The Potential Application Of NFT in the Publishing Industry; Opportunities and Challenges

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***Abstract*— In the past few years, the world has witnessed a massive development in the digital world, which has led to the emergence of a new advanced trading technology called Non-Fungible Tokens (NFTs) as digital crypto assets using blockchain technology. This technology has expanded and developed by leaps and bounds in various aspects of the digital world, including virtual reality and cryptocurrency. This rapid development has created a marketplace that allows users to create, buy and sell their own unique NFT digital assets quickly and easily compared to the real world while maintaining ownership rights. The huge trading market of NFTs and their remarkable technical advantages have attracted Attention and concerns of musicians, artists, collectors and gamers to such an extent that it has sparked interest in studying the applicability of NFT technology in various sectors of the real world. This research came to study the applicability of non-fungible tokens (NFTs) and their opportunities and challenges in the publishing industry, taking into consideration all its stakeholders, in order to open doors for this industry, and maybe to other potential non-digital (real) industries to benefit from it.**

Keywords—Non-Fungible Tokens, NFT, cryptographic assets, unique digital asset, blockchain technology, NFT market, publishing industry, digital wallet

I. INTRODUCTION

Recently, we have begun to witness an unprecedented development in the work environment in the digital world, which has led to the creation of advanced digital technologies that have contributed to simulating life and work in the real world. One such recent technology is the non-fungible tokens (NFTs), which rely on technological mechanisms and tools such as blockchain, cryptocurrencies, and digital wallets. Non-fungible tokens are digital assets that are encrypted and stored on the blockchain to give them innovative and unique identification tokens and metadata in order to verify their uniqueness and ownership and allow them to be traded in the digital marketplace. It is a fact that the NFT market has exploded with the volume and value of huge trading transactions in the market for games, artwork, collectibles, etc., which, as some see it, is a temporary or artificial bubble made to attract the attention of users and investors [1, 2, 3], and others are betting on its collapse [4]. But what caught our interest in doing this research is the importance of this new technology (NFT) and potential to be linked to real assets – as mentioned in [5], NFTs are records can connect digital tokens to tangible (physical) assets.

This research attempts to investigate the potential applications of NFTs in industries/markets that require the use of a combination of both the real world and the digital world, the use of augmented reality (AR)) [5]. This is to guarantee fast and smooth transactions, in which property rights are preserved and profits flow to its owners with fairness and as agreed. Therefore, this research study the extent to which the NFTs technology can be applied in the publishing process by creating a model presents the process in operational charts that explain how NFTs can be employed simply and accurately. The proposed model presents the main components and steps required for applying NFTs in the publishing process, starting from receiving the book (i.e. E-book) from the author, through storing the book (or its chapters) digitally in decentralized storages, creating its/their-in case of separate chapters- unique NFTs and storing them in the Blockchain until it reaches the buyer (the ultimate beneficiary). We highlight the pros and cons of the potential application of NFTs in a publishing house business and the opportunities and challenges that may be encountered during the process.

II. RESEARCH IMPORTANCE

Since digital technologies began to penetrate into the real life of organizations and individuals, it has been necessary to study these technologies and their impact on the performance of production and service sectors.

This research came to highlight NFTs as a potentially useful tool to use in facilitating and simplifying the work of the publishing industry and enhancing its performance while preserving the interests of all stakeholders (parties) in the publishing process, including authors/writers, publishing houses, and buyers (such as wholesalers, retailers, or end users). This paper presents a proposed model for the application and use of NFT techniques in the publishing process. We expect this model to simplify and enhance the publishing process, and effectively maintain legal rights, including property rights, for all stakeholders.

This paper also attempts to explore opportunities for using NFTs to advance the work and performance of publishers. Finally, since the use of NFTs in this industry is still the subject of controversy and debate between proponents and opponents, this paper looks at the main challenges facing the publishing industry when using NFTs in its business and finally comes up with some recommendations for developing and ensuring the publishing process.

III. RESEARCH PROBLEM

The main objective of this research is to explore the applicability of NFT technology in the work of a publishing houses and its ability to enhance the performance of the

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publishing industry and ensure that its transactions are carried out (established) accurately, quickly and smoothly, while ensuring property rights and the flow of profits to its beneficiaries among the various stakeholders. Hence, this research attempts to answer the following questions.

1. Can NFTs technology be applied in the publishing process, and how?

2. How can NFTs improve and enhance the performance of publishing houses?

3. What are the opportunities to use NFTs to develop the publishing industry process to keep pace with the evolution of the digital world? In other words, to what extent can the application of NFTs ensure that publishing transactions are established accurately, quickly and smoothly, while ensuring property rights and fairness in the flow of profits to their beneficiaries among the various stakeholders?

4. What are the main challenges facing the application of NFTs in the publishing industry?

IV. Literature Review

NFT technology is a technical method to enhance the relationship between blockchain and mixed reality technologies that can find varied application in our physical world [5]. NFT uses Blockchain technology to obtain proof of ownership of the item it is associated with [6]. So, NFTs are seen as "smart contracts" that allow instant payments with minimal transaction fees [7]. Reference [1] defined NFT as a "blockchain-recorded right to a digital asset".

Some, such as [1] have considered the NFT marketplace to be one of the greatest notable public successes of blockchain technology. According to [8], NFTs positively affect both the digital economy and the real economy, and play a role in changing consumer behavior. Furthermore, reference [9] claimed that this emerging new technology (NFT) has helped facilitate the employment of evidence-based practice and thus support decision-making. However, reference [10] concluded that the NFT markets still immature and ineffective when exploring the fourteen largest NFT markets from June 2017 to May 2021, in terms of the number of NFT sales, NFT trading volume in US dollars, and a number of unique NFT portfolios traded on the blockchain. Fewer NFT transactions of higher commercial value were found in 2021 compared to previous years of the study period [10]. Hence, various parties, especially researchers, have been interested in studying this technology (NFT) further and investigate the possibility of employing it in different industries and fields of real life, as we do in this research.

Although, the first NFT was created in 2014, by Kevin McCoy and Anil Dash [11, 6], the NFT market has witnessed its exponential growth during the period of 2017, upon the success of the "CryptoKitties" online game [12], up to 2021, during which the market volume of NFTs ranged from $12 billion to over $26 billion in 2021 [13]. However, the NFT market for active traders has dropped from $1 million to around $490,000 in the first quarter of 2022, which has been seen by [8] as a "not good" signal and attributed it to the "lacking new and retained an interest in digital assets". However, According to the statistics revealed in August 16, 2022 by [14], the global spent on NFT in 2022 so far is £30 billion, and that 950,000 Wallets were acquired and sold As NFTs in Q1 of 2022, and that 250,000 people trade NFTs every month on OpenSea. Moreover, stated that there are $10-$20 million worth of NFT sold in the blockchain every week. Reference [14] stated that $10 million in 2021 was raised by 3 NFT marketplaces in the Middle East which was led by UAE. One of the presented sessions in the "Global Conference on Creative Economy" at the Dubai Exhibition Center at Expo 2020 Dubai (i.e. "Non-fungible Tokens: Inclusion in Leadership"), stated that the projected market size of global NFT technology will reach $400 billion by 2025 [15] .

Our research is not the only attempt to investigate the potential use of NFTs in real-life applications. It was stated in [2] that the use of NFTs has the potential to support new patterns of value creation, generate new revenue streams, and support agreement among stakeholders. NFTs applications have already been used in some industries such as games, music, etc. Moreover, its potential use has been studied and investigated in various industries and professions as diverse as dentistry [16, 7], Education [17], Networking and Communications and Information security [18], healthcare [6] [19], publishing industry [3], as we do in this research, etc.

V. NFT in Publishing Industry

This paper is an exploratory one where we try to explore how NFT can be used by publishers and how NFT can boost the business of this industry. We propose an NFT model for the deployment process and then investigate the opportunities and challenges in implementing NFT in the industry.

A. Proposed NFTs Model

Figure 1 shows a publishing house's workflow diagram for creating NFTs for its products (published works). It shows the following: (1) the major stakeholders in the publishing industry (author(s), publishing house, NFT platform(s), and buyer(s)). (2) The relationship between the author and the publishing house on the one hand, and (3) the relationship between the publishing house and the NFT platform on the other.

As shown in Figure 1, the process goes like this. (1) The publishing house receives materials prepared for publication (books, chapters, etc.) from the author after performing all operations related to the revision, coordination and production of the work. (2) The publishing house uploads the materials (e.g. the book's chapters) to the decentralized storage platform and (3) gets a private hash for each chapter (or book, if it is small in size) or part of the material received. (4) The publishing house submit a request to the NFT platform to generate an NFT for the stored contents. (5) The NFT platform makes it easy to create an NFT using author's data, hashs and publishing data as well as MAC (Message Authentication Code). (6) Then the NFT data is then stored in the Blockchain in which (7) all transactions are permanently stored. An NFT is assigned a private unique address to preserve property rights. (8) The minted NFT becomes available for others to bid if they are interested. (9) An interested buyer makes an offer on the listed NFTs, and if (10) the content creator accepts the offer, (11) ownership of the NFT is transferred to the buyer.

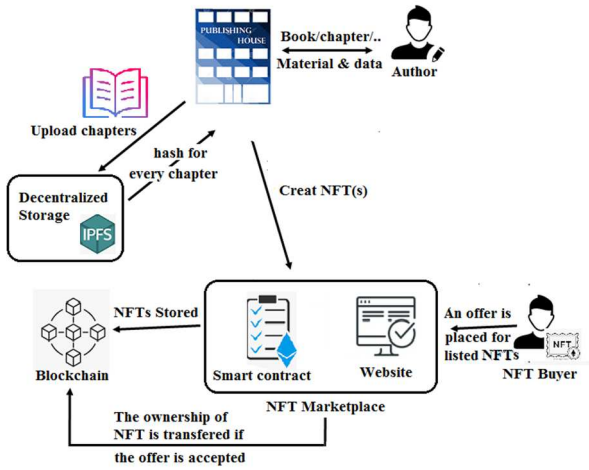

Figure 1 The NFT workflow diagram in the publishing industry

Figure 2 shows the main components of NFT. In general, each NFT includes a token symbol, token ID, and token contract address, as well as the identifier for the NFT creator/source. Moreover, every other component in the process must have their identification data such as the author(s), book, publishing house, as well as the chapters of the book (if possible selling it in separated chapters as well). In general, books (files of the stored books) can be of big sizes, which obviously require a significant increase in the number of nodes [20]. Therefore, storing large files using Blockchain technology is inefficient. That is, blockchain are not the right platform for sharing and storing large files. However, fortunately, file-sharing platforms can be leveraged to support applications while keeping the size of the blockchain small. So restrictions on block size require files to be partitioned and reassembled off the blockchain so one particularly chosen file-sharing platform is resorted to for this purpose, combining file sharing and hash files, which is IPFS (Inter Planetary File System). IPFS identifies, verifies, and transfers files based on hash files encrypted for their contents. For small publications all data stays within the Blockchain blocks without using IPFS.

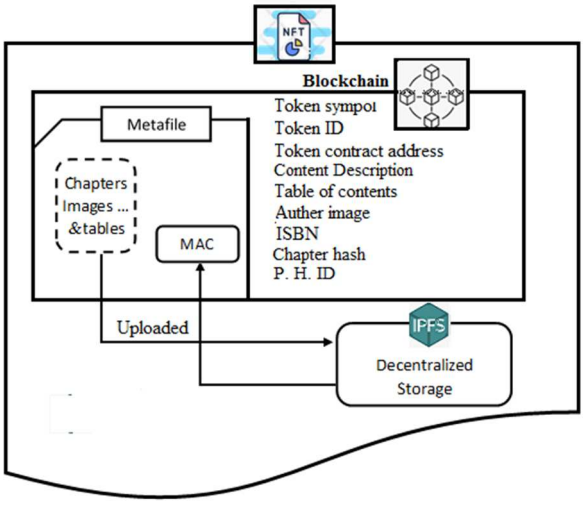

Figure 2 The main NFT components in the publishing industry

B. NFTS OPPORTUNITIES IN THE PUBLISHING INDUSTRY

Managing property rights is a major challenge for small and medium publishers, so legal documents explaining the partnership between copyright owners and publishers must be carefully defined. Most of the small and medium companies of publishing houses do not focus on this aspect, and the rights of the publisher remain wasted, especially those working in the literary field. The NFT smart contract contents system facilitates the management of equity and financial rights. Conditions and warnings are set and coded into the contract so that subsequent sales are automatically transferred to the creator's portfolio using a predefined ownership percentage [2]. In other words, NFTs are stored in, and verified by Blockchain, the original creator of the NFT can be identified, and hence can get a percentage of the new price of the resold asset (called "resale royalties") [3], as set in the original smart contract, at any time in the future, no matter how many wallets they go through [21, 22]. NFTs' shares are also possible to be created which allows a portion ownership instead of full possession of NFT since partial sail has been performed [2].

NFTs can offer a lot of advantages to books, chapters, and the publishing industry in general. What distinguishes NFTs from digital copies of books available on Amazon, Indiebound, or elsewhere is the association of this copy to the existence of the publishing house that issued it and their agreement to support the commodity. However, if the publishing house collapses, this book will disappear with the rest of its platform. With NFTs, you have a copy in a series of copies. In addition, the process of hacking this copy is much more difficult because its dealt with Blockchain. Another aspect of smart contracts is that percentages are included with each sale and the payment is instant and automatic. The contract can be included for emergencies and change of payments or even after the death of the author. Even more so is the resale potential, whereby the owner can put the NFT back up for sale again. Where the interested parties can reap additional profits permanently

C. NFT CHALLENGES IN PUBLISHING INDUSTRY

Great attention should be paid to the preservation of property rights, including intellectual property, when transferring assets from the virtual world to the physical world [23]. What still constitutes fundamental problems in the use of NFTs in general are speculation, fraud and loose legal regulation of their contract [2] . Hence, the safety and security of virtual platforms around the world are fundamental and require great attention to ensure their realization [7, 5].

In the following, we will review the challenges of using NFT in publishing through the main components of the NFT architecture.

1- blockchain

There are some challenges associated with blockchain networks [24, 25] in terms of storage requirements and energy consumption. The electronic work in publishing and preparing books on the one hand, and the marketing and promotion of these publications on the other, requires large interactions and multiple transactions, which leads to congestion in the blockchain network. Thus, it causes long confirmation times and high transaction fees.

In addition, the file sizes and publication materials, which contain a lot of images and graphs, are large compared to what

was initially designed in the Blockchain system. Therefore, NFT content needs a specialized decentralized storage system to accommodate the large number of files that need to be stored. Therefore, large files should be stored off-chain to free up space and avoid clutter.

Blockchain technology deals with IPFS (Inter Planetary File System), where IPFS identifies, verifies and transfers files relying on the cryptographic hashes of their contents. Therefore, the contents are stored off-chain and only the hash of each block is stored inside. These solutions share the idea of a peer-to-peer distributed file system, where data is sliced, encrypted, and distributed to multiple nodes in a network to ensure its integrity and availability. One of the main problems with these systems is the lack of access control [20].

2- Smart Contracts

As NFTs are crypto digital assets that use new technologies (blockchain and cryptocurrencies), there remains fear and uncertainty about how to permanently protect and secure a certificate of title (copyrights in publishing industry), which could pose a potential risk to the asset's ownership and value [26].

NFT clients (stakeholders, in our model) are linked through smart contracts that follow certain standards, such as ERC-721, ERC-1155 and Ethereum [27]. These contracts are usually embedded in market platforms to facilitate exchange between users, so these contracts must be correctly and accurately coded to avoid exploiting vulnerabilities, otherwise NFTs losing their value.

A common vulnerability (weakness) in smart contracts is re-entry and in our case there is a high probability of reentry as some books require each chapter to have its own NFT. This vulnerability allows this functionality to be executed externally [28]. This exploit can be devastating to the value of NFTs as this malicious user can copy a new copy of the NFT from the same smart contract address and thus it becomes difficult for users to distinguish it from the original.

3- Security and privacy

Security and privacy is a priority in every digital system, which representing the biggest challenge for every technology and digital solution connected to a public network, where data is at risk of losing the connection or hacking by unauthorized parties. It is important to consider the risks of fraudulent activities that may occur in the market, licensing and access to assets, intellectual property rights, etc., which may be associated with NFT [8]. The privacy of NFTs is still being studied to this day [29].

NFT security and privacy is inextricably linked to the security and privacy of its core components. Blockchain is related to the hash technology used in the process of securing information. Research into the development of the hash technology [30] used in Blockchain will enhance the security and privacy of NFT. The core of our upcoming research is to study the role of hashing in NFT components in more detail to discover their shortcomings and how to eliminate them and hopefully introduce new hashing techniques that use advanced mathematical algorithms that are more effective in protecting security and privacy.

CONCLUSION AND RECOMMENDATIONS

In this paper, we present a new trend in the potential use of NFT technology in the field of electronic book publishing. In contrast to the theoretical study presented by [3], we proposed an operational plan that links the publishing houses' work process to the NFT platform while identifying its core components. After studying the main features of the components of NFTs, it is explained how to overcome the difficulties of limited storage volumes in the Blockchain by using another storage platform IPFS. Although the use of an additional storage platform leads to the separation of the content of the stored material into two parts, which increases the possibility of hacking and access by third parties. Smart contracts are affected by the nature of the book's stored content, which forces multiple access to the contents of a book consisting of multiple chapters. Therefore, searches for specific topics require building an NFT for each chapter of the book. To secure these processes requires setting strict conditions and standards in smart contracts.

NFT technology is a guarantor of copyright even after the demise of the publishing house, because it adopts smart contract technology.

There is an urgent need for more research into the reliability of NFTs and the degree of property security by examining methods for securing key components of an NFT architecture.

NFT cannot be considered a bubble that may disappear as some have mentioned at any time, but it is a technology that may require more time to become a broader technology in securing digital and real (non-digital) properties.

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