Navigating The Legal Landscape of Real Estate Tokenization: Analysis of Deed Recording on The Blockchain and Potential Challenges

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Recommended Citation
Smith, Jada Nicole, "Navigating The Legal Landscape of Real Estate Tokenization: Analysis of Deed Recording on The Blockchain and Potential Challenges" (2024). Featured Student Work. 15. https://repository.usfca.edu/studentwork/15
Navigating The Legal Landscape of Real Estate Tokenization: Analysis of Deed Recording on The Blockchain and Potential Challenges.

By: Jada Smith

I. INTRODUCTION

Blockchain technology has the potential to revolutionize the real estate industry, particularly in the secure and transparent recording of deeds. Blockchain is a shared, immutable ledger that facilitates the process of recording transactions and tracking assets in a business network.¹ A blockchain is maintained by a network of peers who are operating without a centralized authority, like a bank. The system is managed by many computers or nodes² acting as one network through code resulting in a record that cannot be altered retroactively without the consensus of the network.³ Unlike the traditional system, information can be seen by everyone and is etched in the ledger forever. Why is this important? This technology allows peer-to-peer transacting without the need for a 3rd party intermediary. Almost anything of value can be tracked and traded on the blockchain.⁴

The real estate industry is very complex with a lengthy transfer process that can benefit greatly from blockchain technology. This paper will explore the importance of blockchain as a secure and transparent means of recording and verifying real estate transactions and offer

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² Nodes are generally computer systems that contain a copy of a blockchain's primary protocol and its entire transaction history. Worldcoin, *What's a Blockchain Node?*, WORLDCOIN, (Sept. 4, 2023), https://worldcoin.org/articles/what-is-a-blockchain-node.
⁴ IBM, *supra* note 1.
recommendations to policymakers, legal practitioners, and real estate professionals. Specifically, Part I will discuss the current legal landscape of recording deeds, the benefits of recording deeds on the blockchain, legal issues that we have seen or will see with this technology, and recommendations for the future implications of blockchain technology in real estate transactions. Part II of this paper will discuss background information on traditional real estate and deed recording, including current problems with the system as is. This section will also introduce blockchain technology and its key benefits for recording deeds on the blockchain. Part III will discuss the legal issues surrounding the lack of legal recognition of blockchain technology in some jurisdictions, enforcement of smart contracts, successful implementation of blockchain-based land registries like California, Sweden, and India, and the challenges faced with this technology. Part IV will explore the benefits of tokenization as a means to promote inclusivity and broaden the investor pools. Lastly, Part V will discuss recommendations and future implications for blockchain technology including a potential legal framework for blockchain-based land registries.

II. BACKGROUND

A. Traditional Real Estate Transactions and Deed Recording:

Typically, a property sale involves a sale from the buyer to the seller, and then a recording of the deed. Deed recording serves as an important part of our system as a way to protect property owners and to ensure the property belongs to who they say it does. Traditionally, real estate transactions were paper-based, with the deed recorded into a volume filled with other deeds stored on shelves containing hundreds of other volumes. A deed could also be a photograph,

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placed on microfiche in a public land recorder’s office. The Uniform Real Property Electronic Recording Act (URPERA), which most states have adopted, allows local recording offices to accept deeds and other property records in electronic form.

Before the deed is recorded, buyers are subject to a somewhat complicated regime of title searching through a tract index to see if there are any encumbrances or easements on the land that might affect purchasing. This title search consists of searching the seller’s name in the grantee index and finding the name of the person they purchased the property from, where that deed can be found, and when it was recorded. This process continues deed by deed, with each grantee until they reach an ending point to which the process starts and continues again, this time in the grantor index. Beginning with the first grantor in the chain of title, the potential buyer would look forward in time, looking under each grantor’s name deed by deed to see if they conveyed an interest to anyone who is not in the known chain of title. This process can prevent instances like buying a home from a seller just to quickly learn that there was an easement, a right of access across your property given to an unknown person that prevents you from making any substantial changes to the use and enjoyment of your land.

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6 Id.
9 Sprankling & Coletta, supra note 5, at 561.
10 Id.
11 Id.
Imagine that there was an easement on the side of your property that extends to a lake, and you would like to expand your property in the area where that easement is to build a guest house or to fence off the area. This easement would prevent the buyer from the ability to build on the property for the life of the property, due to the easement. Some states may have statutory provisions that limit the title searching to forty years, which would mean a buyer would only be subject to any encumbrance affecting the property within that span of years. This could surely protect the buyer but does not eliminate the labor-intensive process of checking the records to protect themselves and the hope that anything affecting the title was recorded and was not subject to any human error.

Traditional real estate transacting can also be too expensive. Recording office staff must review and process the physical documents which can be very time-consuming, especially with more complex transactions as the industry is driven by age-old and paper heavy processes. Physical storage of these documents is also significant considering the number of land transactions that happen over time and the need to maintain the system over time. Most importantly, with the traditional way of recording and processing deeds, the system is subject to human errors that can be detrimental to the value of the property and result in additional costs in litigation fighting over ownership. This likely could result in the recorder's office and other parties outside of the buyer and seller at issue, being brought into the swarm of litigation. Overall, the traditional method of recording has the potential to subject buyers to expensive and labor-producing effects.

12 Id.
14 Id.
B. Blockchain Technology Key Features

Recording deeds on the blockchain provides a lot of benefits. First, blockchain technology is immutable and on a decentralized ledger that can be accessible by all parties.\(^\text{15}\) This transparency gives buyers and sellers peace of mind knowing that the transaction is secure and tamper-proof. Transactions are also verified by the people running the node that can check whether a transaction is legitimate or not before adding the block to the chain.\(^\text{16}\) Second, recording deeds on the blockchain can be more efficient. This technology allows buyers and sellers to automate the process of transferring ownership, reducing time and resources. This process can be completed in minutes, whereas traditional real estate transactions can take weeks or even months to complete.\(^\text{17}\)

Third, this technology helps with privacy and security concerns. Any traditional system can be vulnerable to data breaches and cyber-attacks. Blockchain technology is more secure than the traditional system in that a cyber-attack would require a 51% attack on the network, meaning a miner\(^\text{18}\) would have to rally enough resources to attack more than 50% of the network’s mining power to take control.\(^\text{19}\) This effort is practically impossible due to the exhaustion of computing power. Lastly, the blockchain reduces the need for intermediaries. With blockchain, buyers and


\(^{16}\) Id.


\(^{19}\) The Investopedia Team, 51% Attack: Definition, Who Is At Risk, Example, and Cost, INVESTOPEDIA, (June 07, 2023), https://www.investopedia.com/terms/1/51-attack.asp#:~:text=A%2051%25%20attack%20is%20an%20attack%20on%20the%20blockchain.
sellers can transact peer-to-peer without the need for third-party interference.\textsuperscript{20} Traditionally, real estate transactions include transacting with a title company, real estate attorneys, banks, and sometimes agents.\textsuperscript{21} These intermediaries drive up costs because everyone in the middle of the transaction takes a cut. Removing all middlemen and transacting on the blockchain can save both parties lots of money.

III. LEGAL ISSUES WITH BLOCKCHAIN

A. Lack of Legal Recognition and Privacy Concerns

There is currently a lack of legal acceptance of blockchain technology in some jurisdictions.\textsuperscript{22} For example, nine countries have banned cryptocurrency completely and have deemed it illegal.\textsuperscript{23} Those countries are Algeria, Bangladesh, China, Egypt, Iraq, Morocco, Nepal, Qatar, and Tunisia.\textsuperscript{24}

In the United States, most states require recording with county recorders who oftentimes have no legal recognition of blockchain technology as a valid means of recording deeds. Instead of transacting in this way, states require deeds to be recorded traditionally. The lack of knowledge and use of this technology as a form of recording gives blockchain technology a sense of uncertainty and deters the adoption of blockchain-based land registries.

\textsuperscript{21} Allison Landa, \textit{Who is Present at Closing? Get to Know the Faces of Your Home Sale’s Grand Finale}, HOMELIGHT, (Dec. 31, 2018), \url{https://www.homelight.com/blog/who-is-present-at-closing/}.
\textsuperscript{22} Julio V. Perez, \textit{Countries Where Cryptocurrency is Legal and Illegal}, MONEY, (Oct. 21, 2022), \url{https://money.com/cryptocurrency-legal-status-by-country/}.
\textsuperscript{23} Id.
\textsuperscript{24} Id.
In California, Government Code 27287 emphasizes that the law requires that grant deeds are notarized, and the County Recorder will not accept the grant deed without a notary acknowledgment. This means that even if blockchain technology was considered a viable means, there would still be an additional notary component. On-chain KYC could be a solution to mitigate the need for a notary because it utilizes blockchain technology to enhance the integrity and confidentiality of personal documents; thus there is a sense of clarity that a person is who they say they are. The information is stored on a distributed ledger using cryptography which ensures enhanced security reducing exposure to fraud. This is just one example of how blockchain can be used as a backdoor to curb present legal issues.

California has already begun transacting on the blockchain with its first property sale in Daly City, CA. There, the property was executed via Ethereum smart contracts, making it the first residential transaction to be fully executed end-to-end on a blockchain platform. The process between the buyer and seller took only 45 minutes and was conducted on Propy, a global real estate platform that utilizes blockchain technology to conduct residential property transactions. Transacting in this way speeds up the slow and disorganized process that traditional real estate can bring. Propy consists of only five steps when purchasing real estate. Those steps are 1)
property choice (finding a property on their list of properties); 2) generation of the purchase and sale agreement that gets recorded on the blockchain (with ownership being verified by a 3rd party); 3) additional documents like a disclosure and title reports; 4) payment for the property; and 5) the title deed with a blockchain address. This platform has become the number one blockchain real estate platform and is a great example of deed recording moving in the right direction.

It is evident that the technology is effective, nevertheless, it is not the usual mode of transacting. Governor Gavin Newsom, recognizing the potential of this game-changing technology, signed a law that established the option of using blockchain to deliver individuals’ records, such as birth and marriage certificates, in California. This blockchain-based delivery of records being accepted is a victory for California, as it provides a faster, more secure, and more transparent way of delivering records. However, regulations regarding a blockchain option for deed recording have not yet been passed. Nevertheless, this is a promising sign that the state of California is keeping up with technological advancements and adapting to new methods of transacting. Hopefully, this is a sign that deed recording is next.

B. Enforcement of Smart Contracts

To record deeds on a blockchain, buyers and sellers transact using a smart contract. Boiled down to its very essence, a smart contract is a transaction protocol that self-executes when certain pre-
determined conditions are met. To use a vending machine example, when you buy a bag of chips from a vending machine, you insert your dollar which gets verified to determine if the money is real or counterfeit. Then, once determined that the currency is real and you have selected an option, the machine is programmed to release a particular item such as your chips. Similarly, a smart contract self-executes actions that the parties set when certain conditions are met like the transfer of funds for a house. They follow a simple “if/when…then.” scenario.

On September 30th, 2018, Bill AB 2658, was passed by the California State Legislature and was signed into law recognizing smart contracts as valid contracts under state contract law. This is a push in the direction of blockchain for California because although blockchain may have hiccups with legal recognition for recording deeds, there is clarity and recognition for the use of smart contracts in electronic transactions. With this huge step by California, companies and even individuals could have greater confidence to transact in this way promoting the use of blockchain throughout. This also reduces traditional contract costs and exposure to litigation in the event of disputes because of its self-executing feature. For example, in traditional contracts, you have two parties that are transacting through means of a written agreement. That agreement may state the terms, but the parties can deviate from what is written. In a smart contract, the terms are locked in place and only go into effect when the other party has offered their share of the bargain. Using the vending machine example, if you place a dollar in a machine for an item that costs a dollar and fifty cents, the machine knows not to disperse the item. In a traditional contract situation, parties can “short-change” each other and can bring up defenses or any other mechanisms to

35 Id.
36 https://legiscan.com/CA/text/AB2658/id/1732549
back out of the contract. With smart contracts, there's transparency and no need to trust or worry about the other party not bringing their share of the bargain. With this transparency and lack of trust, this could be a method the court could use to cut down on mediation and resolve disputes which saves time and money.

C. Implementation of Blockchain-based Land Registries

1. Successful Implementation

In countries where there is no centralized land registry for real property ownership, this form of recording can be beneficial. For example, Sweden has been using blockchain-based land registries since 2017.37 There, the Swedish mapping, cadastral, and land registration authority (Lantmäteriet) started a pilot project using smart contracts for recording property-based transactions on the blockchain.38 They used the technology as a way to save time and money while exploiting the built-in transparency and security of the blockchain technology.39 India also has been using a blockchain-based recording system since 2018. Their exposure to the technology is fueled by an effort to make it more reliable considering 67 percent of the total 220 million people there are dependent upon the land to earn a living.40 They used the Ethereum blockchain and smart contracts to insert the terms of the agreements in lines of code.41

38 Id.
39 Id.
41 Id.
In California, the city of South Burlington partnered with Propy to develop a blockchain-based deed registration system giving them the ability to scan, cryptographically secure, and store deeds on the Ethereum blockchain.\textsuperscript{42} This is currently still a pilot project that is in the works for California, but this could trigger the government to switch to this form of secure and transparent transacting.\textsuperscript{43}

These case studies demonstrate various applications of blockchain technology and provide practical examples of how this technology can be utilized to bring significant benefits to land registry systems worldwide. Sweden and India demonstrate how blockchain can enhance efficiency and trust in property transactions, which is particularly vital in regions where bureaucratic delays and legal disputes are common. The pilot program in South Burlington also highlights blockchain's potential to offer secure, transparent, and cost-effective solutions that can be adapted to different legal and administrative contexts. Collectively, these examples demonstrate how blockchain can revolutionize land registration and advocate for its broader adoption as a viable solution to contemporary challenges in land management and governance.

2. Challenges Faced

New technologies are often met with some pushback and potential challenges. Deeds have been recorded in a centralized way for ages so there may be a question of whether deed recording can truly move over from its current state to a blockchain-based secure form. Additionally, existing


\textsuperscript{43} \textit{Id.}
issues with traditional recording methods, such as fraudulent deed transfers and disputes over ownership, complicate the situation. Jurisdictions may vary, with some requiring not just a record of a transaction but also adherence to "first-in-time" principles. Given the unstable foundation of the current real estate system as evidenced by some of the problems listed in this paper, there are significant concerns about integrating historical data into a new blockchain system. Despite blockchain's benefits of immutability and accessibility, these transitions pose substantial challenges causing a perhaps major delay.

Another major issue is the question of who has access to the records. Should there be a public blockchain open to everyone or a private blockchain where parameters are set to who has access?44 If everyone has access, concerns arise over who is responsible for maintaining records. Moreover, privacy concerns may arise due to broad accessibility that can conflict with stringent privacy regulations such as CCPA (California Consumer Privacy Act) and GDPR (General Data Protection Regulation). Both regulations give individuals the right to access their data and, in some cases, request its deletion.

The CCPA requires that consumers know what personal information is collected, who it is shared with, and the purpose behind it.45 Specifically, businesses must disclose to consumers at or before the point of data collection what these collected categories of personal information are.46 This level of transparency and protection is crucial in blockchain, but if the information is

46 Id.
public due to the immutable nature of blockchain, this information may be disclosed to an undefined and unlimited number of users conflicting with the privacy laws purpose. Additionally, under this law, customers can request information to be deleted but this poses as a challenge when the structure of blockchain is intended to be permanent and unchangeable.

Similarly, GDPR requires transparent processing of personal data, only for the purpose for which it was collected. The law ensures that individuals are fully aware of the scope and intent of the processing, limiting the purpose of the data. This could be difficult in blockchain because it often involves complex processing activities and with the decentralized nature, this data has the possibility to be processed across multiple nodes. Additionally, if the data were to be processed for a new purpose that the prior one, it would be challenging to alter this information because the blockchain is immutable. This directly goes against why the blockchain was created in the first place.

Introducing blockchain in land registries while achieving compliance with these laws is therefore challenging. Public blockchains store data in a decentralized and immutable manner, which can go against GDPR's "right to be forgotten." Private blockchains are generally considered to require robust mechanisms to control access to sensitive information, ensuring that only

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48 Id.
authorized parties can view or modify it. Additionally, they would likely need to incorporate mechanisms for data correction and deletion to align with privacy laws.

To address these concerns, developers could consider hybrid models that combine the transparency and efficiency of public blockchains with the privacy controls of private networks. Advanced cryptographic techniques like zero-knowledge proofs\footnote{What is Zero-Knowledge Proof?, CHAINLINK, (Nov 30, 2023), \url{https://chain.link/education/zero-knowledge-proof-zkp}} can enable transaction verification without revealing underlying data, aligning blockchain technologies with CCPA and GDPR requirements. Additionally, ongoing governance and compliance frameworks would need to be established to monitor and enforce these privacy protections in real-time, adapting to technological and regulatory changes.

IV. BENEFITS OF TOKENIZATION TO PROMOTE INCLUSIVITY

Recording deeds on the blockchain is just one aspect but there are many other use cases of blockchain in real estate, like the use of tokenization. Real estate tokenization is a revolutionary way in how ownership of real estate assets is structured. By digitizing real estate assets and representing ownership as digital tokens on a blockchain, tokenization offers the potential to democratize real estate investment and increase accessibility for a broader range of investors.\footnote{Andres Zunino, The Future Of Real Estate: Tokenization And Its Impact On The Industry, FORBES, (May 22, 2023), \url{https://www.forbes.com/sites/forbestechcouncil/2023/05/22/the-future-of-real-estate-tokenization-and-its-impact-on-the-industry/?sh=2b0b706346bf}} Tokenization uses automated smart contracts just like in deed recording, allowing for greater traceability and regulatory efficiency.\footnote{Id.}
A. Fractional Ownership and Lower Barriers to Entry

One of the key advantages of real estate tokenization is its ability to enable fractional ownership of real estate assets. How fractional ownership works is that a property is broken down into smaller, tradable units, allowing each unit to represent a fraction of that property.\textsuperscript{53} For example, a three-bedroom property can be divided by three people allowing person one to own the master bedroom, person two owning another bedroom, and person three owning the last bedroom. Each room represents a token, and these tokens are issued on a blockchain platform, where they can be bought, sold, and traded.\textsuperscript{54} Each person can collect rent payments on solely their share allowing them to benefit as an owner without buying the entire property. This has a transformative impact on inclusivity and expansion of investor pools because of the accessibility in owning a room versus the entire property. Owning property does not have to be a thing that is unaffordable. Tokenization empowers a wide range of investors to diversify their portfolios and build wealth even if capital is limited.

B. Access to Global Markets

Tokenization also facilitates access to global real estate markets, providing investors with opportunities to invest in properties around the world.\textsuperscript{55} Through tokenized offerings, investors can access a diverse range of properties across different geographic locations and asset classes, regardless of their physical location or financial resources.\textsuperscript{56} This global accessibility broadens

\textsuperscript{53} Id.

\textsuperscript{54} Spydra, The Future of Real Estate: Exploring the Benefits of Tokenizing Property Assets, MEDIUM, (Mar 01, 2024), \url{https://medium.com/coinmonks/the-future-of-real-estate-exploring-the-benefits-of-tokenizing-property-assets-0db4f5a4ea00}

\textsuperscript{55} Exploring the trends in the tokenization of Real Estate, PROPTECH JOBS, (2024), \url{https://proptechjobs.com/exploring-the-trends-in-the-tokenization-of-real-estate/}

\textsuperscript{56} Id.
the investor pool, fosters cross-border investment, and promotes inclusivity in real estate markets.

C. Enhanced Liquidity and Secondary Markets

In addition to increasing accessibility, tokenization enhances liquidity in real estate markets by enabling the trading of real estate tokens on secondary markets. Unlike traditional real estate investments, which can be illiquid and require significant time and effort to buy or sell, tokenized assets offer investors the flexibility to trade their property easier. This enhanced liquidity can improve accessibility for investors, encourage greater participation in real estate markets, and contribute to the expansion of investor pools. With the ability to invest in high-value properties or even to build diverse portfolios presents an opportunity for investors to build wealth. There is a gateway to so many untapped investment opportunities.

D. Practical Application of Tokenization for Inclusivity

Numerous real-world projects have successfully leveraged tokenization to promote inclusivity and broaden investor pools in real estate markets. From fractional ownership platforms that enable retail investors to access high-value properties to tokenized real estate investment trusts (REITs) that offer diversified portfolios of real estate assets, these initiatives have democratized access to real estate investment and generated positive social and economic impacts.

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58 *Id.*
USP is an example of a platform that hosts a marketplace for tokenized real estate where you can buy ownership in various properties. While there are many platforms that cater to investors with a minimum investment threshold, USP allows transaction with little as $1. This is just one example of the transformative potential of tokenization but there are more.

Tokenization is heavy used in the art and collectible space. Typically, while this space is reserved historically for weather investors and collectors, tokenization has allowed these rare collectables to be accessible to a wider audience. Syngum bank tokenized Pablo Picasso’s 1964 “Fillette au beret” painting which allowed 50 investors to purchase 4,000 tokens representing fractional ownership. Curioinvest also tokenized collectible cars.

E. Regulatory Considerations and Challenges

Tokenization of real estate assets offers many benefits, but it also presents regulatory challenges that need to be addressed for its widespread adoption. Some of these challenges are market adoption, operational complexity, valuation concerns, and security threats. Different jurisdictions also have varying regulatory frameworks governing tokenized assets, investor protection, and legal recognition of digital securities, which require careful navigation. These technological challenges such as security, scalability, and interoperability must also be overcome to ensure the reliability and integrity of tokenized real estate assets. For instance, digital asset

59 How It Works, USP, (2024), https://usp.io/learn/how/
60 Id.
62 Id.
63 Id.
regulation is still uncertain in many parts of the world, creating risks for prospective issuers and users.\textsuperscript{65} Regulatory challenges seem to be a major issue in this uncertainty, and web3, in general, has faced fraud cases, bankruptcies, and enforcement actions over the past year. There must be a balance between focusing on the cryptocurrency as opposed to the underlying infrastructure but there still is hope as there is a renewed interest in blockchain as opposed to crypto, which has created opportunities for tokenization.\textsuperscript{66} It is predicted that tokenized digital securities alone will reach $4-$5 trillion by 2030.\textsuperscript{67}

By addressing some of these regulatory considerations and challenges, stakeholders can unlock the full potential of tokenization to promote inclusivity and broaden investor pools in real estate markets.

V. RECOMMENDATIONS AND FUTURE IMPLICATIONS

As we explored the potential of tokenization to transform the real estate market and make investment more accessible, it is essential to address the foundational processes that enable these innovations. To integrate blockchain technology effectively into the real estate sector, we need not only innovative concepts like tokenization but also robust frameworks for recording deeds. The potential of blockchain goes beyond tokenization, changing the way we register and transfer property ownership. Therefore, while tokenization offers a glimpse into the future of the real estate market, it also highlights the need for a comprehensive approach to implementing blockchain across all aspects of real estate documentation and transactions.

\textsuperscript{65} Id.
\textsuperscript{67} Id.
The following recommendations aim to improve the underlying systems that support traditional and innovative practices, ensuring that blockchain's benefits can be fully realized. Although real estate tokenization has some issues to work through, states and municipal jurisdictions can take different steps within the system to make it a well-oiled machine.

A. Increased Research

The first hurdle right now is the lack of research and understanding of blockchain in traditional real estate industries. Land registries should have an additional requirement to understand at least the basics of blockchain to be able to well inform others of potential options. In California where traditional notarization is required, adding identity verification services that comply with applicable digital verification standards could be beneficial. Although merging centralized and decentralized methods can be seen to strip the very nature in which web3 was created, a hybrid approach as noted above, could be a viable solution to spreading the knowledge of blockchain.

B. Proposed Statutes & Litigation Strategies

Statutes that legally recognize the validity of blockchain-based property records could make it easier for businesses to switch over. The legal certainty that owners who use blockchain could have is enormous because, without legal recognition when litigation arises, there may be no recourse. Stakeholders would likely feel more comfortable investing in a company that they

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68 Centralized methods compromise security because there is a single point of failure. With a hybrid system, the lack of security and transparency can exist. Blockchain is a trustless system and centralized methods cut into the ability for that to stand true.
know is legally protected. Records would likely be able to be used in court as well. This effect can even spill over to government agencies who transact with other agencies.

C. Local State & Federal Government Protection

Like the countries mentioned above, different branches of government can conduct pilot programs for blockchain-based deed recording to test the effectiveness and identify legal challenges that need to be addressed. With the number of inaccurate deeds and fraud, this could be a major target in the pilot program to figure out ways to address this. Sandboxing\(^69\) can add another layer on top of this. Sandboxing is using an isolated environment or “sandbox” to conduct testing without affecting the application, system, or platform.\(^70\) Software developers will use sandboxing to test code safety.\(^71\)

As applied here, local, state, and federal governments can create a controlled environment where they test out different scenarios for smoothly rolling over to deed recording on the blockchain and areas of improvement without the need to take a huge pilot project. They could also invest in venture capital funds that are already working on solutions in the space. Lastly, they can work with Propy or Contracoin,\(^72\) another real estate blockchain-based platform, to figure out ways to introduce this method into our current system. These partnerships could provide funding for the pilot programs and the results could be used to further widen the adoption.


\(^70\) *Id.*


D. Incentives

Various incentives can be offered to property owners to stimulate the adoption of blockchain technology in real estate transactions. One effective incentive is the waiving of recording fees traditionally associated with deed recording. These fees can often be substantial and serve as a significant deterrent to adopting new methods. By exempting property owners from these fees when they choose to utilize blockchain for deed recording, governments or regulatory bodies can provide a tangible benefit that encourages the transition to blockchain-based systems. Over time, the cost savings realized from using blockchain over traditional methods could prove to be substantial, potentially outweighing the waived fees and making it a sustainable incentive model in the long run.

Another avenue for incentivizing blockchain adoption is through tax incentives. Governments could introduce tax credits or deductions for property owners who opt to record their deeds on a blockchain. These incentives could apply to expenses related to blockchain implementation, including software development, training, and maintenance costs. By alleviating some of the financial burdens associated with adopting blockchain technology, property owners are more likely to embrace the innovation, leading to broader adoption and the associated benefits of increased transparency, security, and efficiency in real estate transactions.

VI. Policy Implications

A. Racial Inequalities

Racial inequalities are very prevalent in the real estate industry and blockchain can help solve this. According to the New York Times, out of roughly 112,000 real estate development
companies in the United States, about 111,000 are white-owned. The lack of success can be attributed to the inaccessibility of capital which has historically been an issue in black and brown communities. Blockchain allows transactions without historical barriers. If you want to buy a home in California, the power of blockchain could allow the transaction to go through without the need for bias and knowing what race a buyer or seller is.

There was a three-year study done by Newsday that used two undercover testers, one black-identified and one white-identified, to participate in an experiment where they tried to purchase a home. They presented similar financial profiles and requested identical terms for houses in the same area. The result led to agents directing minorities to different neighborhoods than their white counterparts, giving them fewer housing listings, putting them under greater financial scrutiny, and disparaging minority communities when speaking with white people. Blockchain helps protect individuals from the harm of being unfairly deprived of equal opportunity.

The switch over to blockchain also has the potential to help low-income individuals cut down on costs by transacting peer-to-peer. It is a privilege to be able to afford to buy a home and even more, the ability to pay for things along the way of the buying process. Deleting the middleman can be the difference between being able to afford a home in a more desirable zip code and settling for a less preferred area. People could be able to invest in their preferred locations.

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74 Id.
76 Id.
77 Id.
B. Ethical and Societal Implications

Blockchain technology has the potential to revolutionize various industries and solve long-standing issues, but its adoption raises important ethical and societal concerns that must be carefully considered. One such consideration is the potential to exacerbate existing digital disparities and inequalities in technology access as blockchain-based solutions become more widespread.\textsuperscript{78} Marginalized communities with limited access to technology may be further marginalized, resulting in worsening socio-economic inequalities.\textsuperscript{79} Additionally, the complexity of blockchain technology may pose a steep learning curve, preventing widespread understanding and adoption. This could lead to a scenario where only a select few with the resources and knowledge to leverage this technology may benefit, deepening the divide between the tech-savvy and those less familiar with digital technologies. To ensure equitable benefits, proactive measures need to be taken to enhance digital literacy and infrastructure in underserved regions.

Another issue that is prevalent is related to the accuracy of converting physical data over to digital form which could be time consuming and expensive while trying to remain accurate.\textsuperscript{80} The blockchain relies on the immutability of data, and errors can lead to integrity issues.\textsuperscript{81}

\textsuperscript{78} Luz, Ayuns & Kayode, Sheriffdeen & Frank, Edwin, RESEARCHGATE, Digital Inequality: Examining the unequal access to digital technologies and the resulting disparities in opportunities, resources, and information, (April 03, 2024), https://www.researchgate.net/publication/378704510_Digital_Inequality_Examining_the_unequal_access_to_digital_technologies_and_the_resulting_disparities_in_opportunities_resources_and_information.

\textsuperscript{79} Id.


\textsuperscript{81} Ellis Nash, Enhancing Data Integrity in Business with Blockchain’s Immutable Ledgers, STATEZEROLABS.com, (Nov 26, 2023), https://www.statezerolabs.com/enhancing-data-integrity-business-blockchain/
Exploring advanced verification technologies like AI-driven data validation tools could help, but the cost would likely be extensive. Implementing these advanced tools could be a significant barrier in regions with limited technology infrastructure because of the ability to remedy issues quicker like the ability to help handle increased transaction volumes more efficiently and enhance confidentiality while still maintaining privacy. This balance between cost and efficiency underscores the need for carefully considered strategies in the deployment of blockchain technologies, especially in under-resourced areas.

Blockchain technology has its tradeoffs though, such as deciding efficiency versus security, and accountability versus privacy. Developing structure and standards that are custom across platforms could benefit blockchain technology. However, as blockchain technology continues to evolve, researchers and innovators are exploring emerging trends and advancements that have the potential to shape its future trajectory. One trend that works across platforms is the rise of interoperability protocols. These protocols enable different blockchain networks to communicate and exchange data seamlessly. Interoperability is essential for unlocking the full potential of blockchain by facilitating cross-chain transactions, interoperable decentralized applications (dApps), and collaborative blockchain ecosystems. This flexibility could make it

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83 Id.
84 Id.
86 Id.
easier for more people to get involved in real estate investment because makes it easier for different systems to work together.87

With real estate tokenization, interoperability allows anyone to invest in tokenized real estate assets, regardless of which blockchain platform they prefer. It's like being able to use different banking apps to access your money, even if you switch between different banks. This flexibility makes processes like transferring property ownership across different countries much simpler and faster. Additionally, the seamless integration of blockchain systems with existing property databases makes it like having a universal translator that ensures information flows smoothly between traditional and blockchain-based record-keeping systems. This increased connectivity also paves the way for enhanced transparency and security in transactions, ensuring that all parties have access to consistent and reliable information which can build greater trust across the real estate sector.

VI. Conclusion

Overall, blockchain technology has the potential to improve the accuracy and efficiency of deed recording while at the same time reducing fraud in the real estate market. There are legal hurdles that still need to be addressed to ensure deed recording on the blockchain becomes a sound recognizable method that is used. Additionally, through fractional ownership and increased accessibility to real estate investment, tokenization democratizes access to property ownership, leading to the promotion of equity and a fairer, just, land registry system.

87 Id.