Assessment of Web3 Technology in Land Ownership Transactions

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The advantages of publicly distributed, transparent, accountable, traceable, safe, and well organized database ledger has made the blockchain technology gained popularity and acceptance. As the world keeps growing in the knowledge and the adoption of the technology, it is very important to practically harness the opportunities in this technology in land administration system to combat the insecurity, poor database and copyright challenges facing land ownership transactions in the Cadastre System in developing countries. The aim of this paper is to examine the practicability of harnessing the Web3 Technology in Land Ownership Transactions with an objective to mint and transact a Registrable Instrument on a cryptographic blockchain. To achieve this, two Non- Fungible Token (NFT) accounts were created on Core blockchain, two templates of survey plans were also minted into an Art NFT on the same blockchain. The Minted NFTs were transacted (transferred and sold) between the two accounts on the YoungParrot NFT marketplace. These two transactions (sales and transfer) were completed, recorded and stored on the blockchain public ledger, with evidence that can be traced and viewed on the blockchain using the transaction hash/ID. The blockchain transaction was found to be fast, effortless, secured and organized on the blockchain transaction ledger, hence presenting the Web3 blockchain Technology as a possible solution to the challenges facing the Cadastre System. However, the acceptance of the technology in land administration, land ownership and transactions still face some other administrative challenges which this paper further addressed.

Keywords: Cadastre System, Land Transaction, Art Non-fungible Token, Web3, Core Blockchain, YoungParrot market place

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INTRODUCTION

The invention of blockchain technology has triggered a new wave of technological advancement in industrial methods of engagement, processing and systems of administering and managing transactions, which is optimal than the usual (Sakiz & Gencer, 2021). Transactions on a blockchain are processed by computers (referred to as nodes) working together on a public or private network on a specified blockchain to confirm blockchain transactions in blocks. These blocks are sequentially and continuously linked with previously confirmed transactions to form a transaction ledger on the blockchain. A blockchain ledger is a publicly transparent architecture of continually confirmed blocks of transactions which is recorded on every single node (computer) on the blockchain. An advantage of this ledger is that it cannot be altered (Liu, 2023).

Over the years, the challenges of land transaction have been insecurity, lack of transparency and lack of database. To add to the list is the time taken to complete such transactions between two partners. According to Muller and Seifert (2019), the advantages of the blockchain technology includes: faster implementation of pending ownership changes; automated notification and transparency of ownership changes; automation of archives for contracts and files; and flexibility, resilience and greater security for land registration actors. For this purpose, the blockchain technology for the real estate market is considered as a feasible technology (Ibrahim, 2021; Eder, 2019). The aim of this paper is to examine the practicability of harnessing the Web3 Technology in Land Ownership Transactions with an objective to mint and transact a Registrable Instrument on a cryptographic blockchain.

Surveying is the art, science and technology of making measurements and observations about the earth surface or part of the earth surface as well as presenting it on plans/maps drawn to scale (Babalola, 2022). This exercise of measurement and observations can be done for the purpose of land registration, construction, deformation and disaster monitoring and so on. The introduction of Web3 technology into surveying profession tends to be very useful (with non-fungible token). The rigid nature of current system of land administration and ownership transactions in countries around the world has a common problem of system security (Eder, 2019; Muller & Seifert, 2019; Ibrahim *et al*., 2021). These problems can be effectively addressed via the use of the blockchain technology, but the hindrances to the adoption of this technology still includes conceptual challenges, trust issues, regulatory challenges, complexities and volatility and market risks (Patil, 2020).

In Nigeria for instance, there are professional bodies governing the rules and regulations in respective professional careers aiming at a standard and will coordinate land administration and cadastre system.

Examples are the Town Planners Registration Council of Nigeria (TOPREC) and Surveyors Council of Nigeria (SURCON). With emphasis on cadastre system, this work tends more to the survey aspect of the cadastre system with reference to the Surveyors Council of Nigeria (the body that controls the practice of the Surveying profession in Nigeria) as the legislations regulating the practice of the surveying profession in Nigeria include the SURCON Enabling Act (2014) and the SURCON Survey Rules and Regulations. The law that governs land Ownership in Nigeria is the Land Use Act of 1978, now Land Use Act (2004).

Limitations to the adoption of the blockchain technology in Land Administration and Cadastre System of developing and underdeveloped countries are subjected to the inability to synchronize the technology with the existing customary and statutory laws governing the Cadastre System of these countries (Racetin *et al*., 2022; Bakar *et al*., 2022; Shuaib *et al*., 2022). It is important to understand that for a successful adoption of this new technology in the cadastre system of a country, it is necessary that the technology is built in line with the laws, rules and regulations of such country (Racetin *et al*., 2022). For instance, in Nigeria, the consent of the Governor on matters relating to land ownership or transfer of ownership by lease, assignment is necessary, else such transaction would be null and void (Section 26, Land Use Act, 2004). The problems facing Land Administration and Cadastre system of developing Nations include lack of efficiency, transparency, security and organized database; high cost of transaction and high time complexity (Shuaib *et al*., 2022). To assess the possibility of the blockchain technology to address these issues, the research questions is, how can a cryptographic blockchain for Land Administration and Cadastre system be developed and maintained for a developing and underdeveloped countries?

LITERATURE REVIEW

Introducing web3 as a solution requires a brief insight into the previous web generation. The initial Web is a linked information system, which is based on graph and link organization mode. A significant feature of Web 1.0 applications is static pages. Visitors are permitted to perform a few simple operations, such as clicking, reading and downloading from static websites. Web 2.0 was developed and built on the previous. It is capable of writing and uploading on the internet which promotes interactions on the web. Other added advantages of this generation are novel technologies (Java script, XML) enjoyed on the web. This also brought light into the entertainment industry via social media like Facebook, TikTok and Twitter (Gan *et al*., 2023). To improve on Web 2.0 technology, Web 3.0 and Web3 are built to break monopolies, which are the default constraint of Web 2.0 (Gan *et al*., 2023).

Table 1: Differences among Stages of Webs

S/N	Web	Period	Architecture	Representative Products	Characteristics	Benefit Distribution
1	Web 1.0	1989 – 2001	centralized	Yahoo, Sina, Netscape	host-generated content, host-generated authority	Platform monopoly
2	Web 2.0	2004 – now	centralized	Baidu, Google, Facebook	host-generated content, host-generated authority	Profit-sharing (platforms and netizens)
3	Web 3.0	2006 – now	Distributed model, decentralized	Tor, Twine	user-generated content, user-generated authority, efficiency and intelligence, adopts solid pod storage, data records can be modified or deleted effortlessly.	Peer-to-peer, RDF schema, resource description framework
4	Web3	2014 – now	distributed mode, decentralized	Ethereum, Binance, Core DAO, etc.	user-generated content, user-generated authority focuses on Security and ownership, utilizes a cryptocurrency digital wallet, Data records are difficult to modify or delete.	Blockchain, smart contract, cryptocurrency

Source: Gan *et al*. (2023) and Wan *et al.* (2023)

The application of Web3 can be by blockchain, smart contract, decentralized finance, non-fungible token, decentralized autonomous organization, and Metaverse (Wan *et al*., 2023). Among all these, the most applicable form of Web3 in the world of Surveying and Geoinformatics, Land Administration and ownership transaction is the Non-Fungible Token, a special and unique kind of digital token of collection that cannot be divided, unlike a Bitcoin, Ethereum and other tokens that can be divided (Fungible tokens). To effectively adopt a Web3 technology to solve land transaction and administration related problems, there is a need to have the blockchain technology.

NFTs and Marketplaces

NFTs are unique tokens which cannot be exchanged 'like-for-like', making it suitable for identifying something or someone in a unique way. NFT is a type of Cryptocurrencies that is derived by smart contracts. As Ethereum cryptography gave birth to other blockchains (other than the Bitcoin), so are the non-fungible tokens built on ERC-20, ERC-721, and ERC-1155 (Kim, 2021; Patil, 2020). However, it is a remarkable effort that recent blockchains are implementing their versions of NFTs and smart contracts that is Ethereum Virtual Machine (EVM) supported. Such blockchains include Core DAO, Binance, Polygon Network, to list but a few.

The trends in blockchain for land right as stated by Biasolo (Eder, 2019), can also be adopted in performing land ownership transactions on blockchains such as: public registries, facilitating the recordkeeping of relevant transactions; Tokenized trading: tokenization of the registered survey plan for trading on a blockchain as NFTs; and trading such NFTs through Cryptocurrency (native tokens) of the blockchain.

(a)

(b)

Figure 1: (a) Template 1 (b) Survey Plan

Transacting Survey Plan as Art NFT

The Survey plans were minted into an Art NFT on the Core DAO blockchain on YoungParrot marketplace as follow;

1. Create a collection account on the desired market place;
2. Validate and confirm the created NFT collection account;
3. Convert the survey plan into an electronic format acceptable by the NFT blockchain (JPG, JPEG, PNG, GIF, SVG, MP3, MP4, WEBM, OGG, MOV, WAV, GLB, GLTF formats but must be less than of 100mb size);
4. Select the NFT categories you wish to mint (Art NFT category in this case);
5. Mint the art into a Non-Fungible token on the Blockchain; ascribing NFT Name (Survey Template), descriptions, metadata and required information. This also includes the percentage you would like to earn whenever the buyer wishes to re-sell again.

The descriptions and metadata (like the geographical description beacon numbers and coordinates of the

MATERIAL AND METHODS

In this paper, a cryptographic blockchain technology was used to transact two sets of "Survey Plan templates" that was minted as art NFTs (Figure 1), with the aim to practically examine the possibility of land ownership transaction on cryptographic blockchain. Two accounts (Account1 and Account2) were created in YoungParrot NFT marketplace built on Core blockchain. NFT transactions (sales and transfer) were performed between these two accounts. Due to the high cost of Ether and transactions on Ethereum blockchain network, core blockchain was adopted as an alternative.

Data Acquisition

The sets of data used were survey plan template titled "Template 1" and "Survey Plan". These survey plans were drawn for the purpose of experimenting the transaction of land and landed property ownership on Web3 (see Figure 1).

instrument/land; the name of the previous owner; the name and address of the approved office that processed the document initially etc.) would be the required information to identify the Registrable instrument in question. This would be made available only to the buyer/benefactor.

To achieve the aim of the work, the survey plan template was sold and the survey plan was transferred to another account on the same blockchain. This is to consider the two occasions of buying and selling landed properties and the ownership transfer on the ground of gift tenure or devolution of landed property, lease, gift and so on.

RESULTS AND DISCUSSION

Core blockchain is a Web3 decentralized blockchain built to ensure security, scalability and decentralization with a minimum of three confirmations for a successful transaction (Liu, 2023). Minting the plans on Account1 and transacting them with Account2 on the Core blockchain can be traced using the wallet addresses of either the sender or the receiver and the transaction hash/ID. Account1 initially minted 4 plans (as can be viewed in the blockchain), sold out one and transferred one.

Selling "Template 1" from Account1 to Account2, the transaction hash/ID is 0xd6e373d94a116e55d84c93cdf978418e738f2bb4ed6a0e73ec18ef2beb3effcd (https://scan.coredao.org) (see Figure 2). The plan was sold out for 1.0 CORE and the gas fee of 0.00578274 CORE and a loyalty fee of 0.025 CORE were charged, making a total of 1.03078274 CORE (see Figure 3).

Also, transferring "Survey Plan" from Account1 to Account2, the transaction hash/ID is 0x7f773bdb2f05301ac22066a8cd50d6423768a18d2d5aac88d9f677b7821d8484 (https://scan.coredao.org). The transaction fee was charged at 0.00110232 CORE (see Figure 4).

The scan.coredao.org records (as presented in Figure 4) show that the two NFT transactions (sales and transfer) were successful. Details of the transactions show how old is the transaction, including time and cost of transaction between the involved parties. The ownership of the plans was initially recorded as Account1, but after the sale and transfer, it was automatically transferred to Account2. The main difference between the sale and transfer transaction is that the NFT was sold to the buyer at the cost of 1 CORE and 0.03078274 CORE transaction and loyalty fees, while the transferred NFT was at no cost to the receiver. All the records are kept intact on the blockchain.

A survey plan as one of Registrable instruments of land ownership, which is also recognized as a legal document by land administration system of each countries remains a sensitive document which should be treated with high level of security. The availability of transactions on blockchain ledger (as shown in this study) will provide an open, transparent, safe and secured transaction system that can be adopted for solving transaction (sales and transfer) problems relating to land ownership in developing countries.

The concept of land ownership transactions is to transfer the ownership of a land from one person to another (be it by sales, assignment, lease, transfer, gift etc) with all rights preserved in respect to the agreement between the parties. At a successful transaction, the instrument transaction ID will read the buyer as new owner but will still record the seller as the previous owner.

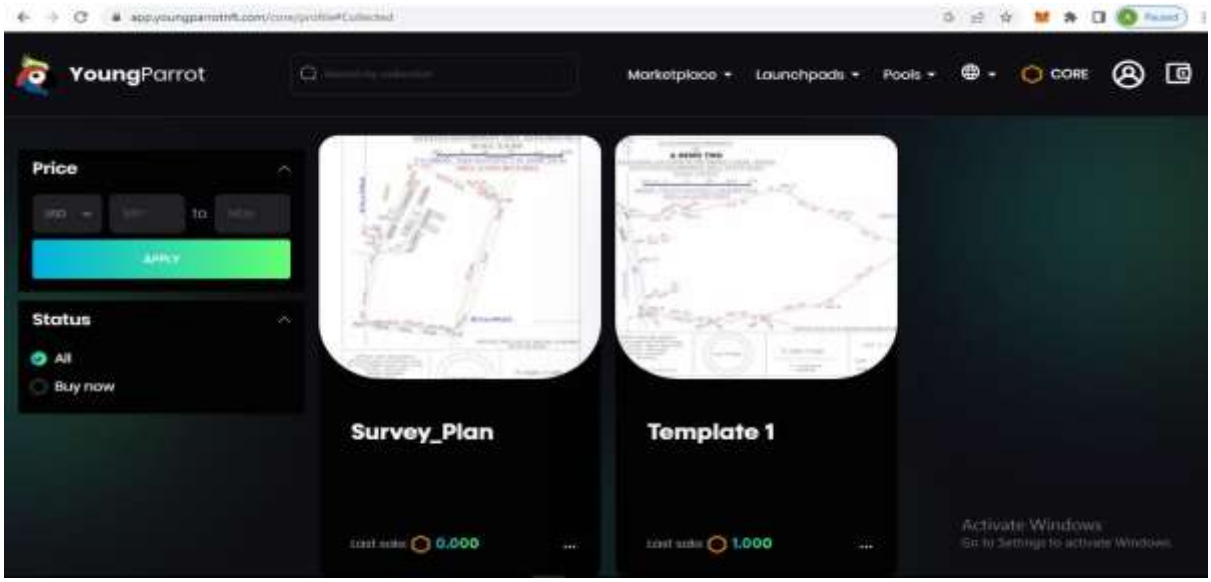

Figure 2: NFT Record on Account2

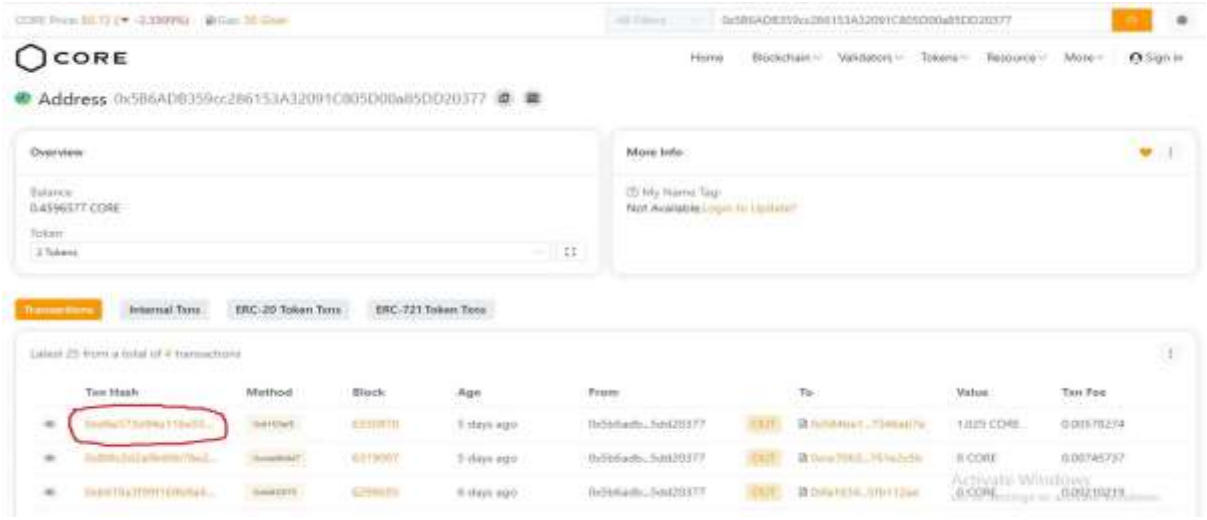

Figure 3: NFT Sales Transaction Details on Scan.coredao.org

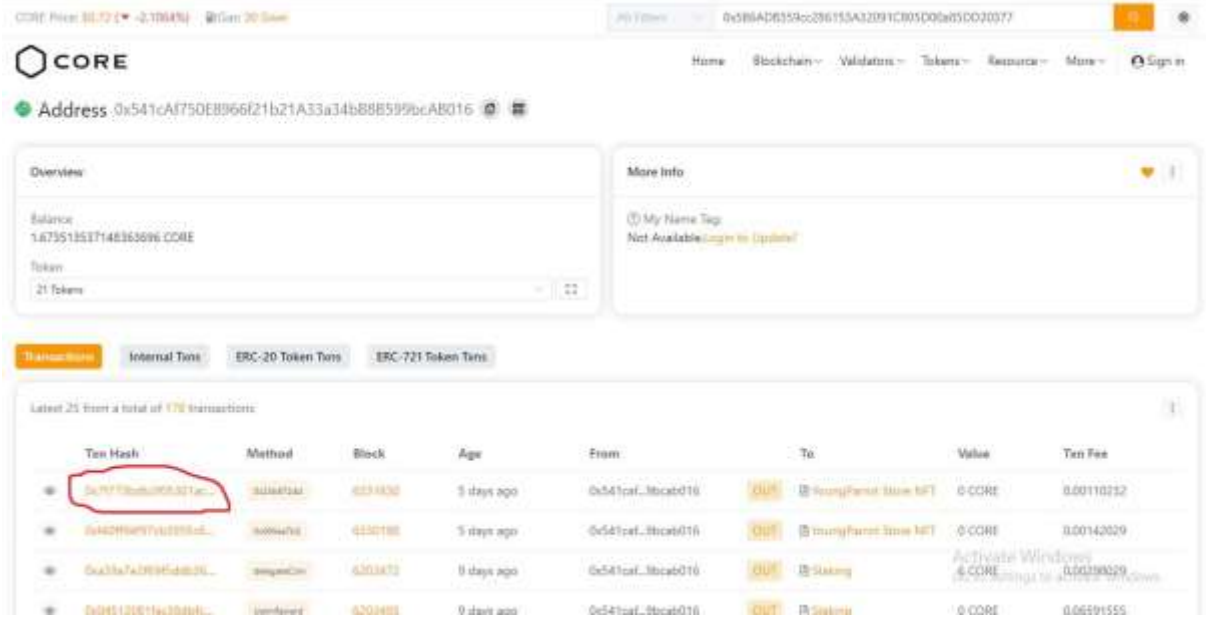

Figure 4: NFT Transfer Transaction Details on scan.coredao.org

To maintain a reliable and efficient adoption of the technology in the cadastre system for developing and underdeveloped countries, Nigeria for example, the first step would be to design a scalable Blockchain Ecosystem. For example (Figure 5), in the Ecosystem of land ownership transactions, SURCON (the professional governing body) would control the governance of the Decentralized Autonomous Organization (DAO) Blockchain (Busch, 2022); the SURCON State Committee on Ethics and Practice of the Surveying Profession (SSCE) and the Nigerian Institution of Surveyors (NIS) at the states level would be Transaction Validators in each state, while the approved offices (subsection 6, section 13, SURCON Enabling Act) would be the blockchain Nodes all over the country.

Recognized access into the blockchain to perform such transactions would be Registered Surveyors and all approved offices, thereby enforcing the laws of land ownership transactions and the rules and regulations of engagement within the ecosystem. With a hybrid DAO blockchain (where the general public will only be able to view and trace transaction, but will not be able to alter it), no land ownership transactions outside the blockchain would be recognized.

In this wise, the transactions on the blockchain should be considered as securing and confirming transactions within the surveying community ecosystem, other than the dark web) for the purpose of combatting insecurity, fraud and ensuring a well-structured database of land ownership transactions.

Since a survey plan is one of the Registrable instruments of land ownership, if a Survey plan template could be minted as art NFT and transacted on a cryptographic blockchain, so could other documents.

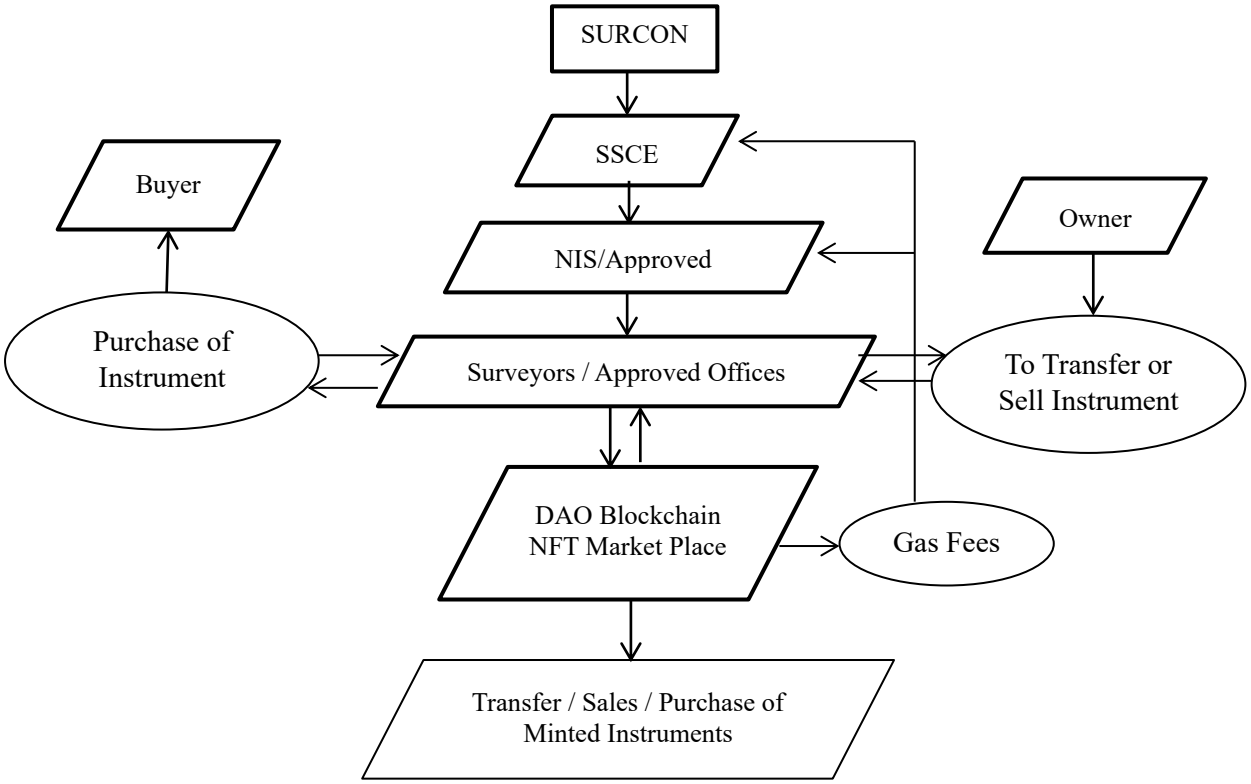

Figure 5: Proposed Structure of Blockchain Ecosystem

CONCLUSION

The possibility of transacting Survey plans on Web3 via a non-fungible token on a decentralized blockchain has been successfully carried out by preparing them as art NFTs on Core blockchain (a secure, scalable and decentralized blockchain) in the YoungParrot NFT marketplace. An NFT called "Template 1" was minted and sold while the "Survey Plan" NFT was minted and transferred. All the transaction details are recorded and detailed on the blockchain ledger and can be viewed anytime to promote security, transparency and a well-structured database of land transactions.

Transactions on Web3 (blockchain) is a promising technology not only to the cryptographic world but in the application of the technology in Land Ownership transactions, like in the professions of Surveying, Architecture, Urban and Regional Planning etc. This research work is not a financial advice, but an insight into what the Web3 technology has to offer to the Surveying profession in the constantly evolving world of technology. It is important to further look into the possibilities of adopting the technology for land administration and ownership transfer by other related professional fields. Further works could be done on the conversion of the minted art NFT back into actual Survey plan (instrument) that will maintain its original scale and properties.

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