NFT: A Non-Fungible Tokens with Solidity Blockchain

Kashmala Muhammad Tariq Khan
Benazir Bhutto Shaheed University Lyari /Department of Computer Science and Information Technology,
Karachi, 75660, Pakistan
E-mail: kashmalatariq254@gmail.com

Areeba Siddique
Benazir Bhutto Shaheed University Lyari /Department of Computer Science and Information Technology,
Karachi, 75660, Pakistan
E-mail: areebasiddiquie83@gmail.com

Abeer Rahim
Benazir Bhutto Shaheed University Lyari /Department of Computer Science and Information Technology,
Karachi, 75660, Pakistan
E-mail: abeerk56@gmail.com

Asher Anjum
Benazir Bhutto Shaheed University Lyari /Department of Computer Science and Information Technology,
Karachi, 75660, Pakistan
E-mail: asheranjum50@gmail.com

Javeria Jamil
Benazir Bhutto Shaheed University Lyari /Department of Computer Science and Information Technology,
Karachi, 75660, Pakistan
E-mail: javeriarao06@gmail.com

Madyan Sarwar
Benazir Bhutto Shaheed University Lyari /Department of Computer Science and Information Technology,
Karachi, 75660, Pakistan
E-mail: madyansarwargill@gmail.com

Received: 12th December, 2022; Accepted: 13th February, 2023; Published: 28th February, 2023

Abstract: This paper presents a concept of a Blockchain innovative contract system for NFT (non-fungible token). For that purpose, we created a website for buying and selling digital assets such as arts, music, social, and game. They are supported by an authentic certificate provided by cryptocurrency supporting Blockchain technology. To mint the NFT on this website, we need a digital wallet that uses the Solana Blockchain technology and connects to a smart contract from Phantom Wallet. This reference implementation is easy to use and makes it easy for artists and people who don't know much about technology to tokenize their visual arts to make collectibles. The primary delivery is a website that allows you to see art and collectibles on a phantom wallet in a visual way. This website will be able to show NFT transactions and balances.

As a website, a reference GUI is implemented for end users. The interface makes it simple to mint and transfer tokens, and users can easily see the assets and collectibles they own across all compatible devices. Without technical expertise, artists can upload, issue, and bind their works to tokens. We are making smart contracts by using Blockchain. This paper extends React.JS tokenization capabilities. The purpose is to make it easier to issue, query, and send tokenized assets, often known as NFTs, in the Blockchain industry. Within the scope of this proposal (Milestone 1), we will provide a visual NFT gallery where users will be able to view their collectibles, as well as metadata associated with tokens, visually. Because the program will be open source, anyone can create their own gallery.

This paper presents the current context of the entire NFT strategy for deploying an NFT chain and functionality. This technique intends to expand on the existing functionality in the Solana wallet. This paper aims to provide a library for asset tokenization features (NFTs) that is React.JS peer dependent. The goal is to make issuing, querying, and sending tokenized assets, also known as NFTs in the Blockchain world, more accessible. A Typescript (JavaScript) library for games and a user-friendly reference implementation allowing artists and non-technical users to tokenize their visual arts to produce collectibles quickly are among the paper's outputs. Because the substrate is so adaptable, react Asset abstracts the concept of a token across numerous asset pallets and possible token contract formats. They allow the developer to deal with various contract types on different nodes while maintaining a consistent process. For content developers, development time and complexity decreased. It also makes NFTs and content transfer from a Blockchain easier, as well as the contract standard.

Index Terms: Blockchain, Solidity, Solana, Smart Contract, NFT, Ownership, Digital wallet.

1. INTRODUCTION

The acceptance of non-fungible tokens (NFTs) has grown during the past 12 months. NFTs are digital products built on the Blockchain with unique units, unlike average cryptocurrencies, which have interchangeable units. On a blockchain, NFTs can store data. The Ethereum Blockchain has the most NFT paper implementations. In some cases, the data can relate to documents that contain media such as images, videos, sounds, and tangible objects. In particular marketplaces, NFTs are frequently bought and sold, giving the holder ownership over the information, material, or whatever the token is related to. The non-fungible permit, or NFT, has distinctive qualities and cannot be replaced or exchanged. When someone purchases a non-fungible pass, they acquire ownership of the content but can still share it online. An NFT can use this to increase its popularity because the more exposure it receives online, the more value it generates.. When the item is sold, the original inventor receives a 20% cut, with a tiny part going to the platform and the rest to the current owner. As popular digital assets are bought and sold over time, there is the possibility for recurring revenue. For this, we proposed Block chain smart contract for NFT (Non-fungible token). In this purpose, we create a website for buying and selling digital assets that represents internet assets such as art, music, social, and games and is supported by an authentic certificate issued by the Blockchain technology that supports Cryptocurrency. It will need a digital wallet to store your NFTs and cryptocurrencies. For this website, we connect from the Phantom wallet [1]. NFTs are making massive money for creators digitally [2].

However, there are several of designs sold online even through in every single day. It is even possible for a designer to earn millions/billions of rupees in just a few seconds when their NFT is sold in the digital space [3], including cryptocurrencies [4, 5].

The decentralized nature of the blockchain implies the following [6]:

- No central authority
- transaction data is copied and distributed over a secure communication channels
- new block is added and shared among the participants
- systems get updates while single changes occur
- and, a single copy of the transactional records is kept

The concept of cryptocurrencies is manly use for NFT payments. However, the current market has faced various types of problems, such as safety while transmitting from one to other, ledger reliability, and integration of crypto-wallet [7]-[8].

Whereas, Ethereum has been the most popular public chain blockchain infrastructure, in which "token *platform since the* introduction of smart contracts". In this scenario, this paper presents a new paradigm in NFT solutions by using Solana network and replacing the traditional public chain cryptocurrency protocols.

Objectives:

- To build an NFT on the website that brings artists and creators together on a single platform.
- To provide a digital asset to artists as a form of ownership.
- To their unique and collectible: Many people enjoy the excitement of buying an exclusive or scarce object. It cannot be changed nor be erased or replaced because of immutable blockchain nature.

1.1. Significance and limitation

In this paper, our goal is to determine the role of Blockchain based technologies and intelligent contract systems for NFT (Non-fungible token). The proposed system is a Blockchain-based innovative contract system for NFT. Blockchain is a database, which is a collection of digitally stored information or data. A blockchain is a collection of data 'blocks' that are linked together. As a result, the critical advantages of NFTs are as follows. Authenticity, Ownership Transferability/Traceability

1.2. Motivation:

We desired to develop an NFT Website by using Block chain smart contract system. The concept of NFTs is the most popular now a day. To do so, we gained motivation from our supervisor, who recommended we create a smart contract system for NFT (Non-fungible token) buying using Blockchain technology. With the help of Blockchain technology, we easily secure over Website.

2. LITERATURE REVIEW

A literary review is the study of the pertinent literary research of the previous work for the relevant paper and performs the critical integration of research work. It is helpful to explore the similar work of others, their significance, and the limitations of the paper.

However, NFT sales volume reached almost 2.5$ billion with the interoperable platform in the first half of 2021. For instance, it is expected the sales volume will reach it around 95$ million in 2022-. According to research ,sports and collectible NFT will be the most popular categories in 2020-21[1].

The availability of data on the NFT market includes funds, assets, and coins, which may have significantly influenced the connectedness of financial chains. The researchers emphasize that the division of data into pre-COVID-19 and ongoing COVID-19 periods was severely hampered by financial crises [2].

Blockchain technology, on the other hand, is a radical innovation that has the potential to challenge or even replace existing business models that rely on third parties for trust (Beck & Müller-Bloch, 2017). [3]

NFT has a globally unique identifier, is transferable, and can include metadata. NFTs were explicitly designed to represent ownership of digital or physical assets (Entriken et al., 2018). [4]The research paper provides an overview of the sentiment and volume analysis of tweets based on the blockchain concerning NFT. Jelmer van Slooten used the Bored Ape Yacht Club (BAYC) NFT collection for his research. Therefore, the trading volume increased significantly following Jimmy Fallon's tweet about buying the newest Bored Ape Yacht NFT. Thus, this study explores the influence of tweet volume and sentiment on the trading volume and the average price of the Bored Ape Yacht Club the following day. [5]

Another piece of research put forth a blockchain-based theory for the behavior and causes of market illiquidity for non-fungible tokens (NFTs). For his study, Serhat Yildiz has demonstrated many similarities between highly developed financial markets and the general factors affecting NFT liquidity. This study briefly explains how the availability of new information affects the liquidity of the NFT market. NFT news increases NFT liquidity by lowering informational frictions, mainly when the media source tends to offer more detailed or technical information about NFT. The results demonstrate that a 10% increase in NFT articles increases NFT liquidity by approximately 3.30%. [6]

Another study proposed Blockchain-based technology. This research paper includes a brief overview of the NFT Marketplace. The Author: BRETT ASHLEY CRAWFORD, discusses the benefits and drawbacks of using an NFT Marketplace and its impact on the environment for research purposes. This study concludes Overall, NFTs are proving to be a fascinating change in how art is purchased and sold. It will be interesting to see how NFTs expand into traditional spaces such as auction houses and museums and what laws are enacted to ensure that artists retain ownership of their minted work. Hopefully, alternative green energy sources will soon be able to power mining rigs. If NFTs continue to gain popularity, artists and buyers will want to be mindful of their environmental impact, seeking greener ways to mint and mine in the crypto space. [7]

A Blockchain-based technology was proposed in another research paper. Design, Evaluation, and Challenges of the NFT Sneaker Marketplace. Yaoyao is the author for research purposes. Christos Zhu This essay introduces the NFT sneaker market's implementation and historical context. On top of ERC-20 within the Ethereum network, we construct sneaker NFTs using a top-to-bottom design approach. To prevent spoofing and repudiation, we especially advise using a cold wallet for client transactions and putting multi-signature contracts into place. This study provides a summary of how Our NFT sneaker marketplace, which Open Sea inspired, links actual sneakers with NFTs so that investors in sneakers can complete transactions more quickly. This paper will outline the workings of an NFT marketplace, the technology stacks employed, and the platform testing procedures. The costs of transactions and delivery times in the physical sneaker market will be drastically reduced due to the introduction of the sneaker NFT marketplace. We hope that investors in the physical asset sector can discover a quicker, simpler, and more affordable method of trading physical assets. [8]

Another study report proposed a Blockchain-based system.

Metaverse Platforms and Museums as Market Places are currently used for digital curation of NFT art. Philippa Jane Brownlie's thesis, produced for research reasons, intends to give the museum sector information, inspiration, and confidence about NFT work, influencing and supporting its future presentation. To do this, three digital NFT exhibitions and platforms are highlighted: Katsushika Hokusai on La Collection, Ethereal Aether in the Celestial Hermitage, and Victor Castillo on Decentralization. This report briefly summarizes them, the first two platforms are among the largest-scale museum interactions with NFT. NFTs are shown in Decentral land, a user-owned metaverse realm that is not a museum. [9]

Market Intelligence and Marketplace Design at NFT The study's author was Pavel Kireyev. In 2021, non-fungible tokens (NFTs) were projected to produce billions of dollars in transaction volume. Meanwhile, market intelligence services have evolved to track summary pricing and sales activities across several NFT collections. We demonstrate how marketplace design may significantly influence market intelligence by concentrating on bidding prices, which might differ amongst marketplaces based on transaction fees, the presence of bidding bots, or the user interface for putting bids. Using data from the CryptoPunks marketplace, we create an empirical model of the strategic interaction between sellers and buyers. This study explains. Our data suggest that this conclusion is more complex than it appears because BAYC was sold through OpenSea, where bidding fees are much lower than on the Larva Laboratories market. BASIC NFTs most likely had more extraordinary listing and selling prices, and comparing these figures across markets might be deceptive. Due to our research, NFT listing and sale prices will climb when bidding becomes more accessible due to bidding bots or UX design adjustments. [10]

NFT market emergence, co-integration, and interactions on the public blockchain. This research was written by Lennart Ante. This paper provides an overview of NFTs. The number of non-fungible transactions peaked in late 2017, when the most considerable trading activity occurred, and the number of active wallets with unprecedented continuing transactions increased by up to 20% by the end of 2021.While the NFT submarkets in this study are defined briefly as having a long-run equilibrium connection, other non-fungible submarkets dominate most of the NFT submarkets. Finally, this paper provides a complete examination of the expansion of the NFT market on the Ethereum Blockchain. Despite this, the results suggest that the market is expanding. The findings show that the demand is increasing even though it is still in its infancy. [11]

3. RESEARCH DESIGN

3.1. Methodological Model

The NFT website allows users to store and exchange their NFTs. NFTs can trade in a variety of ways. The auction approach is the most common, in which NFTs sell in a public auction. The other option is to purchase the NFT at its current fixed interest rate. The most popular smart contract is the Solana-based contract standard Known as SOL. The, also known as the proof-of-history and proof-e-working Smart Contract Standard, was launched to transfer the operation and track NFT in the smart contract.

3.1.1. Working Operations of the Proposed NFT in Accordance with the website

I. The user does not need to create an account on the platform; the Web also links a cryptocurrency wallet, as shown in Figure 1.
II. The NFT create, and all of the essential parameters are defined.
III. The next stage would be to put the newly minted NFTs up for sale and wait for processing. When the auction is running, the buyers that enter the platform will bid.
IV. The website transfers cryptocurrency and NFTs to the associated crypto wallet when purchasing the desired NFT.

Working Mechanism of NFT marketplace website

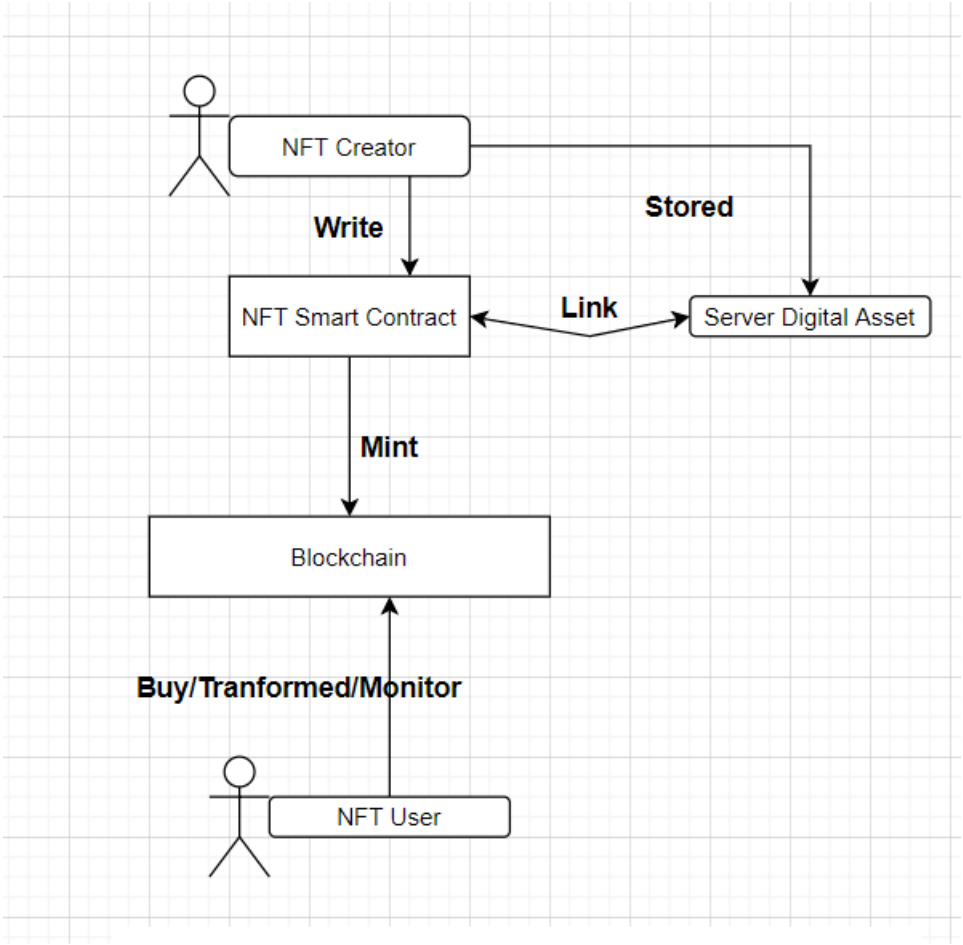


Fig.1. NFT website work Methodology

3.1.2. Features of creating an NFT:

3.1.2.1. Storefront:

Any NFT web requires a flawless storefront. This storefront will serve as a control panel. This function offers the user with the necessary information, such as owners, bids, previews, and value histories.

3.1.2.2. High-end token search:

Users who access the platform should be immediately provided with all essential information about the NFT. As a result, the NFT web should include a high-end token search feature that organizes each NFT asset into categories.

3.1.2.3. Filters:

For a NFT web platform, filters are necessary. The filter improves the user's search for and selection of their desired NFT. A variety of filters are provided, including category, payment mode, listing status, and due date.

3.1.2.4. Listing creation:

The user can use this function to list their NFTs on the platform. The NFTs will be organized in such a way that customers will be able to browse through them and begin purchasing them either directly or through auction mode.

3.1.2.5. Wallet Integration:

The NFT website should be compatible with a variety of cryptocurrency wallets to give the platform more options. It's also necessary to include the right crypto wallet, as shown in Figure 2.

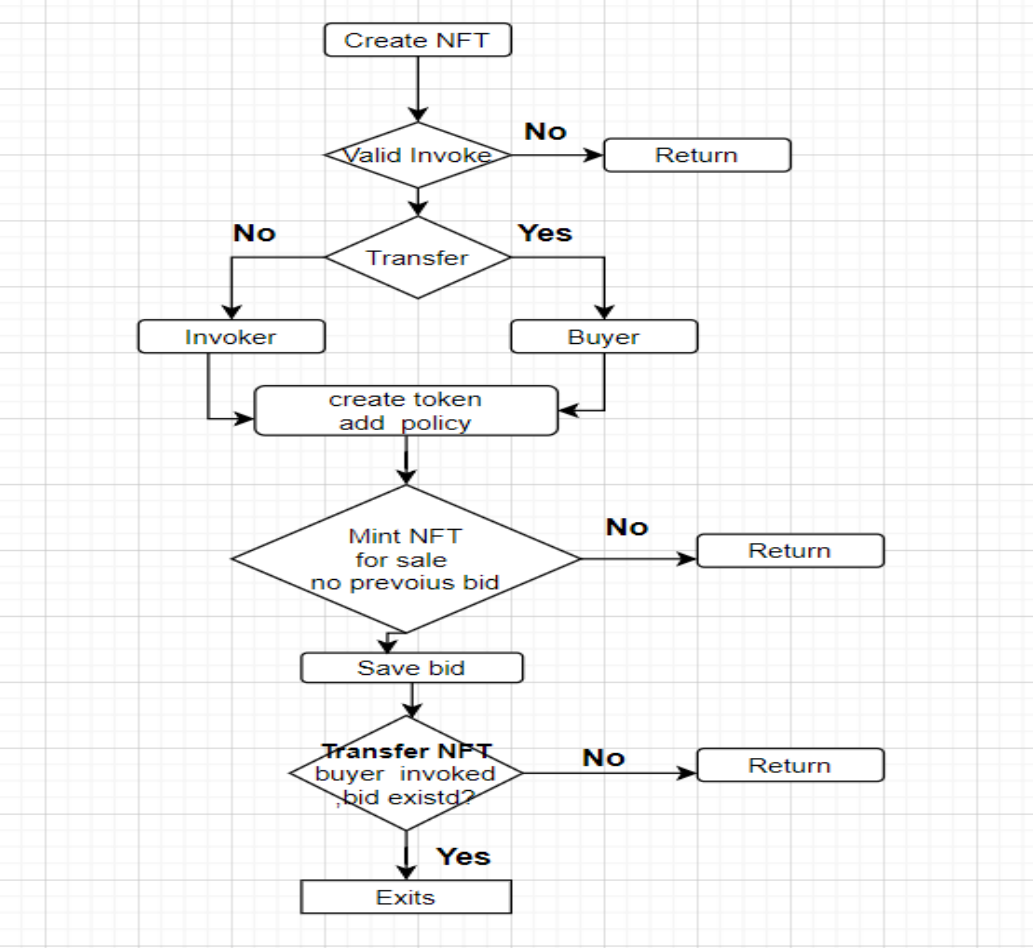


Fig.2. System Flowchart of NFT Web

3.2. More Features:

Digital Asset**:** The working operation of the proposed digital assets is shown in Figure 3.

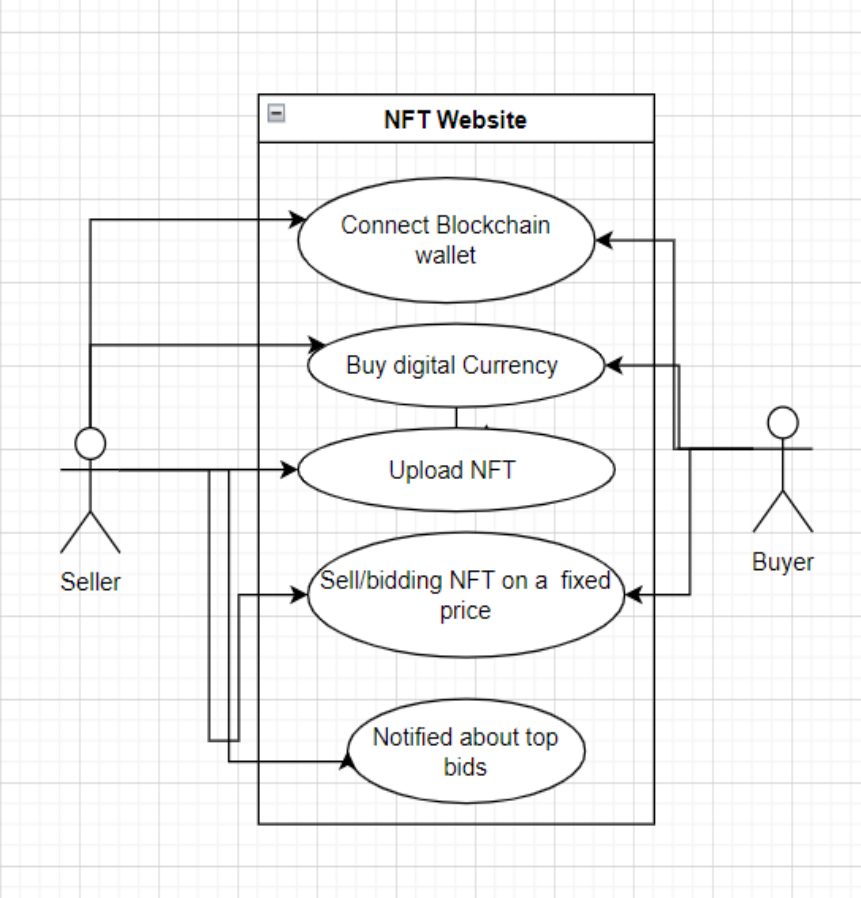


Fig.3. Use case Diagram of NFT Website

3.2.2. Tools and Technologies:

Paper Implementation can define as integrating different modules of the paper and using multiple or single tools and technologies to complete the paper and converting plans and visions of the paper into reality. Considering paper vision, plan and requirements, completing the paper development stage is based on the NFT marketplace website, so the investor directly invests digitally, and the artist uploads the art digitally. Consumers and buyers easily interact with each other.

Blockchain:

Blockchain is a method of storing data in the distributed public/private networks of computer systems that maintains duplicate copies of all transactions in a DLT throughout the network. The two main features of Blockchain in you only insert and update the data. You cannot delete the data because they store lifetime data users only read data and can neither be manipulated the data.

Smart Contract:

A code (chain code) enables to conduct trustworthy transactions without the involvement of a third party; these transactions are traceable and irreversible. Benefits of intelligent contract (Speed, efficiency and accuracy, Trust and transparency**,** Savings, security).

Solidity:

Smart contracts are digital contracts stored on a Blockchain that are automatically executed when predetermined terms and conditions are met. It enables you to conduct trustworthy transactions without the involvement of a third party; these transactions are traceable and irreversible. The benefit of intelligent contract (Speed, efficiency and accuracy, Trust and transparency**,** Savings, security).

Solana Blockchain:

Solana is fast, safe, and scalable compared to Ethereum and decentralized, and markets are offered by the web-scale Blockchain known as Solana.

Web 3.0:

Web 3.0 is commonly known World Wide Web. Also, Blockchain-powered Web3, a new version of the internet, supports decentralized applications. Its Decentralization and token-based economics are two ideas that are part of the Web 3 (sometimes referred to as Web 3.0) concept, a future version of the World Wide Web built on Blockchain technology. Cryptocurrency is a crucial component of web3 also substitutes fiat money and a computing edge and works on peer-to-peer and Blockchain-based distributed services.

- Cryptocurrency is one of the big examples (the working of the cryptocurrency is discussed in Figure 4).

JavaScript:

It is the most popular and common web-based programming language. It is an independent platform that's why everyone freely used and also easy to learn. The programmers preferred because it is lightest weight interpreter programming languages. They are directly run-on browser and also update web standard like element, Event etc.

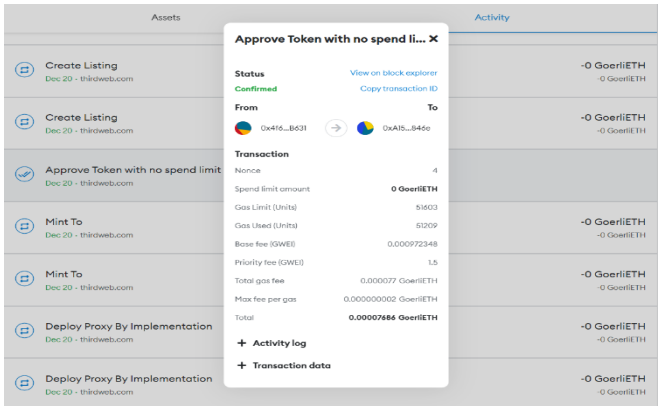


Fig.4. Meta Mask Transactions History While Minting or Creating NFTs

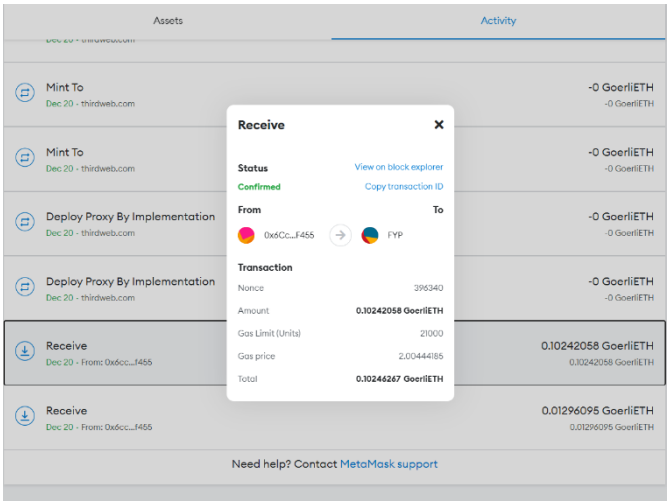


Fig.5. Meta Mask Wallet & Transactions History (1)

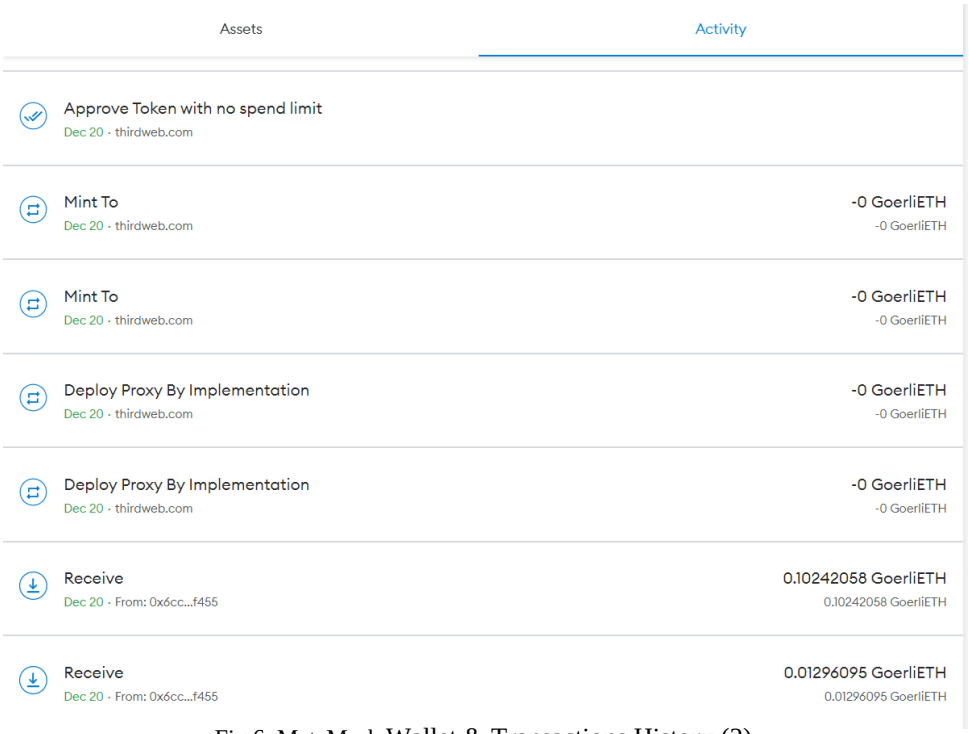


Fig.6. MetaMask Wallet & Transactions History (2)

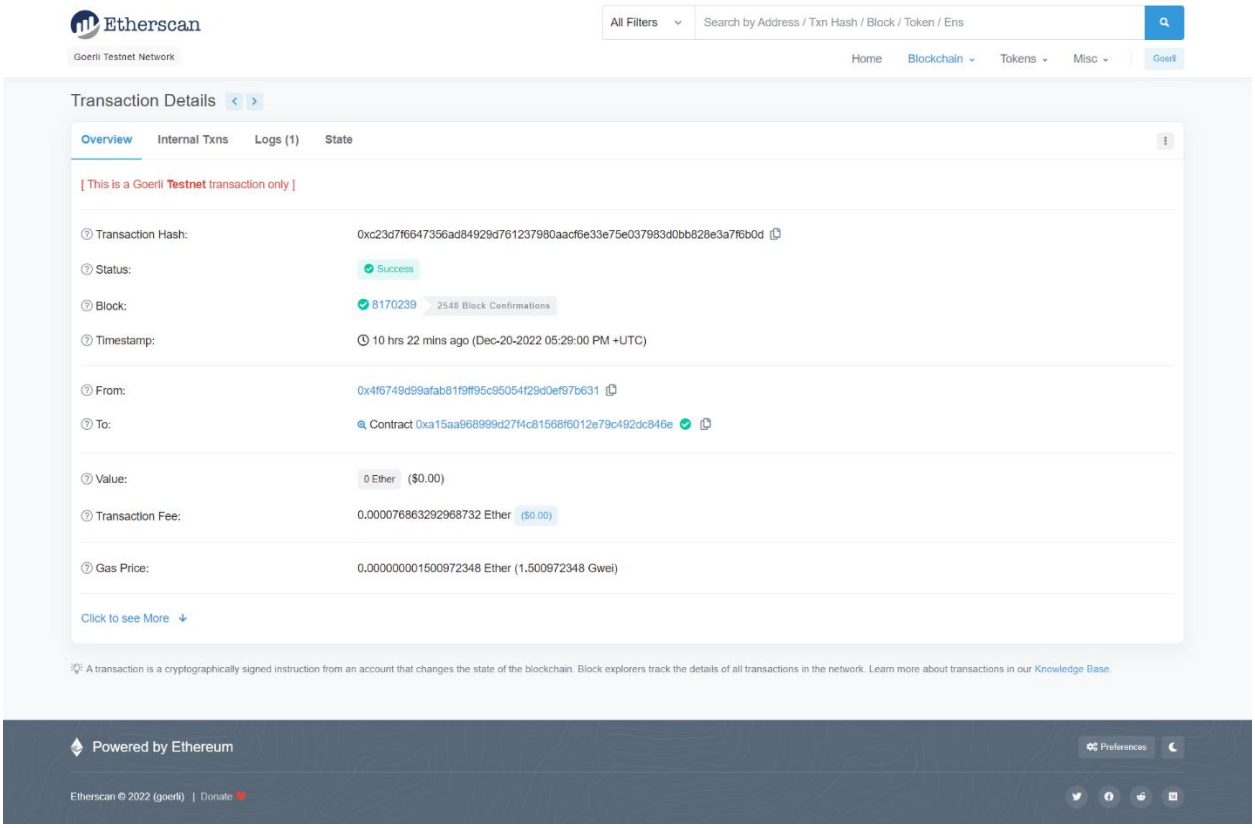


Fig.7. Third web NFT's Listing & Smart Contracts of NFT Collections & NFT Marketplace
Whereas the History for the Transaction which has been done in user's wallet.

4. RESULTS AND DISCUSSION

The NFT market is a relatively new phenomenon that grew out of similarly recent technological developments (smart contracts around 2015 and the Blockchain around 2009). The market has already seen several peaks in this short time, such as The great success of Crypto Kitties in late 2017 and the boom that started in 2021 with a massive increase in trading volume. Our findings and visual analysis indicate that the NFT market should be studied from various angles (users, revenue, and activity). Given that the more significant cryptocurrency markets primarily rely on the NFT market (Ante, 2021a), one would ask if the enormous NFT trading volume in early 2021 was entirely caused by rising cryptocurrency prices. As a result, it would be advantageous to analyze the pricing of NFTs concerning the price of Ether or Bitcoin, as well as the extent to which the market for cryptocurrencies impacts token values in the much smaller markets for NFTs, which affects volume, sales, and so on. NFT wallet activities, as well. This study's financial emphasis on the NFT market is particularly innovative. It complements the work of (Nadine et al.2021), who also map the NFT market but emphasize the interplay between NFT items, traders, and sectors rather than focusing on individual papers. According to the complaint, Solana Labs founder Anatoly Yakovenko leased more than 11.3 million tokens to a market maker in April 2020 without revealing this information to the broader public. Even though Solana only burnt 3.3 million tickets, the complaint alleged that the firm indicated it would cut supply by this amount. Solana employs a brand-new consensus method known as Proof-of-History, which allows the network to function. NFT wallet activities, as well. This study's financial emphasis on the NFT market is particularly innovative. It complements the work of (Nadine et al.2021), who also map the NFT market but emphasize the interplay between NFT items, traders, and sectors rather than focusing on individual papers. According to the complaint, Solana Labs founder Anatoly Yakovenko leased more than 11.3 million tokens to a market maker in April 2020 without revealing this information to the broader public. Even though Solana only burnt 3.3 million tickets, the complaint alleged that the firm indicated it would cut supply by this amount. Solana employs a brand-new consensus method known as Proof-of-History, which allows the network to function. lightning-fast and efficiently. Solana completes Ethereum 2.0's promises 20 times more quickly. At layer one, it has a throughput of 50,000 transactions per second and can scale up to a million. In addition, there are virtually no transaction fees on Solana. The organization has north of 500 hubs, which makes it substantially more decentralized than Blockchain, like Wave or Heavenly, which have fewer validator hubs. Compared to other cryptocurrencies, a node on Solana needs hardware worth $3,000 to $4,000, which may seem like a lot. However, the entry barrier is low. notwithstanding its block season of just 0.4 seconds, it gives the Solana people group the possibility to become one of the most amazing decentralized Blockchain stages in the business. Solana is a fast, censorship-resistant, highly secure, and highly effective blockchain. It offers effective Defi (decentralized finance) solutions by using the permission less nature of Blockchain technology.

Although the topic's initial work began in 2017 and was launched in March 2020, it was not until 2021 that it was noticed and received praise. The coin quickly increased the market cap rankings, moving from position 42 in February 2021 to position 7 in September of the same year. The Solana community has solid foundations and is a highly effective platform. However, the "Degenerate Ape Academy" NFT paper was the driving force behind the SOL coin price explosion. This paper, which went live in the middle of August on the Solana Blockchain, quickly sold over 10,000 "smoothest brain" apes. Solana's (SOL) cost began ascending in February 2021, when the entire crypto market was mooning. However, in contrast to other crypto giants, Solana did not experience the crash as strongly as Bitcoin or Ethereum did in late spring 2021.However, its price did fall. According to Trading View's technical analysis as of April

2022, SOL is the ninth most valuable cryptocurrency in terms of market valuation. Last but not least, Solana is one of the "coins that will explode in 2022" on the list. This might be beneficial to SOL investors. In April 2022, the OpenSea marketplace introduced SOL support to its platform. As a result, the fortunes of Solana's native cryptocurrency NFTs have shifted. It has surpassed Ethereum, Polygon, and Klaytn to become the fourth most significant OpenSea Blockchain. SOL tokens continue to dominate Magic Eden, the leading Blockchain-based NFT marketplace.

However, the integration with OpenSea now poses a threat to it. We anticipate a high degree of uncertainty among users and investors because NFTs are a relatively new phenomenon and papers vary significantly in terms of technical and legal security. So, it should not be a surprise that we found much movement in the NFT market. Applications and assets known as NFTs or NFT papers are extremely unproven and whose long-term benefits are highly uncertain. Although the Beeple image mentioned in the introduction, sold at auction for $69 million, is likely to provide high levels of technical and legal certainty, this frequently is not the case for 19 papers or artworks that are less well-known, well-known expensive. If something goes wrong in one case, it can spread to the entire NFT industry, which could be why there is so much co-movement [7]-[21].

5. LIMITION AND FUTURE

The most popular Solana NFT marketplace, Magic Eden, is where you can make, sell, and buy NFTs. They charge a 2% transaction fee, but no listing fee exists. However, creators can set their royalties and receive payment immediately following a sale mainly because Solana has a higher throughput capacity, lower fees, and faster transaction speeds. Everything can do faster, cheaper, and easier on Solana than on Ethereum. As a result, it only makes sense that Solana has experienced a significant increase in activity. In 2021, NFTs will be huge. They will still be the hottest trend in 2022.

The Metaverse, a digital future, can now be created thanks to the phenomenal rise in the popularity of NFTs. Metaverse lets users create their avatars to experience a virtual world. The metaverse growth will significantly depend on NTFS. NFTs will emerge as a significant component of the digital world because The developing digital ecosystem is expected to produce one trillion dollars yearly income within several years. Everything will alter as a result of NFTs. Numerous mechanisms and financial supporters must be implemented to make this anticipation a reality. Healthcare, architecture, design, education, and other professions will benefit from the new technology. Students will learn things practically rather than depending simply on the theoretical content of books. Educating pupils about the future of the digital world must begin in schools. Our children should be taught about the Metaverse, NFTs, Blockchain, and other digital technologies that will revolutionize the world in the following years. Digital products or freelance employment are examples of both. SOL is the ninth most valuable cryptocurrency in terms of market valuation.

Last but not least, Solana is one of the "coins that will explode in 2022" on the list. This might be beneficial to SOL investors. In April 2022, the OpenSea marketplace introduced SOL support to its platform. As a result, the fortunes of Solana's native cryptocurrency NFTs have shifted. It has surpassed Ethereum, Polygon, and Klaytn to become the fourth most significant OpenSea Blockchain. SOL tokens continue to dominate Magic Eden, the leading Blockchain-based NFT marketplace.

Additionally, this will lower unemployment rates worldwide. Integrating these digital assets in the Metaverse will enhance digital identification, item authentication, AI NFTs, personal health data monetization, business, secure transaction platform, appropriate win-win technology, smart contracts, art selling, tickets, events, virtual worlds, and digital commerce. Artisans will have more control over their work thanks to NFTs, as they will no longer rely on corporate forces or middlemen. These artists can simply contact buyers and sell their work straight to them. NFTs will have access to or ownership of unique things. These digital assets have the potential to greatly minimize all types of fraud and aid in the resolution of insurance sector concerns. They will also give authors and artists custody of their data and work.

This paper discusses the concept of NFTs, the data storage on the immutable Blockchain, describing most NFT current issues highlighted in previous articles while using Solana Blockchain. However, for this purpose, the role of blockchain-based ownership certificates is addressed with a cryptographic encryption mechanism. Whereas a digital file (typically an image, video, or GIF) mints, they are created. This means that a certificate of ownership and uniqueness is created using cryptocurrency. In the future, the NFT will convert to the metaverse is beneficial because it reduces our need to travel and consume physical resources. We can visualize and interact with any object in 3-d without much effort or time. We can switch between activities, chats, locations, and data with a single gesture. Instead of switching between apps and a web browser, everything in this digital world is linked and accessible. In the recent era, the NFTs, the most demanding entertaining asset, was very high because this was the first digital. They move from one platform to another quickly on this website. We can easily buy the NFTs and sell they also show the collection of NFTs on the website.

CONCLUSION AND FUTURE DIRECTION

This study examines the notion of NFTs and data storage on the immutable Blockchain and describes most NFT current difficulties mentioned in earlier publications while using Solana Blockchain. Nevertheless, a cryptographic encryption process addresses the role of blockchain-based certificates of ownership in this context. They are generated, as opposed to minting, a digital file (usually a picture, video, or GIF). This implies that bitcoin creates a certificate of ownership and uniqueness. The NFT will convert to the metaverse in the future, which will be helpful because it will lessen our need to travel and consume physical resources. We can view and interact with any 3-D item with little effort or time. We may flip between activities, chats, locations, and data with a single motion. Everything in this digital world is linked and accessible, so there is no need to move between applications and a web browser. Because this was the first digital, they readily moved from one platform to another on this website, where we can simply purchase and sell NFTs. They also present the collection of NFTs on the internet.

Acknowledgment

Dr. Mazhar Ali Dootio (Associate Professor and Head of the Department of Computer Science and Information Technology), Mr. Abdullah Ayub Khan (Lecturer of the Department of Computer Science and Information Technology), and Mr. Raheel Sarwar (Lecturer of the Department of Computer Science and Information Technology) at Benazir Bhutto Shaheed University Lyari, Karachi 75660, Pakistan, deserve our profound appreciation. As things became tough, they both convincingly led and urged us to stay professional and find the right path. With their ongoing monitoring and guidance, we completed our study.

References

[1] 0xcert. (2018). “NFT Spotlight #3 - Known Origin, the non-fungible art platform.” Retrieved from https://0xcert.org/news/nft-spotlight-3-knownorigin/

[2] Akoka, J., I. Comyn-Wattiau, N. Prat and V. C. Storey. (2017). “Evaluating knowledge types in design science research: An integrated framework.” Lecture Notes in Computer Science.

[3] Atzei, N., M. Bartoletti and T. Cimoli. (2017). “A Survey of Attacks on Ethereum Smart Contracts (SoK).”

[4] In: M. Maffei & M. Ryan (Eds.), Principles of Security and Trust (pp. 164–186). Springer.

[5] Autonomous NEXT. (2018). “Crypto Utopia.” Retrieved from https://t.co/QsFhfc8MSlaventus. (2018). A Blockchain-Base.

[6] D. Te Phillips, “10 most expensive NFTs ever sold,” 2021, [Online]. Available: https://decrypt.co/62898/the-10-most-expensive-nfs-ever-sold. (Accessed 20 May 2021). (Decrypt).

[7]. Tepper, F. People have spent over \$1m buying virtual cats on the Ethereum block chain. (2017). https://techcrunch.com/2017/12/03/people-have-spent-over-1m-buying-virtual-catson-the ethereum-blockchain/. (Accessed 4 May 2021). (TechCrunch).

[8] S. Arora, “What Is Cryptocurrency: Types, Benefits, History and More,” Feb 16, 2020, 2020.

[9] Q. Wang, R. Li, Q. Wang, and S. Chen, Non-Fungible Token (NFT): Overview, Evaluation, Opportunities and Challenges. 2021. [Online]. Available: http://arxiv.org/abs/2105.07447

[10] L. Ante, “The non-fungible token (NFT) market and its relationship with Bitcoin and Ethereum,” 2021. doi: 10.2139/ssrn.3861106.

[11] Laghari, Asif Ali, Abdullah Ayub Khan, Reem Alkanhel, Hela Elmannai, and Sami Bourouis. "Lightweight-BIoV: Blockchain Distributed Ledger Technology (BDLT) for Internet of Vehicles (IoVs)." Electronics 12, no. 3 (2023): 677.

[14] Khan, Abdullah Ayub, Aftab Ahmed Shaikh, and Asif Ali Laghari. "IoT with Multimedia Investigation: A Secure Process of Digital Forensics Chain-of-Custody using Blockchain Hyperledger Sawtooth." Arabian Journal for Science and Engineering (2022): 1-16.

[15] Khan, Abdullah Ayub, Asif Ali Laghari, Muhammad Shafiq, Shafique Ahmed Awan, and Zhaoquan Gu. "Vehicle to Everything (V2X) and Edge Computing: A Secure Lifecycle for UAV-Assisted Vehicle Network and Offloading with Blockchain." Drones 6, no. 12 (2022): 377.

[16] Khan, Abdullah Ayub, Asif Ali Laghari, Peng Li, Mazhar Ali Dootio, and Shahid Karim. "The collaborative role of blockchain, artificial intelligence, and industrial internet of things in digitalization of small and medium-size enterprises." Scientific Reports 13, no. 1 (2023): 1656.

[17] Khan, Abdullah Ayub, Asif Ali Laghari, Muhammad Shafiq, Omar Cheikhrouhou, Wajdi Alhakami, Habib Hamam, and Zaffar Ahmed Shaikh. "Healthcare Ledger Management: A Blockchain and Machine Learning-Enabled Novel and Secure Architecture for Medical Industry." HUMAN-CENTRIC COMPUTING AND INFORMATION SCIENCES 12 (2022).

[18] Khan, Abdullah Ayub, Asif Ali Laghari, Zaffar Ahmed Shaikh, Zdzislawa Dacko-Pikiewicz, and Sebastian Kot. "Internet of Things (IoT) security with blockchain technology: a state-of-the-art review." IEEE Access (2022).

[19] M. Nadini, L. Alessandretti, F. Di Giacinto, M. Martino, L. M. Aiello, and A. Baronchelli, “Mapping the NFT revolution: market trends, trade networks, and visual features,” Sci. Rep., vol. 11, no. 1, pp. 1–11, 2021, doi: 10.1038/s41598-021-00053-8.

[20] T. W. Lounge, “Choosing the right blockchain for your NFT,” 2020, [Online]. Available: https://medium.com/phantasticphantasma/choosing-the-right-blockchain-for-yournft-d1df2bebae91

[21] A. S. and H. S. Ben Luke, “WTF are NFTs? Why crypto is dominating the art market,” 2021, [Online]. Available: https://www.theartnewspaper.com/2021/02/26/wtf-are-nfts-whycrypto-is-dominating-the-art-market.

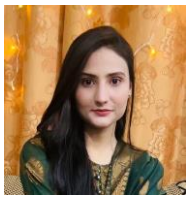
Authors' Profiles

Kashmala (350BSIT/19-S/5) Recently done Bachelor in Information Technology from Benazir Bhutto Shaheed University, Lyari Karachi.

Areeba Siddique (324BSIT/19-S/5) Recently done Bachelor in Information Technology from Benazir Bhutto Shaheed University, Lyari Karachi.

Abeer 315BSIT/19-S/5) Recently done Bachelor in Information Technology from Benazir Bhutto Shaheed University, Lyari Karachi.

Asher (326BSIT/19-S/5) Recently done Bachelor in Information Technology from Benazir Bhutto Shaheed University, Lyari Karachi.



Javeria Jamil (345BSIT/19-S/5) Recently done Bachelor in Information Technology from Benazir Bhutto Shaheed University, Lyari Karachi.

Madyan (353BSIT/19-S/5) Recently done Bachelor in Information Technology from Benazir Bhutto Shaheed University, Lyari Karachi.