



Non-Fungible Token-Based Waqf as an Innovative Financing Mechanism for Education in Marginalized Communities

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Abstract

This study explores the potential of Non-Fungible Token (NFT)-based waqf as an innovative model for financing education in marginalized communities. The emergence of blockchain technology enables digital assets to be uniquely identified, transparently managed, and sustainably utilized, creating new opportunities for productive waqf management. NFT waqf is positioned not only as a form of digital philanthropy but also as an instrument of Islamic social finance that strengthens equity and inclusiveness in educational access. The research applies a literature-based, descriptive-analytical method by reviewing classical waqf jurisprudence, blockchain applications, and current practices of digital waqf. Findings suggest that NFT waqf has strong potential to generate continuous financial resources through sales, auctions, and royalty mechanisms. These resources can be distributed to cover scholarships, improve learning facilities, and expand digital infrastructure in underprivileged communities. Despite its promise, several challenges remain, particularly related to regulatory frameworks, the digital literacy gap, and the need for clearer legal and sharia compliance of digital assets. To address these issues, the study recommends active collaboration among regulators, waqf managers, technology developers, and educational institutions. Such cooperation is essential to ensure the sustainability, legitimacy, and social impact of NFT waqf as a practical solution for inclusive and equitable education.

Penelitian ini mengeksplorasi potensi wakaf berbasis Non-Fungible Token (NFT) sebagai model inovatif untuk pembiayaan pendidikan di komunitas-komunitas terpinggirkan. Munculnya teknologi blockchain memungkinkan aset digital diidentifikasi secara unik, dikelola secara transparan, dan dimanfaatkan secara berkelanjutan, sehingga menciptakan peluang baru bagi pengelolaan wakaf yang produktif. Wakaf NFT diposisikan tidak hanya sebagai bentuk filantropi digital, tetapi juga sebagai instrumen keuangan sosial Islam yang memperkuat kesetaraan dan inklusivitas dalam akses pendidikan. Penelitian ini menerapkan metode deskriptif-analitis berbasis literatur dengan meninjau yurisprudensi wakaf klasik, aplikasi blockchain, dan praktik wakaf digital saat ini. Temuan menunjukkan bahwa wakaf NFT memiliki potensi kuat untuk menghasilkan sumber daya keuangan berkelanjutan melalui penjualan, lelang, dan mekanisme royalti. Sumber daya ini dapat didistribusikan untuk membiayai beasiswa, meningkatkan fasilitas pembelajaran, dan memperluas infrastruktur digital di komunitas kurang mampu. Meskipun menjanjikan, masih terdapat beberapa tantangan, terutama terkait



kerangka regulasi, kesenjangan literasi digital, serta kebutuhan akan kepatuhan hukum dan syariah yang lebih jelas terhadap aset digital. Untuk mengatasi masalah ini, studi ini merekomendasikan kolaborasi aktif antara regulator, pengelola wakaf, pengembang teknologi, dan lembaga pendidikan. Kerja sama semacam itu sangat penting untuk memastikan keberlanjutan, legitimasi, dan dampak sosial dari waqf NFT sebagai solusi praktis bagi pendidikan yang inklusif dan adil.

A. INTRODUCTION

Education is a fundamental factor in human development and in improving people's quality of life. Access to adequate education has been shown to have a significant impact on reducing poverty, increasing social mobility, and strengthening national competitiveness (UNICEF, UNESCO, & World Bank, 2022). Nevertheless, significant inequality in access to education persists, particularly among marginalized and underprivileged communities. In Indonesia, for example, the Central Statistics Agency (BPS, 2023) reported that school enrollment rates among low-income households continue to lag behind those of the upper-middle class, particularly at the secondary and tertiary levels. This gap underscores the need for more inclusive and sustainable education-financing mechanisms.

In the Islamic tradition, waqf has long been recognized as a socio-economic philanthropic instrument that plays a significant role in supporting public services, including education, health, and infrastructure development (Kahf, 2003; Hasan & Abdullah, 2018). The long-term, productive, and public-benefit character of waqf makes it a potential instrument for addressing disparities in access to education. However, waqf practice in many countries, including Indonesia, still faces challenges related to asset optimization, management transparency, and adaptation to digital technology (Ascarya, 2021).

The emergence of blockchain technology offers new opportunities to make waqf management more transparent, accountable, and sustainable. One emerging innovation is Non-Fungible Token (NFT)-based waqf. NFTs are unique digital assets that can be traded and verified via blockchain, ensuring authenticity, ownership, and a transparent transaction record (Taherdoost, 2023). Through sales, auctions, and royalty mechanisms, NFTs allow waqf to function not merely as a one-time donation but as a source of recurring income that supports the sustainability of social programs, including education (Saroh et al., 2023).

Furthermore, NFT waqf has the potential to expand public participation, particularly among younger generations who are more familiar with the digital ecosystem. This aligns with the rapidly growing trend of digital philanthropy in Indonesia and globally (Robbani et al., 2022). However, the implementation of NFT waqf also faces several challenges, including inadequate regulation, low public digital literacy, and the need for legal certainty and sharia compliance for digital assets (Hudaefi, 2020).

Building on this background, this study seeks to explore the potential of NFT waqf as an innovative model for financing education in marginalized communities. It reviews the foundations of classical waqf jurisprudence, developments in blockchain technology, and contemporary digital waqf practices in order to formulate the opportunities, challenges, and strategic recommendations for developing NFT waqf as an inclusive, equitable, and sustainable Islamic social finance instrument.

B. RESEARCH METHODOLOGY

This study employs a qualitative, descriptive-analytical approach based on a literature review. This approach was chosen because Non-Fungible Token (NFT)-based waqf is a relatively new topic that requires in-depth conceptual exploration before it can be empirically tested.

The research data were obtained from primary and secondary literature. Primary literature includes classical works on waqf jurisprudence, such as Ibn Qudamah's *Al-Mughni*, al-Nawawi's *Al-Majmu'*, and Ibn Rushd's *Bidayat al-Mujtahid*, which were used to examine the foundations of waqf jurisprudence. Secondary literature includes reputable journal articles, reports from international institutions such as UNESCO and the World Bank, regulatory documents related to waqf and digital assets in Indonesia, and recent publications discussing blockchain, NFTs, and digital waqf.

Data collection was conducted through a systematic literature review. The process involved developing search keywords such as NFT waqf, blockchain philanthropy, Islamic social finance, digital waqf, and education financing in marginalized communities. The literature search was conducted through international academic databases such as Scopus, Web of Science, and Google Scholar, as well as relevant national publications. Literature was then selected based on relevance to the topics of waqf, NFT, and education; a publication period of the last ten years (2013–

2023) for secondary literature; and the inclusion of classical waqf fiqh literature as a primary reference.

Data analysis was conducted in three stages. First, thematic classification grouped the literature into the dimensions of waqf concepts and jurisprudence, blockchain and NFT technology, digital philanthropy practices, and education financing for marginalized communities. Second, descriptive-analytical analysis was used to illustrate the concepts and compare findings across the literature regarding the potential, challenges, and opportunities of implementing NFT waqf. Third, conceptual synthesis was used to formulate an NFT waqf model as an instrument for financing sustainable education and to develop strategic recommendations for its implementation in Indonesia.

To ensure the validity and reliability of the findings, this research employed source triangulation. This involved comparing classical fiqh literature with contemporary waqf regulations in Indonesia, combining national and international literature to obtain a broader perspective, and integrating conceptual findings with recent empirical studies on blockchain and NFTs in the context of philanthropy.

Through this method, the study aims to present a comprehensive conceptual picture of the potential of NFT waqf as an instrument for financing education in marginalized communities, while also contributing novel insight to the fields of Islamic economics and digital philanthropy.

C. RESULTS AND DISCUSSION

Results

1. Digital Waqf

Waqf is a form of ongoing charity that plays a strategic role in supporting social development and strengthening the economic resilience of Muslim communities (Solihah & Abdulghani, 2022; Aziz, 2024). In today's modern era, marked by the acceleration of digital technology, waqf practice has also evolved through the integration of digital innovation, giving rise to what is known as digital waqf. This term refers to the application of information technology to facilitate the implementation of waqf, whether in the form of cash funds, digital assets, or online services. This development creates a new paradigm for charitable giving, in which community involvement is no longer limited by geographic distance or conventional administrative procedures.

Conceptually, digital waqf encompasses various methods of giving waqf through digital platforms, such as the official websites of waqf institutions, mobile-based applications, and blockchain technology. This innovation enables the Muslim community to perform waqf more easily, quickly, and transparently. With the support of an accountable and efficient digital system, the potential for waqf fundraising can be significantly maximized and improved (Rustariyuni, 2023; Auna, 2024). Within the sharia framework, the spirit of digital waqf remains grounded in the principle of sincerity and continuity of benefit (*istibdal al-manfa'ah*), as explained in the following hadith:

إِذَا مَاتَ الْإِنْسَانُ انْقَطَعَ عَنْهُ عَمَلُهُ إِلَّا مِنْ ثَلَاثٍ: صَدَقَةٍ جَارِيَةٍ أَوْ عِلْمٍ يُنْتَفَعُ بِهِ أَوْ وَلَدٍ صَالِحٍ يَدْعُو لَهُ

Meaning: "When a person dies, his deeds come to an end except for three: ongoing charity (*sadaqah jariyah*), beneficial knowledge, or a righteous child who prays for him." (Narrated by Muslim)

One of the main advantages of digital waqf lies in the ease of access and flexibility it offers. Through digital platforms such as mobile applications and the official websites of waqf institutions, donors can fulfil their waqf obligations instantly, without being constrained by time or location. This convenience makes waqf more inclusive and responsive to the lifestyle of modern society. Furthermore, transparency and efficiency in waqf-fund management have improved significantly through the integration of digital technology. Donors can monitor the use of waqf funds in real time — including management reports, benefit distribution, and program achievements — thereby increasing public trust in the institutions concerned (Kadir et al., 2023; Mayana & Pratama, 2022; Setiawan & Nurjaman, 2022). In the Qur'an, Al-Baqarah, verse 261, it is stated:

مَثَلُ الَّذِينَ يُنْفِقُونَ أَمْوَالَهُمْ فِي سَبِيلِ اللَّهِ كَمَثَلِ حَبَّةٍ أَتَتْ سَبْعَ سَاوِلَ فِي كُلِّ سُنبُلَةٍ مِائَةُ حَبَّةٍ وَاللَّهُ يُضَاعِفُ لِمَنْ يَشَاءُ وَاللَّهُ وَاسِعٌ عَلِيمٌ

Meaning: "The parable of those who spend their wealth in the way of Allah is like a seed which grows seven ears, and in every ear there are a hundred grains. And Allah multiplies (His reward) for whom He wills, and Allah is All-Encompassing, All-Knowing." (QS. Al-Baqarah: 261)

This verse emphasizes the importance of productive, impactful giving whose benefits can be traced and evaluated transparently. In the context of waqf digitalization, various forms of implementation have emerged in line with

technological advances. One such form is cash waqf, which can now be distributed through online transfer mechanisms, simplifying the donation process and expanding the reach of community participation, including through crowdfunding-based waqf platforms (Ramdhani, Mulyana, & Afendi, 2022). Another emerging form is digital-asset waqf, which covers assets such as cryptocurrency and legally donated ownership shares.

Digital waqf is not limited to financial contributions; it also includes contributions in the form of technology-based services, such as the development of software, applications, or educational platforms provided for public benefit. This type of waqf represents a form of digital philanthropic participation that aligns with the needs of the times and is relevant to the technology-savvy Muslim generation. Thus, the digitalization of waqf not only expands the range of waqf instruments but also opens up innovative space for Muslims to engage in social development through methods that are contextual and adaptive to the dynamics of the digital era (Saroh, 2023).

2. Characteristics of Non-Fungible Tokens

A Non-Fungible Token (NFT) is a digital representation of an asset that is unique and cannot be exchanged on a one-to-one basis with other digital tokens. In blockchain technology, an NFT is defined as a unit of data that cannot be duplicated, because each token carries its own unique identifying code that distinguishes it from every other token. As a result, NFTs do not possess the interchangeability that characterizes conventional crypto-assets. Unlike fungible cryptocurrencies such as Bitcoin or Ethereum, in which one unit holds a value identical to another, NFTs carry a unique, non-substitutable value. For instance, an NFT representing a particular piece of digital artwork cannot be replaced by another NFT, even if the two belong to the same general category. This characteristic shows that an NFT more closely resembles a digital collectible than a medium of exchange (Robbani, 2022).

NFTs are built on blockchain infrastructure — a permanent, transparent, distributed recording system. Although the Ethereum network is currently the dominant platform for NFT development, various other blockchains, such as Binance Smart Chain and Flow, have also developed support for this type of token. Blockchain allows all NFT-related transactions, including sale, purchase, and transfer of ownership, to be permanently recorded and publicly verified. Blockchain technology guarantees the authentication and ownership of NFTs because data stored within the

network cannot be unilaterally altered. Consequently, every activity involving an NFT is recorded in a transaction block, making the tracking of ownership history and asset validity highly transparent and accountable (Fauzi et al., 2023).

NFTs possess unique characteristics that significantly differentiate them from conventional digital assets. Their principal feature — non-fungibility — makes every NFT unique and impossible to duplicate. This uniqueness is determined by a special identifying code permanently recorded within the blockchain, a decentralized ledger technology that ensures security, transparency, and data integrity. It functions like a digital certificate of authenticity for an asset, one that cannot be replicated or falsified. In this sense, an NFT serves as legal proof of ownership of a particular digital asset, comparable to an authentication certificate for a rare physical artwork. Just as the painting Mona Lisa exists in only one original version, an NFT likewise represents an exclusive claim to a particular digital work. Every transaction involving an NFT — whether a sale, purchase, or transfer of ownership — is transparently and irrevocably recorded on the blockchain, allowing the public to openly trace its ownership history. This gives NFT owners a high degree of confidence, since the validity and legality of their digital assets can be verified at any time through the public blockchain network.

The reliability of blockchain-based verification has pushed NFTs beyond digital-art collections into broader applications such as property-rights certification, digital event tickets, and even virtual identity management. The ability of NFTs to guarantee the originality and uniqueness of an asset has attracted investor interest, positioning them as a potential investment alternative. Their fluctuating value — with the potential to rise alongside market demand — makes NFTs a high-risk asset with long-term promise (Dowling, 2022). An additional feature that makes NFTs attractive to creators is the automatic royalty system, which allows creators to receive a share of the profit each time their NFT is resold on secondary markets. This mechanism provides a sustainable incentive for artists, musicians, and digital content creators to continue producing original works in NFT form. NFTs therefore represent not only the economic value of digital assets but also an innovation in the monetization of creative work and its contribution to the global digital creative economy (Rustariyuni et al., 2023).

Discussion

1. Waqf as an Instrument of Educational Philanthropy

Waqf has a rich and profound history in the context of education, particularly in the empowerment of Muslim communities. Since classical times, waqf has been a crucial pillar in the development of educational institutions, including both madrasas and universities. One of the most famous examples is Al-Azhar University in Egypt, founded in the tenth century and largely funded through waqf. The waqf endowment at Al-Azhar not only provided access to education for thousands of students but also served as an influential center for the study of Islamic science and culture to this day (Kahf, 2003). In this sense, waqf functions as a mechanism that enables education to continue sustainably, providing the funds necessary for educational institutions to operate without relying on temporary funding sources.

The long-term nature of waqf makes it a vital instrument for providing public services, including education. Waqf provides educational institutions with stable and sustainable resources, allowing them to focus on curriculum development and teaching quality. However, in the contemporary era, waqf management in Indonesia still faces various challenges. One major obstacle is the low productivity of waqf assets: many waqf assets are not managed optimally and therefore fail to provide maximum benefit to the community. For example, unused or undeveloped waqf land can become a source of both financial and social loss.

Limited transparency is also a serious problem in waqf management. Many people hesitate to donate to waqf because of a lack of information about how waqf assets are managed and distributed, which has eroded public trust in waqf institutions. In addition, slow adaptation to digital technology presents a further challenge. Despite rapid technological advancement, many waqf institutions still rely on traditional asset-management methods, which prevents them from competing with more innovative institutions (Ascarya, 2021).

The NFT (Non-Fungible Token)-based waqf model is a new innovation in productive waqf management that utilizes blockchain technology. The process involves three main actors: the waqif, who owns the digital endowment asset; the waqf institution, which acts as manager (nazhir); and asnafpreneurs, the beneficiaries who are empowered through a productive business scheme. The systematic steps of the process are as follows.

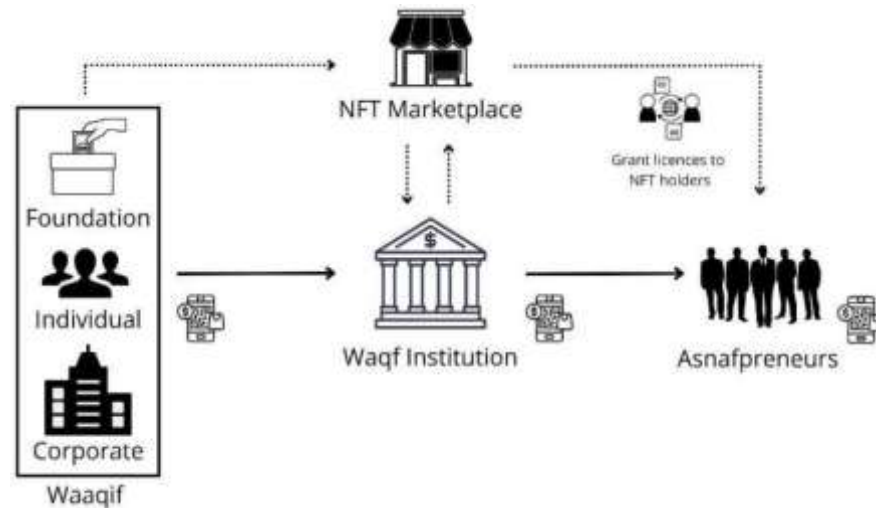


Figure 1. NFT Waqf Model Scheme. Source: Primary data (processed).

First, the process begins with the waqif, who owns a digital asset in the form of an NFT. This NFT may take the form of digital artwork, intellectual property rights, a metaverse asset, or a tokenized property certificate, held in the waqif's personal digital wallet. The waqif then explicitly declares the intention to endow the asset — either verbally or in writing on a digital platform — before transferring the NFT to the official digital wallet of the waqf institution. This transfer is executed through a smart contract designed specifically for waqf, which specifies the type of waqf contract (mu'abbad/perpetual or mu'aqqat/temporary) and its intended purpose.

Second, after receiving the NFT from the waqif, the waqf institution is responsible for verifying and validating its ownership and legality. This validation also includes assessing the NFT's economic benefit and its compliance with sharia principles, including ensuring that the waqf object does not contain any prohibited elements such as interest (riba), gambling (maysir), or excessive uncertainty (gharar). Once validation is complete, the NFT is recorded on a public blockchain to ensure transparency and accountability.

Third, the waqf institution manages the NFT asset through two strategic options: (1) using it directly as a productive waqf asset — for example, through copyright, content access, or digital licenses that generate ongoing royalties; or (2) converting it into cash through a sharia-compliant NFT marketplace. The proceeds from managing the NFT are then channelled into the productive waqf-fund portfolio and allocated to economic-empowerment programs.

Fourth, the proceeds from NFT management — whether royalties, sales revenue, or investment returns — are distributed to the waqf beneficiaries, namely

asnaf groups with entrepreneurial potential. These beneficiaries are empowered to become asnafpreneurs: micro-entrepreneurs who receive working capital, training, and market access through a productive waqf financing scheme. This process not only promotes the economic independence of mustahik but also strengthens a sharia-based economic ecosystem grounded in justice and sustainability. Every activity in this NFT waqf process is automatically recorded and monitored through the blockchain-based smart contract system, allowing the waqif, the waqf institution, and the public to access real-time transaction information through a digital waqf dashboard. This mechanism creates a reporting system that is accountable, transparent, and auditable, consistent with the principles of trust (amanah) and benefit (maslahah) in managing waqf assets.

From a jurisprudential perspective, a key question is whether an NFT can be categorized as *māl mutaqaawwim* — property that is recognized and legitimately owned under Islamic law. Some scholars argue that, despite being digital, an NFT can be considered property because it holds economic value and can be bought and sold. Others contend that an NFT remains too abstract and lacks the tangible benefit required to be categorized as an asset from a sharia perspective. Further *ijtihad* and scholarly study are therefore needed to clarify the legal status of NFTs in Islam, particularly regarding their use as waqf instruments.

2. Islamic Philanthropy and the Role of Blockchain

Blockchain is not merely a technological instrument; it is also a system capable of offering transparency, accountability, and reliability in every recorded transaction. Every transaction on the blockchain is openly traceable, permanent, and irreversible, giving donors assurance that the funds they distribute are genuinely used for their intended purpose (Muneeza, 2019). In the context of education, particularly for marginalized communities, trust in the fund-distribution system is crucial. One fundamental obstacle to educational-empowerment programs is public doubt about the accountability of fund managers, which often leads to minimal community participation. By utilizing blockchain, waqf is managed openly rather than in a closed manner, allowing the wider public to monitor the distribution of funds. This is particularly significant for marginalized communities, as it helps ensure that waqf contributions are genuinely directed toward financing learning facilities, providing scholarships and digital devices, and building educational infrastructure in underserved areas. Blockchain thus not only addresses the classic waqf problem of

public trust but also offers an innovative instrument that directly strengthens access to education for those most in need.

Furthermore, the development of Islamic fintech shows significant potential for increasing public participation in Islamic social finance, including in education. Integrating digital technology with Islamic philanthropic instruments — for example, through sharia-compliant crowdfunding platforms — enables communities to collectively contribute to strategic social projects. Unlike traditional philanthropic practices, this model not only facilitates small but cumulatively substantial donations but also allows donors to participate in setting funding priorities. For marginalized communities, this can be directed toward urgent programs such as building emergency schools, providing vocational skills training, expanding internet access for online learning, or strengthening the education ecosystem of Islamic boarding schools (*pesantren*). The transparency offered by digital platforms also helps ensure that every contribution truly reaches its intended beneficiaries, minimizing the risk of fund misuse.

From a broader perspective, the integration of digital waqf, blockchain, and Islamic fintech can help build a more inclusive and sustainable education ecosystem. Challenges faced by marginalized communities — such as limited learning resources, restricted access to higher education, and limited financial support for continuing education — can be gradually addressed through Islamic social-finance instruments optimized with digital technology. In other words, digital transformation is not only a technical tool but also a social instrument capable of narrowing the education gap between community groups. If managed systematically, digital-technology-based waqf can become an alternative financing source that expands access to education, strengthens social justice, and gives a new generation from marginalized communities equal opportunity to thrive.

3. NFT Waqf as an Education Financing Model

In an increasingly advanced digital era, NFT waqf has emerged as a highly relevant innovation for addressing the educational challenges faced by marginalized communities. Available data indicate that, between the 2022/2023 and 2023/2024 academic years, dropout rates increased across most education levels: from 0.17% to 0.19% at the elementary level, from 0.14% to 0.18% at the junior secondary level, and from 0.23% to 0.28% at the vocational secondary level (Badan Pusat Statistik [BPS] &

Kemendikbudristek data, as reported in GoodStats, 2024). According to the same source, the national dropout figure represents a substantial share of the roughly 30.2 million school-age children in Indonesia, with the highest concentration at the senior secondary level. In the so-called 3T regions (Disadvantaged, Outermost, and Frontier areas), the situation is far more critical — for example, the elementary-school dropout rate in Yalimo Regency, Papua, reportedly reached 2.40%, well above the national average of around 0.16%. This situation underscores the urgency of a more adaptive and sustainable waqf approach for marginalized communities.

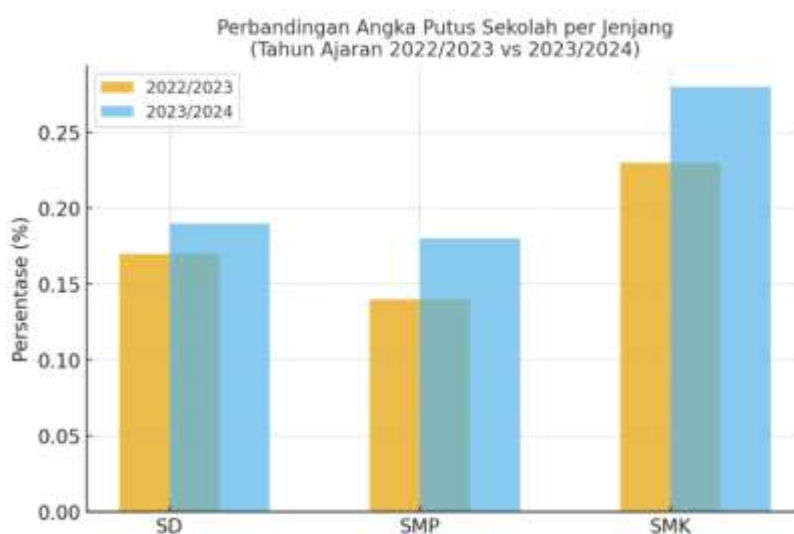


Figure 2. Comparative Chart of School Dropout Rates in Indonesia, 2022/2023–2023/2024. Source: as cited in text.

Beyond the sustainability of schooling itself, access to education is also a major issue. A survey by the Association of Indonesian Internet Service Providers (APJII) found that only 31% of students in underdeveloped villages have access to digital learning materials such as videos and e-books, while 12.5% do not use the internet for learning at all. More strikingly, nearly 40% of schools in Indonesia — from elementary to vocational secondary level — lack internet access, a figure that rises even further at the elementary level (45.94%). Given this situation, conventional waqf alone is insufficient; a model aligned with digital and inclusive conditions is needed.

This is where NFT waqf becomes highly strategic, for at least three reasons. First, by tokenizing students' work — such as artwork, academic projects, or other creative output — into a unique NFT format, nazhir institutions can auction or sell these works, with the proceeds allocated to educational funding such as scholarships,

learning facilities, or digital devices. This not only increases the available funding but also elevates the creative potential of students, particularly those from marginalized communities, into assets of economic and social value.

Second, the ongoing royalty structure of NFTs allows for a continuous flow of waqf funds each time an NFT is resold. This feature matters because marginalized communities often face funding uncertainty, and a one-time grant is rarely sufficient to address structural educational challenges. With ongoing royalties, NFT waqf can provide a more stable and predictable long-term financing instrument, underpinning the provision of books, infrastructure improvements, and internet access in marginalized areas.

Third, NFT-based crowdfunding opens up transnational participation. Through digital platforms, the Muslim diaspora and the wider global community can purchase NFTs representing contributions to educational projects — such as school construction, scholarships, or the provision of digital facilities in remote areas. These contributions strengthen solidarity and a shared sense of ownership of the educational-justice agenda, while helping to bridge geographic and economic gaps.

Overall, NFT waqf is more than a technological innovation; it is a transformative instrument that addresses two issues at once — the transparency and sustainability of waqf, and unequal access to education. Amid persistently high dropout rates, limited digital infrastructure, and the instability of conventional waqf funding, this model offers a holistic, inclusive, and long-term solution. As such, NFT waqf has the potential to become a new pillar of digital philanthropy, addressing the pressing needs of marginalized communities while strengthening social justice through education.

4. Challenges to Implementing NFT-Based Digital Waqf

Although the NFT waqf concept holds significant potential, its implementation faces a number of structural challenges that must be addressed from the outset. One major obstacle is regulation: Indonesia currently lacks a legal framework that explicitly governs the management of digital-asset-based waqf. This legal uncertainty has serious implications, as both nazhirs and donors are likely to hesitate to participate without legal assurance. Clear and progressive regulation is essential for establishing NFT waqf as a legitimate, measurable, and sustainable Islamic social-finance instrument; without a robust legal framework, the potential of NFT waqf will remain confined to discourse. Collaboration between the government, financial authorities,

the Indonesian Waqf Board (BWI), and sharia institutions is therefore urgently needed to formulate regulation that is responsive to technological development while upholding sharia principles.

Another significant challenge is low digital literacy, particularly among marginalized communities, who are the primary target of NFT waqf-based education programs. As noted above, a survey by the Association of Indonesian Internet Service Providers (APJII) found that nearly 40% of schools in Indonesia still lack internet access, while in remote villages only 31% of students have access to digital learning materials. Under these conditions, promoting the participation of marginalized communities in the blockchain ecosystem without first improving digital literacy is akin to building a house on an unstable foundation. Limited understanding of NFTs and blockchain risks creating new forms of digital exclusion, in which only the upper-middle class benefits from NFT waqf. Community-based outreach, training, and workshops are therefore essential to ensure that this technology does not become a symbol of "digital elitism" but instead becomes a genuinely inclusive instrument for educational empowerment.

Beyond regulatory and literacy issues, legal and sharia certainty are also central concerns. Classical waqf fiqh has not explicitly addressed digital assets as objects of waqf (*mauquf bih*), which raises doubts among scholars and practitioners. If these doubts are not promptly addressed through a fatwa or more specific fiqh guidelines, the potential of NFT waqf risks being constrained by normative resistance. Collaboration between ulama, academics, and legal practitioners is therefore essential to produce comprehensive sharia fatwas and regulations, so that NFT waqf can be accepted as a legal instrument consistent with *maqashid al-shariah*, particularly in ensuring fair access to education for all levels of society.

Equally important is the challenge posed by highly volatile crypto markets. Digital-asset prices can fluctuate dramatically within a short period, risking a decline in the value of NFT waqf. If this risk is not managed through thorough risk analysis, the primary goal of financing education in marginalized communities could be jeopardized. Mitigation strategies therefore need to be developed, such as portfolio diversification, the use of sharia-compliant stablecoins, or sharia-compliant hedging mechanisms. These measures would help ensure that, despite crypto-market volatility, the value of NFT waqf remains stable and continues to function as intended.

In sum, the success of NFT waqf as an education-financing instrument depends not only on technological sophistication but also on the extent to which these challenges can be strategically addressed. Clear regulation, widespread digital literacy, sharia legal certainty, and prudent risk management are essential foundations for NFT waqf to become a genuinely sustainable solution for education in marginalized communities.

5. Optimization Strategy

Addressing the challenges described above requires a comprehensive strategy that is not merely reactive but also proactive and forward-looking, so that the implementation of NFT waqf can be optimized. Four strategic priorities are proposed.

a. Multi-stakeholder collaboration

Regulation and governance of NFT waqf cannot rest solely with the government or the Indonesian Waqf Board (BWI). It requires synergy among regulators, nazhirs, technology developers, Islamic financial institutions, and educational institutions. In a collaborative approach, each party contributes according to its capacity: regulators provide legal certainty, religious scholars ensure sharia compliance, developers provide secure technological infrastructure, and educational institutions, as beneficiaries, ensure transparency in the distribution of funds. This cross-sector dialogue is essential to prevent policy fragmentation and to strengthen the social and legal legitimacy of NFT waqf.

b. Digital literacy education.

Digital literacy must be a systematic and sustained priority. The public's limited understanding of blockchain and NFTs can breed resistance and distrust. Digital literacy programs should therefore be designed at multiple levels: (1) basic education for the general public on the principles of digital waqf, (2) technical training for nazhirs and philanthropic institutions on managing digital assets, and (3) integration of digital literacy into the Islamic higher-education curriculum. With this tiered strategy, the NFT waqf ecosystem can become not only more inclusive but also capable of producing a generation of young Muslims who combine digital competence with a commitment to philanthropy.

c. A hybrid model combining NFT waqf with real assets.

This provides a strategic response to the risk of digital-market volatility by allowing the value of digital assets to be converted into more stable physical

infrastructure, such as schools, laboratories, or training centers. In this way, NFTs become not merely speculative instruments but a gateway to building concrete and sustainable educational facilities — for example, NFT auction proceeds could be allocated to constructing a school building, while the NFT certificate itself remains as proof of the donor's participation. This approach combines digital innovation with the Islamic tradition of philanthropy grounded in real assets, thereby strengthening its social and sharia legitimacy.

d. An adaptive regulatory framework.

Regulation that is too rigid will stifle innovation, while regulation that is too lax risks the misuse of assets. A revision of the Waqf Law and its derivative regulations under the Indonesian Waqf Board (BWI) is therefore needed to accommodate digital assets on the principle of technology neutrality. Such regulation should clarify the definition of digital assets as legitimate waqf objects, establish technological security standards, and formulate blockchain-based audit and transparency mechanisms. An adaptive legal framework of this kind would strengthen public trust by giving donors confidence that they are protected both legally and in accordance with sharia.

Taken together, these four strategies can move the implementation of NFT waqf from mere discourse toward a concrete digital-philanthropy model: cross-sector collaboration ensures legitimacy, digital literacy expands participation, the hybrid model strengthens the stability of benefits, and adaptive regulation creates legal certainty. Combined, these elements provide a solid foundation for NFT waqf to become not only a technological innovation but also a sustainable solution for equal access to education in marginalized communities.

D. CONCLUSION

This research confirms that the application of Non-Fungible Tokens (NFTs) in digital waqf management is a promising innovation for increasing the effectiveness and accountability of waqf-asset distribution. NFTs enable the digital certification of waqf assets, guaranteeing authenticity, ownership, and real-time tracking of benefits. This concept of asset tokenization also encourages the involvement of the digital-native generation in Islamic philanthropic activities, thereby expanding the reach of inclusive social participation.

From the perspective of Islamic law, an NFT can be used as a valid waqf instrument if it satisfies sharia principles such as *milkiyyah* (legitimate ownership),

clarity of benefit, and freedom from gharar, maysir, and riba. With an adaptive approach to fiqh muamalah and an appropriate contractual scheme, an NFT can be categorized as *māl mutaqaawwim* that carries value for society.

This research offers several novel contributions: the integration of fiqh muamalah principles with NFT technology as a new theoretical approach; a conceptual model for waqf-asset tokenization that combines economic, legal, and technological dimensions; and the identification of practical opportunities and challenges in developing a digital waqf ecosystem.

These findings are relevant not only theoretically — by expanding Islamic legal discourse on digital assets — but also practically, by supporting more inclusive and efficient waqf management. At the policy level, cross-sector synergy is needed among regulators, waqf institutions, religious scholars, and technology developers to realize a digital waqf system that is secure, transparent, and sharia-compliant. In this way, NFTs can become a strategic instrument for optimizing productive waqf in order to achieve community welfare in the digital economy era.

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