fell under the taxable income from other sources category (Lucian et al., 2020). • The Global Consortium for Digital Currency Governance was created at the World Economic Forum annual meeting in 2020. It was mandated to coordinate how cryptocurrencies would be regulated globally. (Marchant et al., 2020).

Research Question	Findings
<p>3. What were the key recommendations made to regulators by academics?</p>	<ul style="list-style-type: none"> • Bitcoin had characteristics of technology-based products, emerging asset classes, and bubble events so existing financial regulations were not ideal for regulating it (White et al., 2020). • Technology assurances were proposed for any safety-critical and high-risk-based applications. So as not to stifle innovation, Ellul et al. (2020) also proposed that these technology assurances would be voluntary for sectors and applications viewed as being low risk. • Cryptoassets are a relatively new technology, and so regulation of cryptoassets is new as well. Yet, as the technology of cryptoassets accelerates, and national governments struggle to keep up with their national regulations, the need for some international coordination of governance has also become apparent. In particular, the increase in divergent terminology and regulatory requirements creates uncertainties and barriers to international commerce (Marchant et al., 2020, Hooper and Holtbrügge, 2020).
<p>4. What have been the challenges faced by regulators?</p>	<ul style="list-style-type: none"> • Licensing cryptocurrency exchanges as payment institutions faces several challenges. For example, problems arising from the interpretation of the existing laws and risks associated with cryptocurrency payments cannot be fully addressed using existing laws (Nabilou, 2020). • Cryptocurrencies as new assets had characteristics that did not seem to fit the existing asset classes, making accounting for them challenging (Pelucio-Grecco et al., 2020). • Cryptocurrencies at the WTO raised numerous concerns. For example, Venezuela's dispute against the United States led to the WTO dealing with cryptocurrencies for the first time. The dispute showed that new technologies could have an impact on treaties that were signed years before the new technologies were introduced (Chandy and Bhardwaj, 2020).

Table 4.8: 2021

Research Question	Findings
<p>1. Why should cryptocurrencies be regulated?</p>	<ul style="list-style-type: none"> • Effectively regulating cryptocurrencies would deter their use for illegal purposes and boost consumer confidence in them (Ukwueze, 2021). Money laundering is the main issue associated with cryptocurrencies. Research has shown that significant proportions of cryptocurrencies have been used for illegal purposes (Teichmann and Falker, 2021, Park and Youm, 2021). • Pseudo-anonymity, transactions in real-time, the lack of intermediaries and inadequate regulations made cryptocurrencies ideal for use in illicit activities (González-Gallego and Pérez-Cárceles, 2021, Al-Tawil and Younies, 2021, Sanz-Bas et al., 2021). • Adequate and enforced tax regulations on cryptocurrency transactions provided governments with the ability to generate additional tax income revenue (Ukwueze, 2021). • Cryptocurrencies were not mainly held directly by investors but were held by lightly regulated exchanges which were responsible for facilitating transactions and keeping client funds which left investors vulnerable (Solinas, 2021). • A crypto market failure could have a detrimental effect on bankruptcies, with overwhelmed and underprepared bankruptcy courts (McDermott, 2021). • To protect investors, policymakers needed to design a strong regulatory model for the ICO market instead of either leaving it unregulated or completely banning it (Zhang et al., 2021). • Cryptocurrencies’ explosive and unregulated nature has made them very volatile in the short

	term which has impacts on investors and financial markets (Khan et al., 2021).
Research Question	Findings
2. What were the steps taken by regulators since the introduction of cryptocurrencies?	<ul style="list-style-type: none"> • Scepticism was the initial approach towards Cryptocurrencies of Nigeria's financial regulators. They warned financial institutions against dealing with cryptocurrencies. Nigeria's Securities Exchange Commission over time changed its approach and formally recognised cryptocurrencies. The central bank on the other hand banned financial institutions from facilitating transactions in cryptocurrency. <p>The research highlighted though that there was no legislation that actually prohibited the use of or dealing in cryptocurrencies (Ukwueze, 2021).</p> <ul style="list-style-type: none"> • In South Africa in 2016 the Intergovernmental Fintech Working Group was formed to study the increasing role of financial technology and innovation and to look at how regulators could be more proactive in looking at opportunities and threats of these new technologies. The Crypto Assets Regulatory Working Group was later formed to come up with a national policy on the technology. <p>A position paper on establishing a regulatory framework was then put forward in 2020 (Ukwueze, 2021).</p>
3. What were the key recommendations made to regulators by academics?	<ul style="list-style-type: none"> • Teichmann & Falker 2021 suggested that the Liechtenstein Blockchain Act could be used as a good example for other regulators trying to find ways of regulating blockchain technology. The Act was said to be ideal as it did not concentrate on just cryptocurrencies like other regulations looked at it. • Regulators and law enforcement authorities need the relevant legal tools, knowledge, and

	<p>resources to be able to combat the criminal activity that has been growing since the introduction of cryptocurrencies. There was a need to train the police and other law enforcement agencies, prosecutors, and judges on a continuous basis as the technology continues to evolve (Sanz-Bas et al., 2021).</p>
Research Question	Findings
<p>3. What were the key recommendations made to regulators by academics? (continued)</p>	<ul style="list-style-type: none"> • Central banks should focus on monitoring cryptocurrencies and their effect on economies instead of starting their own Central Bank Digital Currencies. They along with other regulators should monitor cryptocurrencies along with activities associated with them, making sure cryptocurrency exchanges and other associated entities are properly registered and meet some minimum operating and licencing guidelines. Regulations associated with anti-money laundering and terrorism financing should be implemented as well (Widjaja, 2021). • Cryptocurrency hard forks occur as cryptocurrencies evolve and this is part of the innovation advancing. As this happens taxation regulators should be considerate of how they apply their rulings on those affected (Sabu, 2021).
<p>4. What have been the challenges faced by regulators?</p>	<ul style="list-style-type: none"> • Regulators normally take time to begin regulating alternative finance systems, as they tend to avoid situations where the introduction of regulations too early could lead to failures in innovati (Renwick and Gleasure, 2021). Government agencies cannot entirely oversee the whole society and economy. Hence regulators usually entrust some of their functions to private entities to maximise efficiency. This however sometimes leads to agency problems caused by conflicts of interest (Teichmann and Falker, 2021).

4.5 Discussion and Conclusion

Some of the reasons researchers propose that cryptocurrencies should be regulated have not changed over time, such as how to guard against their use in illegal activities. This has been a major worry for regulators as cryptocurrencies usually provide a high level of pseudo-anonymity. Although this is true for cryptocurrencies, it is also true for other transactions such as those facilitated in cash as there is no digital trail with cash transactions. With cryptocurrency transactions, however, there is a permanent digital record of a transaction. Yet, it would take a considerable amount of work to uncover the identity of the parties in the transactions. Cryptocurrencies also make it easier for international payments to be made, which is much harder when dealing with cash. This is also why authorities are concerned about their use in money laundering and funding terrorism.

Taxation is important for countries to function as governments need to collect taxes to fund their services. Transactions carried out using cryptocurrencies can easily slip through the regulators' nets. This again is true for transactions in cash; however, regulators are likely to lose more in revenue because of the use of cryptocurrencies as they are not only a means of payment but an investment asset that has seen many investors end up with significant realised and unrealised capital gains. There is also an opportunity for sellers to have a wider market due to the use of the Internet to sell products and services, which is harder to do with cash. It is argued that even with all transactions being made open and transparent to everyone, the different levels of anonymity associated with cryptocurrencies make them the best candidate for a new tax haven.

The decentralised and unregulated character of cryptocurrencies could have an impact on the economic and financial policies of governments (De Filippi, 2014). Central banks have for years been responsible for the monetary policy in countries. A major tool they have used has been controlling the money supply. To the extent that cryptocurrencies function as money, the introduction of cryptocurrencies has meant that central banks no longer fully control the money supply. With the increased use of cryptocurrencies some have questioned the ability of central banks to conduct effective monetary and macroeconomic policies. Also due to the global connection of financial systems, a greater acceptance of cryptocurrencies could affect international financial markets.

With the increase in the number of virtual currency transactions and the number of organisations accepting them, there is a need for more detailed accounting processes and disclosures. Without these, there would be a high probability for cryptocurrency accounting fraud cases as measurement and revenue recognition principles of accounting are not yet clear. Full disclosure of accurate public accounting information is not only important to regulators but also to investors wishing to make informed decisions.

Accounting, which is the language of business, should evolve to adapt to the introduction of cryptocurrencies so that credible reports can be produced. This is so organisations can communicate their performance and activities reliably to investors, regulators, and creditors. Standardised accounting practices will result in clarity in showing the financial impact of transactions in cryptocurrency, the tax effects of the transactions, and how they affect the economy.

The introduction of cryptocurrencies also has an impact on federal budgets. The effect was initially small but increased over time. Seigniorage refers to central banks making a profit from issuing currencies. The profit arises from the cost of producing a currency versus the value of that currency. Central banks also earn seigniorage when they hold assets that bear interest that they purchase with those that do not bear interest. An increase in the demand for cryptocurrencies would then be likely to reduce the ability of central banks to raise revenue from seigniorage as less supply of the fiat is required.

Cryptocurrency users have been subject to scams and other fraudulent activities due to the lack of regulation and oversight. Digital currency exchanges hold cryptocurrency on behalf of their customers. This arrangement can lead to custody problems such as how investors can ensure that the exchanges do not misuse assets. As more investors trade and hold cryptocurrencies through these platforms, regulators should consider how to protect the clients. The introduction of Initial Coin Offerings also brought about more scammers that investors must be protected from.

Different countries have taken different approaches to the regulation of cryptocurrencies since their introduction. Some have accepted the innovation; others have adopted a wait-and-see position while others have not accepted the innovation. Due to the nature of cryptocurrencies, completely banning use in a particular jurisdiction is almost impossible. Selective regulation and selective prohibition are possibly the only two feasible regulatory approaches for regulators.

Cryptocurrencies by their nature are impossible to fully regulate. They were initially designed to avoid centralisation. However, due to the limitations of decentralisation, there was a vacuum that could only be filled by intermediaries. Academics have agreed that the intermediaries should be the main focus of regulations. Intermediaries are able to collect information on behalf of regulators and are also able to assist in the enforcement of regulations. The technology continues to evolve and there is a need for international coordination to regulate and enforce regulations on the evolving technology. The lack of agreement internationally on how to regulate cryptocurrencies can hinder acceptance by some individuals and businesses that would be seeking clarity on accounting, taxation and protection of their investments.

CHAPTER 5: RESULTS - QUALITATIVE ANALYSIS

5.1 Introduction

This chapter is on the qualitative analysis of 20 completed questionnaires using open-ended questions. Respondents were recruited via social media groups and word of mouth. Questionnaires with open-ended questions were chosen and respondents from different countries were recruited for the study. A semi-structured interview protocol was adapted to gather responses from the respondents using a range of open-ended questions related to the barriers towards the adoption of cryptocurrencies.

Results obtained from the interviews were interpreted using thematic analysis using an iterative process and tools to structure data such as MS Word and MS Excel as suggested by Ose (2016). The interview transcripts were organised and coded systematically in order to identify trends and themes that emerged regarding barriers associated with the adoption of cryptocurrencies. Data analysis was conducted in five major steps (1) organising data, (2) identifying themes, (3) associating categories and patterns related to the themes, (4) interpretation and (5) addressing research objectives.

Table 5.1: Interview protocol

Category	Questions
Functional barriers	<p>Usage barrier</p> <ol style="list-style-type: none"> 1. What are your thoughts on how easy or difficult cryptocurrencies are to understand? Please explain why you think so. 2. What are your thoughts on how easy or difficult cryptocurrencies are to use? Please explain why you think so.
	<p>Value barrier</p> <ol style="list-style-type: none"> 1. Do you think cryptocurrencies provide better value as a payment system as compared to normal money? Please explain why you think so. 2. What are your thoughts on whether cryptocurrencies add value to your way of life? Please explain why you think so. 3. What are your thoughts on the time taken to conduct transactions in cryptocurrency? Please explain why you think so.
	<p>Risk barrier</p> <ol style="list-style-type: none"> 1. What risks do you think are associated with using cryptocurrencies? Please explain why you think so. 2. Do you have any fears regarding using cryptocurrencies? If yes, please explain what these fears are.
Psychological barriers	<p>Traditional barrier</p> <ol style="list-style-type: none"> 1. Would you say you have any biases towards cryptocurrencies? If yes, please explain what these biases are.
	<p>Image barrier</p> <ol style="list-style-type: none"> 1. What image do you associate with cryptocurrencies?

5.2 Results

A total of 20 interview responses were collected using an open-ended questionnaire. According to the Innovation Resistance theory barriers are primarily divided into two major categories: Functional Barriers and Psychological Barriers. The functional barriers are further divided into 3 sub-categories, namely, Usage Barriers (UB), Value Barriers (VB) and Risk Barriers (RB). On the other hand, psychological barriers are divided into the Traditional Barrier (TB) and the Image Barrier (IB). Seven categories were identified under functional barriers and three under psychological barriers. The following table shows the themes, categories and items of concern that facilitate addressing research objectives.

Table 5.2: Central themes and categories

Themes	Categories	Items of concern
Usage barrier	Complexity of Understanding	Complexity of information
		Variations in cryptocurrencies
		Unpredictable nature
	Usability Challenges	Transactional challenges
Lack of widespread usage		
Value barrier	Accessibility and functional complexity	Virtual Presence only
		Internet connectivity concerns
	Lack of Trust	Legitimacy concerns
		Reported criminal activities
		Lack of transparency
Risk barrier	Volatility Risk	Market volatility
	Lack of consumer protection	Fears about loss of funds
		Fraudulent activities
Tradition barrier	Biases	Distrust
		Market instability
Image barrier	Futuristic investment	Means to enhance returns with greatest level of risk
	Negative image	Scams and frauds

5.3 Functional barriers

The first theme of active resistance is the Usage Barriers (UB). This is further categorised into complexity of understanding and usability challenges.

5.3.1 Usage Barrier

The respondents found cryptocurrencies difficult to understand. Lack of education about cryptocurrencies, their volatility, and the large number of them were some of the main reasons given as to why they are difficult to understand.

i. Complexity of Understanding

Many respondents found cryptocurrencies difficult to understand. The complexity of information about them, variations in the large number of cryptocurrencies, and their unpredictable nature majorly contributed to the difficulty in understanding.

One respondent described the level of difficulty when asked about the understanding of cryptocurrency as:

“They can be difficult to understand as they’re different types. You have to know which ones are the best to own at a given time. For me, they are too unpredictable, and you can lose or gain money easily” (Respondent 7, Mechanical Engineer, UK).

To the same question, another respondent narrated:

“I find them challenging but my partner explains them in plain language to me”
(Respondent 12, Registered Nurse, Australia).

For the minority who understood them, taking time to self-educate was required.

Those who understood them either own or have owned cryptocurrencies.

“They are pretty easy to understand I find it easier than share investments and also much easier for me to self-track progress of my investment online. I did a lot of self-learning online before starting.” (Respondent 9, Nurse, Australia).

Those who owned cryptocurrencies generally found them easy to use while those who did not were mainly non-committal on that question. Mainly using them as investment assets, self-education, use of custodial services and the increase in the number of businesses now accepting payments in cryptocurrencies were the main reasons why users found them easy to use.

“In the past few years, developments have made crypto a lot easier to use via centralised custodial services. However, this comes with risk as you don’t have self-custody and the risk is passed on to the custodial provider to secure your crypto. Current self-custody apps still make crypto difficult for the average person, because it requires someone to securely store their keys, back it up etc” (Respondent 27, Senior Actuarial Specialist, South Africa).

“I use them only for investment and not necessarily for transactional purposes, so it is easy to use on that front” (Respondent 22, Statistician, South Africa).

ii. Usage Challenges

There were certain usage challenges related to limited acceptances by banks, or difficulty in making withdrawals, as one respondent stated:

They are difficult to use. Not all banks allow you to deposit into crypto wallets and withdrawing can be as annoying. However, once you know which bank

allows crypto transactions it becomes easy” (Respondent 7, Mechanical Engineer, UK).

Another main usage barrier element identified regarding the adoption of cryptocurrencies is usage challenges since cryptocurrencies are not widespread across diverse geographical locations. One respondent from South Africa described his experience as:

Cryptocurrencies are not widely accepted in Africa and they (sic) is still a lot of uncertainty around its future use in the economy. As a result, it is currently not feasible to consider it for daily transactional purposes (Respondent 27, Senior Actuarial Specialist, South Africa).

5.3.2 Value Barrier

The second theme is the Value Barrier (VB). Respondents found that cryptocurrencies did not offer better value as a payment system compared to fiat currencies. Lack of legislation and consumer protection, volatility and that they are largely used online were the main reasons given.

i. Accessibility and functional complexity

Respondents were asked to describe their perceptions about the value perceived from cryptocurrencies as a better payment system relative to traditional money. One of them explained it as:

“No, normal money is better, easy to make transactions and refunds can be processed easily. If you don’t have your device on you or the Internet you can’t make transactions with crypto. With normal money you can have physical cards or on mobile phones and do not require Internet to use them.

Normal money is easy to use for everyone; people will find it hard to use cryptocurrencies especially the older generation. There is no protection when buying goods or services. Compared to MasterCard for example, where unauthorised transactions won't be held against the holder, once you lose your cryptocurrency getting it back is virtually impossible” (Respondent 7, Mechanical Engineer, UK).

For those who owned cryptocurrencies, there was also an even split in regard to their thoughts on the time taken to conduct transactions in cryptocurrency. For those who owned cryptocurrencies and found them fast, the reasons given were the use of crypto exchanges and easy use in online transactions. For those who owned cryptocurrencies and found it slow, the reasons given were the speed of some exchanges, the self-education required, and the amount of information required to transact. Those who did not own cryptocurrencies were mainly unsure of this question.

“Way too long. For example, when sending USDT to someone, (a) you have to have the USDT in your wallet, (b) know which withdrawal network to use, (c) know the address which you are sending to (sic). (One can easily make a mistake when typing this address and send it to the wrong person.), (d) select the amount and send, and (e) there are just too many steps to go through. Also, it difficult (sic) to get through the helplines provided for support. Comparing all this to a standard bank transfer, you can just select the person you want to send money to, select the amount and send. You can also go to the bank easily and can access telephone banking easily.” (Respondent 7, Mechanical Engineer, UK).

Another one stated:

“My partner understands the system, so he takes a limited amount of time. If I had to do it because my understanding is low it would take much longer”

(Respondent 9, Nurse, Australia).

ii. Lack of Trust

Another main concern reported by respondents was the lack of consumer protection or legislation, which degrades its value in comparison with traditional money.

“No, I don't think so due to the extra layers and a lack of legislation on their legality compared to normal currency makes them less valuable as a means of payment” (Respondent 3, Research Fellow, Australia).

For those who owned cryptocurrencies, there was an even split regarding whether cryptocurrencies added value to their way of life. For those who owned cryptocurrencies and found that they added value to their way of life, the reasons given were the speed of transfer for transactions and their use as speculative investments with low cost of entry and management. For those who owned cryptocurrencies and found that they did not add value to their way of life, the reasons given were lack of regulations and user protection, volatility and the time-consuming self-education required.

“Can't really see much of a value add. Besides me profiting from the occasional pump and dump. However, in the complex literature, they mention

that the Blockchain ledger technology can increase transparency in transactions” (Respondent 25, Quantitative Analyst, USA).

The benefits of blockchain technology were also pointed out as a value addition.

“I believe it will one day add value once they solve the barriers that allows (sic) the average person to easily use and store crypto. It provides a lot of transparency on the blockchain on how funds are used and dispersed. This is one of the main benefits and one of the primary reasons that so many fraudsters and illegal transactions are discovered. In a traditional banking system, this is not visible to the public eye” (Respondent 27, Senior Actuarial Specialist, South Africa).

Those who did not own cryptocurrencies believed they did not add value largely due to their volatility and their reported use in criminal activity.

“At the moment they add no value because I am not participating in them. I am too scared to put my money on them because the market is so volatile.” (Respondent 1, Social Worker, Australia).

Some respondents were extremely sceptical about cryptocurrencies due to reported criminal activities associated with them. When asked to express their thinking on the value cryptocurrency adds to their life, one responded:

“No, they don't. The (sic) probably dismiss my way of life as they are a means for criminals such as hackers, drug dealer (sic) and terrorists to be able to transfer wealth within the oversight and intervention on law enforcement” (Respondent 10, Accountant, Australia).

5.3.3 Risk Barrier

The third theme is Risk Barrier (RB). For respondents who had used cryptocurrencies and those who had not, volatility was identified as the main risk and fear. Other risks and fears identified were that of losing entire investments due to fraud or exchange bankruptcy and illegal activities. Lack of consumer protection, adequate regulations and lack of clear governance transparency were also identified as risks.

i. Perceived Volatility

The respondents highlighted the risks associated with market volatility in the cryptocurrency space. One of them referred to a recent news event where a significant platform went bankrupt, causing investments to vanish, which influenced her perception of cryptocurrencies that prices can experience drastic fluctuations, potentially leading to financial losses. She quoted:

“Market volatility is (sic) biggest risk even just looking at the news today

13/11/22 huge platform going bankrupt and investments disappearing”

(Respondent 13, Clinical Psychologist, Australia)

ii. Lack of consumer protection

Cryptocurrency users were asked to describe their point-of-view on the critical issues such as risks associated with cryptocurrency. It appears that some users are deeply concerned about unsophisticated users facing significant risks, including the potential for fraud and financial loss due to the absence of robust regulatory

frameworks. This highlights the urgent need for regulatory measures to protect users and ensure the stability and trustworthiness of the cryptocurrency ecosystem.

“Lack of regulation leaves unsophisticated users at significant risk of fraud and financial loss. Even for sophisticated users, the lack of barriers of entry for new cryptocurrencies can mean that (sic) supply of crypto is unlimited, which impacts on confidence and value. Lack of transparency on the governance and technology around most currencies.” (Respondent 21, Finance Executive, Australia).

There was also an emphasis on the risk of losing all of an individual's money from wallet security breaches and phishing attacks because the majority of cryptocurrencies lack sufficient security measures. One of them quoted:

“Risks of losing entire funds due to wallet security breach, phishing. The majority of cryptos are not secure due to concentration risk i.e., certain institutions/group (sic) hold the majority of power to take over the chain” (Respondent 27, Senior Actuarial Specialist, South Africa).

5.4 Psychological Barriers

Two themes are discussed under psychological barriers: traditional barriers and image barriers.

5.4.1 Traditional Barrier

The fourth theme is traditional barriers which provide a reflection of respondents' biases towards cryptocurrencies. Overall, the majority of the respondents reported no bias. Nevertheless, cryptocurrency users suggested that the platform should be thoroughly evaluated prior to subscription.

“No, you just have to know the risks associated with crypto and understand trading markets” (Respondent 7, Mechanical Engineer, UK).

Another user, to the same question, responded as follows:

“No biases. However, I evaluate cryptocurrencies like I would any other traditional currency or asset class and there are some clear gaps that I think the sector will need to solve in the future” (Respondent 21, Finance Executive, Australia).

i. Biases

Some respondents did reveal biases, often rooted in concerns about security and transparency.

“Yes, I believe the security and transparency of crypto in particular for public entities and institutions to ensure funds are not misappropriated and misused” (Respondent 27, Senior Actuarial Specialist, South Africa).

It appears that some respondents prioritise their peace of mind and ethical considerations over the potential financial gains from investing in cryptocurrencies, as some are strongly risk averse and believe that it is more acceptable to miss out on potential riches than to invest in something they consider inherently unsafe.

“Serious mistrust for it as I have already explained earlier. Mainly on a spiritual basis. I'd rather know I did not get rich even if the whole thing turned out to be safe, I'll be happy for those who took the risk and gained. It is better that way than think for me to think it is safe only to find out later that I was wrong” (Respondent 26, Student, Australia).

In a similar vein, another respondent narrated his particular biases towards American-based cryptocurrency:

“I am biased to (sic) American-based cryptocurrencies as the market is bigger and gives me some level of reassurance to market permanency” (Respondent 9, Nurse, Australia).

5.4.2 Image Barrier

The last theme is image barriers. Varied perceptions can be observed in this theme as respondents withhold both negative and positive images.

i. Negative image

One related question was asked in this regard about the image respondents associate with cryptocurrencies. The non-users provided certain negative comments such as “gambling”, “scamming and pyramid schemes”, “ponzi scheme” and “dodgy”.

ii. Futuristic Investment

On the other hand, the previous or existing users of cryptocurrency viewed it as a “futuristic investment”, embodiment of “gold coin”, “future of finance”, “get rich quick scheme”, and “highly technical and volatile”. They acknowledge the opportunity for enhanced returns but emphasise their preference for limited exposure to this asset category.

One explained it as:

An alternative investment vehicle that can be used to enhance returns but with a significant level of risk. As a result, I would not always tend to have

limited exposure to this asset class” (Respondent 22, Statistician, South Africa).

5.5 Conclusion

The findings confirmed all three sub-themes of the functional barriers as being barriers to the adoption of cryptocurrencies. Respondents found usability challenges and complexity of understanding as the main usage barriers related to cryptocurrencies. They were concerned about accessibility without the Internet, functional complexities of the platform, the sheer number of cryptocurrencies, unpredictability and variations in information majorly contributed to usage barriers. Taking time to self-educate was required to remove these barriers. Respondents believed that traditional fiat currencies offer superior value as payment systems than cryptocurrencies, which was reflected in the value barriers. As an alternative to fiat currencies, cryptocurrencies were not found to add value, as fiat currencies were still the preferred method of transacting for respondents.

High volatility, the number of instances of fraud and hacking in the cryptocurrency market and the possibility of completely losing one’s investment were the main risks identified as barriers. These concerns suggest a need for regulatory institutions or measures to ensure market stability, security and cryptocurrency user protection. In addition, as suggested by one of the respondents, these platforms need to be user-friendly, with wallets to simplify the technical process.

Moreover, users must be educated through organised workshops or programs, and a robust customer support service channel that addresses concerns promptly to enhance their experience (Eriksson, et al., 2021).

The psychological barriers of tradition did not come out as a relevant factor as respondents mainly did not identify as having any biases towards cryptocurrencies. The image barrier was relevant as some respondents associated cryptocurrencies with volatility as well as fraudulent and criminal activities. Some respondents viewed it as a futuristic investment, which indicates that users see cryptocurrencies as a dynamic and promising investment class. As such, the data highlights the diverse range of perspectives on cryptocurrencies, as some respondents embraced them as innovative investments, while others appear to be sceptical, and insecure, emphasising the need for trust and ethical assurance in their financial decisions. However, it is suggested that strict actions should be taken against violations of laws that pose a danger towards any user (Eriksson, et al., 2021).

Findings from the qualitative analysis were used in a further quantitative analysis into the barriers to the adoption of cryptocurrencies using the innovation resistance theory. Results from both analyses were then used to make a final conclusion.

CHAPTER 6: RESULTS – QUANTITATIVE ANALYSIS

6.1 Analysis of Data from Cryptocurrency Users

A total of 261 responses were gathered and were considered for data analysis using the JASP program. This section includes the various statistical tools and techniques applied to the data to extract meaningful information and draw rational conclusions. The various statistical analyses used in this study are descriptive statistics, Pearson correlation, and regression analysis. Lastly, the results drawn from data analysis are discussed in detail to conclude whether the posited hypotheses of the study are supported with reference to previous findings.

6.1.1 *Demographics*

The descriptive statistics analysis concluded that out of a total of 261 responses, female participants were at a proportion of 44.1%, 55.6% were male participants, and 0.4% identified as other. Individuals all around the world were allowed to participate in the study and were included in the sample for data analysis and interpretation. That is, participants from 34 different countries were included to represent diversity.

Table 6.1: Gender Cryptocurrency Users

	Frequency	Percent	Valid Percent	Cumulative Percent
Female	115	44.1	44.1	44.1
Male	145	55.6	55.6	99.6
Other	1	.4	.4	100.0
Total	261	100.0	100.0	

The study targeted those over 18 years old. 47.9% of the respondents were 30 – 39 years old, which was the dominant age group, followed by younger individuals of 18 -29 years with 22.6% frequency, and 40 – 49 years old with 21.1% frequency.

Table 6.2: Age Cryptocurrency Users

	Frequency	Percent	Valid Percent	Cumulative Percent
18-29	59	22.6	22.6	22.6
30-39	125	47.9	47.9	70.5
40-49	55	21.1	21.1	91.6
50-59	20	7.7	7.7	99.2
60 and over	2	.8	.8	100.0
Total	261	100.0	100.0	

Regarding education level, as shown in Table 6.3, individuals with undergraduate degrees constituted approximately half of the sample, that is 48.3%, while 31% had a Masters degree, which indicates that the sample of the study is well-educated.

Table 6.3: Education level Cryptocurrency Users

	Frequency	Percent	Valid Percent	Cumulative Percent
Certificate or Diploma	25	9.6	9.6	9.6
High School	22	8.4	8.4	18.0
Masters	81	31.0	31.0	49.0
PhD and Doctorate	7	2.7	2.7	51.7
Undergraduate degree	126	48.3	48.3	100.0
Total	261	100.0	100.0	

Similarly, the occupation or employment status in Table 6.4 shows that the participants belonged to diverse professional backgrounds, which included students, government officers, healthcare professionals, technicians, business individuals, labourers and military or armed officers.

Table 6.4: Employment Cryptocurrency Users

	Frequency	Percent	Valid Percent	Cumulative Percent
General Employment	41	15.7	15.7	15.7
Government/Public Service/Civil Service	11	4.2	4.2	19.9
Health Care Professional	19	7.3	7.3	27.2
Labourer	10	3.8	3.8	31.0
Military/Police/Uniformed Services	2	.8	.8	31.8
Professional/Manager/Executive/Technician	113	43.3	43.3	75.1
Self-employed	35	13.4	13.4	88.5
Student	30	11.5	11.5	100.0
Total	261	100.0	100.0	

Furthermore, the participants were asked about their overall technical skills or proficiency in using a computer. The analysis concluded that most of the respondents were advanced (32.3%) to above average users (33.7%), while some were computer or IT professionals (10.7%) and very few were beginners (0.8%), as presented in Table 5.

**Table 6.5: How do you rate your overall computer skills?
Cryptocurrency Users**

	Frequency	Percent	Valid Percent	Cumulative Percent
Above average user	88	33.7	33.7	33.7
Advanced user	84	32.2	32.2	65.9
Average user	59	22.6	22.6	88.5
Beginner	2	.8	.8	89.3
Computer Expert / IT Professional	28	10.7	10.7	100.0
Total	261	100.0	100.0	

6.1.2 Descriptive Statistics

Descriptive statistics are one of the main elements of data analysis. Six variables are taken into account in this study – that is, five independent variables and one dependent variable. The following table (Table 6.6) shows the measure of dispersion of all the underlying variables in terms of standard deviation, mean, minimum and maximum value of the variables.

The mean for 'usage barrier', 'value barrier' and 'risk barrier' are 4.32, 4.18 and 4.39 respectively. Since the values are above 3, it indicates that participants showed a substantial degree of agreement with the survey questions related to the functional barriers. The mean for 'image barrier' and 'tradition barrier' are 3.94 and 3.72 respectively, where closeness to 4 indicates certain agreement. The dependent variable or the adoption intention has a mean of 2.09 with a standard deviation of 0.786, demonstrating that the majority of the users have a low intention to use cryptocurrency.

In addition, the mean of 'risk barrier' is the highest (mean = 4.39 and std. dev. = 0.655), while adoption intention (mean = 2.09 and std. dev. = 0.78) has the lowest mean.

Table 6.6: Descriptive Statistics Cryptocurrency Users

	N	Minimum	Maximum	Mean	Std. Deviation
Usage Barrier	261	2.80	5.00	4.3280	.57514
Value Barrier	261	1.80	5.00	4.1862	.71455
Risk Barrier	261	1.83	5.00	4.3978	.65502
Tradition Barrier	261	1.60	5.00	3.7272	.81641
Image Barrier	261	2.00	5.00	3.9416	.62457
Adoption Intention	261	1.00	5.00	2.0920	.78641

6.1.3 Reliability Test

Reliability score refers to the analysis of the internal consistency of the scales, which is done through Cronbach's alpha. The variables are acceptable if the Cronbach's alpha value is around 0.6 or above (Hair, Black, Babin, & Anderson, 2010). All the variables have the value of Cronbach's alpha between the ranges of

0.685 to 0.861, which is the acceptable range as illustrated in Table 6.7. Thus, the reliability score implies that the survey scale and instrument are reliable in determining the variables without random error.

Table 6.7: Reliability Statistics Cryptocurrency Users

	Number of items	Cronbach's Alpha
Usage Barrier	5	0.825
Value Barrier	5	0.836
Risk Barrier	6	0.861
Tradition Barrier	5	0.798
Image Barrier	4	0.685
Adoption Intention	2	0.717

6.1.4 Correlation

Pearson correlation is used to determine the direction and strength of association present between variables. The coefficient value near +1 indicates a perfect positive correlation. In Table 7, it is observed that 'adoption intention' is correlated with each of the independent variables. The highest correlation is observed with the 'image barrier' ($r = -0.391$, $p = 0.000$), followed by 'tradition barrier' ($r = -0.363$), 'risk barrier' ($r = -0.254$), usage barrier ($r = -0.225$) and 'value barrier' ($r = -0.204$). Notably, all the relationships measured through Pearson correlations indicate a negative but significant correlation between cryptocurrency adoption with all the independent variables of the study. Thus, the overall results indicate that the adoption intention for cryptocurrency is weak but significantly related to all of the selected barriers.

Table 6.8: Correlations of Cryptocurrency Users

	Adoption	Usage	Value	Risk	Tradition	Image
Adoption Pearson Correlation Sig. (2-tailed) N	1 261					
Usage Pearson Correlation Sig. (2-tailed) N	-.225** .000 261	1 261				
Value Pearson Correlation Sig. (2-tailed) N	-.204** .001 261	.646** .000 261	1 261			
Risk Pearson Correlation Sig. (2-tailed) N	-.254** .000 261	.625** .000 261	.656** .000 261	1 261		
Tradition Pearson Correlation Sig. (2-tailed) N	-.363** .000 261	.561** .000 261	.610** .000 261	.639** .000 261	1 261	
Image Pearson Correlation Sig. (2-tailed) N	-.391** .000 261	.521** .000 261	.570** .000 261	.631** .000 261	.600** .000 261	1 261

** . Correlation is significant at the 0.01 level (2-tailed).

6.1.5 Regression Analysis

Multiple regression models were used to test the significance of the stated five hypotheses of the study by examining the causal relationship between variables (Bryman & Cramer, 2004). The regression model was conducted to find the relationship between the adoption of cryptocurrency and its inhibiting factors or barriers to adoption. Tables 6.9, 6.10 and 6.11 show the model summary, ANOVA statistics and coefficients of the regression model respectively.

From Table 6.9, R square is the indicator that implies the degree of variation explained by independent variables for the dependent variable and subsequently determines the goodness of fit. The R square value is 0.189, which reflects weak model fitness. The R-value is 0.435, which depicts a moderate association between adoption intention and the barriers. That is, the adoption intention of cryptocurrency is moderately influenced by the stated barriers. Furthermore, the adjusted R and R square value 0.189 indicates that variation in the values of variables brings no adequate change to the overall model. From Table 6.10, the ANOVA statistics, the significant value is 0.000, which indicates that the regression model is statistically significant with an F value of 11.897.

Considering Table 6.11, tradition barriers and image barriers have a significant association with adoption intention as the p-value is within the acceptable range. Notably, value barriers and risk barriers have a positive relationship with adoption intention as the standardised beta is 1.395 and 0.586 respectively. However, these relationships are insignificant due to p-value being 0.164 for 'value barrier' and 0.558 for 'risk barrier', which exceeds the optimum acceptable range.

On the other hand, functional barriers, which consisted of usage barriers, risk barriers and value barriers failed to generate a significant relationship with adoption intention as evident from the p-value exceeding 0.05 threshold. The standardised beta coefficient for image barriers is -0.324, meaning that any unit increase in image barrier results in a 32.4% decrease in adoption intention. Similarly, the tradition barrier has a standardised beta of 0.264, indicating a moderate strength of significance but a negative association with the adoption intention. That is, an increase in tradition barriers or image barriers is very likely to result in a decrease in user intention to adopt cryptocurrency.

Therefore, the regression analysis shows that the psychological barriers, represented through tradition barriers and image barriers, have a negative and significant relationship with the adoption intention of users towards cryptocurrencies. However, functional barriers, proxied through value barriers, usage barriers and risk barriers, are insignificant in determining user intention to use cryptocurrency.

Table 6.9: Model Summary Cryptocurrency Users

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.435 ^a	.189	.173	.71505

a. Predictors: (Constant), UB, VB, RB, TB, IB

Table 6.10: ANOVA Cryptocurrency Users

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	30.414	5	6.083	11.897	.000 ^b
Residual	130.379	255	.511		
Total	160.793	260			

a. Dependent Variable: Adoption Intention

b. Predictors: (Constant), UB, VB, RB, TB, IB

Table 6.11: Coefficients of Cryptocurrency Users

Model	Unstandardised Coefficients		Standardised Coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	3.929	.370		10.620	.000
Usage Barriers	-.023	.109	-.017	-.207	.836
Value Barriers	.131	.094	.119	1.395	.164
Risk Barriers	.062	.106	.052	.586	.558
Tradition Barriers	-.255	.078	-.264	-3.252	.001
Image Barriers	-.408	.099	-.324	-4.135	.000

a. Dependent Variable: Adoption Intention

Table 6.12: Hypothesis Results for Cryptocurrency Users

No.	Independent Variable	Correlation coefficient	Beta Coefficient	P-value	Significance	Conclusion
H1	Usage Barriers	-0.225	-0.017	.836	Insignificant	Rejected
H2	Value Barriers	-0.204	0.119	.164	Insignificant	Rejected
H3	Risk Barriers	-0.254	0.052	.558	Insignificant	Rejected
H4	Tradition Barriers	-0.363	-0.264	.001	Significant	Accepted
H5	Image Barriers	-0.391	-0.324	.000	Significant	Accepted

(Kaur, Dhir, Singh, Sahu, & Almotairi, An innovation resistance theory perspective on mobile payment solutions, 2020) (Gupta & Arora, 2017)(Moorthy, Suet, Weng, Yin, Sin, & Kok, 2017)

6.2 Analysis of Data from Cryptocurrency Non-users

A total of 270 responses were gathered and were considered for data analysis using the JASP program. Like the above analysis of data from cryptocurrency users, this section includes the various statistical tools and techniques applied to extract meaningful information and draw rational conclusions.

6.2.1 Demographics

The descriptive statistics analysis concluded that out of a total of 270 responses, female participants were at a proportion of 59.0%, 38.8% were male participants, and 2.2% preferred not to say. Individuals all around the world were allowed to participate in the study and were included in the sample for data analysis

and interpretation. That is, participants from 34 different countries were included to represent diversity.

Table 6.13: Gender of Cryptocurrency Non-users

	Frequency	Percent	Valid Percent	Cumulative Percent
Female	160	59.3	59.3	59.3
Male	104	38.5	38.5	97.8
Preferred not to say	6	2.2	2.2	100.0
Total	271	100.0	100.0	

The study targeted adults over the age of 18. As such, 23.6% of the respondents were of 30 – 39 years old which was the dominant age group, followed by younger individuals of 18 -29 years with 35.4% frequency, and 22.1% were 40 – 49 years old.

Table 6.14: Age of Cryptocurrency Non-users

	Frequency	Percent	Valid Percent	Cumulative Percent
18-29	95	35.2	35.2	35.2
30-39	64	23.7	23.7	58.9
40-49	60	22.2	22.2	81.1
50-59	28	10.3	10.3	91.5
60 and over	23	8.5	8.5	100.0
Total	271	100.0	100.0	

Regarding education level, as shown in Table 4, individuals with an undergraduate degree constituted approximately half of the sample, that is 46.1%, while 23.2% had a Masters degree.

Table 6.15: Education level of Cryptocurrency Non-users

	Frequency	Percent	Valid Percent	Cumulative Percent
Certificate or Diploma	24	8.9	8.9	8.9
High School	47	17.4	17.4	26.3
Masters	63	23.3	23.3	49.6
PhD and Doctorate	11	4.1	4.1	53.7
Undergraduate degree	125	46.3	46.3	100.0
Total	271	100.0	100.0	

Similarly, the occupation or employment status in Table 6.16 shows that the participants belonged to diverse professional backgrounds which included students, government officers, healthcare professionals, technicians, business individuals, labourers and military or armed officers.

Table 6.16: Employment of Cryptocurrency Non-users

	Frequency	Percent	Valid Percent	Cumulative Percent
General Employment	43	15.9	15.9	15.9
Government/Public Service/Civil Service	19	7.0	7.0	22.9
Health Care Professional	12	4.4	4.4	27.3
Labourer	10	3.7	3.7	31.0
Military/Police/Uniformed Services	1	.4	.4	31.4
Professional/Manager/Executive/Technician	49	18.1	18.1	49.4
Self-employed	50	18.5	18.5	67.9
Student	77	28.8	28.8	96.7
Retired	9	3.3	3.3	100.0
Total	261	100.0	100.0	

Furthermore, the participants were asked about their overall technical skills or proficiency in using a computer. The analysis concluded that most of the respondents were average (36.3%) to above-average users (32.6%) as presented in Table 6.17.

**Table 6.17: How do you rate your overall computer skills?
Cryptocurrency Non-users**

	Frequency	Percent	Valid Percent	Cumulative Percent
Above average user	88	32.6	32.6	32.6
Advanced user	49	18.1	18.1	50.7
Average user	98	36.3	36.3	87.0
Beginner	6	2.2	2.2	89.2
Computer Expert / IT Professional	22	8.2	8.2	97.4
Novice	7	2.6	2.6	100.0
Total	261	100.0	100.0	

6.2.2 Descriptive Statistics

Six variables are considered in this study – that is, five independent variables and one dependent variable. For each variable, the respondent could answer strongly disagree, disagree, neutral, agree and strongly agree. Each of these responses was represented by numbers, that is 1 through 5. The following Table (6.18) shows the measure of dispersion of all the underlying variables in terms of standard deviation, mean, minimum and maximum value of the variables.

The mean for usage barriers, value barriers, risk barriers, and image barriers are 3.747, 3.517, 4.041 and 3.593 respectively. Since the values are above 3 but closer to 4 it indicates that participants showed a certain agreement to the survey questions. The mean for tradition barriers was 2.769 indicating a certain level of disagreement with the survey question. The dependent variable or the adoption intention has a mean of 2.707 with a standard deviation of 1.022, demonstrating that the majority of the users have a lower intention to use cryptocurrency. In addition, the mean of risk barriers is the highest (mean = 4.041 and std. dev. = 0.619), while adoption intention (mean = 2.707 and std. dev. = 1.022) has the lowest mean.

Table 6.18: Descriptive Statistics Cryptocurrency Non-users

	N	Minimum	Maximum	Mean	Std. Deviation
Usage Barriers	270	1.40	5.00	3.747	0.663
Value Barriers	270	1.40	5.00	3.517	.670
Risk Barriers	270	2.50	5.00	4.041	.619
Tradition Barriers	270	1.00	5.00	2.769	.814
Image Barriers	270	1.40	5.00	3.593	.656
Adoption Intention	270	1.00	5.00	2.707	1.022

6.2.3 Reliability Test

The Reliability score refers to the analysis of internal consistency of the scales, which is done through Cronbach's alpha. The variables are acceptable if the Cronbach's alpha value is around 0.6 or above (Hair, Black, Babin, & Anderson, 2010). All the variables have the value of Cronbach's alpha between the ranges of 0.644 to 0.836, which is the acceptable range as illustrated in table 6.19. Thus, the reliability score implies that the survey scale and instrument is reliable to determine the variables without random error.

Table 6.19: Reliability Statistics for Cryptocurrency Non-users

	N of items	Cronbach's Alpha
Usage Barriers	5	0.760
Value Barriers	5	0.741
Risk Barriers	6	0.727
Tradition Barriers	4	0.700
Image Barriers	5	0.670
Adoption Intention	2	0.753

6.2.4 Correlation

Pearson correlation is used to determine the direction and strength of association present between variables. The coefficient value near +1 indicates a perfect positive correlation. In Table 6.20, it is observed that adoption intention has a vague correlation with all the independent variables. However, the highest correlation is observed with the value barriers ($r = -0.479$, $p = 0.000$), followed by image barriers ($r = -0.385$), usage barrier ($r = -0.295$), risk barriers ($r = -0.203$) and tradition barriers ($r = -0.165$). Notably, all the relationships measured through Pearson correlations indicate a negative but significant correlation between cryptocurrency adoption with all the independent variables of the study.

Thus, the overall results indicate that the adoption intention of cryptocurrency is weak but significantly related to all the selected barriers.

Table 6.20: Correlations Cryptocurrency Non-users

	Adoption	Usage	Value	Risk	Tradition	Image
Adoption Pearson Correlation	1					
Sig. (2-tailed)						
N	270					
Usage Pearson Correlation	-.295**	1				
Sig. (2-tailed)	.000					
N	270	270				
Value Pearson Correlation	-.479**	.400**	1			
Sig. (2-tailed)	.001	.000				
N	270	270	270			
Risk Pearson Correlation	-.203**	.424**	.372**	1		
Sig. (2-tailed)	.000	.000	.000			
N	270	270	270	270		
Tradition Pearson Correlation	-.165**	.277**	.208**	.136**	1	
Sig. (2-tailed)	.006	.000	.000	.025		
N	270	270	270	270	270	
Image Pearson Correlation	-.385**	.422**	.500**	.564**	.167**	1
Sig. (2-tailed)	.000	.000	.000	.000	.006	
N	270	270	270	270	270	270

** . Correlation is significant at the 0.01 level (2-tailed).

6.2.4 Regression Analysis

Multiple regression models were used to test the significance of the stated five hypotheses of the study by examining the causal relationship between variables (Bryman & Cramer, 2004). The regression model was conducted to find the relationship between the adoption of cryptocurrency and its inhibiting factors or barriers to adoption. Tables 6.21, 6.22 and 6.23 show the model summary, ANOVA statistics and coefficients of the regression model respectively.

From Table 6.21, R square is the indicator that implies the degree of variation explained by independent variables for the dependent variable and subsequently determines the goodness of fit. R square value is 0.270, which reflects weak model fitness. R-value is 0.520 which depicts a moderate association between adoption intention and the barriers. That is, the adoption intention of cryptocurrency is moderately influenced by the stated barriers. Furthermore, the adjusted R and R square value is 0.256, which provides an indication that variation in the values of variables brings no adequate change to the overall model. From Table 6.22, the ANOVA statistics result in a significant value of 0.000, which indicates that the regression model is statistically significant with F value of 19.530.

Considering Table 6.23, tradition barriers and image barriers have a significant association with adoption intention as the p-value is within the acceptable range. Notably, risk barriers have a positive relationship with adoption intention, as the standardised beta is 1.466. However, the relationship is insignificant due to the p-value being 0.144, which exceeds the 0.05 threshold.

The usage barriers and tradition barriers failed to generate a significant relationship with adoption intention as evidenced by the p-value exceeding 0.05. The standardised beta coefficient for the image barrier is -0.213, meaning that any unit increase in the image barrier results in a 21.3% decrease in adoption intention. Similarly, the value barrier has a standardised beta of -0.364 meaning that any unit increase in the value barrier results in a 36.4% decrease in adoption intention.

Table 6.21: Model Summary Cryptocurrency Non-users

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.520 ^a	.270	.256	.881

a. Predictors: (Constant), UB, VB, RB, TB, IB

Table 6.22: ANOVA Cryptocurrency Non-users

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	75.844	5	15.169	19.530	.000 ^b
Residual	205.042	264	.777		
Total	280.886	269			

a. Dependent Variable: Adoption Intention

b. Predictors: (Constant), UB, VB, RB, TB, IB

Table 6.23: Coefficients - Cryptocurrency Non-users

Model	Unstandardised Coefficients		Standardised Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	5.862	.421		13.940	.000
Usage Barrier	-.136	.096	-.088	-1.411	.159
Value Barrier	-.555	.096	-.364	-5.778	.000
Risk Barrier	.159	.109	.097	1.466	.144
Tradition Barrier	-.054	.069	-.043	-0.777	.438
Image Barrier	-.332	.109	-.213	-3.059	.002

a. Dependent Variable: Adoption Intention

Table 6.24: Hypothesis Results - Cryptocurrency Non-users

No.	Independent Variable	Correlation coefficient	Beta Coefficient	P-value	Significance	Conclusion
H1	Usage Barrier	-0.136	-0.088	.159	Insignificant	Rejected
H2	Value Barrier	-0.555	-0.364	.000	Significant	Accepted
H3	Risk Barrier	0.159	0.097	.144	Insignificant	Rejected
H4	Tradition Barrier	-0.054	-0.043	.438	Insignificant	Rejected
H5	Image Barrier	-0.332	-0.213	.002	Significant	Accepted

6.3 Conclusion

The Innovation Resistance Theory or IRT framework comprises two major groups of barriers: functional and psychological (Ram & Sheth, 1989). These categories are further divided into subcategories. That is, functional barriers include risk barriers, value barriers and usage barriers, while psychological barriers include tradition and image barriers. Quantitative data analysis through correlation and regression models

was conducted to test the significance of the impact of these barriers on users' intention to adopt cryptocurrency. The analysis was done separately for users of cryptocurrencies and non-users of cryptocurrencies.

Based upon the collected data for cryptocurrency users, the regression analysis suggested that psychological barriers have a negative and significant impact on user intention to adopt cryptocurrencies, while functional barriers have an insignificant association. Both the variables of psychological barriers are significantly and negatively affecting the adoption intention; however, the beta coefficient provides a clear indication that the image barrier ($b = -0.324$) has a higher impact than the tradition barrier ($b = -0.264$) on users.

Similarly, the results of the correlation analysis also align with these findings, as the correlation coefficient of adoption intention is highest with image barriers ($r = -0.391$) and tradition barriers ($r = -0.363$). In addition, the correlation test indicated a significant relationship between all the variables undertaken in the study. However, regression analysis provides a more nuanced understanding of relationships between variables, thereby it is considered more accurate and precise.

In terms of hypotheses testing, the first hypothesis assumed a negative but significant relationship between tradition barriers and the adoption of cryptocurrency, but the data analysis showed a negative and insignificant relationship which leads to the rejection of H1 under the current study. Similarly, hypotheses 2 and 3 relate to the relationship of value barriers and risk barriers with the adoption of

cryptocurrency, respectively, which are also rejected based on the results of the data analysis.

Hypotheses 4 and 5 assumed a significant but negative impact of tradition barrier and image barrier on cryptocurrency adoption, respectively. The data analysis through regression analysis, supports H4 and H5 that tradition and image barriers negatively influence cryptocurrency adoption. In conclusion, H1, H2 and H3 are rejected while H4 and H5 are accepted and supported in the current study. These findings are contradictory to some of the previous studies, where functional barriers were identified to be significant factors in influencing user adoption of technology, while psychological barriers were regarded as insignificant factors under the IRT framework (Kaur et al., 2020b). On the other hand, some studies support the presence of a relationship between tradition barrier and technology adoption (Gupta & Arora, 2017), and between image barrier and technology adoption (Moorthy et al., 2017).

Based upon the collected data for cryptocurrency non-users, the regression analysis results were mixed for functional and psychological barriers. One of the functional barriers, the value barrier's variables was significantly and negatively affecting the adoption intention with a beta of -0.364. The psychological barrier of image also had a significant and negative effect on the adoption intention with a beta of -0.213.

The results of the correlation test also align with these findings as the correlation of adoption intention is highest with 'value barrier' ($r = -0.479$) and 'image

barrier' ($r = -0.385$). In addition, the correlation test indicated a significant relationship between all the variables undertaken in the study.

In terms of hypotheses testing, the first hypothesis assumed a negative but significant relationship between tradition barriers and the adoption of cryptocurrency, but the data analysis showed a negative and insignificant relationship, which leads to the rejection of H1 under the current study. Similarly, hypotheses 3 and 4 relate to the relationship of value barriers and risk barriers with the adoption of cryptocurrency, respectively, which are also rejected based on the result of data analysis. Hypotheses 2 and 5 assumed a significant but negative impact of value barriers and image barriers on cryptocurrency adoption, respectively. The data analysis supports H2 and H5 through regression analysis as well as correlation coefficient analysis, that tradition and image barriers negatively influence cryptocurrency adoption. In conclusion, H1, H3 and H4 are rejected while H2 and H5 are accepted and supported in the current study.

CHAPTER 7: DISCUSSION AND CONCLUSION

7.1 Introduction

Bitcoin and the cryptocurrency ecosystem have evolved since the introduction of Bitcoin in 2009. The history of cryptocurrencies reflects its pioneers' desire for a payment system such that governments and institutions could not access a user's personal information, as they believed this was what was needed for a truly free society.

The main objective of this study was to investigate the barriers to cryptocurrency adoption. The research initially investigated what led to the introduction of Bitcoin, its initial structure and how it then evolved from what its inventors intended it to be to what it and other cryptocurrencies are in 2024.

The research also investigated how the increase in the use of cryptocurrencies has influenced the regulations and policies in different countries. This assisted in highlighting how regulations or lack thereof affect cryptocurrency adoption. To achieve this a systematic literature review was conducted into research on cryptocurrency regulations.

Finally, using the Innovation Resistance theory proposed by Ram and Sheth (1989) an investigation was done into what individuals perceived to be barriers to their adoption of cryptocurrencies. This was done in two stages. Firstly, 20 respondents were requested to complete open-ended questionnaires that were then analysed. Following this, online surveys with Likert scale questions were then completed by 532 respondents, which were then analysed.

This study used the Innovation Resistance Theory in contrast to previous studies in adoption, which used models such as the Technology Acceptance Model and the UTAUT. Previous research has identified that these models do not explain probable barriers to adoption as they focus on enablers as opposed to barriers to adoption. Ram (1987) maintained that research on innovations had been mainly restricted to adoption and diffusion. This was attributed to the assumption that all innovations are in the best interest of consumers and the tendency to view late adopters as laggards. The research however argued that as innovations impose a change on individuals, resistance to this change is a normal human behaviour. As individuals who resist innovations are often more numerous than those who adopt them, it is important to understand the psychology of those resisting to develop innovations.

7.2 Cryptocurrency Regulations

An important aspect in proposing and implementing any regulation is to firstly identify why the regulations are being proposed. One reason has been to guard against the use of cryptocurrencies in illegal activities. This has been a major worry for regulators as cryptocurrencies usually provide a high level of pseudo-anonymity.

Taxation is important for countries to function, as governments need to collect taxes to fund their services. As interest in cryptocurrencies has grown over the years their value has also increased. They have become an investment class that regulators have had to understand so as to develop the appropriate way to tax cryptocurrency transactions and investments. The introduction of cryptocurrencies

has meant that central banks and governments no longer fully control the money supply as cryptocurrencies now do so as well.

With the increase in the number of virtual currency transactions and the number of organisations accepting them, the development of suitable accounting processes has arisen. Without set standards, there may be a high probability for cryptocurrency accounting fraud cases. Full disclosure of accurate public accounting information is not only important to regulators but also to investors wishing to make informed decisions.

Accounting, which is the language of business, should evolve to adapt to the introduction of cryptocurrencies so that credible reports can be produced. This is so organisations can communicate their performance and activities reliably to investors, regulators, and creditors. Standardised accounting practices will result in clarity in showing the financial implications of cryptocurrency transactions, their related tax effects, and the economic ramifications of their exchange. Lack of clear accounting and taxation procedures could be considered a barrier to the adoption of cryptocurrencies.

Cryptocurrency users have been subject to scams and other fraudulent activities due to the lack of regulation and oversight. Digital currency exchanges hold cryptocurrency on behalf of their customers. This has led to custody problems such as how investors can ensure that the exchanges do not misuse assets. As more investors trade and hold cryptocurrencies through these platforms, regulators should consider how to protect the clients. The introduction of Initial Coin Offerings also

brought about more scammers that investors must be protected from. Being a victim or fear of being a victim of these things could be considered a barrier to the adoption of cryptocurrencies.

Different countries have taken different approaches to the regulation of cryptocurrencies since their introduction. Some have accepted the innovation; others have adopted a wait-and-see position while others have not accepted the innovation. Academics have agreed financial intermediaries should be the main focus of regulations as they are able to collect information on behalf of regulators and are also able to assist in the enforcement of regulations. The technology continues to evolve and there is a need for international coordination to regulate and enforce regulations on the evolving technology.

7.3 Findings from Qualitative Research

The findings confirmed all three sub-themes of the functional barriers to be barriers to the adoption of cryptocurrencies. The usability challenges and complexity of understanding were found to be the main usage barriers to cryptocurrency adoption. Accessibility without the Internet, functional complexities of the platform, the sheer number of cryptocurrencies, unpredictability and variations in information also contributed as usage barriers. Taking time to self-educate was required to remove this barrier. One of the respondents also suggested that exchange platforms and wallets need to be more user-friendly.

Traditional fiat currencies were still considered to offer superior value as payment systems when compared with cryptocurrencies. As an alternative to fiat

currencies, cryptocurrencies were not found to add value, as fiat currencies were still the preferred method of transacting for respondents. This was the main value barrier.

High volatility, the number of instances of fraud and hacking in the cryptocurrency market and the possibility of completely losing one's investment were the main risks identified as barriers. These concerns suggest a need for regulatory institutions or measures to ensure market stability, security and user protection in cryptocurrency platforms.

The psychological barriers of tradition did not come out as a relevant factor as respondents mainly did not identify as having any biases towards cryptocurrencies. The image barrier was relevant as some respondents associated cryptocurrencies with volatility as well as fraudulent and criminal activities.

7.4 Findings from Quantitative Research

Based on the analysis of cryptocurrency users, psychological barriers were found to have a negative and significant impact on user intention to adopt cryptocurrencies, while functional barriers have a negative but insignificant association with cryptocurrency adoption.

Based on the collected data for cryptocurrency non-users, the regression analysis results were mixed with regard to functional and psychological barriers. The variables of functional barriers and value barriers variables were found to significantly and negatively affect the intention to adopt. The psychological barrier of image also had a significant and negative effect on the adoption intention. The remaining barriers showed a negative but insignificant association.

These findings contradicted some of the previous studies, where functional barriers were identified to be significant factors in influencing user adoption of technology, while psychological barriers were regarded as insignificant factors under the IRT framework (Kaur et al., 2020). On the other hand, some studies support the presence of a relationship between tradition barriers and technology adoption (Gupta & Arora, 2017), and between image barrier and technology adoption (Moorthy et al., 2017) .

7.5 Research Limitations

This research has the following limitations that should be considered when interpreting the study's results and for future study:

1. Results for the quantitative analysis were obtained from online platforms such as Amazon Mechanical Turks, Surveycircle and Surveyswap. Due to there being small incentives for respondents to participate in the survey, it is possible some of the responses may not be reliable. However it can also be argued that any incentive could skew results as well.
2. Some of the questions in the survey may not have been easy to understand or relatable to cryptocurrency non-users. This may be something to be considered by future researchers.
3. Variables used in the study could have been too limited and possibly further variables might need to be investigated.

7.6 Further Research Opportunities

Further research is required on how international coordination can be achieved in regulating cryptocurrencies and blockchain in general as each country trying to regulate separately creates gaps that can be exploited. In addition, there is a need to research the impact of cryptocurrency transactions that are not facilitated through exchanges.

There is an opportunity for future researchers to redesign and expand the study model to add more constructs that may assist in identifying barriers to cryptocurrency adoption. Different demographics can also be used for the study. Feedback from an anonymous researcher points out the importance of investigating the impact of a country an individual lives in on their cryptocurrency adoption intention. The factors to be considered among others would be public policy, consumer preferences, technological infrastructure and societal implications. An anonymous researcher also pointed out the need to investigate the impact on cryptocurrency adoption intention of an individual having knowledge of the impact that cryptocurrency mining has on the environment due to the amount of energy being used.

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APPENDICES

Appendix A: Barriers to Cryptocurrency Adoption

Survey Questionnaire

The purpose of this survey is to conduct research to investigate the relationship between types of barriers and adoption intention to Cryptocurrencies.

Please answer all questions to the best of your ability. All responses are completely confidential. Thank you for your participation.

Instructions:

- 1) Please answer ALL questions in ALL sections.
- 2) Completion of this form will take you less than 10 minutes.
- 3) The contents of this questionnaire will be kept strictly confidential.

Demographic Profile

In this section, we would like you to fill in some of your personal details. Please tick your answer. Your answers will be kept strictly confidential.

Q1: What gender do you identify as?

- Female
- Male
- Do not wish to answer
- Other. Please specify.....

Q2: What is your age bracket?

- 18-29
- 30-39
- 40-49
- 50-59
- 60-69
- 70+

Q3: How do you rate your overall computer skills?

- Beginner
- Novice user
- Average user
- Above average user
- Advanced user
- Computer expert / IT Professional

Q4: What is the highest level of education you have completed?

- High School
- Certificate or Diploma
- Degree

- Masters
- PhD and Doctorate

Q5: 5

What is your occupation or industry your job is most aligned to?

- Government/ Public Service/ Civil Service
- Health Care Professional
- Professional/ Manager/ Executive/ Technician
- General Employment
- Labourer
- Professional athlete
- Student
- Self-employed
- Retired

Q6: Which country do you live in?

Q7: 7

Do currently own or have you ever owned cryptocurrency?

- Yes
- No

Cryptocurrency Barriers

This section is seeking your opinion regarding how strongly you agree or disagree with the statements given on barriers to cryptocurrency use. Respondents are asked to indicate the extent to which they agreed or disagreed with each statement using 5 Likert scale [(1) = strongly disagree; (2) = disagree; (3) = neutral; (4) = agree and (5) = strongly agree] response framework. Please circle one number per line to indicate the extent to which you agree or disagree with the following statements.

No	Questions	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
UB	Usage Barrier					
UB1	Cryptocurrencies are difficult to use.	1	2	3	4	5
UB2	Cryptocurrencies are inconvenient to use	1	2	3	4	5
UB3	Cryptocurrency services take significant time to use.	1	2	3	4	5
UB4	Cryptocurrencies are difficult to understand.	1	2	3	4	5
UB5	Significant effort is required to self educate on cryptocurrencies	1	2	3	4	5
VB	Value Barrier					

VB1	Using cryptocurrencies as a payment method is expensive.	1	2	3	4	5
VB2	Using cryptocurrencies does not offer any advantage when compared to other ways of handling financial matters.	1	2	3	4	5
VB3	Using cryptocurrencies services does not increase my ability to control financial matters.	1	2	3	4	5
VB4	Cryptocurrencies are not a good substitute of traditional fiat currencies to conduct transactions.	1	2	3	4	5
VB5	Using cryptocurrencies services does not eliminate the constraints of time and space when conducting transactions.	1	2	3	4	5
RB	Risk Barrier					
RB1	I am afraid (or would be) of making mistakes when using cryptocurrencies.	1	2	3	4	5
RB2	I am afraid (or would be) of faults occurring within the cryptocurrency systems.	1	2	3	4	5
RB3	I am afraid of my private information being stolen if I use cryptocurrency exchanges.	1	2	3	4	5
RB4	Cryptocurrency markets are too volatile.	1	2	3	4	5
RB5	Cryptocurrencies are not sufficiently regulated.	1	2	3	4	5
RB5	There is insufficient consumer protection for cryptocurrency users.	1	2	3	4	5
TB	Impact of Tradition on Cryptocurrency Use					
TB1	I prefer physical forms of payments.	1	2	3	4	5
TB2	I prefer to engage in face-to-face interaction when buying products or services.	1	2	3	4	5

TB3	I do not like buying products or services online.	1	2	3	4	5
TB4	New technology is often too complicated to use.	1	2	3	4	5
TB5	Cryptocurrency services are perceived as being difficult to use.	1	2	3	4	5
IB	Image Barrier					
IB1	Cryptocurrency services project a very negative image.	1	2	3	4	5
IB2	I associate cryptocurrencies with criminal activities.	1	2	3	4	5
IB3	I associate cryptocurrencies with volatility.	1	2	3	4	5
IB4	I associate cryptocurrencies with losing money.	1	2	3	4	5

Cryptocurrencies Adoption Intention

This section is seeking your opinion regarding the impacts of adoption intention of cryptocurrencies with the types of barriers given. Respondents are asked to indicate the extent to which they agreed or disagreed with each statement using 5 Likert scale [(1) = strongly disagree; (2) = disagree; (3) = neutral; (4) = agree and (5) = strongly agree] response framework. Please circle one number per line to indicate the extent to which you agree or disagree with the following statements.

No	Questions	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
AI	Adoption Intention					
AI1	I already use cryptocurrencies and intend to continue to use them.	1	2	3	4	5
AI2	I do not use cryptocurrencies but intend to use them in the future.	1	2	3	4	5
AI4	I intend to learn how to use cryptocurrencies.	1	2	3	4	5
AI6	I intend to recommend cryptocurrencies to my friends.	1	2	3	4	5

Appendix B – SLR Data Collection Results

	NUMBER OF PAPERS								TOTAL
	2014	2015	2016	2017	2018	2019	2020	2021	
KEY TOPICS									
AML/CTF	1	0	0	0	1	3	1	3	9
Bitcoin Futures	0	0	0	0	0	1	0	0	1
Financial Accounting	0	1	0	0	1	0	3	0	5
ICOs	0	0	0	0	0	1	0	1	2
Illegal activities	0	0	0	1	3	1	1	2	8
International Finance	0	0	0	0	0	0	1	0	1
International Tax	0	0	0	0	0	0	1	0	1
Libra Coin	0	0	0	0	0	0	3	0	3
Regulations in New Zealand	0	0	0	0	0	0	0	1	1
Regulations in Poland	0	1	0	0	0	0	0	0	1
Regulation Considerations	1	0	2	3	5	10	3	3	27
Regulations and volatility	0	0	0	0	0	0	0	1	1
Regulations in Baltic countries	0	0	0	0	0	1	0	0	1
Regulations in BRICS	0	0	0	0	0	1	0	0	1
Regulations in Canada	0	0	0	1	0	0	1	0	2
Regulations in India	0	0	0	0	1	0	0	0	1
Regulations in Indonesia	0	0	0	0	0	0	0	1	1
Regulations in Kazakhstan	0	0	0	0	1	0	0	0	1
Regulations in Malta	0	0	0	0	0	0	1	0	1
Regulations in Nigeria	0	0	0	0	1	0	0	0	1
Regulations in Nigeria & South Africa	0	0	0	0	0	0	0	1	1
Regulations in Russia	0	1	0	0	0	1	0	0	2
Regulations in South Africa	0	1	0	0	0	2	0	0	3
Regulations in the EU	0	0	0	0	0	1	1	0	2
Regulations in Ukraine	0	0	0	0	1	5	1	0	7
Regulations in USA	0	1	0	0	0	3	2	2	8
Review of Legislation in different countries	1	0	0	0	2	0	0	0	3
Regulations in Romania	0	0	0	0	0	0	1	0	1
	3	5	2	5	16	30	20	15	96

Appendix C – The Legal Status of Bitcoin by Nation (Hendrickson et al., 2016).

Nation	Status	Updated
Argentina	Permissive	Jan 30th, 2014
Australia	Permissive	Mar 24th, 2014
Austria	Permissive	Mar 6th, 2014
Belarus	Permissive	Jan 30th, 2014
Belgium	Permissive	Jan 21st, 2014
Brazil	Permissive	Apr 8th, 2014
Bulgaria	Permissive	Apr 8th, 2014
Canada	Permissive	Feb 1st, 2014
China	Contentious	Mar 23rd, 2014
Colombia	Permissive	Mar 23rd, 2014
Croatia	Permissive	Mar 26th, 2014
Cyprus	Permissive	Feb 3rd, 2014
Czech Republic	Permissive	Jan 26th, 2014
Denmark	Permissive	Mar 23rd, 2014
Estonia	Permissive	Feb 3rd, 2014
Finland	Permissive	Jan 20th, 2014
France	Permissive	Jan 29th, 2014
Germany	Permissive	Feb 23rd, 2014
Greece	Permissive	Feb 13th, 2014
Greenland	Permissive	Jan 12th, 2014
Hong Kong	Permissive	Jan 24th, 2014
Hungary	Permissive	Feb 19th, 2014
Iceland	Hostile	Jan 26th, 2014
India	Contentious	Jan 23rd, 2014
Indonesia	Permissive	Feb 6th, 2014
Iran	Permissive	Mar 11th, 2014
Ireland	Permissive	Jan 6th, 2014
Israel	Permissive	Feb 19th, 2014
Italy	Permissive	Feb 4th, 2014
Japan	Permissive	Mar 23rd, 2014
Jersey	Permissive	Apr 24th, 2014
Jordan	Contentious	Feb 23rd, 2014
Kazakhstan	Contentious	Feb 4th, 2014
Latvia	Permissive	Feb 7th, 2014
Lebanon	Permissive	Jan 26th, 2014
Lithuania	Permissive	Feb 10th, 2014
Luxembourg	Permissive	Mar 24th, 2014
Malaysia	Permissive	Feb 1st, 2014
Malta	Permissive	Feb 4th, 2014
Mexico	Contentious	Mar 11th, 2014

Netherlands	Permissive	Jan 1st, 1970
New Zealand	Permissive	Feb 19th, 2014
Norway	Permissive	Jan 20th, 2014
Philippines	Permissive	Mar 11th, 2014
Poland	Permissive	May 28th, 2014
Portugal	Permissive	Feb 4th, 2014
Russia	Contentious	Feb 6th, 2014
Singapore	Permissive	Mar 24th, 2014
Slovakia	Permissive	Feb 4th, 2014
Slovenia	Permissive	Feb 20th, 2014
South Africa	Permissive	Feb 20th, 2014
South Korea	Permissive	Feb 1st, 2014
Spain	Permissive	Feb 4th, 2014
Sweden	Permissive	Jul 26th, 2014
Switzerland	Permissive	Feb 1st, 2014
Taiwan	Permissive	Feb 3rd, 2014
Thailand	Contentious	Jul 30th, 2014
Trinidad and Tobago	Permissive	Mar 24th, 2014
Turkey	Permissive	Feb 4th, 2014
Ukraine	Permissive	Nov 12th, 2014
United Kingdom	Permissive	Mar 24th, 2014
United States	Permissive	Mar 23rd, 2014
Viet Nam	Hostile	Feb 28th, 2014