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# Decentralized Finance (DeFi), Strengths Become Weaknesses: a Literature Survey

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***Abstract***

*The use of blockchain technology in Decentralized Finance (DeFi) has gained popularity, with 23 public companies and one country holding bitcoin. DeFi aims to create an open and decentralized financial ecosystem that is accessible to everyone, eliminates intermediaries like financial institutions, and is verifiable, immutable, globally accepted, fast, low-cost, anonymous, and non-custodial. Despite its benefits, the rapid growth of DeFi has led to increased security risks. This study assesses the validity of DeFi's superiority claims in light of security incidents and events in 2022 and Twitter trends. This study used a Systematic Literature Review from various research articles and news from 2022. This research found that DeFi's superiority claims seem to be inconsistent with what is being advertised. It also found that if DeFi is not properly prepared and audited, its strength (Anonymous, open-source, decentralized, non-custodial, eliminates third parties and regulation) may become its weakness. Despite this, users still exhibit high levels of trust and optimism, as seen in the most popular terms shared by user tweets during significant losses, with 301,654 unique tweets between April 30 and May 31, 2022 and 344,519 unique tweets between October 3 and December 3, 2022, that are crypto, nft, and blockchain.*

*Keywords: defi; blockchain; security incident; fintech; twitter; cbdc*

## 1. Introduction

The Popularity of implementing blockchain technology for Decentralized Finance (DeFi) has soared with 174,374,4658 bitcoins worth $2,893,591,595 being held by 23 public companies [1]. From a country perspective, El Salvador holds 2,381 bitcoins, now valued at $41,000,000 (65% loss) [2]. El Salvador has also launched an application called 'chivo wallet' and made the "Bitcoin Law" which legalizes trading and exchange of bitcoins [3]. Around the world, based on the latest data for November 2021, there are 103 regulations governing cryptocurrencies, with 9 countries banning them absolutely and 42 countries banning them implicitly [4]. DeFi has many definitions, one of which is defined by Wharton and World Economic Forum as a intersection development of digital assets, blockchain, and financial services [5]. According to Maia, DeFi (Decentralized Finance) refers to a system of decentralized applications or dapps (software that operate on a decentralized network and function automatically when specific conditions are met. They ensure secure and verifiable transactions and maintain legitimate changes in state on a public blockchain) that offer financial services and operate on peer-to-peer, trustless networks, not requiring central authority [6]. DeFi itself aims to build a financial ecosystem accessible to all, is non-custodial (participants have full control of their funds at any time), everyone can verify the health or financial security of the system [7], accepted globally, has transaction records that cannot be changed and guaranteed integrity, is open, decentralized, able to serve lightning-fast transactions at almost no cost, is anonymous and eliminates third parties such as financial institutions or central banks [8]. The character of DeFi, which distinguishes DeFi from the existing financial system, is described in Patrick Schueffel's writings into 18 characters, namely (1) Degree of Automation, (2) Network Structure, (3) Self Custodial, (4) Trustless, (5) Technology Importance, (6) Intermediary Importance, (7) Cost of Services, (8) Product Focus, (9) Single Point of failure, (10) Counterparty Risk, (11) Anonymous, (12) Inclusive, (13) Transparent, (14) Open Source, (15) Permissionless, (16) Flexibility, (17) Security, (18) Regulated [9].

Despite of Bitcoin highly volatility [10], several Decentralized Finance projects are emerging rapidly, such as loans, decentralized exchanges (DEX), derivatives, payments, asset management [11],

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compliance and KYT (Know Your Transaction), decentralized autonomous organization (DAO), gaming, identity, insurance, stable coins, margin trading, marketplaces, savings, staking, synthetic assets, tokenization, trading, compliance and KYT (Know Your Transaction), decentralized autonomous organization (DAO), gaming, identity, insurance, stable coins, margin trading, marketplaces, savings, staking, synthetic asset, tokenization, trading , trading [12], ICO (Initial Coin Offering) [13].

Decentralized Finance is related to smart contracts. The smart contract cannot be change or edited the code after it being published in the blockchain network [14]. Most smart contracts are developed in the Solidity language, an object-oriented language similar to JavaScript [15]. Writing secure and bug-free smart contracts is a difficult task [16]. Daniel and Benjamin in their research have identified 6 smart contract vulnerabilities in the Ethereum Virtual Machine, namely (1) Re-Entrancy, (2) Unhandled Exceptions, (3) Locked Ether, (4) Transaction Order Dependency, (5) Integer Overflow, and (6) Unrestricted Action. Daniel and Benjamin also mapped available analytical tools with the ability to detect 6 smart contract vulnerabilities on the Ethereum Virtual Machine [17]. Jamal Hayat in his thesis, made a taxonomy of threats to blockchain technology consisting of (1) Double-spending, (2) Mining Pools, (3) Blockchain Network, (4) Wallets, and (5) Smart Contracts [18]. Wenkai Li in his research has summarized attacks in the real world and classified these attacks into 4 layers, namely the layer of data, consensus, smart contract, and application [19].

A high-level systematic picture of DeFi is described in Liyi Zou's research, which consists of a network layer, consensus layer, DeFi Protocol layer, and Auxiliary Services [20]. DeFi's development that are fast [21], has many variations, is open code, and involves a lot of public funds causing a high risk of security appear. Based on information from Cryptosec, to date there have been 122 exploits against DeFi, with details in 2022 there were 38 exploits, in 2021 there were 62 exploits, and in 2020 there were 16 exploits [22].

Previous studies on Decentralized Finance (DeFi) conducted by Peterson have already shown that most research on DeFi investigates the concept, functioning, benefits, and challenges through discourse analysis. However, none of these studies have used real-data incidents to conduct any in-depth empirical analysis. Additionally, most studies have had a positive perspective on DeFi, but there are currently no critical studies that compare expectations and reality based on news and incidents. Furthermore, no studies examine public sentiment about DeFi in Twitter conversation during months of high-loss incidents [23].

DeFi has emerged as a crucial investment option that cannot be disregarded, however the intricacy of DeFi protocols and coins presents a significant obstacle for both novice and experienced cryptocurrency investors [24]. This is why, this current study will discuss the level of consistency of the 'superiority claim' of decentralization finance from every security incident or event in 2022, and the trend of decentralized finance conversations on Twitter from 30 April 2022 to 31 May 2022 and from 31 October 2022 to 03 December 2022. To see the sentiment of DeFi, this research analyzes the focus of conversation on Twitter about DeFi as the most common medium used to promote the ICO process [25].

## 2. Research Methods

This research uses Systematic Literature Review (SLR). SLR data sources come from several research articles and news from incidents regarding DeFi that occurred in 2022 which can describe the definition, characteristics, developments, and challenges of Decentralized Finance. The researcher uses the research flow formulated by Xiao and Watson into 8 stages as seen from Figure 1 [26].

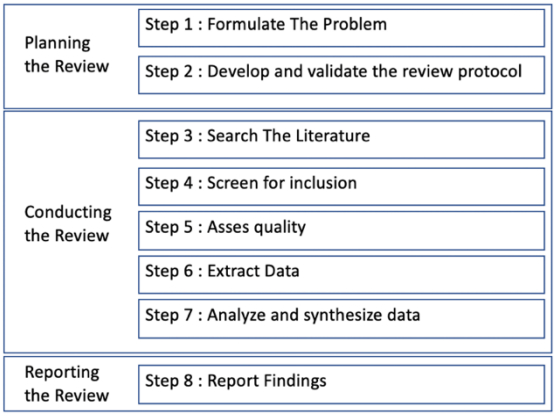


Figure 1. Process of systematic literature review

In the first stage, problems are formulated by creating research questions (RQ), as shown in table 1. The literature review process will follow the guidance of the research questions and the specific focus of the research question impacts the duration of the research.

Table 1. Research Question

| No | Question |
|---|---|
| 1 | What is the definition and characteristics of Decentralized Finance (DeFi)? |
| 2 | What are the advantages of Decentralized Finance? |
| 3 | What DeFi incidents happened in 2022? |
| 4 | In what month biggest loss happened in 2022? |
| 5 | What was the discussion on Twitter during month of high loss incident period? |
| 6 | What was the discussion on Twitter during the non-incident period? |

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Stage 2 is to develop and validate the review protocol, as protocols outline the reasoning, hypothesis, and intended methods of the project before the review starts and enable readers of finished reviews to detect any deviations from the planned methods and determine whether these deviations influence the interpretation of review results and conclusions as shown in Table 2.

Table 2. Review Protocol

| Item | Description |
|---|---|
| Team member | 3 |
| Rationale and objective of the review | In 2 months can identify the consistency of 'superiority claim' of Defi |
| Eligibility criteria | data about DeFi in 2022 including paper and news |
| Key terms of the literature search | 'Decentralized Finance' |
| Process and Tools | snscrape python |

From stage 3 to 7, literature (papers or news) is gathered from the internet with years of publication from 2016 to 2022 with statistics as shown in Table 3.

Table 3. Literature statistic

| Year | Number of literatures |
|---|---|
| 2022 | 60 |
| 2021 | 6 |
| 2020 | 0 |
| 2019 | 2 |
| 2018 | 2 |
| 2017 | 0 |
| 2016 | 1 |

In stage 8, The report is compiled so that it can describes the systematic literature review process with clear steps and all conclusions are backed up by data. Additionally, the report notes new and surprising discoveries, and identifies potential avenues for future research.

## 3. Results and Discussions

### 3.1 *Anonymous*

The Decentralized Finance Ecosystem can be explained from Figure 2. Figure 2 explains that even though it is said that decentralized finance is anonymous and eliminates third parties such as financial institutions and central banks, in reality to make transactions for the first time, people still have to get in touch with the bank/fintech/credit institution and a centralized exchange to exchange fiat money to stablecoins. Even to get an account on a centralized exchange, registering using a photo of identification card and a selfie with the identification card (Know Your Customer Process) is required. Centralized exchanges themselves work within their respective blockchain networks, such as binance working on the BNB Smart Chain (BEP20), Ethereum (ERC-20), AVAX C-Chain, BNB Beacon Chain (BEP2), and Polygon networks, while the centralized exchange kraken works on ERC-20 network, Polkadot, algorand, cardano, dogecoin, phantom, ripple, solana. As a note, the topic of blockchain network combination and interaction has been relevant in recent years [14]. It is not uncommon for a centralized exchange to issue its own native token through an ICO (Initial Coin Offering) process.

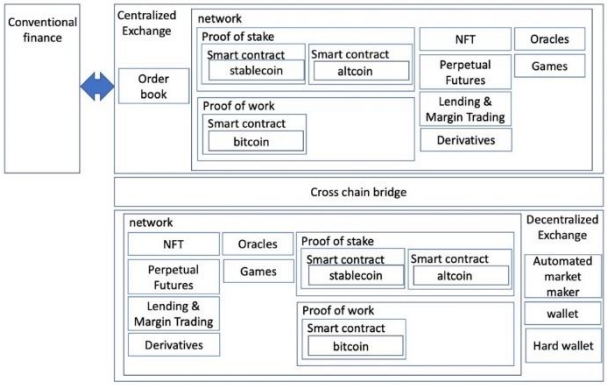


Figure 2. Decentralized Finance Ecosystem

In table 4, the best exchanges in November 2022 [27] with trading volume details in 24 hours [28], [29] and the location of the registered company.

Table 4. Best Crypto Exchanges According to Forbes

| Product | Volume | Registered | Native Token |
|---|---|---|---|
| Kraken | $277,717,669 | FinCEN in USA<br>FINTRAC in Canada | Basic Attention Token (BAT) |
| Gemini | $17,139,340 | Virtual Asset Service Provider in Ireland | - |
| Crypto.com | $162,399,870 | Singapura | Cronos (CRO) |
| Kucoin | $318,903,347 | - | KuCoin Token (KCS) |
| Coinbase | $651,582,810 | Nevada Department of Business and Industry as a money transmitter. | - |
| Bityard | $7,475,803 | Singapore | - |

Anonymous transactions can be a strength in the decentralized finance (DeFi) ecosystem because they allow users to make financial transactions without revealing their personal identity or information. This can be beneficial for individuals who want to maintain privacy and protect their financial information from being accessed by third parties. However, anonymous transactions can also be a weakness in the DeFi ecosystem because they can be used to facilitate illegal activities, such as money laundering or financing terrorism. Additionally, anonymous transactions can

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make it difficult to trace the source of funds, which can make it harder to detect and prevent fraud or other financial crimes. As a result, anonymous transactions may be subject to regulatory scrutiny and may be more risky for individuals to use.

### 3.2 Open Source and Decentralized

DeFi platforms are often built on open-source technology, users can access the platform's underlying code (smart contract). The use of open source technology has been a vital factor in the advancement and expansion of the decentralized finance (DeFi) industry. It allows for transparency, collaboration, and innovation within the ecosystem. However, open source code can also potentially be a weakness if it is not properly audited and secured. Hackers can exploit vulnerabilities in the code, leading to loss of funds for users. In 2022, up to November 2022, there have been 43 security incidents with a total loss of $ 310,114,953,628 as shown in Table 5. One of the most significant incidents occurred in May, when Terra Luna stable coin (UST) experienced depegging from $ 1 to as low as $ 0,2 in just 9 days [30]. Totally in May 2022 there are $ 300,191,300,000 loss from various project like Rari Capital, Fei Protocol, Terra Luna, Blizz Finance, Mirror protocol, and Venus Protocol. It is important for DeFi projects to prioritize security and regularly update and audit their open source code to prevent potential attacks.

Table 5. Decentralized Finance Incident in 2022

| Date | Project | Loss | Source |
|---|---|---|---|
| 11/11/2022 | FTX | $ 8,000,000,000 | [31, 32] |
| 02/11/2022 | Skyward Initital Dex Offering (IDO) | $ 3,000,000 | [33] |
| 02/11/2022 | Solend | $ 1,200,000 | [34] |
| 19/10/2022 | Moola Market | $ 500,000 | [35] |
| 11/10/2022 | TempleDAO | $ 2,300,000 | [36] |
| 11/10/2022 | Mango Market | $ 100,000,000 | [37] |
| 06/10/2022 | BNB Chain Bridge | $ 100,000,000 | [38] |
| 02/10/2022 | Transit Swap | $ 21,000,000 | [39] |
| 08/09/2022 | New Free DAO | $ 1,250,000 | [40] |
| 06/09/2022 | Nereus Finance | $ 371,000 | [41] |
| 01/09/2022 | Kyber Network | $ 265,000 | [42] |
| 14/08/2022 | Acala | $ 1,200,000 | [43] |
| 02/08/2022 | Nomad Bridge | $ 200,000,000 | [44] |
| 24/07/2022 | Audius | $ 1,080,000 | [45] |
| 24/06/2022 | Horizon Bridge | $ 100,000,000 | [44] |
| 16/06/2022 | Inverse Finance | $ 1,200,000 | [46] |
| 31/05/2022 | Mirror protocol | $ 2,000,000 | [44] |
| 31/05/2022 | Venus Protocol | $ 11,000,000 | [47] |
| 28/05/2022 | Mirror protocol | $ 90,000,000 | [44] |
| 12/05/2022 | Blizz Finance | $ 8,300,000 | [48] |
| 07/05/2022 | Terra Luna | $ 300,000,000,000 | [30] |
| 01/05/2022 | Rari Capital + Fei Protocol | $ 80,000,000 | [44] |
| 30/04/2022 | Saddle Finance | $ 10,000,000 | [49] |
| 28/04/2022 | Deus Finance | $ 13,400,000 | [50] |
| 18/04/2022 | Beanstalk Farms | $ 182,000,000 | [44] |
| 13/04/2022 | Elephant Money | $ 11,200,000 | [51] |
| 07/04/2022 | Starstream Finance | $ 4,000,000 | [52] |
| 07/04/2022 | Wonderhero | $ 320,000 | [53] |
| 02/04/2022 | Inverse Finance | $ 15,600,000 | [46] |
| 29/03/2022 | Ronin Network | $ 625,000,000 | [44] |
| 23/03/2022 | Cashio | $ 52,800,000 | [44] |
| 21/03/2022 | One Ring Finance | $1,454,672 | [54] |
| 21/03/2022 | Li Finance | $ 600,000 | [55] |
| 20/03/2022 | Umbrella Network | $ 700,000 | [56] |
| 09/03/2022 | Fantasm | $ 2,600,000 | [57] |
| 03/03/2022 | Treasure DAO | $ 1,400,000 | [58] |
| 21/02/2022 | Dego Finance | $ 10,000,000 | [59] |
| 06/02/2022 | Meter | $ 4,300,000 | [60] |
| 03/02/2022 | Wormhole | $ 326,000,000 | [38] |
| 03/02/2022 | Klayswap | $ 1,900,000 | [61] |
| 28/01/2022 | Qubit | $ 80,000,000 | [62] |
| 20/01/2022 | Crypto.com | $ 31,066,200 | [63] |
| 10/01/2022 | Lympo | $ 18,700,000 | [64] |

Decentralization can be a strength in the decentralized finance (DeFi) ecosystem because it allows for greater transparency and security. Because DeFi transactions are recorded on a decentralized, public ledger (such as a blockchain), they are more difficult to alter or manipulate. This can help to build trust and confidence in the DeFi ecosystem. However, decentralization can also be a weakness in the DeFi ecosystem because it can make it more difficult to make changes or updates to the system. Because DeFi systems are decentralized, no central authority can make decisions or implement changes. This can lead to slower development and a lack of agility in the face of emerging challenges or opportunities. Additionally, decentralization can make it harder to resolve disputes or address problems that may arise within the DeFi ecosystem.

### 3.3 Non-Custodial

One of the goals of decentralized finance is non-custodial. Decentralized finance aspires to make participants have full control over their funds at any time, participants can withdraw funds, or transfer between wallets. In fact, in 2022 there have been several incidents (shown in table 6) that suggest otherwise. As an example, from January to November 2022, Binance already suspend withdrawal three times.

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Table 6. List of Network Suspension and Termination of Funds Withdrawal Incident at Centralized Exchange

| Date | Name | Source |
|---|---|---|
| 16 November 2022 | Genesis | [65] |
| 14 November 2022 | BlockFi | [66] |
| 9 November 2022 | Crypto.com | [67] |
| 8 November 2022 | FTX | [68] |
| 1 November 2022 | Binance | [69] |
| 24 October 2022 | Freeway | [70] |
| 7 October 2022 | Binance | [71] |
| 9 August 2022 | Hodlnaut | [72] |
| 4 July 2022 | Vauld | [73] |
| 17 June 2022 | Babel Finance | [74] |
| 13 June 2022 | Binance | [75] |
| 12 June 2022 | Celsius | [76] |
| 20 January 2022 | Crypto.com | [63] |

Non-custodial solutions can be a strength in the decentralized finance (DeFi) ecosystem because they allow users to retain control of their assets. In a non-custodial system, users hold their private keys and fully control their assets. This can provide an extra layer of security and reduce the risk of funds being stolen or misappropriated by third parties. However, non-custodial solutions can also be a weakness in the DeFi ecosystem because they require users to take on more responsibility for the security of their assets. If users lose their private keys or do not take sufficient precautions to protect them, they risk losing access to their assets. Additionally, non-custodial solutions may not offer the same level of convenience and support as custodial solutions, which can deter some users from participating in the DeFi ecosystem.

### 3.4 Eliminates Third Parties, and Regulation

Eliminate the need for third parties (banks and financial institutions), in financial transactions can lead to lower fees, faster transaction times, and increased financial inclusion. However, the absence of third parties can also be a weakness in DeFi. Without the oversight and regulation provided by traditional financial institutions, there is a higher risk of fraud or mismanagement within DeFi projects. It is important for users to thoroughly research and evaluate the risks and potential drawbacks before using DeFi platforms.

The lack of regulation in the decentralized finance (DeFi) ecosystem can be a strength because it allows for greater innovation and creativity. Without the constraints of traditional regulatory frameworks, DeFi projects have the freedom to experiment with new ideas and technologies. This can lead to the development of novel financial products and services that may not be possible in a more heavily regulated environment. However, the lack of regulation in DeFi can also be a weakness because it can create uncertainty and increase the risk for users. Without regulatory oversight, it may be more difficult for users to understand the risks associated with different DeFi products and services. Additionally, the lack of regulation can make it harder to detect and prevent fraud or other financial crimes. This can lead to a lack of trust in the DeFi ecosystem and may deter some users from participating.

### 3.5 Sentiment of Decentralized Finance Despite of Many Security Incidents

To see the sentiment of DeFi, data from Twitter was obtained using a Python module called snscrape, which has proven to be able to retrieve up to 183,369 data [77], then the data will be cleaned and a wordcloud is created to show the current DeFi trend. Twitter data was taken from the period October 31, 2022, to December 3, 2022, with a total of 344,519 unique tweets. The wordcloud of the data is shown in the image below (Figure 3), while as 301,654 unique tweets from 30 April 2022 to 31 May 2022 is shown in Figure 4.


Figure 3. Wordcloud DeFi 31 October 2022 to 03 December 2022


Figure 4. Wordcloud DeFi 30 April 2022 to 31 May 2022

Figure 3, figure 4, and Table 5 explain that there is no corelation between security incident in May ($ 300,191,300,000 loss) and DeFi sentiment. Wordcloud of unique tweet data in 30 April 2022 to 31 May 2022 not showing word of fraud, scam, bankrupt, or death.

Table 7. Comparison of Top 9 Words Most Discussed During the DeFi Incident Period and During Non-Incident Period

| During DeFi Incident Period | word count | During Non-incident period | word count |
|---|---|---|---|
| crypto | 56.938 | crypto | 65.789 |
| nft | 37.324 | nft | 29.989 |
| blockchain | 21.297 | blockchain | 28.347 |
| cryptocurrency | 21.170 | web | 27.912 |
| project | 20.247 | nfts | 23.304 |
| eth | 18.650 | eth | 21.513 |
| nfts | 18.409 | btc | 20.942 |
| btc | 18.076 | bitcoin | 19.644 |
| bsc | 17.138 | ftx | 16.576 |

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As we can see from table 7, the word LUNA is not in the list of top 9 word that appear on twitter conversation, despite of $ 302,117,706,872 total loss.

## 4. Conclusion

Security remains a significant challenge in DeFi development in 2022, up to November 2022, there have been 43 security incidents with a total loss of $ 310,114,953,628. DeFi superiority claims compared to the conventional financial system still seem inconsistent with what is being promoted, especially when viewed from the nature of Anonymous, Eliminates Third Parties, Regulation, Open Source & Decentralized, and Non-Custodial.

The Defi topic and the security topic seem to be something unrelated. Trust and optimism level towards DeFi is still high. This can be seen from the unique tweet data wordcloud results which do not find negative words such as fraud, scam, bankruptcy and so on, even though the unique twitter data was taken in the month with the biggest losses.

Future Research can focus on exploring the potential benefits and challenges of integrating CBDCs (Central Bank Digital Currency) with the DeFi ecosystem. This could include analyzing the impact of CBDCs on DeFi's current strengths such as accessibility and transparency and whether they can address some of the weaknesses such as security, scalability and regulatory challenges. The research can also examine the potential implications of integrating CBDCs with DeFi for monetary policy, financial stability, and consumer protection.

Future research can also examine the potential interoperability issues between existing DeFi protocols and CBDCs. Interoperability is a crucial aspect for the DeFi ecosystem to thrive and grow. It is essential to understand how CBDCs can integrate with existing protocols and their implications for the ecosystem.

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