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Research Article

Automated Market-Makers

A New Era of Automated Market-Makers (AMM) powered by Non-Fungible Tokens- A Review

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Blockchain technology has advanced significantly in recent years and will soon have a significant positive impact on our corporate environment. The most well-known cryptocurrency, Bitcoin, is one of many that are sweeping the globe. Along with them, fungible tokens traded on numerous centralised or decentralised exchanges are different from non-fungible tokens traded on NFT marketplaces. The majority of NFTs are currently digital, and in the future, producers may innovate in this area to allow for more innovative user experiences. It is obvious that the blockchain and its NFTs can provide fantastic chances for artists and content producers to profit from their work. An artist can instead offer her creations to customers as NFTs. Because blockchain is a relatively new technology, resources are limited, perfection is elusive, and creating an intricate NFT marketplace is much more difficult. The NFT Marketplace intends to be at the centre of all these fantastic use cases for NFTs by giving users a platform to produce and exchange non-fungible tokens. NFTs offer a wide range of application cases. Automated Market Makers (AMMs), which are essentially decentralised markets for crypto-tokens and offer users three core operations—depositing crypto tokens in exchange for AMM shares, performing a dual operation in which shares are obtained in exchange for base tokens, and exchanging two tokens for one another—are some of the main applications of DeFi. This conceptual research discusses AMMs that are already in existence on the Ethereum blockchain and their developments, including the AMM that is now being created on the Tezos blockchain. The goal of this study is to present a thorough understanding of blockchain technology and all of its practical uses, including voting, trading NFTs, and cryptocurrencies. It then focuses on how NFTs are traded on various platforms before aiming for improved NFT trading marketplaces, namely Automated Market Makers on various blockchains like Ethereum and Tezos.

Keywords: Blockchain, Cryptocurrencies, Fungible-tokens, non-Fungible tokens, NFT Collection, NFTs Market Places, Automated Market Maker (AMMs)

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Introduction

Technology and innovation in recent years have given cryptocurrencies a boost in technical areas. For instance, Bitcoin [1], the most widely used cryptocurrency, has experienced tremendous success. In 2016, its market capital reached $10 billion. The blockchain is a crucial technology that enables transactions to occur on the Bitcoin network without interruption from an outside source. It was first suggested in 2008 and put into use in 2009 [2]. The extremely high volatility of bitcoin and the antagonism it encountered from many countries due to its complexity initially hampered its development, but as time went on, the advantages of blockchain—the technology that underpins bitcoin—became increasingly significant. Some of the advantages of blockchain include its distributed ledger, decentralisation, information transparency, and attack-proof architecture. The development of blockchain technology has advanced over time and begun to digitalize the world with the aid of a number of its applications. [3].

Blockchain applications: The blockchain or "Internet of People" has been referred to as a revolutionary paradigm. Blockchain functions as a distributed ledger that records transactions in a growing chain of blocks from an architecture perspective. By showing a hash connection between each block, Figure 1 demonstrates how a linked list is built. The hash of the block before it is stored in each subsequent block in Figure 1 [4].

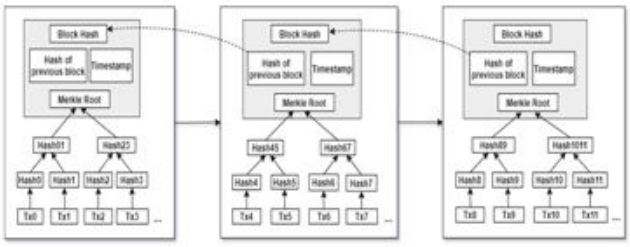

Figure 1. Blockchain architecture[4]

Benefits in dependability, collaboration, organisation, identification, quality, and transparency are promised by blockchain technology. Decentralization, to put it simply, is the process of configuring an application on a network so that no single server has complete control over data management and execution. Each server in this cluster only receives the data in its current state; no one has the ability to delete or change previous transactions.

The term "distributed" denotes that each server node is linked to every other node either directly or indirectly. You might think of ledger, an accounting term, as specialised data storage and retrieval [4].

Blockchain technologies and cryptocurrencies have recently piqued the curiosity of both academics and businesses [5]. Cryptocurrencies are essentially digital money that uses blockchain technology and cryptography to allow for private and secure transactions. The value of the cryptocurrency market has surpassed USD 500 billion. Many organisations and countries are starting to understand and incorporate the concept of cryptocurrencies into their organisational structures [6]. There may be a need to modify existing trade-related systems once cryptocurrencies take over as the primary method of carrying out transactions [27,32]. This is done in order to deal with the competition at the time. As a result, cryptocurrencies may end up becoming one of the most potent and sophisticated technologies ever introduced to the world's financial institutions. Because each coin has the same value as any other coin of the same type at any given time, they are excellent instances of fungible tokens (FTs) [7]. According to the studies [28-31], certificate verification is a highly helpful application of blockchain.

Non-fungible tokens (NFT): A crucial use case for blockchain

In order to distinguish each token with a certain set of recognisable signals, non-fungible tokens were initially proposed by an Ethereum token standard. Most NFTs are now part of the Ethereum [9] blockchain. A type of cryptocurrency created via smart contracts is called an NFT. NFTs are suitable for uniquely identifying things or persons because they are distinct tokens that cannot be swapped like-for-like. It is a tool for defending intellectual property. An NFT designates ownership of a tangible piece of art; each piece of digital art is unique, just like each asset and NFT. The digital scarcity symbol is the NFT. NFT examples include tickets, collectibles, game items, cryptographic artwork, financial products, deeds, and other things. The market capitalization of non-fungible tokens was $17,408,786,221.48 as of June 29, 2021, and the 24-hour trading volume was $1,147,366,236.48. The table below shows the top 10 NFT coins according to Coingecko's market capitalization [10].

Since everything is automated, authors may unwind and enjoy their money while the labour is transferred to someone else. Many creators are being underpaid since calculating royalties takes so much time and is so imprecise. If you include a royalty in your NFT, you won't ever forget to pay it.

NFTs are not just for the arts when it comes to making money. To raise money for charities, companies like Taco Bell and Charmin have auctioned off themed NFT artwork. In a matter of minutes, all of the Taco Bell NFT art was gone. A cat GIF named Nyan Cat sold in February for nearly $600,000. A company called NBA Top Shot has sales of more than $500 million as of March 10]. The advantages and disadvantages of non-fungible tokens are presented in Table 1. Additional NFT use cases could include:

1. Digitally available content

2. Items of gaming

3. Unique identifiers like domain names

4. Items with physical significance

5. Collateral properties.

Table 1: Non-fungible tokens: pros and cons [11].

Prons	Cons
The creators/owners of any NFT can defend and claim their instantly recognisable work, and they will be compensated each time it is exploited.	Since the digitised artwork is an exact replica of the original, This calls into question the value and utility of holding an NFT.
An industry or niche soon develops a community or following. Additionally, creators frequently get paid when NFT is sold and resold.	There is no cap on the total number of copies that can be produced and disseminated, therefore a creator is free to choose to sell more than one copy of the exact same NFT.
NFT developers and holders can readily vouch for their absolute ownership of NFTs.	An NFT could become priceless due to a recent or new surge of entries, which could weaken the market as a whole. There are no legal frameworks created to support NFTs. Because there are fewer commercial interests involved, it is still unclear how NFTs will be categorised and what responsibilities come with owning one.

NFT trading and marketplaces: The use of nonfungible tokens (NFTs) increased dramatically in 2021 [8]. The development of market intelligence technologies has allowed for the tracking of extensive pricing and sales information for a variety of NFT collections. With a special emphasis

On the expenses of bidding, marketplace design has a significant impact on market intelligence. The conclusions might affect how NFT market intelligence is to be perceived [12].

Peer-to-peer markets dominate NFT (similar to eBay). While permitting participants to submit bids that are frequently less than the specified pricing, they mandate that vendors produce products for a predetermined price. There are three options available to the item's seller: accept the bid, defer taking payment until the asking amount is paid, or make a new bid. Markets may, at one extreme, forbid bidding and require sellers to only offer NFTs for sale through fixed price posts. Other options include promoting the development of bidding bots, developing user interfaces that make placing bids easier, or developing a system to keep bids "off-chain" (avoiding transaction costs). On the Ethereum blockchain, transaction fees associated to placing bids are referred to as "gas fees." In reality, real-world markets diverge greatly along these dimensions. For instance, OpenSea [15] enables users to put free bids on as many things as they like, whereas the market costs users a (gas) fee to place a bid. While NBA Top Shot [14] or Axie Infinity [13] forbade the use of third-party bots and restricted associated accounts, OpenSea promoted their use.

Recently, a study was conducted to identify some concerns with trading platforms that usually act as barriers, to understand the motivations behind new NFT users, and to offer appropriate design suggestions that would allow a free use of the platform. A poll was undertaken to find out how various user groups see NFTs. For the top 2 well-known NFT markets, we also tested the user interface and found a few issues. The results indicated that NFT systems need to be significantly improved, especially for novice users. Additionally, it offers suitable user-centered design approaches that can make NFT platforms easier to use. [16].

It is inevitable that the blockchain network on which NFT Marketplace is based will experience issues. It should be emphasised that these challenges might be addressed with meticulous execution and a sturdy system architecture for the entire programme. Many of the concerns mentioned above can be solved through layer 2 market solutions. They would provide a terrific user experience because of their remarkable speed

And fuel efficiency. Selecting the proper ERC standard, which differs according on the application, is the first and most crucial step in building a market [17].

Uniswap Protocols for AMM Markets

Recently, the trading of cryptocurrencies has increased, and the decentralised finance (Defi) [18] sector has developed quickly. Instead of using order books, most recent attempts to build DEXs have focused on the use of automated market makers (AMMs) [22]. As of the time of this writing, the market capitalization of decentralised exchanges (DEX) [21] using automated market maker (AMM) protocols had topped $100 billion. The constant product market maker known as Uniswap [20] is a simple but surprisingly efficient market maker for exchanging fungible tokes. These marketplaces provide an easy way to conduct decentralised trade between coin pairs. They have become a popular (and useful) replacement for other types of DEXs [19].

A market maker frequently provides a platform where an asset can be bought or sold so that the ask-bid spread can be used to generate profit. This procedure is automated by an AMM [22], which takes trader orders and determines the price by an algorithm. In order to execute the AMMs, users can exchange assets with a pool that contains both input and output assets. A liquidity pool first gets assets from several liquidity suppliers. While LPs benefit from assets delivered with exchange fees from users, users benefit from immediate liquidity and don't need to designate an exchange counterparty.

Non-fungible tokens (NFTs) AMM market

The emergence of AMMs with Uniswap and the ensuing Sushiswap vampire attacks are interesting stories in and of themselves, but they are not the main topic of this article other than to serve as a reminder that it has been one of the biggest use's cases for crypto and that it has been on an unstoppable ascent. Because they provide exit liquidity for a number of token pairs, AMMs have been quite effective for fungible ERC-20 tokens. NFTs or ERC-21 tokens, however, pose a different issue. Some AMMs for NFTs were also developed in order to liquidate them for simple trading, along with various AMMs for fungible tokens or cryptocurrencies [23].

Platforms like Sudoswap [23] and NFTX [24,25] are useful for this. A simple, gas-efficient automated market maker (AMM) system that permits NFT-to-token exchanges (and vice versa) based on flexible bonding curves is the sudoswap AMM, sometimes known as just sudoswap. Sudoswap supports all ETH and ERC20 tokens as well as ERC721 NFTs. NFTX creates liquid marketplaces in order to benefit illiquid Non-Fungible Tokens (NFTs). Users deposit NFTs into a vault, from which a fungible ERC20 token (vToken) is created and which claims a random item in the vault [24]. A specified NFT from the vault is redeemed using the minted vTokens. The Etherum blockchain is being used for both AMMs due to its continued popularity.

Although they are still in their infancy, ATMs have emerged as one of the most significant advances in decentralised finance. Platforms like Sudoswap and NFTx use AMMs, although these AMMs have few functionalities. The crypto community has not yet adopted more sophisticated AMMs like those used by Balancer and AMMs on many better blockchains.

Literature Review

The literature survey consists of blockchain and its applications studies, non-fungible tokens, their trading and marketplaces, decentralized finance (Defi) and AMM etc.

Related work on Blockchain and applications

Table 2: Papers studied on Blockchain

S.No.	Title	Author / Source	Method/ Findings	Future Work
1.	Bitcoin: A Peer-to-Peer Electronic Cash System [1]	Satoshi Nakamoto	A trustable infrastructure for conducting digital transactions was proposed.	Laid the groundwork for potential outstanding studies on several cryptocurrencies
2.	An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends [2]	Zibin Zheng, Shaoan Xie, Hongning Dai, Xiangping Chen, and Huaimin Wang	Provides a background on blockchain technology and contrasts various consensus techniques.	Future efforts aimed at preventing centralization, analysing huge data, and expanding the use of blockchain.
3.	Software Engineering Applications Enabled by Blockchain Technology [4]	Selina Demi, Ricardo Colomo-Palacios and Mary Sánchez-Gordón	By doing a mapping analysis, a general understanding of software engineering and the blockchain is provided.	To investigate how blockchain 4.0 will affect software engineering and to provide a framework that supports blockchain technology.

4.	Blockchain and Cryptocurrencies [5]	Stephen Chan, , Jeffrey Chu, Yuanyuan Zhang and Saralees Nadarajah	based on cryptocurrency, a contemporary and digital type of exchange	Focused on cryptocurrencies' financial and risk assessments.
5.	A Blockchain-Based Decentralised Computing And NFT Infrastructure For Game Networks [6]	Koushik Bhargav Muthe, Khushboo Sharma, Karthik Epperla Nagendra Sri	Proposes a completely decentralised gaming infrastructure and discusses certain issues with existing gaming networks.	Laid path for creating models by integrating other proof of stake-based blockchains
6.	An Analysis of Cryptocurrency, Bitcoin, and the Future. [7]	Peter D. DeVries	Explains how Bitcoin contributes to a shift in economic paradigms via a SWOT analysis.	To demonstrate how additional cryptocurrencies can modernise the internet.

Non-Fungible tokens, their trading and market places

Table 3: Papers studied on NFTs

S.No.	Title	Author / Source	Method/ Findings	Future Work
1.	A Review Paper on Non–Fungible Tokens (NFT) [8]	Mrs Vidya, Jayanth G, Karthik Kulkarni, Kavya K P, Kavya Mahesh Sureban	They suggested an electronic transaction system that did not rely on trust.	It demonstrated how digital products may be tokenized using NFTs.
2.	Blockchain Beyond Cryptocurrency: Non-Fungible Tokens [10]	Dr. Burcu Sakız, Prof. Dr. Ayşen Hiç Gencer	Explains how blockchain and NFTs can work together.	To advance proof-of-stake blockchains' NFT technology.
3.	NFT Marketplace Design and Market Intelligence [12]	Pavel Kireyev	Discussed the various mathematically necessary NFT market parameters.	Other design factors, such as commission fee structures and other factors, can be examined in future studies.
4.	User-Centred Evaluation and Design Suggestions for NFT Markets [16]	S. Viannis Murphy Caxton, K. Naveen, R. Karthik, S. Sathya Bama	Investigated new NFT users and recommended the best practises for creating a freely-accessible trading platform.	Offered design patterns to improve the utilisation of the NFT platforms on the basis of the study.
5.	Challenges of Implementing an NFT Marketplace [17]	Yash Mhatre, Devansh Dixit, Ritesh Salunkhe, Dr Sanjay Sharma	ERC restrictions, high gas costs, and smart contract risks were mentioned as significant difficulties encountered when putting together an NFT Marketplace.	This work will assist in determining the best strategy for developing and operating an NFT Marketplace.

Study on Defi and AMMs for Cryptocurrencies and NFTs

Table 4: Papers studied on Defi and AMMs

S.No.	Title	Author / Source	Method/ Findings	Future Work
1.	Blockchain disruption and decentralised finance [18]	YanChena, Cristiano Bellavitis	presented several Defi advantages and business strategies so that their issues and limitations may be evaluated	Explains how decentralised finance may create a platform for creativity and entrepreneurship.
2.	SoK: Decentralised Exchanges (DEX) with Automated Market Maker Protocols [19]	Jiahua Xu, Krzysztof Paruch, Simon Cousaert, Yebo Feng	In order to formalise the state-space representation of systems and to define economics, a general framework on AMM was established.	The study of AMM innovations may be studied in various novel ways as a result of future research into AMM mechanisms.
3.	DEX: A DApp for the Decentralised Marketplace [21]	Chris Dai	Focused on the installation of DEX and tokenization in order to trade and record crypto assets	Disregarded the DEX and said that there was still a lot of work to be done to address the blockchain scalability issue.
4.	Sudoswap & NFT AMMs [25]	Bowse.eth	Presented NFT market difficulties as well as a study of Sudoswap and NFT AMMs.	Suggested rules to help NFT AMMs fit inside the ecosystem and create a new decentralised future.

Challenges and Future Work

AMMs have been a key driver of Defi and the democratisation of liquidity access despite the fact that they can have severe constraints. Mainstream consumers will need a fresh wave of innovation to keep up with this transition and better control their risks. Existing AMMs have a few drawbacks, including low capital utilisation, increased risk exposure, and the frequently brought up subject of temporary loss.

The goal of our entire study and project is to establish a decentralised platform that enables users to construct NFT index funds or fungible tokens backed by NFT collectibles, instantaneously purchase, sell, and swap their crypto collectibles, and stake their tokens to earn incentives from liquidity providers. They would be tokenizing their NFTs as a result. They would receive substantial dividends in exchange for the NFTs rather than having them languish in their wallets. Additionally,

It would lessen temporary loss. To lower the cost of the application, gas cost optimization can be done for the smart contract [26]. Because it provides a number of technological and potent breakthroughs in terms of smart contract security, consensus mechanism, and self-upgrade procedures, Tezos has been selected by us as the building blockchain for our AMM.

Conclusion

Non-fungible tokens (NFTs), which have enormous market potential, represent a sense of ownership in a pseudonymous context in a special way. They are among the most significant applications of current blockchain technology. This unique quality has advantages and disadvantages. Selling pricey NFTs that reflect anything worth quickly is one of the main problems.

To solve this issue, the work will offer NFT trading using autonomous market makers on the Tezos blockchain (AMMs). We chose to build on Tezos since it is one of the oldest and most well-known Proof-of-Stake (PoS) blockchains. This suggests that it is more widely available and advantageous for the environment.

The objective is to provide clients a product that is inexpensive in terms of gas prices, smoothly works with the present ecosystem infrastructure, and provides a top-notch user experience. We intend to leverage Plenty DeFi liquidity pools in conjunction with our application as one of the most successful Indian businesses ever to operate on the Tezos blockchain.

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