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Cryptocurrency Exchange Adoption: Influence of Decentralized Exchanges

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Master Thesis

presented as partial requirement for obtaining a Master's Degree in Data-Driven Marketing

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CRYPTOCURRENCY EXCHANGE ADOPTION: INFLUENCE OF DECENTRALIZED EXCHANGES

by

Valentim Galinha Cardoso

Master Thesis presented as partial requirement for obtaining the Master's degree in Data-Driven Marketing, with a specialization in Marketing Intelligence

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STATEMENT OF INTEGRITY

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism, any form of undue use of information or falsification of results along the process leading to its elaboration. I further declare that I have fully acknowledged the Rules of Conduct and Code of Honor from the NOVA Information Management School.

Valentim Galinha Cardoso
Santarém, 2024

DEDICATION

To those who have taught me that it's okay not to know exactly where the path leads, that life is about trying, exploring, and embracing the unknown. If you find something you love, go for it with everything you've got. And if you're not sure, give it a shot anyway – because trying new things always leads to new possibilities.

I'd like to thank my family, friends, and mentors for showing me that it's not about having all the answers or knowing exactly what's coming next. It's about being willing to take the next step, even if it's a bit uncertain, and trusting that the journey will reveal itself as we go along.

This work is dedicated to you for encouraging me to face the future with curiosity and openness, knowing that each step, however uncertain, brings new opportunities.

ABSTRACT

This study looks at the impact of decentralization in cryptocurrency exchanges, evaluating whether there are differences between centralized and decentralized platforms. Decentralized exchanges are becoming more important in the world of cryptocurrency, representing the true purpose of crypto exchanges. However, centralized exchanges still dominate the market, holding 90% of the share. Decentralized exchanges give users more security, control, and transparency by removing the need for middlemen. Unlike centralized exchanges, which hold users' assets, DEXs let users manage their own funds, reducing risks related to trust and central control. Despite these advantages, there are big differences between centralized and decentralized exchanges that have not been fully studied, especially using the UTAUT2 model. The findings show that, even though there are some differences between decentralized and centralized exchanges, users don't see much of a difference in how they perform, how easy they are to use, or how much they trust them. This suggests that users may see both types of exchanges as offering similar practical outcomes.

KEYWORDS

Cryptocurrencies exchanges; Centralized exchanges; Decentralized exchanges; Utaut2

Sustainable Development Goals (SDG):

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LIST OF ABBREVIATIONS AND ACRONYMS

CEX Centralized Exchange

DEX Decentralized Exchange

DEFI Decentralized Finance

1. INTRODUCTION

In recent years, cryptocurrency has become increasingly popular, driven by growing acceptance among individuals and institutions. The rise of decentralized finance (DeFi) has attracted investors who view cryptocurrency as a hedge against inflation and political instability (Alamsyah et al., 2024). The market is expected to grow significantly, with projected revenue reaching $51.5 billion in 2024—a 26% increase from 2023 (Statista, 2024). The approval of a Bitcoin ETF by U.S. regulators (SEC) has further legitimized the cryptocurrency industry, pushing Bitcoin into the financial mainstream, and strengthening its credibility (Gary, 2024).

As cryptocurrency adoption increases, cryptocurrency exchanges—the platforms used to buy and sell digital assets—are also seeing rapid growth. In March 2021, Coinbase, the largest U.S. cryptocurrency exchange, reported 56 million registered users, with 6.1 million actively trading in Q1 2021, reflecting a 2.18x growth over the previous quarter (Dean, 2023).

Cryptocurrency exchanges can be categorized into centralized exchanges (CEXs) and decentralized exchanges (DEXs). CEXs, such as Coinbase and Binance, are managed by a central authority and offer user-friendly features like fiat-to-crypto trading and staking. However, they face risks such as hacking, fraud, and regulatory changes, requiring users to trust the platform with their funds (Arslanian & Fischer, 2019; Yousaf et al., 2023). In contrast, DEXs operate without intermediaries, allowing users to trade directly from their wallets using blockchain-based smart contracts. While DEXs offer greater transparency and security, they are less beginner-friendly and often face challenges like limited liquidity and high transaction fees (Han et al., 2022; Aspris et al., 2021).

Despite their growing popularity, cryptocurrency exchanges face significant challenges. The industry is often associated with crimes like fraud and hacking. Since 2010, 107 of 238 cryptocurrency exchanges have shut down (Milunovich & Lee, 2022). Platform reputation is critical; for example, the collapse of FTX, the third-largest exchange at the time, caused global distrust in the cryptocurrency ecosystem (Reiff, 2023).

The adoption of cryptocurrency exchanges is crucial for the global expansion of digital assets. These platforms have the potential to transform how individuals and institutions interact with cryptocurrencies. However, a critical gap exists in understanding why users choose to adopt these platforms, particularly decentralized exchanges (Illia et al., 2023).

This study seeks to address this gap by exploring the question: "What is the Influence of Decentralized Exchanges?" To contribute to this area of research, the study applies the Unified Theory of Acceptance and Use of Technology (UTAUT2). The next sections will delve into the background, outline the research gap, present the conceptual model and hypotheses,

describe the methodology, and discuss the findings, implications, limitations, and recommendations for future research.

2. LITERATURE REVIEW

2.1. BLOCKCHAIN

In 2008, Nakamoto published a white paper criticizing the existing electronic payment system, which relies on financial institutions as trusted third parties. He argued that this system is inefficient, involves high transaction costs, and proposed a ground-breaking solution based on cryptographic techniques called hash-based proof-of-work. This technology enables the creation of a tamper-proof ledger that increases security and transparency by distributing transaction records across a network of computers. This ledger is known as blockchain. Although blockchain technology was first conceptualized in 1990, it has since found applications in various fields, including healthcare, finance, logistics, government, the Internet of Things (IoT), and identity security (Bamakan et al., 2020).

Blockchain operates as a type of public ledger, accessible to everyone, where transactions are recorded in a chain of blocks that continuously grows as new blocks are added. The system leverages asymmetric cryptography and distributed consensus algorithms to ensure both user security and the consistency of the ledger (Zheng et al., 2017). One of blockchain technology's defining characteristics is decentralization—no single authority controls the system. This lack of central authority reduces costs and enhances performance (Li et al., 2020).

Once a transaction is added to the blockchain, it becomes nearly impossible to remove or reverse. Transactions are validated by a decentralized network of computers, ensuring security and reliability. Blockchain transactions are also anonymous; each user is assigned a unique address that does not reveal their actual identity. Corrupting the system is highly challenging, as each transaction must reference one or more unspent previous transactions. Once added, these previous transactions are marked as spent. This process makes it easy to verify and track transactions (Zheng et al., 2017). Blockchain technology offers a durable, widely distributed peer-to-peer network, enabling users to interact without the need for trust in a central authority (Christidis & Devetsikiotis, 2016).

2.1.1. SMART CONTRACTS

First introduced in literature in 1994, smart contracts are a digital transaction record created to perform the conditions of a contract automatically. The idea was to turn contract clauses into code that could be used as software or hardware (Szabo, 1997). Smart contracts are autonomous entities that act in predictable ways that behave in a predictable manner because of this they can perform on-chain logic by utilizing the available on-chain data inputs, as long as the necessary data is accessible within their own system, their reliability is guaranteed (Christidis & Devetsikiotis, 2016).

2.1.2. BLOCKCHAIN ADOPTION

Blockchain, originally recognized as the foundation for cryptocurrencies such as Bitcoin, has rapidly evolved into a transformative technology with applications across various industries (Nguyen, 2016). The biggest financial institutions, including Bank of America, Barclays, Citigroup, Goldman Sachs, and UBS, have explored blockchain's potential to improve transaction efficiency and reduce operational costs (Heires, 2016). However, the influence of blockchain technology extends much difference sector then just the financial (Angelis & Ribeiro da Silva, 2019). Blockchain is widely used in supply chain management because it solves common problems like tracking products, ensuring transparency, and improving efficiency (AlShamsi et al., 2022).

The healthcare sector has demonstrated a growing interest in blockchain applications, using the technology to address critical challenges in data sharing, electronic health records, and access control (Pawczuk et al., 2018). The internet of things (IoT) blockchain helps the devices secure data exchange and automation in smart urban infrastructures (Monrat et al., 2019).

Blockchain is improving real estate by making property transactions easier and more secure with smart contracts, helping education sector by verifying academic credentials and protecting student records, and assisting governments by enabling secure digital IDs, transparent voting, and reducing fraud in public spending (Sunny et al., 2022).

But there´s still some uncertainly regarding the adoption of blockchain technology, in their study Marengo & Pagano (2023) review 1,786 papers to identify 152 factors influencing blockchain adoption across 25 industries and 21 countries, they highlight regulatory issues, costs, technical understanding, and country-specific factors as key determinants.

One of the biggest barriers to blockchain adoption is the lack of technological knowledge. Organizations understand how blockchain can improve data management, they often don’t have the skills and expertise needed to successfully implement and maintain the technology (Dehghani et al., 2022)

2.2. CRYPTO CURRENCY

Smart contracts integrated with cryptocurrency have the potential to revolutionize the financial industry by introducing greater efficiency and fostering innovation (Rasure, 2024). Cryptocurrency is a digital system characterized by irreversible, partially anonymous, and decentralized transactions. It relies on cryptographically signed digital tokens that are publicly traceable (Bjerg, 2015). Built on the decentralized nature of blockchain networks,

cryptocurrencies derive their value solely from supply and demand, free from the control of central financial institutions (Nakamoto, 2008).

The process of generating new cryptocurrencies, known as mining, involves solving complex computational puzzles to publish new blocks on the blockchain. Successful miners are rewarded with a predefined amount of cryptocurrency. To ensure consensus across all participating nodes in the blockchain network, a consensus algorithm is employed. The two most common consensus algorithms are Proof-of-Work (PoW) and Proof-of-Stake (PoS) (Schilling & Uhlig, 2019).

Nakamoto's 2008 white paper introduced Bitcoin, the first cryptocurrency to achieve mainstream adoption. It remains the leading cryptocurrency in the market (CoinMarketCap). Bitcoin operates using the Proof-of-Work algorithm, which defines the computational tasks that miners must perform to add valid blocks to the chain. The significance of this process lies in the length of the blockchain. A longer chain represents greater accumulated work, increasing the network's confidence in its current state (Reyna et al., 2018).

Ethereum, the second-largest cryptocurrency, uses the Proof-of-Stake algorithm. In this system, validators stake their assets—such as ETH—into a smart contract to verify and occasionally create new blocks. Validators who act dishonestly risk losing part or all of their staked ETH (Proof-of-Stake (PoS), 2023).

In their literature review, Alzahrani and Daim (2019) identified four key factors influencing the adoption of cryptocurrency exchanges: technical, economic, social, and personal. Their findings are summarized in the table below.

Table 1- Factors influencing cryptocurrency adoption.

	Technical
Control over the System	Crypto currency can operate in decentralized way
Anonymity	Some more than other crypto currency offer anonymity
Fast transfer	Faster transactions specially comparing with international transitions
Blockchain Technology	Foundational technology for cryptocurrencies, efficient, verifiable, and secure transactions
System Security	Decentralized systems are more secure
The team behind it	The success of a cryptocurrency is influenced by the team that creates the project
	Economic
Investment opportunity	The adoption is driving by the opportunity of investments returns rather than being used as a currency
Low Transaction Cost	Cryptocurrency has lower fess compared to traditional banks
Alternative Banking System	Can be an alternative banking and wealth storage system
The Supply Limit	Some cryptocurrencies have maximum supply, which can influence their perceived value

Increased Demand for Altcoins	Increased attention for cryptocurrency led to the prices increase
Recognized By Businesses	Major company like Tesla, Microsoft accept as a payment
Alternative Payment System	There´s potential to become an alternative payment system
	Social Factors
Subjective Norms	Family and friends can impact the decision to buy or not cryptocurrencies
Global Attention	During periods of fluctuations, the global attention increases
Influencers Involvement	Celebrities and business figures can influence their followers to buy cryptocurrency
	Personal Factors
Technological Curiosity	Early adopters, new generations driven by curiosity, explore and try to understand emerging technologies in the market
High level of Control Over One' Money	Some systems don't have intermediaries, providing users control over their money
Privacy	Cryptocurrency offers a very high level of privacy; the absence of intermediaries allows user to keep their financial activities private

Font: Research paper Analysis of the cryptocurrency Adoption Decision: literature review

2.2.1. CRYPTOCURRENCY ADOPTION

Cryptocurrency adoption is growing worldwide, influenced by a combination of economic instability, technological advancements, and shifting societal attitudes, particularly in regions where trust in traditional financial systems is low or inflation is rampant, such as Venezuela and Turkey (Saiedi, 2020).

Despite the global momentum, adoption rates in the UAE remain surprisingly low, with research suggesting that factors such as performance expectations, price value, and enjoyment play significant roles in shaping users' intentions, while actual usage is heavily influenced by the availability of supportive infrastructure and regulatory frameworks (Jegerson et al., 2023).

Emerging economies have shown distinctive trends during the COVID-19 pandemic, as seen in Pakistan, where perceived usefulness was identified as a critical driver of behavioral intention, while concerns about risks had little impact among users who were already aware of the volatile nature of cryptocurrencies (Jariyapan et al., 2022).

Trust plays a crucial role in cryptocurrency adoption. When people trust the systems and platforms that support cryptocurrencies, they are more likely to use them. Building this trust is essential to increase awareness and acceptance (Shahzad et al., 2024). Adaptability is also key, with ease of use, usefulness, and technological readiness making a significant impact on adoption rates (Sagheer et al., 2022).

One of the most significant barriers to cryptocurrency adoption remains regulatory uncertainty, with challenges including ensuring consumer protection, implementing robust

anti-money laundering measures, and achieving international regulatory coordination to prevent exploitation, as highlighted by recent events like the collapse of major platforms such as FTX (Brownstein, 2023).

Psychological and functional resistance also play a substantial role in slowing adoption, as research emphasizes that trust issues, perceived risks, and resistance to new technology can discourage users, although improvements in technological readiness and the growth of a critical user mass can mitigate these challenges (Illia et al., 2023).

2.2.2. CRYPTOCURRENCY ACQUISITION AND STORAGE

To acquire cryptocurrency, the first step is to choose a platform. Some platforms are more beginner-friendly than others and offer a variety of features, as discussed in Chapter 2.3. Once a platform is selected, the next step is to create an account. Depending on the platform, identity verification may be required. After setting up an account, it is necessary to deposit funds, which can typically be done by connecting a bank account or using a debit or credit card. Once the funds are available, you can proceed to buy cryptocurrency. Finally, it is crucial to store your cryptocurrency in a safe place to ensure its security (Kumari et al., 2023).

Cryptocurrencies operate on blockchain, so they are different from physical currency, they need a digital storage systems called wallets, they keep hold of the funds and allow to transfer it (Perper, 2023).Wallets keep your public and private keys secure in a physical hardware format or in software, there are two variety of wallets, “hot wallets” that consists in using internet software to keep them safe, which are more susceptible to hacks, and “cold wallet” that involves storing cryptocurrency in an offline manner to keep your private keys safe(Hussain & Khang, 2022).

2.3. CRYPTO CURRENCY EXCHANGES

Comparable to the stock market, the cryptocurrency ecosystem offers similar services. Cryptocurrencies require a marketplace for buying and selling purposes. These exchanges are available in diverse varieties but can be classified into two categories: centralized and decentralized exchanges(Arslanian & Fischer, 2019).

2.3.1. CENTRALIZED EXCHANGES (CEX) VS DECENTRALIZED EXCHANGES (DEX)

Centralized exchanges (CEXs) operate similarly to stock exchanges by connecting buyers and sellers of crypto assets while maintaining a centralized authority. These exchanges fall into two categories: fiat-to-crypto exchanges, which allow users to deposit fiat currencies (e.g., USD or EUR) and convert them into crypto-assets, and crypto-to-crypto exchanges, which facilitate the exchange of one cryptocurrency for another without involving fiat currencies. To use these services, users typically send cryptocurrencies like Bitcoin or Ether to the exchange and then use them to purchase other digital assets (Arslanian & Fischer, 2019).

CEXs offer additional features such as margin trading and staking, enabling users to buy cryptocurrencies with fiat money. However, they also pose significant risks. Regulatory changes can threaten investors' funds, and mandatory identity verification can leave users vulnerable to data breaches and fraud. Historical incidents, such as the Mt. Gox hack (where 850,000 bitcoins were stolen) and the recent collapses of FTX and Terra Luna, highlight the importance of liquidity and the risks centralized exchanges face. Regulators are increasingly concerned about whether these platforms can protect users during market downturns (Yousaf et al., 2023). Since CEXs operate under centralized authority, user trust is critical.

Decentralized exchanges (DEXs), on the other hand, provide a transparent and secure alternative. Unlike centralized exchanges, DEXs do not hold users' funds. Instead, transactions occur directly from users' wallets through blockchain-based smart contracts, every transaction is securely recorded on the blockchain, ensuring transparency and immutability(Raman et al., 2023).

According to Han et al. (2022), DEXs are unique because they reflect investors' collective beliefs about the value of cryptocurrencies. They are characterized by trustworthiness, as their transaction data is accessible and nearly impossible to falsify. Aspris et al. (2021) further highlight that DEXs create a safer and more autonomous way to trade digital assets by eliminating the need for intermediaries.

Table 2-Centralized vs Decentralized

Basis	Centralized exchanges	Decentralized exchanges
Control	-Controlled by a single entity	-Decentralized authority, usually governed by smart contracts
Security	-Generally considered more secure, as centralized exchanges often have more resources to invest in security measures	-May be less secure, as they are reliant on the security of individual wallets and smart contracts

Privacy	-May require personal information to be provided for verification purposes, potentially compromising user privacy	-Often allow for anonymous trading, preserving privacy
Liquidity	-Typically have higher liquidity due to centralized control over funds and order books	-May have lower liquidity due to fragmented order books
Fees	-Often charge higher fees due to centralized control and infrastructure costs	-Generally, charge lower fees, as there is less overhead cost associated with maintaining the exchange
Usability	-Often offer more user-friendly interfaces and customer support	-May require more technical knowledge and experience to use effectively
Censorship	-May be subject to censorship and regulation from governments and other authorities	-Generally, cannot be censored or shut down, as they are. Decentralized and governed by smart

Font: cointelegraph.com

2.3.2. CRYPTO EXCHANGES ECOSYSTEM

People have different views on cryptocurrency exchanges. Some expect global use, while others worry about security vulnerabilities and regulatory gaps (Tobias, 2024).

Centralized exchanges dominate crypto trading despite the rise of decentralized options. However, frequent hacking incidents on centralized platforms have driven the growth of decentralized exchanges. Even though decentralized exchanges offer better security, the vulnerability of private keys remains a major concern, as emphasized in Roubini's testimony (Exploring the Cryptocurrency and Blockchain Ecosystem, 2018). The lack of a comprehensive legal framework exacerbates these challenges, as efforts to establish policy principles are still in progress (Laser, 2024).

Milunovich and Lee (2022) explore the risks investors face when digital exchanges go bankrupt. They highlight the potential dangers of entrusting assets to exchanges, pointing out risks of closure. While high transaction volumes and robust security features may reduce these risks to some extent, uncertainty persists. To mitigate risks, staying informed and transferring assets to personal wallets are recommended strategies.

Decentralized exchanges represent a new paradigm with numerous advantages over centralized exchanges. The simpler process of adding tokens on decentralized exchanges (DEXs) facilitates faster fundraising for new projects and allows users to trade a wide variety of token pairs. This ease of listing new tokens has led to a surge in Initial Coin Offerings (ICOs). However, Aspris et al. (2021) emphasize the challenges of building liquidity, discovering prices,

and attracting investors in decentralized exchanges, particularly as decentralized finance (DeFi) services gain popularity.

Makridis et al. (2023), in their analysis based on aggregated and manually collected crypto asset data, found evidence of higher growth in decentralized exchanges compared to centralized ones. When decentralized exchanges grant governance rights to loyal users, involving them in decision-making, they experience increased trading volume.

Despite the adoption growth of decentralized exchanges, little research has been conducted on their market quality. Barbon and Ranaldo (2023) compare centralized and decentralized exchanges in two key aspects: price efficiency and market liquidity. They found that decentralized exchanges still lag behind centralized platforms in transaction costs and price efficiency. However, the authors argue that decentralized exchanges could match centralized ones in efficiency with modest volume growth, aided by the declining gas costs in proof-of-stake blockchains.

The research by Han et al. (2022) highlights the shortcomings of centralized exchanges, emphasizing their lack of transparency and security concerns. They propose that decentralized infrastructure, DeFi applications, and blockchain-based smart contracts could address these issues. Their results suggest that establishing a central monopoly in such a system would either be impossible or prohibitively expensive.

Centralized exchanges can employ various strategies to rebuild customer trust and mitigate attacks. Marella et al. (2021) suggest that compensating customers after an attack can enhance trust. However, frequent attacks make this strategy inefficient.

Automated Market Makers (AMMs), a type of decentralized exchange using autonomous trading mechanisms, can be challenging due to constantly fluctuating token values. Capponi and Jia (2021) recommend using AMMs only when tokens have stable prices or a high number of users. To prevent losses, users should avoid trading tokens without real value.

When using cryptocurrency exchange websites, users should remain vigilant about potential threats. A basic understanding of blockchain principles and an analysis of the exchange's server distribution and data protection measures are crucial. Users should store private keys in personal wallets to prevent hacking (Kim & Lee, 2018). Since their inception, many cryptocurrency exchanges have been associated with fraud and theft. Allegations of market manipulation, wash trading, spoofing, and insider trading have created additional risks. Weaver (2018) notes that many exchanges actively avoid regulation.

Cryptocurrency exchanges, like other financial institutions, require a high level of trust to facilitate secure and reliable transactions. It is essential for both individuals and organizations to ensure that their transactions are protected and conducted reasonably (Nelms et al., 2018).

Khan and Hakami (2021) emphasize the importance of analysing the relationships between identified trust attributes and users' technical skills. Such an analysis can provide insights into the trust-related technical factors that either enhance or hinder the use of blockchain and its applications.

In a usability evaluation test conducted by Jan et al. (2021), a centralized exchange (Bithumb) was compared with a decentralized exchange (KDEX). The study revealed significant usability issues with decentralized exchanges, where participants struggled with basic actions like preparing a deposit, making a deposit, or trading. The use of cryptocurrency wallets emerged as the most challenging aspect. The authors suggest that providing better guidance on wallets, which function more like bank accounts than traditional wallets, could help address these issues. Similarly, Zhou and Shen (2022), in their empirical study on user experience and security perceptions of cryptocurrency exchanges, reported that participants found centralized exchanges easier to use. Centralized platforms offer better educational resources, have familiar user interfaces, and eliminate concerns such as high gas and transaction fees, which are major issues for decentralized exchange users.

Further evidence comes from Voskobojnikov et al. (2021), who analysed reviews from 45,821 mobile cryptocurrency wallet users. They identified recurring usability challenges, such as unsynced wallets leading to incorrect balances and users being unable to send transactions due to missing buttons. Their findings highlight that users often rely on their understanding of conventional payment systems, which may not translate effectively to cryptocurrency systems. This gap creates confusion and complicates user experience. Additionally, users reported not knowing how long transactions would take, often relying on notifications to confirm their pending status. Despite these issues, Rehman et al. (2020) observed a lack of research focused on the design and usability of cryptocurrency exchanges. They argue that improving usability is a critical factor in building trust among novice users.

2.4. RESEARCH GAP

The dominance of centralized exchanges may soon be in decline to their inherent vulnerabilities. The risk of private key exposure and the lack of transparency and security in centralized platforms have significantly eroded their credibility. These issues could accelerate the acceptance of decentralized exchanges, which offer a good alternative. However, decentralized exchanges also face significant usability challenges when compared to centralized ones.

This raises a critical question: Are decentralized exchanges perceived different then centralized exchanges? Despite the growing relevance of this topic, existing research has yet to address it comprehensively. To the best of our knowledge, no studies have been published

that specifically examine the factors influencing the adoption of cryptocurrency exchanges by users.

For this research, we propose utilizing the extended Unified Theory of Acceptance and Use of Technology (UTAUT2). This model has been widely applied in exploring technology adoption from a customer perspective and has yielded promising results in related sectors, such as finance and mobile banking. Given the similarities between these sectors and cryptocurrency exchanges, insights from these studies can serve as a valuable foundation for understanding adoption drivers in this context.

2.5. CONCEPTUAL MODEL

In 2003, Venkatesh et al. reviewed eight models related to technology acceptance and combined them into the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003). The models included in this union were the Theory of Reasoned Action, the Technology Acceptance Model (TAM), the Motivation Model, the Theory of Planned Behaviour (TPB), the combined TAM and TPB, the Model of PC Utilization by Thompson, Innovation Diffusion Theory, and Social Cognitive Theory. Venkatesh used four constructs performance expectancy, effort expectancy, social influence, and facilitating conditions to predict behavioural intention, he also used behavioural intention and facilitating conditions to predict use behaviour. All these constructs were moderated by age, gender, experience, and voluntariness of use. With the objective of adapting this model to the consumer technology use context, Venkatesh et al. (2012)released UTAUT2 that is specifically tailored to understanding how consumers accept and use technology. This update model incorporates three new constructs Hedonic Motivation, Price Value, and Habit. Hedonic Motivation and Price Value are related only to Behavioural Intention, while Habit is linked to both Behavioural Intention and Use Behaviour. UTAUT2 establishes a new relationship between Facilitating Conditions and Use Behaviour. The target population was not obligated to use the technology for that reason moderator Voluntariness of Use was remove. The moderators for this model are solely Age, Gender, Experience. This model is highly versatile finding application in diverse fields, the model in this version includes the factors Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Hedonic Motivation, and Price Value that influence Behavioural Intention, it considers Facilitating Conditions, Habit, and Behavioural Intention as contributors to Use Behaviour (Tamilmani et al., 2021). This model offers insights into the complexity of the dynamics of technology acceptance and use, when compared to the predecessor (Utaut), showed improvement in the variance explained in behavioural intention (56% to intention (from 56% to 74%) and technology use (from 40% to 52%) (Venkatesh et al., 2012).

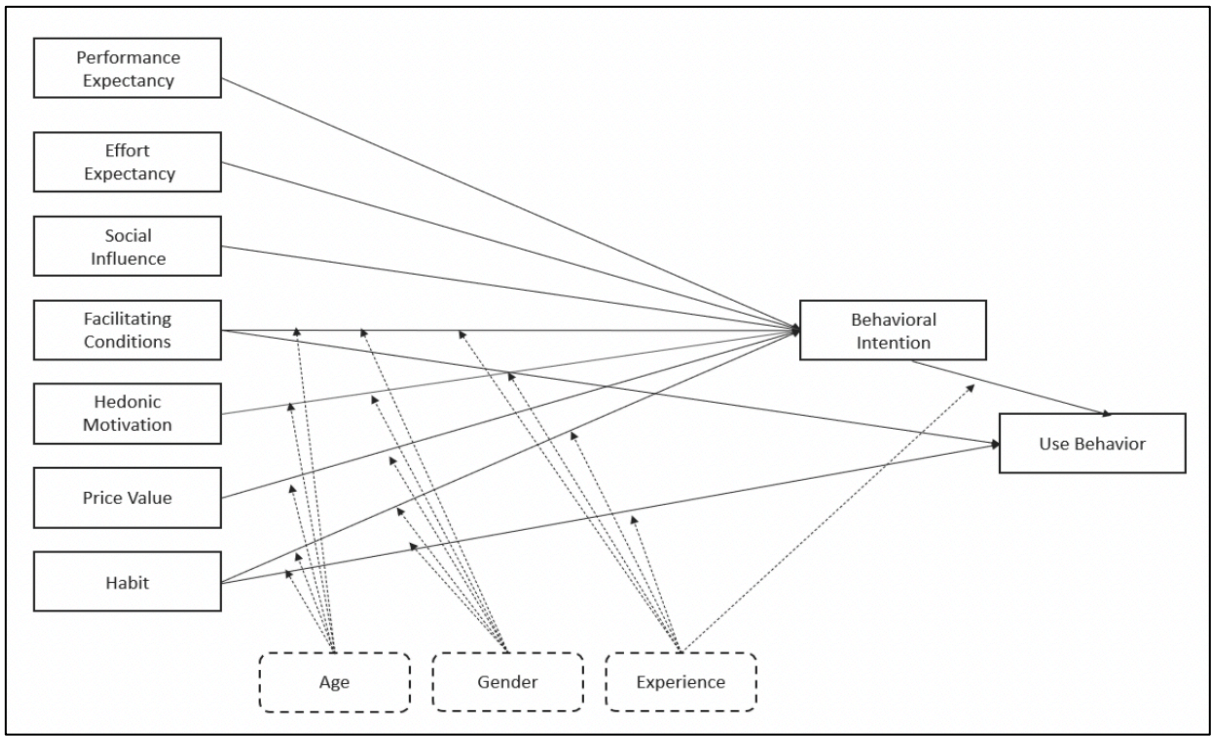

Figure 1- Research model from Venkatesh UTAUT2

In more recent years this model as gather more then 6000 citations UTAUT2 is a model that can be used as a foundation for understanding new ways to conceptualize individual technology acceptance and use, the evaluation results prove that UTAUT2 is a high quality theory on most dimensions (Tamilmani et al., 2021). We are using the model proposed by Venkatesh et al. (2012) to determine its applicability in the cryptocurrency exchange environment. We propose using the same constructs as the original UTAUT2 model, plus adding trust and perceived risk, making necessary adjustments to the hypotheses to fit the particularity of cryptocurrency exchanges. By using the comparability between cryptocurrency exchange sector and mobile banking, trust can be a crucial factor determining customer's perception and intention to adopt cryptocurrency exchanges (Alalwan et al., 2016; T. Zhou, 2012). Perceived risk is a crucial factor that affects end-user intention to use internet banking(Martins et al., 2014). It is possible to achieve similar results in cryptocurrency exchanges. Since we are only applying the survey once in this research, we did not measure experience as a moderator. For every hypothesis stipulated there's is going to be two version since we want to test in both centralized and decentralized.

Performance expectancy

PE is the benefit an individual perceives from using a technology in a particular activity, it's a very precious predictor to a user's intention to adopt a certain technology (Venkatesh et al., 2003). The Customers of a given new technology are more likely to adopt if they perceived this technology is more beneficial and useful in their daily life (Venkatesh et al., 2003). Its positively correlated with the behavioural intentions of bank customers, (Sharma et al., 2020) confirms the intentions of bank customers are dependent of PE if we discuss the attitude regarding internet banking. When researchers used UTAUT model theoretical foundation in their conceptual models, specifically in adoption of banking services they confirmed that performance expectancy will influence positively behavioural intention (Alalwan et al., 2016, 2017; Martins et al., 2014). Cryptocurrency is often considered an investment due to its potential for value appreciation, some value the autonomy it provides, as it is not subject to government regulation like traditional currency (Alzahrani & Daim, 2019).

Decentralised systems are more transparent and secure, they rely on distributed ledgers and cryptographic verification, which users can check, this aligns with the users' expectations of the technology's performance (Ruttenberg, 2016).

Therefore, this study stipulates the following hypothesis:

H1: Performance expectancy will positively influence crypto currency users' intention to adopt cryptocurrency exchange.

H2: Decentralized exchanges will positively influence performance expectancy.

Effort expectancy

EE is extent to which the user is at ease with using a system, therefore, it dictates how much effort is required to learn to use the technology (Venkatesh et al., 2003). EE may be a critical factor in determining customers' intention to use mobile banking technology, which requires a certain level of knowledge and skill (Ruttenberg, 2016). Following the same thought, an earlier research found that EE can have a substantial effect on behavioural intention to use online banking (Riffai et al., 2012). Decentralized exchanges are known for not being beginner friendly, presenting more issues then centralized exchanges(Jang et al., 2021; Voskobojnikov et al., 2021; Z. Zhou & Shen, 2022).

Users often perceive DEXs as less intuitive and more challenging to use than centralized exchanges, which could reduce their perceived ease of use(Pilkington & Lee, 2017).

Thus, this study presupposes the following hypothesis:

H3: Effort expectancy will positively influence crypto currency users' intention to adopt cryptocurrency exchange.

H4: Decentralized exchanges will negatively influence effort expectancy.

Social influence

SI is characterized as being the effect that an individual considered significant to a person can have on the decision of that individual to use a technology (Venkatesh et al., 2003). SI refers to the impact of an individual's social surroundings on their intention to adopt mobile banking services, this influence can come from various factors, including reference groups, family, influential figures, friends, and colleagues(T. Zhou et al., 2010) Prior research supports the idea that social influence plays a significant role in customers' intention to use online banking channels, and the choice of social influence as a key determinant of behavioural intention is based on previous literature(Alalwan et al., 2017; Martins et al., 2014; T. Zhou et al., 2010). In a research, Mahomed (2017) found that social influence significantly drives intent to adopt cryptocurrency the conversations between potential adopters and current adopters could increase these effects.

The adoption of DEXs are often driven by recommendations, platforms like reddit and twitter play and important rule in this community to endorse a given exchange, but centralized exchanges use more a traditional approach to market their products (Cloots, 2019).
Therefore, we derived the following hypothesis:

H5: Social influence will positively influence crypto currency users' intention to adopt cryptocurrency exchange..

H6: Decentralized exchanges will negatively influence social influence.

Facilitating conditions

FC is the perceptions that users have of the available resources and supports to perform the behaviour (Venkatesh et al., 2003). To utilize mobile banking, clients must possess basic skills and resources specifically facilitating conditions (Alalwan et al., 2017). Mobile banking users

are more motivated when they have access to reliable support and infrastructure, such as online assistance, tutorials, and training, these tools have been shown to influence the purpose of mobile banking use (Venkatesh et al., 2012). There is a positive correlation between FC and the usage behaviour in adoption of internet banking (Martins et al., 2014).Decentralized exchange are less suitable for new users, to use this platforms is required to have a wallet, if the holder of an asset loses control of their private keys, there will be no way to reverse the loss of those assets, This is different from centralized exchanges, which often require KYC (Arslanian & Fischer, 2019). Accordingly, this study proposes the following hypothesis:

H7: Facilitating conditions will positively influence crypto currency users' intention to adopt cryptocurrency exchange.

H8: Decentralized exchanges will negatively influence facilitating conditions.

Hedonic motivation

HM is defined as the enjoyment or satisfaction gained from using technology and is an important determinant of consumer acceptance and use of technology (Brown & Venkatesh, 2005). HM is recognized as the most major theoretical addition to the UTAUT2, as it incorporated the emotional component into a largely affective component into a largely cognition-based model (Tamilmani et al., 2019). Hedonic motivation is regarded as a strong predictor of behavioural intention of adopting of mobile banking (Alalwan et al., 2017) . Thus, we can formulate the hypothesis:

H9: Hedonic motivation will positively influence crypto currency users' intention to adopt cryptocurrency exchanges.

Price value

PV is the trade-off between the perceived benefits and the financial costs of using a given technology for the customers (Venkatesh et al., 2012). Users are more likely to adopt new technology if the positive level of price value is higher, using technology should be perceived as more beneficial and useful than the monetary cost paid (Venkatesh et al., 2012). The lower costs of financial transactions through mobile banking have been identified as a positive factor in its adoption (Yang, 2009). The price value of a mobile banking service is a significant factor in predicting behaviour intention (Alalwan et al., 2017). In the cost of financial transactions CEXs are more price efficient than decentralized exchanges in the cost of financial transactions because they follow the law of one price more closely ,in their research Barbon & Ranaldo

(2023) they identify decentralized exchanges as having elevated gas prices and exchange fees, which harm price efficiency.

Consequently, this study proposes the following hypothesis:

H10 Price Value will positively influence crypto currency users' intention to adopt cryptocurrency exchange.

H11: Decentralized exchanges will negatively influence Price Value.

Trust

Following (Gefen et al., 2003) concept of trust, customers' trust in mobile banking can be described as a composition of their perceptions of integrity, benevolence, and capability. These perceptions are crucial in building customer reliance on mobile banking platforms for financial transactions. Research has shown that trust plays a key role in shaping customer perceptions and intentions toward mobile banking (Luo et al., 2010; Zhou, 2012). The lack of transparency not only promotes mistrust between cryptocurrency blockchain operators and development communities, but also introduces centralization, which contradicts the fundamental vision of bitcoin and similar cryptocurrencies, as decentralization is the can be the only way to ensure that cryptocurrencies are transparent and accountable(Rehman et al., 2020). In decentralized systems, trust comes from transparent and secure blockchain technology instead of relying on central authorities (Cloots, 2019; Nakamoto, 2008).

Thus, this study presupposes the following hypothesis:

H12: Trust will positively influence crypto currency users' intention to adopt cryptocurrency exchange.

H13: Decentralized exchanges will positively influence Trust.

Perceived risk

Perceived Risk (PR) is how people see the chances of something going wrong when they do things online, like making a transaction, which affects whether they want to do it or not (Pavlou, 2003). Perceived risk is often considered a key factor in determining consumer behaviour, particularly in predicting technology adoption (Featherman & Pavlou, 2003). Perceived risk helps significantly and to a medium extent in explaining the adoption of m-

banking in rural areas (Kishore & Sequeira, 2016). Anticipated losses to customers may include financial loss, privacy violations, dissatisfaction with performance, psychological stress, waiting time, and long queues when it comes to mobile money (Baganzi & Lau, 2017). Centralized exchange have lack of credibility due to operational without transparency and security concerns, decentralized applications especially DeFi can be a potential solution to these problems (Han et al., 2022). Therefore, this research proposes this hypothesis:

H14: Perceived risk will positively influence crypto currency users' intention to adopt cryptocurrency exchange.

H15: Decentralized exchanges will positively influence Perceived risk.

Behavioural intention

BI is the user's intention to adopt and use a specific tool in the future (Venkatesh et al., 2003).This study suggests that the adoption of cryptocurrency exchanges can be predicted by customers' willingness to use the system. Although this relationship has not been proven in cryptocurrency exchange research, many online banking studies suggest a correlation due to the similarity of the fields (Alalwan et al., 2017; Martins et al., 2014).

Decentralization builds trust by offering secure, unchangeable records and removing single points of failure. This makes users more likely to adopt systems that emphasize fairness, security, and independence (Beck et al., 2017).

Our study proposes the following hypothesis in this context:

H16: Behavioural intention will positively influence cryptocurrency users to adopt cryptocurrency exchanges.

H17: Decentralized exchanges will positively influence behavioural intention.

Usage Behaviour

Usage Behaviour is the actual use of a technology or system and is a critical outcome variable in technology adoption research (Venkatesh et al., 2003). This study suggests that the adoption of decentralized cryptocurrency exchanges can be predicted by users' willingness to engage with the platform. While the relationship between decentralized exchanges and usage behavior has not been extensively studied in cryptocurrency research, findings in online

banking and e-commerce platforms suggest a strong connection due to the similar reliance on technology and user autonomy (Alalwan et al., 2017; Martins et al., 2014).

Decentralization reduces reliance on intermediaries and provides users with greater control, transparency, and security, all of which enhance their likelihood to adopt and actively use such platforms (Beck et al., 2017). This study posits that decentralized exchanges empower users to transact confidently by offering a more autonomous and equitable experience.

H18: Usage Behaviour will positively influence cryptocurrency users to adopt cryptocurrency exchanges.

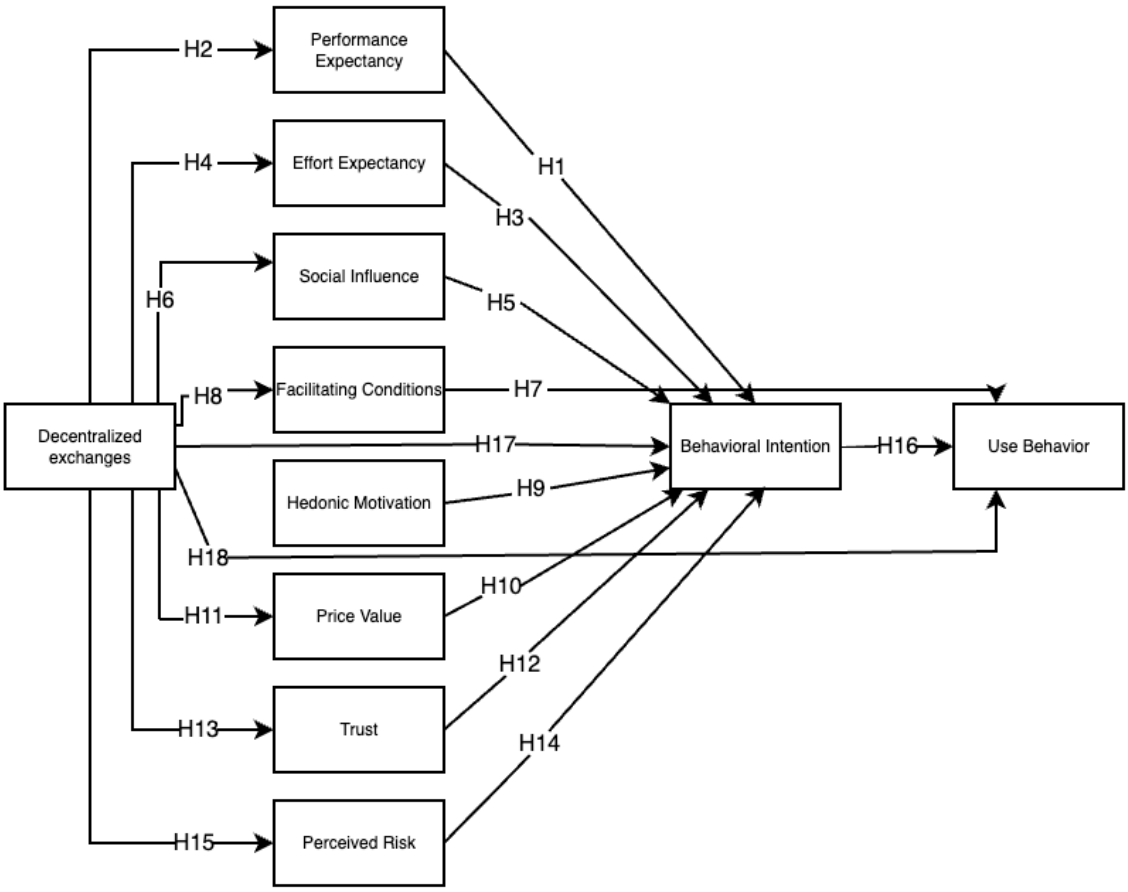

Figure 2 – Proposed Conceptual Model

3. METHODOLOGY

This research aims to assess the impact of decentralized exchange on adoption behaviours. To do so, the method of combining experimental conditions with PLS-SEM of Andrei et al. (2017) is used. In this case an experimental condition where half of the participants see a decentralised exchange and half see a centralised exchange is combined with the identified constructs that we expect to predict adoption. In effect a structural equation model is being used to identify the mediation effects of the experimental condition as recommended in Shrout & Bolger (2002) with PLS-SEM as recommended in Sarstedt et al. (2020).

A skewness-kurtosis method was used to assess the univariate normality of each variable, in accordance with the guidelines set by (Kline, 2005). To evaluate the model, we will use Partial Least Squares Structural Equation Modeling (PLS-SEM), a method well-suited for exploring complex relationships between variables. The evaluation will follow two steps: assessing the measurement model and the structural model. In the measurement model, we will check composite reliability (CR) to ensure consistency, average variance extracted (AVE) to confirm validity, and outer loadings to assess how well indicators represent their constructs(Chin, 1998; Sarstedt et al., 2021; Tenenhaus et al., 2008).

A multi-group analysis (PLS-MGA) will also be performed to determine whether the relationships between the mediator variables differ across experimental conditions, ensuring the stability and comparability of these relationships.

For the structural model, we will analyze the path coefficients and their significance using bootstrapping, which provides p-values and confidence intervals. We will also look at the coefficient of determination (R^2) to see how much of the variance is explained and use the standardized root mean square residual (SRMR) to check overall model fit.

Two surveys were conducted, one for decentralized exchanges and the other for centralized exchanges. Video demonstrations are used as part of the survey methodology. Both surveys with a video that begins with a general introduction to cryptocurrency, followed by a specific focus on the type of exchange. The final section illustrates the process of buying a coin on both decentralized and centralized exchanges. Finally, six closed-ended questions were used to gather demographic information, including age, gender, income, and education level. Some users will see the survey about decentralized exchanges and other centralized exchanges.

The structured questionnaire was designed using the Qualtrics survey platform. The surveys distributed them via social media, primarily on Facebook, WhatsApp groups, the language of the survey will be English. The questionnaire will be based on the constructs of the Unified Theory of Acceptance and Use of Technology 2 (UTAUT 2) model, adapted to the context of cryptocurrency exchange adoption, Trust was adapted ad a construct from Fagih (2016) and perceived risk from Al Fagih (2016).

To measured and validate the hypotheses and discover answers to validate or not these hypotheses. The items adjusted to fit the technology of cryptocurrency exchanges. It can be found in the appendix section. The items on the scales were measured using a seven-point Likert scale, ranging from 'strongly disagree' (1) to 'strongly agree' (7). PlS-SEM techniques will be used to analyse the relationships between the constructs. The sample size will be determined using the inverse square root method. This method has been shown to provide accurate results .

To ensure accuracy for both surveys, a minimum of 155 responses is required for each survey. This assumes a significance level of 5% and a minimum path coefficient of 0.2. Therefore, a total of 310 responses is needed.

3.1. DATA COLLECTION

To collect the data, we initially used online platforms to collect data we shared a survey link on social media to reach a diverse audience. This approach was chosen due to its broad reach and the potential to quickly get many responses at minimal cost. we faced many challenges using these platforms that affected the quality of the results, one main issue was the quality of the responses, many responses were unreliable, people completed the survey in a short time, suggesting they were not engaged, or it was automated. This made the data unreliable because it made me wonder if they had thought about their answers or just rushed through because they were tired or didn't understand the survey. To obtain reliable data for my thesis, we employed a more controlled method of data collection. we used Prolific, a platform for academic research, which offers fair compensation. This ensured that respondents engaged with the survey in a serious manner and completed it within a reasonable timeframe. Prolific facilitated the recruitment of participants who completed the survey within an average time frame, enhanced the quality of responses, and provided the desired quantity of responses. Of 456 answers got on Qualtrics, only 316 validate have a minimum 300 seconds of assistance and 279 are from Prolific.

3.2. RESPONDENTS' PROFILE AND CHARACTERISTICS

In terms of the respondents' education levels, many respondents (47.15%) in the survey hold a bachelor's degree, reflecting the relatively high level of educational in the sample. The second largest group is categorized as having received secondary school education (29.11%). A notable percentage (20.89%) of respondents have obtained a master's degree, while a relatively small proportion (2.53%) have attained a PhD. A mere 0.32% of individuals indicated that they had only completed primary school. The distribution of the respondents' ages shows a somewhat different pattern. The largest proportion of respondents fell into the 25 to 34 age bracket (46.20%), followed by the 18 to 24 age group (26.27%). The third most significant age

group was 35 to 44 (15.51%). In terms of ownership of cryptocurrency, most respondents (56.33%) indicated that they do not own any cryptocurrency, while 43.67% stated that they do. This suggests a concentration in non-ownership of cryptocurrency, indicating that this may be a more common characteristic among the group. Nevertheless, a significant proportion of respondents are still represented by those who do own cryptocurrency, indicating that both categories are relevant in the dataset.

3.3. PAID VS NON- PAID ANSWERS

We used t-tests to see if there were any differences between paid and unpaid participants. The t-test was used to see if there were any differences between the two groups for each variable. Some variables showed significant differences between paid and unpaid participants. PE2 and PE4 showed significant differences, indicating that the paid group had different perceptions compared to the unpaid group. Similarly, EE1 ($t = 3.10$, $p = 0.003$) showed a significant difference in effort expectancy, with the paid group reporting higher levels. Other variables, such as PE1 and PE3, did not show significant differences. This suggests that the paid and not paid groups were relatively similar in these areas. Payment status seems to affect how people performance expectancy and effort expectancy (appendix G).

4. RESULTS AND DISCUSSION

4.1. NORMALITY

The skewness and kurtosis values were found to fall within acceptable ranges. As demonstrated in the table in the appendix H, all skewness values were below the threshold of 3, and kurtosis values did not exceed the recommended limit of 8, thereby supporting the assumption of univariate normality (Kline, 2005; West et al., 1995).

4.2. MEASUREMENT MODEL ASSESSMENT

The results from the outer loadings in this study provide evidence of a high degree of reliability in the measurement model. Many of the loadings exceed the commonly accepted threshold of 0.7, indicating strong relationships between the latent constructs and their respective indicators. The constructs of behavioural intention, hedonic motivation, and social influence exhibit high loadings, with values consistently exceeding 0.9, indicating that these indicators provide a solid reflection of their underlying constructs. In contrast, the indicators for Facilitating Conditions and Price Value exhibit slightly lower loadings (ranging between 0.74 and 0.77). However, these values remain within acceptable limits, ensuring their contribution to the model remains meaningful. (appendix J)

The next step is reviewing if the model demonstrates reliability and validity, we observe (Appendix I) that most constructs within the model exhibit robust reliability and validity, with Cronbach's alpha and composite reliability values exceeding 0.9. This includes constructs such as behavioural intention (BI), effort expectancy (EE) and hedonic motivation (HM), which collectively demonstrate high reliability. However, Facilitating Conditions (FC) and Perceived Risk (PR) exhibit slightly smaller values, with Cronbach's alpha of 0.790 and 0.778, respectively, and reduced average variance extracted (AVE) scores. Nevertheless, these values remain acceptable (Cronbach's alpha above 0.7 and AVE above 0.5).

The last step is to check discriminant validity. Fornell and Larcker (1981) said that the AVE for each construct should be higher than the shared variance with other constructs. However, recent studies have shown that the Fornell-Larcker criterion may not work well in all cases. Henseler et al.(2015) introduced the Heterotrait-Monotrait Ratio (HTMT) as a more reliable alternative. They suggest HTMT values should be between 0.850 and 0.900, most pairs of constructs are distinct, with HTMT values below 0.85. The highest values were between PE and BI (0.899) and SI and BI (0.836), suggesting a stronger relationship between these constructs. Some other relationships, like FC and EE (0.831) and PV and PE (0.713), also showed high values but stayed below the threshold. Lower values were seen for pairs involving Perceived Risk (PR) and other constructs, showing good separateness for these

relationships. The HTMT analysis shows that the constructs have enough distinct validity, with no significant concerns. (Appendix K).

Following the experimental mediation model of Andrei et al.(2017) a multi-group analysis (PLS-MGA) is conducted to ensure the relationships between the mediator variables do not change between the experimental conditions. The analysis is included in appendix P and the results demonstrate that all relationships between the mediator constructs and BI are not significantly different between the two experimental conditions.

4.3. STRUCTURAL MODEL ASSESSMENT

Once the measurement model has been validated, the subsequent step is to assess the structural model. The most frequent evaluation criteria employed include the inner variance inflation factor (VIF), the coefficient of determination (R^2), the cross-validated redundancy measure (Q^2), and the significance and relevance of path coefficients(Hair et al., 2014).

Before analysing the structure, we need to check for collinearity to avoid bias in the regression. VIF values over 5 suggest collinearity among the predictor variables (Vittinghoff et al., 2005).The Variance Inflation Factor (VIF) shows that there is no significant multicollinearity in the model, as all VIF values are below 5. The highest values were for Performance Expectancy (PE) (3.729), Trust (TR) (3.337), and Social Influence (SI) (3.083). These show moderate collinearity but remain within acceptable limits. Other constructs, including BI, EE, and FC, have lower VIF values between 1.7 and 2.6, suggesting low multicollinearity. (Appendix L)

R^2 shows how much of the total variation in the data is explained by each construct. Chin (1998) says models are classified by their R^2 values: weak if below 0.50, moderate between 0.50 and 0.67, moderately strong from 0.67 to 0.75, and strong if equal to or above 0.75. The model produced an R^2 of 0.678 and an adjusted R^2 of 0.676, indicating it is moderately strong. (Appendix M)

The Q^2 method looks at how well a model predicts and explains data by removing and replacing data points. A higher Q^2 value means better predictive accuracy. Q^2 values above 0, 0.25, and 0.5 indicate small, medium, and large predictive relevance(Henseler et al., 2015; Sarstedt et al., 2021). With a Value of 0.052 the model exhibits small predictive relevance. (Appendix N)

The final step is to evaluate the statistical significance and relevance of the path coefficients (see Appendix O). To evaluate the statistical significance and relevance of the path coefficients, a bootstrapping analysis with 5000 iterations was conducted. The path coefficient values, which range from -1 to 1, offer valuable insights into the direction (positive or negative)

and strength (weak or strong) of the relationships between variables. The findings of this analysis, along with their interpretation, are presented in the following sections.

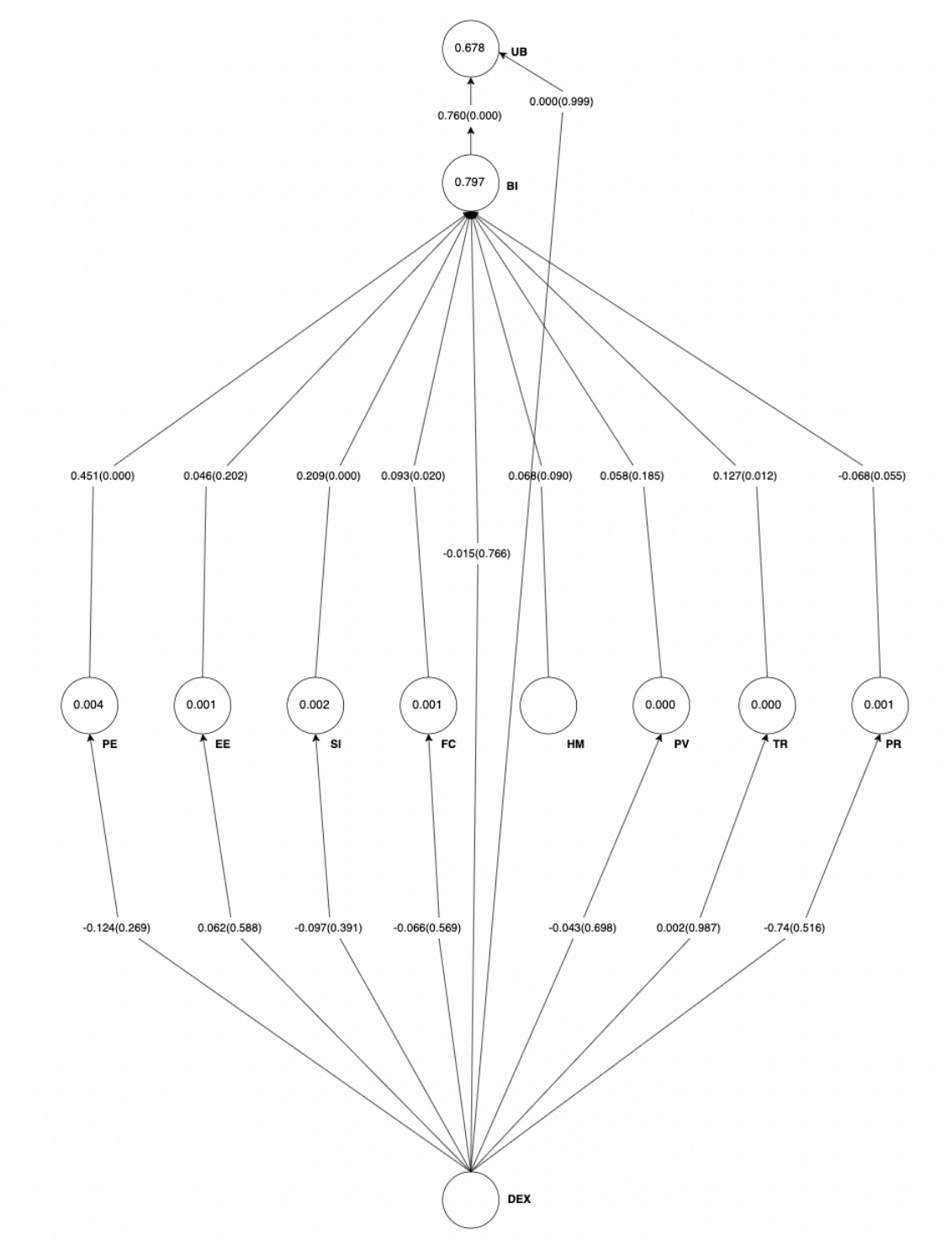

Figure 3- Structural Model Estimates

4.4. HYPOTHESIS SUPPORT

For the hypothesis to be confirmed, it is necessary for the p-value to be less than 0.05. The hypotheses regarding decentralized exchanges were not supported, indicating that decentralized exchanges do not significantly influence factors such as performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, trust, or perceived risk in relation to users' intentions to adopt cryptocurrency exchanges. This suggests that users may perceive centralized and decentralized exchanges as relatively similar in these aspects.

On the hypotheses where we see if the constructs of the model are good in predictors of behaviour intention and therefore adopt, Performance expectancy, social influence, Facilitation conditions and trust are significant factors. On the other hand, effort expectancy, hedonic motivation, price value and perceived risk show no influence on users' intention to adopt crypto currency exchanges.

Table 3- Support of Hypothesis

Hypothesis	**Path Coefficient**	**P-value**	**Supported?**
H1: Performance expectancy will positively influence crypto currency users' intention to adopt cryptocurrency exchange.	0.451	0.000	✓
H2: *Decentralized exchanges will positively influence performance expectancy.*		0.269	✗
H3: *Effort expectancy will positively influence crypto currency users' intention to adopt cryptocurrency exchange*.		0.202	✗
H4: *Decentralized exchanges will negatively influence effort expectancy*.		0.588	✗
H5: *Social influence will positively influence crypto currency users' intention to adopt cryptocurrency exchange*.	0.209	0.000	✓
H6: *Decentralized exchanges will negatively influence social influence*.		0.391	✗

H7: Facilitating conditions will positively influence crypto currency users to adopt cryptocurrency exchange.	0.093	0.019	✓
H8: *Decentralized exchanges will negatively influence facilitating conditions*.		0.569	✗
H9: Hedonic motivation will positively influence crypto currency users' intention to adopt cryptocurrency exchanges.		0.089	✗
H:10 Price Value will positively influence crypto currency users' intention to adopt cryptocurrency exchange		0.184	✗
H11: Decentralized exchanges will negatively influence Price Value		0.698	✗
H12: Trust will positively influence crypto currency users' intention to adopt cryptocurrency exchange.	0.058	0.012	✓
H13: Decentralized exchanges will positively influence Trust		0.987	✗
H14: Perceived risk will positively influence crypto currency users' intention to adopt cryptocurrency exchange.		0.056	✗
H15: Decentralized exchanges will positively influence Perceived risk.		0.516	✗
H16: Behavioural intention will positively influence cryptocurrency users to adopt cryptocurrency exchanges.	0.760	0.000	✓
H17: Decentralized exchanges will positively influence behavioural intention.		0.766	✗
H18: Decentralized exchanges will positively influence cryptocurrency users to adopt cryptocurrency exchanges		0.999	✗

5. DISCUSSION

5.1. MAIN FINDINGS

The objective of this study was to examine the influence of decentralized exchanges (DEXs) of cryptocurrency users adopting cryptocurrency exchanges. To accomplish this, an extended UTAUT2 model was used to test 18 hypotheses concerning the impact of DEXs on various factors, including performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, trust, perceived risk, and behavioural intention.

The study revealed that decentralized exchanges have no significant impact on the constructs, performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, trust, and perceived risk. The p-values for these relationships were all above the 0.05 threshold, indicating that decentralized exchanges do not significantly impact in users' perceptions of these factors. This may indicate that users perceive both decentralized and centralized exchanges as offering comparable functionality, security, and ease of use, despite the unique features each type of exchange offers.

Many people see decentralization as a key advantage of blockchain technology. It is often celebrated for promoting transparency, eliminating intermediaries, and giving users full control over their assets (Cloots, 2019; Tapscott & Tapscott, 2016). These features are commonly highlighted as reasons why decentralized exchanges (DEXs) could be superior to centralized exchanges (CEXs). However, our results suggest that decentralization does not significantly influence how users perceive important factors like performance, trust, or social influence.

This disconnect may be due to several reasons. First, while decentralization offers theoretical benefits, users may not fully understand or feel these advantages in their daily use of the platforms. Features like public transparency or decentralized governance may sound appealing, but they might not directly impact the practical experience for most users. As a result, the structural differences between DEXs and CEXs may not be obvious or compelling.

Second, the current limitations of DEXs could overshadow their decentralized benefits. Problems like lower liquidity, slower transactions, and the complexity of managing private keys can make DEXs seem less convenient than CEXs. For many users, these practical challenges may outweigh any perceived advantages of decentralization.

Another potential factor is a lack of understanding among users about the fundamental differences between decentralized and centralized exchanges. Many users of cryptocurrencies are still relatively new to the space and may not yet have a full understanding of the implications of decentralization. For these users, the distinction between the two types of exchanges may not be as significant as the ability to trade cryptocurrencies. Furthermore,

decentralized exchanges frequently necessitate a higher degree of technical proficiency (e.g. utilizing external wallets, comprehending blockchain fees), which may dissuade casual users from fully appreciating the advantages of decentralization. This may also explain why decentralized exchanges do not significantly impact constructs such as effort expectancy or facilitating conditions, as the perceived complexity of using DEXs has become less over time. Other factors may also affect this, so more research is needed to understand how people use and accept cryptocurrency exchanges.

Performance expectancy stood out as a key factor influencing behavioral intention. Users are more likely to adopt an exchange if they believe it will help them achieve their goals. For DEXs, this means emphasizing benefits like transparency and user autonomy, while CEXs can rely on their reputation for speed, reliability, and customer support.

Interestingly, effort expectancy was not a significant factor, suggesting that users are willing to navigate some level of complexity. On the other hand, social influence played an important role, with peer recommendations and community trust strongly impacting behavioral intention. This highlights the importance of community engagement and social proof, as users tend to rely on trusted networks when deciding which platform to use.

Facilitating conditions also significantly influenced behavioral intention. Users need to feel confident that tools like wallets and educational resources are readily available. Platforms that provide a seamless onboarding experience and accessible support are more likely to attract and retain users. Trust was another key driver, as users favor platforms they perceive as secure and reliable. However, decentralization alone didn't automatically enhance trust. For DEXs, concerns around risks like private key management and lack of customer support may undermine their perceived security. Addressing these risks through education, transparency, and additional safeguards will be critical for building trust.

Hedonic motivation and price value had minimal impact on behavioral intention. Users maybe view exchanges as functional tools, focusing on practicality over enjoyment or cost savings. Similarly, while perceived risk had a weak negative effect, it was not enough to outweigh the benefits users see in these platforms. This suggests that both CEXs and DEXs have an opportunity to further reduce user concerns through clear communication and risk mitigation strategies.

These findings are important for several groups involved in cryptocurrency adoption. For researchers, they challenge the assumption that decentralization is a primary driver of user behavior. The results highlight the need to explore why decentralization does not strongly influence user perceptions and how its benefits can be better communicated or integrated into user experiences. This could refine future studies and provide a clearer understanding of what motivates users.

For industry practitioners, the findings offer practical guidance. Decentralized exchanges (DEXs) need to move beyond relying on decentralization as a selling point. Instead, they should focus on improving usability, addressing risks like private key management, and showcasing practical benefits like autonomy and transparency. Centralized exchanges (CEXs) can continue to leverage their strengths in reliability, speed, and customer support, which clearly appeal to users.

These results are also significant for blockchain advocates and policymakers. They suggest that decentralization alone is not enough to attract users. Efforts to promote blockchain adoption should shift from ideological arguments to demonstrating how decentralization delivers tangible benefits like security and transparency.

Understanding these dynamics is crucial because it shows what users truly prioritize. By focusing on practical benefits such as security, performance, and trust, stakeholders can design strategies that better meet user needs. This approach will help drive adoption and create a more user-centered foundation for the broader acceptance of blockchain technologies.

5.2. RESEARCH LIMITATIONS

Studying the impact of decentralized exchanges (DEXs) is difficult because they are so technical. Many users may not understand decentralized technologies like smart contracts, blockchain networks and self-custody wallets. This may make them give inconsistent or unclear answers in surveys or interviews. DEXs might be underestimated because many users still must learn a lot about them.

Centralized exchanges have historically dominated the market and are often the first point of contact for new cryptocurrency users, so research may be biased. Users who know centralized exchanges may not see the benefits of decentralized alternatives. This makes it hard to understand how decentralized exchanges affect users. Users may use centralized exchanges because they are easy to use.

The videos used to explain decentralized and centralized exchanges may not have made the differences between the two types clear enough for users that don’t know about cryptocurrency exchanges. Viewers may have been confused or unable to understand the unique characteristics of each exchange. This could lead to mistakes in how the study's results are understood. For example, viewers might not have understood the difference between decentralized and centralized exchanges, which could have affected how they answered questions about trust, risk and effort expectancy. This confusion could affect the results, as users may not have understood the exchanges in the videos.

The study does not consider how geography and regulation affect the use of decentralized exchanges. In regions with strict regulations or government oversight, decentralized exchanges may be more appealing to users seeking privacy and control. In regions with lax regulations or better protections for centralized exchanges, the appeal of decentralized platforms may be reduced. This study's failure to incorporate these differences limits the usefulness of the findings across different user populations.

5.3. FUTURE CONTRIBUTIONS

Some parts of the model did not affect whether people adopted decentralized exchange. However, the reasons for these non-significant findings may not be fully explained. For example, users may not see much difference between decentralized and centralized exchanges because the markets are becoming more similar. This is just a guess, though, and we need to test it more in future. This shows that the model might not fully explain why people use cryptocurrency.

Further research should look at how people use cryptocurrency exchanges after they first adopt them. Knowing why people use a particular exchange (centralized or decentralized) or switch to another will show what makes an exchange successful in the long term. This could include trust after a breach or user experience after updates.

Future research could look at how people use cryptocurrency exchanges in real time. Blockchain data on transactions, use, and trades could give more objective insights into user behaviour. Tracking on-chain behaviour could also show that people's intentions and actions are not always the same. This could help us understand why people use exchanges.

Post-adoption behaviour and satisfaction. Future research should look at how people use, are happy with and stay loyal to decentralized exchanges. Studying why users stay loyal to DEXs or switch back to centralized exchanges could help us understand how to keep users engaged long-term. This will help developers improve user experience and retention on decentralized platforms.

6. CONCLUSION

This research provides a comprehensive framework for understanding the influence of decentralized exchanges on the adoption of cryptocurrency by users, applying the UTAUT2 model. The model, in conjunction with an exhaustive literature review, enabled the examination of the causal relationship between multiple variables and users' intention to adopt cryptocurrency exchanges.

The results indicated that decentralized exchanges had no significant impact on factors such as performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, trust, and perceived risk. This indicates that users perceive decentralized and centralized exchanges as offering comparable benefits in terms of ease of use, performance, and risk management. This is likely due to the convergence of features between the two types of platforms.

Despite the growing importance of decentralized exchanges in the cryptocurrency ecosystem, the results indicate that technical distinctions between centralized and decentralized platforms do not significantly driver of user adoption. This finding emphasizes the necessity for specific educational initiatives to enhance users' comprehension of decentralized exchanges, as well as the significance of concentrating on usability enhancements to reduce the perceived effort and boost adoption.

The findings of this study offer valuable insights into the factors influencing the adoption of cryptocurrency exchanges, providing key takeaways for exchange developers, policymakers, and industry stakeholders. Furthermore, the integration of decentralized features must be accompanied by clear communication and user education to address existing knowledge gaps. Policymakers should consider developing frameworks that promote user-centric exchange designs and educational content that emphasize the benefits and practicalities of decentralized platforms, ensuring that users are empowered to make informed decisions in the evolving cryptocurrency World.

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APPENDIX

A. Ethics Committee Report

This is to certify that
Project No.: **DDMKT2024-3-215275**
Project Title: **Factors influencing crypto currency exchange adpotion**
Principal Researcher: **Valentim**

according to the regulations of the Ethics Committee of NOVA IMS and MagIC Research Center this project was considered to meet the requirements of the NOVA IMS Internal Review Board, being considered **APPROVED** on 3/27/2024.

It is the Principal Researcher's responsibility to ensure that all researchers and stakeholders associated with this project are aware of the conditions of approval and which documents have been approved.

The Principal Researcher is required to notify the Ethics Committee, via amendment or progress report, of
- Any significant change to the project and the reason for that change;
- Any unforeseen events or unexpected developments that merit notification;
- The inability of the Principal Researcher to continue in that role or any other change in research personnel involved in the project.

Lisbon, 3/27/2024

NOVA IMS Ethics Committee
ethicscommittee@novaims.unl.pt

B. Centralized Exchanges Video Script

Beginning General

In this video, we'll explain what blockchain is and explore some popular cryptocurrencies that you can buy and sell.

Blockchain is a technology that records transactions across a network of computers. Transactions are stored in blocks and linked together in a chronological chain. This creates a secure and transparent record of transactions that cannot be easily altered or manipulated.

Blockchain is used in finance to create cryptocurrencies such as Bitcoin and Ethereum. These digital or virtual currencies use cryptography for security and operate on blockchain networks. This allows for transactions to take place on a client-to-client basis without the need for intermediaries, such as banks. To buy, sell, trade these digital currencies we use platforms called cryptocurrency exchanges.

Centralized Exchange

Now Let's explore one type of crypto currency exchanges what they are and how they work.

What are centralized exchanges?

Centralized exchanges (CEX) are like online stores where people can trade cryptocurrencies. They're run by companies and act as a middleman for buying, selling, and trading digital currencies.

CEXs allow users to trade with each other on the system of a central authority.

centralized exchanges (CEXs) are managed by companies or organizations, serving as intermediaries between users and implementing security measures like encryption and multi-factor authentication to safeguard user funds.

CEXs allow privacy between users but require users to complete identity verification processes to comply with regulations.

CEXs typically offer higher liquidity, resulting in potentially faster and more efficient trades.

Transactions on CEXs are privately recorded by the centralized party, without transparency or accountability.

CEXs have a centralized party to provide customer support services to assist users with inquiries and technical issues.

CEXs are subject to censorship, as they are controlled by a single entity.

BINANCE PART

In this part of the video we are going to do a step-by-step guide on buying Ethereum (ETH) on Binance, one of the most popular centralized cryptocurrency exchanges.

Log in to your Binance account using your registered email address and password.

Once logged in, navigate to the Deposit tab

Choose the currency you want to deposit in this case EURO and select the deposit method.

We Can see the transaction fees

Follow the instructions to complete the deposit process. Your funds will typically be available in your Binance account after a short processing time.

In the case of this example, we will need to convert the euros to USDT a cryptocurrency stablecoin

After your funds are deposited, we click on the binance logo tab e select Convert.

Select the USDT amount you want to trade for Ethereum.

Click preview conversion.

This transaction has no fees

Click convert

Once your order is successfully processed, you'll see your Ethereum balance updated in your Binance wallet.

C. DECENTRALIZED EXCHANGES VIDEO SCRIPT

Beginning General

In this video, we'll explain what blockchain is and explore some popular cryptocurrencies that you can buy and sell.

Blockchain is a technology that records transactions across a network of computers. Transactions are stored in blocks and linked together in a chronological chain. This creates a secure and transparent record of transactions that cannot be easily altered or manipulated.

Blockchain is used in finance to create cryptocurrencies such as Bitcoin and Ethereum. These digital or virtual currencies use cryptography for security and operate on blockchain networks. This allows for transactions to take place on a client-to-client basis without the need for intermediaries, such as banks. To buy, sell, trade these digital currencies we use platforms called cryptocurrency exchanges.

Decentralized Exchange

Decentralized Exchanges (DEX) are like community marketplaces for trading cryptocurrencies. They're not run by companies, but instead operate on blockchain technology.

DEXs allow users to trade directly with each other without a central authority.

Transactions on DEXs are secured by blockchain technology, reducing the risk of hacks or fraud between users without having to rely on a central authority.

DEXs prioritize user privacy by allowing trading without revealing personal information.

DEXs often offer lower liquidity, resulting in potentially slower and more expensive trades.

Transactions on DEXs are publicly recorded on the blockchain, ensuring transparency and accountability.

DEXs have no centralized party to provide customer support services to assist users with inquiries and technical issues.

DEXs are resistant to censorship, as they are not controlled by a single entity.

UNISWAP Part

In this part of the video we are going to do a step-by-step guide on buying Ethereum (ETH) on Uniswap , one of the most popular decentralized cryptocurrency exchanges.

To buy tokens on the Uniswap interface you need to connect your cryptocurrency wallet. Click on the "Connect Wallet" button, in this specific wallet you can deposit funds using bank transfer or credit card

After connecting your wallet, select USDT as the token you want to trade. Next, click on the "Select a token" button to choose Ethereum (ETH) the token you want to trade for USDT.

Enter the amount of Ethereum you want to buy or the equivalent amount of the token you're trading and we will see the gas fees that are the transaction fees

Click on the "Swap" button.

After confirming the transaction, you'll need to wait for the transaction to be processed on the Ethereum blockchain. Once confirmed, the Ethereum and the token you exchanged will be transferred to your wallet.

In this part of the video, we are going to do a step-by-step guide on buying Ethereum (ETH) on Uniswap, one of the most popular decentralized cryptocurrency exchanges.

D. QUESTIONS FORMS CENTRALIZED EXCHANGES

Constructs		**Items**	**Sources**
Performance Expectancy (PE)	PE1	I find CEX cryptocurrency exchange would be useful in my daily life.	Venkatesh et al. (2012)
	PE2	Using CEX cryptocurrency exchange would increases my chances of achieving tasks that are important to me.	Venkatesh et al. (2012)
	PE3	Using CEX cryptocurrency exchange would help me accomplish things more quickly.	Venkatesh et al. (2012)
	PE4	Using CEX cryptocurrency exchange would increases my productivity.	Venkatesh et al. (2012)
Effort expectancy (EE)	EE1	Learning how to use CEX cryptocurrency exchange is easy for me.	Venkatesh et al. (2012)
	EE2	My interaction with CEX cryptocurrency exchange would be clear and understandable.	Venkatesh et al. (2012)
	EE3	I would find CEX cryptocurrency exchange easy to use.	Venkatesh et al. (2012)

	EE4	It would be is easy for me to become skillful at using CEX cryptocurrency exchange.	Venkatesh et al. (2012)
Social influence (SI)	SI1	People who are important to me would think that I should use CEX cryptocurrency exchange.	Venkatesh et al. (2012)
	SI2	People who influence my behaviour would think that I should use CEX cryptocurrency exchange.	Venkatesh et al. (2012)
	SI3	People whose opinions that I value would prefer that I use CEX cryptocurrency exchange.	Venkatesh et al. (2012)
Facilitating Conditions (FC)	FC1	I would have the resources necessary to use CEX cryptocurrency exchange.	Venkatesh et al. (2012)
	FC2	I would have the knowledge necessary to use CEX cryptocurrency exchange.	Venkatesh et al. (2012)
	FC3	CEX cryptocurrency exchange is compatible with other technologies I use	Venkatesh et al. (2012)
	FC4	I can get help from others when I would have difficulties using CEX cryptocurrency exchange.	Venkatesh et al. (2012)
Hedonic Motivation (HM)	HM1	Using CEX cryptocurrency exchange can be fun.	Venkatesh et al. (2012)
	HM2	Using CEX cryptocurrency exchange can be enjoyable.	Venkatesh et al. (2012)
	HM3	Using CEX cryptocurrency exchange can be very entertaining.	Venkatesh et al. (2012)
Price Value (PV)	PV1	CEX cryptocurrency exchange is reasonably priced.	Venkatesh et al. (2012)
	PV2	CEX cryptocurrency exchange is a good value for the money.	Venkatesh et al. (2012)
	PV3	At the current price, CEX cryptocurrency exchange provides a good value.	Venkatesh et al. (2012)
Trust (TR)	TR1	I believe that CEX cryptocurrency exchange is trustworthy.	Alalwan et al. (2017)
	TR2	I believe that CEX cryptocurrency exchange is trustworthy.	Alalwan et al. (2017)
	TR3	I do not doubt the honesty of CEX cryptocurrency exchange.	Alalwan et al. (2017)
	PR1	Using CEX cryptocurrency exchange can be risky.	Al Fagih (2016)

	PR2	There is too much uncertainty associated with the use of DEX cryptocurrency exchange	Al Fagih (2016)
	PR3	Compared with other platforms, CEX cryptocurrency exchange can be riskier.	Al Fagih (2016)
Behavioral Intention (BI)	BI1	I intend to use CEX cryptocurrency exchange in the future.	Venkatesh et al. (2012)
	BI2	I will always try to use CEX cryptocurrency exchange in my daily life.	Venkatesh et al. (2012)
	BI3	I plan to use CEX cryptocurrency exchange frequently.	Venkatesh et al. (2012)
Use Behavior (UB)	UB	What would be your expected frequency of CEX cryptocurrency exchange? i) I Will not use; ii) Once a year; iii) Once in six months; iv) Once in three months; v) Once a month; vi) Once a week; vii) Once in 4–5 days; viii) Once in 2–3 days; ix) Almost every day; x) Every day; xi) Several times a day.	Martins et al. (2014)

E. QUESTIONS FORMS DECENTRALIZED EXCHANGES

Constructs	**Items**		**Sources**
Performance Expectancy (PE)	PE1	I find DEX cryptocurrency exchange would be useful in my daily life.	Venkatesh et al. (2012)
	PE2	Using DEX cryptocurrency exchange would increase my chances of achieving tasks that are important to me.	Venkatesh et al. (2012)
	PE3	Using DEX cryptocurrency exchange would help me accomplish things more quickly	Venkatesh et al. (2012)

	PE4	Using DEX cryptocurrency exchange would increase my productivity	Venkatesh et al. (2012)
Effort expectancy (EE)	EE1	Learning how to use DEX cryptocurrency exchange is easy for me.	Venkatesh et al. (2012)
	EE2	My interaction with DEX cryptocurrency exchange would be clear and understandable	Venkatesh et al. (2012)
	EE3	I would find DEX cryptocurrency exchange easy to use	Venkatesh et al. (2012)
	EE4	It would be is easy for me to become skillful at using DEX cryptocurrency exchange.	Venkatesh et al. (2012)
Social influence (SI)	SI1	People who are important to me would think that I should use DEX cryptocurrency exchange.	Venkatesh et al. (2012)
	SI2	People who influence my behaviour would think that I should use DEX cryptocurrency exchange.	Venkatesh et al. (2012)
	SI3	People whose opinions that I value would prefer that I use DEX cryptocurrency exchange.	Venkatesh et al. (2012)
Facilitating Conditions (FC)	FC1	I would have the resources necessary to use DEX cryptocurrency exchange.	Venkatesh et al. (2012)
	FC2	I would have the knowledge necessary to use DEX cryptocurrency exchange.	Venkatesh et al. (2012)
	FC3	DEX cryptocurrency exchange is compatible with other technologies I use	Venkatesh et al. (2012)
	FC4	I can get help from others when I would have difficulties using DEX cryptocurrency exchange.	Venkatesh et al. (2012)
Hedonic Motivation (HM)	HM1	Using DEX cryptocurrency exchange can be fun	Venkatesh et al. (2012)
	HM2	Using DEX cryptocurrency exchange can be enjoyable.	Venkatesh et al. (2012)
	HM3	Using DEX cryptocurrency exchange can be very entertaining.	Venkatesh et al. (2012)
Price Value (PV)	PV1	DEX cryptocurrency exchange is reasonably priced.	Venkatesh et al. (2012)
	PV2	DEX cryptocurrency exchange is a good value for the money.	Venkatesh et al. (2012)
	PV3	At the current price, DEX cryptocurrency exchange provides a good value.	Venkatesh et al. (2012)

Trust (TR)	TR1	I believe that DEX cryptocurrency exchange is trustworthy.	Alalwan et al. (2017)
	TR2	I trust in DEX cryptocurrency exchange.	Alalwan et al. (2017)
	TR3	I do not doubt the honesty of DEX cryptocurrency exchange.	Alalwan et al. (2017)
Perceived Risk (PR)	PR1	Using DEX cryptocurrency exchange can be risky	Al Fagih (2016)
	PR2	There is too much uncertainty associated with the use of DEX cryptocurrency exchange	Al Fagih (2016)
	PR3	Compared with other platforms, DEX cryptocurrency exchange can be riskier	Al Fagih (2016)
Behavioral Intention (BI)	BI1	I intend to use DEX cryptocurrency exchange in the future.	Venkatesh et al. (2012)
	BI2	I will always try to use DEX cryptocurrency exchange in my daily life	Venkatesh et al. (2012)
	BI3	I plan to use CEX cryptocurrency exchange frequently.	Venkatesh et al. (2012)
Use Behavior (UB)	UB	What would be your expected frequency of CEX cryptocurrency exchange? i) Will not use; ii) Once a year; iii) Once in six months; iv) Once in three months; v) Once a month; vi) Once a week; vii) Once in 4–5 days; viii) Once in 2–3 days; ix) Almost every day; x) Every day; xi) Several times a day	Martins et al. (2014)

F. DEMOGRAPHIC CHARACTERISTICS

Demographic Characteristics		Sample (N=316)	Percentage (%)
Age	18-14	83	26,26
	25-34	146	46,20
	35-44	49	15,50
	45-54	24	7,59
	55-64	9	2,84
	65 +	5	1,58
Level of education	Primary School	1	0,31
	Secondary School	92	29,11
	Bachelor´s Degree	149	47,15
	Master´s Degree	66	20,88
	Doctorate's Degree	8	2,53
Owning crypto currency	Yes	178	43,67
	No	138	56,32

G. PAID VS NON- PAID ANSWERS

Variable	T-Statistic	P-Value
PE1	1.513626	0.136661
PE2	2.633309	0.011314
PE3	1.889368	0.064916
PE4	2.399093	0.020257
EE1	3.100985	0.003326
EE2	3.290171	0.001923
EE3	2.353056	0.022723
EE4	3.146001	0.002848
SI1	3.966466	0.000221
SI2	2.883643	0.005758
SI3	3.451871	0.001129
FC1	1.796408	0.078960
FC2	1.862954	0.069019
FC3	2.352961	0.023079
FC4	2.105427	0.040468
HM1	3.356173	0.001579

HM2	3.028898	0.003959
PV1	3.532940	0.000890
PV2	2.947175	0.005012
PV3	3.921184	0.000292
TR1	3.244662	0.002187
TR2	3.969063	0.000241
TR3	2.924570	0.005222
PR1	-1.473536	0.146933
PR2	-2.336939	0.023452
PR3	-1.139333	0.260408
BI1	2.456219	0.017296
BI2	2.172441	0.034049
BI3	3.421492	0.001187
UB	3.508749	0.000918

H. ASSESSMENT OF NORMALITY

Constructs	Items	Skewness	Kurtosis
Performance Expectancy (PE)	PE1	-0.987	-0.189
	PE2	-1.165	-0.136
	PE3	-0.873	-0.388
	PE4	-1.022	-0.148
Effort expectancy (EE)	EE1	-0.292	-0.779
	EE2	-0.071	-0.757
	EE3	0.180	-0.898
	EE4	-0.546	-0.572
Social influence (SI)	SI1	-1.072	0.113
	SI2	-0.965	0.082
	SI3	-0.997	0.038
Facilitating Conditions (FC)	FC1	-0.275	-0.798
	FC2	-0.453	-0.713
	FC3	0.242	-0.876
	FC4	-0.592	-0.613
Hedonic Motivation (HM)	HM1	-0.133	-0.629
	HM2	0.050	-0.747
	HM3	0.098	-0.371
Price Value	PV1	0.335	-0.439

(PV)	PV2	0.357	-0.495
	PV3	-0.361	-0.368
Trust (TR)	TR1	-0.534	-0.331
	TR2	-0.550	-0.275
	TR3	0.073	-0.702
Perceived Risk (PR)	PR1	-0.585	-0.203
	PR2	0.072	0.121
	PR3	-1.091	-0.137
Behavioral Intention (BI)	BI1	-1.103	0.193
	BI2	-1.169	0.163
	BI3	-0.711	0.586
Use Behavior (UB)	UB	-2.013	0.13

I. OUTER LOADINGS

Construct	Outer loadings
BI1 <- BI	0.955
BI2 <- BI	0.949
BI3 <- BI	0.972
EE1 <- EE	0.908
EE2 <- EE	0.941
EE3 <- EE	0.944
EE4 <- EE	0.891
FC1 <- FC	0.782
FC2 <- FC	0.823
FC3 <- FC	0.784
FC4 <- FC	0.742
HM1 <- HM	0.975
HM2 <- HM	0.977
PE1 <- PE	0.935
PE2 <- PE	0.946
PE3 <- PE	0.903
PE4 <- PE	0.923
PR1 <- PR	0.845
PR2 <- PR	0.875

PR3 <- PR	0.770
PV1 <- PV	0.897
PV2 <- PV	0.939
PV3 <- PV	0.943
SI1 <- SI	0.941
SI2 <- SI	0.958
SI3 <- SI	0.941
TR1 <- TR	0.944
TR2 <- TR	0.954
TR3 <- TR	0.923
TYPE <- TYPE	1.000
UB <- UB	1.000

J. MEASUREMENT MODEL ASSESSMENT MEASURES OVERVIEW

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
BI	0.956	0.956	0.971	0.919
EE	0.940	0.945	0.957	0.849
FC	0.790	0.794	0.864	0.614
HM	0.950	0.951	0.975	0.952
PE	0.945	0.948	0.961	0.859
PR	0.778	0.806	0.870	0.691
PV	0.917	0.922	0.948	0.858
SI	0.942	0.942	0.963	0.896
TR	0.935	0.938	0.958	0.885

K. HETEROTRAIT-MONOTRAIT RATIO (HTMT)

Constructs	Heterotrait-monotrait ratio (HTMT)
EE <-> BI	0.617
FC <-> BI	0.742

FC <-> EE	0.831
HM <-> BI	0.710
HM <-> EE	0.591
HM <-> FC	0.662
PE <-> BI	0.899
PE <-> EE	0.613
PE <-> FC	0.740
PE <-> HM	0.720
PR <-> BI	0.665
PR <-> EE	0.415
PR <-> FC	0.493
PR <-> HM	0.479
PR <-> PE	0.644
PV <-> BI	0.718
PV <-> EE	0.517
PV <-> FC	0.677
PV <-> HM	0.682
PV <-> PE	0.713
PV <-> PR	0.517
SI <-> BI	0.836
SI <-> EE	0.604
SI <-> FC	0.704
SI <-> HM	0.648
SI <-> PE	0.842
SI <-> PR	0.632
SI <-> PV	0.643
TR <-> BI	0.780
TR <-> EE	0.584
TR <-> FC	0.719
TR <-> HM	0.679
TR <-> PE	0.748
TR <-> PR	0.690
TR <-> PV	0.809
TR <-> SI	0.719
TYPE <-> BI	0.045
TYPE <-> EE	0.032
TYPE <-> FC	0.089
TYPE <-> HM	0.010
TYPE <-> PE	0.065

TYPE <-> PR	0.046
TYPE <-> PV	0.023
TYPE <-> SI	0.050
TYPE <-> TR	0.020
UB <-> BI	0.839
UB <-> EE	0.518
UB <-> FC	0.656
UB <-> HM	0.598
UB <-> PE	0.745
UB <-> PR	0.544
UB <-> PV	0.615
UB <-> SI	0.676
UB <-> TR	0.633
UB <-> TYPE	0.036

L. INNER VARIANCE INFLATION FACTOR

Constructs	VIF
BI -> UB	1.718
EE -> BI	1.728
FC -> UB	1.718
HM -> BI	2.280
PE -> BI	3.729
PR -> BI	1.715
PV -> BI	2.631
SI -> BI	3.083
TR -> BI	3.337
TYPE -> EE	1.000
TYPE -> FC	1.000
TYPE -> PE	1.000
TYPE -> PR	1.000
TYPE -> PV	1.000
TYPE -> SI	1.000
TYPE -> TR	1.0

M. R-SQUARED

	R-square	R-square adjusted
UB	0.678	0.676

N. Q-SQUARED

	Q^2predict	RMSE	MAE
UB	0.052	0.979	0.820

O. PATH COEFFICIENTS

Path	Hypothesis	Original sample	Sample mean	Standard deviation	T statistics	P values
BI -> UB	H9	0.760	0.758	0.030	25.074	**0.000**
HM -> BI	H5	0.068	0.068	0.040	1.701	0.089
TYPE -> EE	H2	0.062	0.061	0.115	0.542	0.588
TYPE -> FC	H4	-0.066	-0.067	0.116	0.570	0.569
TYPE -> PE	H1	-0.124	-0.127	0.113	1.105	0.269
TYPE -> PR	H8	-0.074	-0.072	0.113	0.649	0.516
TYPE -> PV	H6	-0.043	-0.046	0.112	0.388	0.698
TYPE -> SI	H3	-0.097	-0.098	0.113	0.859	0.391
TYPE -> TR	H7	0.002	0.001	0.111	0.016	0.987

P. MULTI GROUP ANALYSIS (MGA)

	Difference (CEX - DEX)	1-tailed (CEX vs DEX) p value	2-tailed (CEX vs DEX) p value
BI -> UB	-0.141	0.990	0.020
EE -> BI	-0.039	0.699	0.603
FC →> UB	0.120	0.063	0.126
HM -> BI	0.080	0.161	0.323
PE -> BI	-0.030	0.600	0.800
PR -> BI	0.015	0.423	0.846
PV -> BI	-0.089	0.842	0.315
SI -> BI	0.122	0.140	0.280
TR -> BI	-0.071	0.756	0.488

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