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Enriching Real Estate and Financial Literacy: Exploring Real Estate Use-Cases for Blockchain Technology

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ABSTRACT: Over the past decades, in Germany, substantial reforms in pension systems have shifted a considerable portion of responsibility for post-retirement income from the government to individuals. As a result, people are now obligated to proactively plan for their future provisions and refrain from delaying savings. At the same time, the problem of solving poverty among older people is a pressing topic. Meanwhile, to achieve an economic edge, a country's population must be well-educated regarding economic issues, such as securing retirement provisions, evading speculative bubbles, or fostering entrepreneurial pursuits. Proficiency in financial literacy, including real estate investments, enables individuals to access and engage with various financial tools and resources, enhancing their ability to make informed financial decisions and optimize their economic well-being. This paper aims to expand and enrich the current landscape of financial literacy literature. This is achieved by conducting a comprehensive interdisciplinary literature review. First, the given paper offers a perspective on literacy research, particularly emphasizing financial literacy in the context of real estate investments, including equity release opportunities. Real estate literacy is a sub-category of financial literacy with an explicit focus on real estate transactions. The authors then delve into the impact of blockchain technology within the real estate sector, showcasing distinct use cases that pave the way for the future of real estate. We argue that a comprehensive understanding of the real estate market, which involves knowledge of equity release options, can fundamentally change and enhance retirement considerations.

KEYWORDS: Financial Literacy, Digital Literacy, Real Estate, Blockchain, Equity Release, Germany

1. Introduction

To achieve an economic edge, a country's population must be well-educated regarding economic issues, such as ensuring retirement provisions, avoiding speculative bubbles, or encouraging entrepreneurship. Notably, young adults at the

beginning of their professional careers still face many financial decisions. Consequently, they represent critical societal stakeholders in various literacy disciplines, such as digital, financial, or real estate literacy.

Digital literacy is thereby increasingly intertwined with financial literacy, as modern financial activities and transactions often occur in digital spaces. This requires individuals to possess both technological competence and financial acumen to navigate and manage their financial affairs effectively in the digital age. Proficiency in digital literacy enables individuals to access and engage with various financial tools and resources to make informed financial decisions. Real estate literacy can be seen as a sub-category of financial literacy with an explicit focus on real estate transactions.

This paper originates from a interdisciplinary literature review. Given this context, this paper aims to enhance the existing literature concerning financial-, real estate literacy. First, it offers a perspective and describes the interrelation of literacy concepts, particularly emphasizing literacy relevance in the context of finance and real estate investments. Second, it delves into the impact of blockchain technology within the real estate sector, showcasing distinct use cases that pave the way for the future of real estate.

2. Technological Transformation in the Context of Advancing Literacy

2.1. Importance of Financial Literacy in the Context of Real Estate

The concept of financial literacy is prospering in the 21st century. Meanwhile, compared to other research subjects, this discipline can be classified as rather emerging. Not until 1992, the term financial literacy was coined in a report by the National Foundation for Educational Research (NFER) on behalf of a survey by Australia's NatWest Bank (Noctor et al. 1992, 4). In today's digital landscape, financial activities, and transactions frequently occur online, demanding individuals to master technological skills and financial expertise. This dual proficiency is essential for handling financial matters in the modern era. Meanwhile, within financial literacy, real estate literacy emerges as a subset discipline that centers explicitly on real estate transactions and offers measures to counteract retirement issues. In the past decades, extensive pension system reforms have shifted a substantial part of the responsibility to ensure income from the government to individuals after retirement.Consequently, individuals are today required to plan provisions early in their lives and avoid procrastination of savings. Nevertheless, according to several authors, the risk of old-age poverty is imminent (Stolper and Walter 2017, 1; Leiber 2018, 41). In this context, real-estate literacy is gaining importance which refers to the ability to make informed judgments and effective decisions regarding real estate transactions. Today this discipline is less acknowledged, as it primarily falls under the umbrella of financial literacy. However,

considering the importance and market size of the real estate sector, it is merely a question of time until it receives the appropriate recognition it merits.

From a financial viewpoint, the expenditure on real estate rent forms a considerable component of a household's financial planning. A rule of thumb in Germany states that the monthly rent should not exceed 30 percent of the monthly net household income. However, with retirement, the pay usually falls; meanwhile, living costs tend to rise. In fact, according to the Statistisches Bundesamt, the housing cost burden amounts on average in Germany to 27.7%. The leader in terms of the cost burden is Hamburg, with 30.4%. The other end of the scale is represented by Thüringen, with 23.1% (Statistisches Bundesamt 2018). According to a press release of October 2020, 11.4 million, representing 14% of the population in Germany, lived in 2019 in households overburdened by their housing costs. These individuals spend more than 40% of their disposable income on housing (Statistisches Bundesamt 2020). Moreover, income usually falls with retirement, while living costs tend to rise.

Insights collected by the Sparda Survey "Wohnen in Deutschland" 2019 further support the importance of this research emphasis. The survey shows that 63% of Germans believe home ownership is worthwhile. Meanwhile, the home-ownership rate in Germany occupies the penultimate place among all OECD countries with 51 percent, undercut only by Switzerland with 41.6 percent (Sparda Survey 2019). According to the Deutsche Bundesbank (2020), this causes wealth inequality.

A comprehensive understanding of the real estate market, encompassing familiarity with equity release choices, has the potential to change and enhance retirement considerations fundamentally. For example, equity-release products enable older people to ensure liquidity once retirement lies ahead. A stereotypical example of an asset-rich, cash-poor individual is described by McLean as the "Devon widow," living alone in the former family home but receiving only a small pension income (McLean 2018, 196; Loutzenhiser and Mann 2020 3). In an ideally symbiotic cycle, the challenge of retirement can be mitigated, simultaneously addressing the "house rich, cash poor" dilemma highlighted by McLean and tackling the issue of younger individuals struggling to save for their future needs. Within the mutually beneficial cycle, the retired individual could, for instance, transfer ownership while still residing in the house. The selling price might be a seller's loan, repaid by the younger buyer in manageable installments. It offers younger residents a chance to achieve property ownership and retirement provisions within a familiar area while enhancing retirees' financial situation and maintaining their quality of life. We believe this construct could resonate well in communities where residents are familiar with each other.

Remarkably, these equity release options generally differ from country to country and show different acceptance rates, despite, in some cases, similar demographics. In Germany, the term "Immobilienverrentung" describes equity

release options. As we delve into a more detailed exploration of equity release products and blockchain technology in the subsequent sections, a short introduction to most known equity release products is presented here:

Table: Equity Release Products

Equity Release Product	Characteristics
Leibrente (Life Annuity)	In a Leibrente, the homeowner sells their property and receives a lifelong monthly payment from the buyer. The buyer takes possession of the property upon the homeowner's passing.
Rückmietverkauf (Sale and Leaseback)	Homeowners can sell their property to an investor or buyer and then lease it back for a specified period.
Teilverkauf (Partial Sale):	Homeowners can sell a portion of their property to a buyer while retaining the right to live there. The buyer becomes a co-owner and receives their share upon the homeowner's passing.
Umkehrhypothek (Reverse Mortgage)	A reverse mortgage allows homeowners to receive payments from a lender against the equity in their property. The loan and interest are repaid when the property is sold, or the homeowner dies.
Zeitrente (Time-limited Annuity)	Like Leibrente, however, the homeowner receives regular payments for a fixed duration, as specified in the agreement.

Source: Own illustration

Concerning the outlined equity release options, it is important to emphasize that these products are not standardized. In Germany, all these products are subject to freedom of contract, resulting in diverse agreements. In the next chapter, this paper will provide a background on blockchain technology, including smart contracts. After that, it explores real estate use cases in the context of blockchain technology to further enrich the literacy literature.

2.2. Introduction to Blockchain Technology

2.2.1. Basics of Blockchain Technology

In the era of the digital revolution, individuals, organizations, and even countries find themselves surrounded by disruptive technologies. In the past, blockchain technology was mainly associated with the technology behind the cryptocurrency Bitcoin. Today, experts consider blockchain a major innovation beyond its initial scope (Swan 2015; Tapscott and Tapscott 2017; Marotta and Duc 2021). This creates many questions and fruitful debates about which business models and services may become obsolete and where processes can be streamlined and further optimized through blockchain applications (see Marotta and Duc 2021)

Blockchain technology shows an impressive debut. Only in 2008 did the technology arise from the introduction of the crypto-currency Bitcoin (BTC) of which the origin is a whitepaper published in 2008 under the pseudonym "Satoshi

Nakamoto" with the title: "Bitcoin: A Peer-to-Peer Electronic Cash System" (Nakamoto 2008 in Nordgren et al. 2019, 49). Then in July 2016, blockchain was already located at the top of the peak of Gartner's hype curve, between "smart robotics" and the "connected home," and in 2017, the blockchain and distributed ledgers technology were listed as a "Top ten strategic technology trend" (Panetta 2017 in O'Leary 2017, 138). Today, Big Techs try to position themselves to use this technology; meanwhile, on the other side, governments attempt to regulate crypto along with blockchain applications given the potential interference of crypto and blockchain in state affairs.

Concerning regulation, there is a need to govern and educate. Blockchain is still in its early days and requires extensive monitoring to protect customers and users. At some point, due to its decentralized nature, it should eventually make central institutions and, therefore, the centralization of power dispensable. Until then, regulations are still required to support a well-functioning and sustainable ecosystem that protects customer interests (EU 2022).

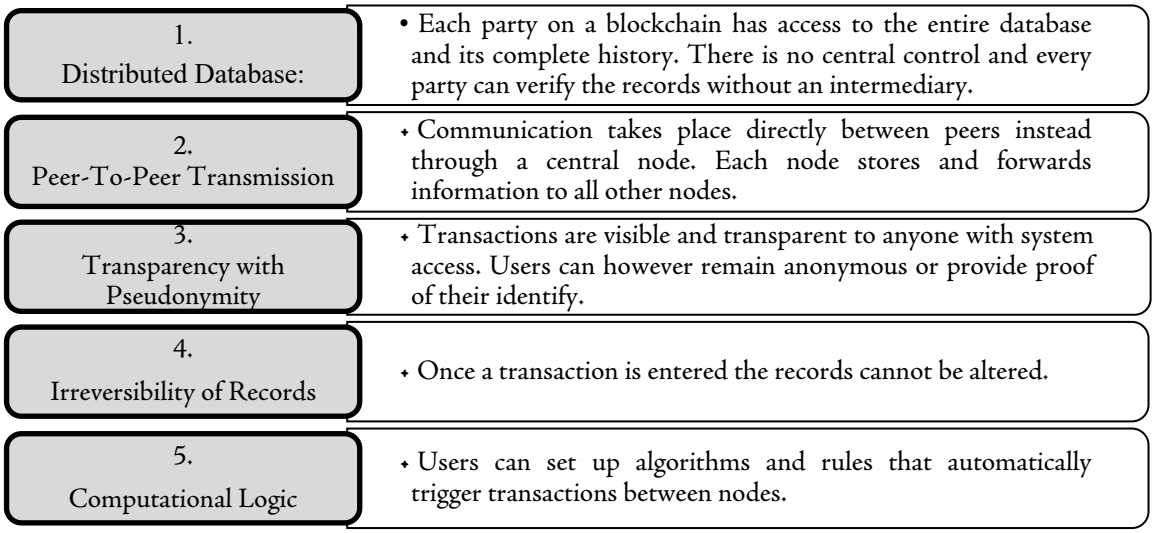
Now, what is Blockchain?

In short, a blockchain is an open, distributed data structure that can efficiently record transactions. All executed transactions are stored in blocks, whereby each block refers to the previous one. These linear and chronological blocks form a data chain that stipulates all kinds of information, such as ownership and asset transfers. All blocks confirm any transaction's exact time and sequence, creating a counterfeit-proof chain. This prevents any block from being altered or inserted between two existing blocks. The validation of new transactions depends on the type of blockchain (Hacker and Thomale 2017, 8).

The objective of the blockchain is the creation of a decentralized peer-to-peer network. Peer-to-peer means that communication occurs directly between the network nodes, thereby making central authorities obsolete, for instance, coordinating and approving transactions. Unlike conventional networks, each network node stores all information instead of storing all data on a single server (Christidis and Devetsikiotis 2016, 2293; O'Leary 2017, 138). In contrast to centralized networks, the distributed ledger of a peer-to-peer technology allows each participant to obtain a local copy of the blockchain. Network participants can legitimize and verify transactions at any time or place. Consequently, the data storage is regulated locally, as well as the communication between the participants. As a result of the decentralized storage, the peer-to-peer network is considered more efficient and resistant to hacker attacks by ensuring a higher level of reliability in contrast to centralized systems (Rosic 2019).

The Harvard Business Review has identified the following principles as the "five basic principles" of blockchain technology:

Figure 1: The 5 Basic Principles of the Blockchain Technology



Own Illustration based on Iansiti and Lakhani 2017, 5; Tapscott and Tapscott 2017, 3

2.2.2. Basics of Smart Contracts

A critical use case of blockchain technology involves "smart contracts." These contracts can potentially leverage blockchains' usefulness on a truly meaningful scale (Crosby et al. 2016, 8). A contract is a bilateral or multilateral legal act that establishes rights and obligations based on an arranged transaction (Hart and Holmstrm 1986, 1). In principle, smart contracts feature the same kind of agreements between the different parties. However, unlike conventional contracts, smart contracts are algorithmic, self-executing, and self-enforcing computer programs that can implement contract terms automatically (Lauslahti et al. 2017, 2). Blockchain is thus the ideal place to store such a contract because of its immutability and cryptographic security (Marino 2015).

The concept of smart contracts was first introduced by Nick Szabo in 1996 (Magazzeni et al. 2017, 2 et seq.) and is, therefore, chronologically seen as more mature than blockchain technology itself. Szabo explained the idea of smart contracts as exemplary of a missing installment for a leased car. In the case of overdue payments, the smart contract automatically revokes the digital key to operate the vehicle (Szabo 1997). Smart contracts and their rules provide security for all involved parties in a transaction because the rules are written in unchangeable code. The most noticeable feature of any smart contract is the potential to eliminate the need for an intermediary to trust the execution of the contract. A trustless network is created, and the parties can transact even though they may not know and trust each other (Christidis and Devetsikiotis 2016, 2292). Ironically, the circumstances of a need for trust and liability initially favored the introduction of banks in the first place. Banks verified contract parties and gave guarantees regarding their trustworthiness. Today, via blockchain, the verification of contractual conditions can be realized through algorithms and subsequent contract terms, which are automatically executed without the interventions of intermediaries. This

comes with a faster reconciliation between transacting parties and offers a high level of automation potential by replacing many human interactions. According to several researchers, three elements of smart contracts make them distinct (Swan 2015, 15; Anjum et al. 2017, 84):

- autonomy,
- self-sufficiency, and
- decentralization

Currently, there are over 19.000 different cryptocurrencies that can be traced back to a variety of blockchain networks (CoinMarketCap 2022). Regarding smart contracts, the most extensive and most prominent blockchain network is Ethereum with its native token Ether. Most companies and projects are building on the Ethereum blockchain because of its vast community and its role as a pioneer in smart contracts. However, more blockchain networks are arising, challenging the incumbent regarding the scalability problems, e.g., transactions per second (TPS) or high Gas Fees. Blockchain networks such as Solana, Cardano, and Polkadot are just a few of them to mention. These blockchain networks pool great opportunities for smart contract usability (ibid.).

Today, several business ideas and projects are already up and running that connect the real estate market and blockchain or distributed ledger technology (DLT) applications. As illustrated in Figure 2, the overall market cap of crypto coins and tokens associated with real estate amounts to about $95M. Meanwhile, the overall crypto market cap amounts to about $1.23T (CoinMarketCap 2022). This also shows the early stage of the blockchain-based real estate business regarding the global real estate market volume.

Figure 2: Top Real Estate Tokens by Market Capitalization

Top Real Estate Tokens	Abbreviation	Price	Market Cap	in %
Propy	PRO	$ 1,10	$ 80.879.459,00	85,17%
vEmpire DDAO	VEMP	$ 0,03639	$ 6.318.866,00	6,65%
Onooks	OOKS	$ 0,3422	$ 3.733.151,00	3,93%
LABS Group	LABS	$ 0,001387	$ 3.066.548,00	3,23%
ATLANT	ATL	$ 0,006434	$ 348.750,00	0,37%
Others	---	---	$ 612.451,00	0,64%
Sum			**94.959.225 €**	

Own Illustration based on CoinMarketCap 2022

Next, the literature review provides an overview of research on the potential of blockchain applications in the real estate industry.

3. Use Cases of Blockchain in Real Estate

3.1. Introduction to Use-Cases

Blockchain possesses the potential to change the traditional real estate market fundamentally. Use cases can enhance existing processes and create new business models for companies and governments. There is a broad spectrum of possible use cases, such as:

- Scenario 1: Use Cases for investment opportunities
  For example, tokenization of ownership (in the context of equity release)
- Scenario 2: Use Cases for efficient and effective processes/transactions
  For example, transparency and safety about title transfer and title fraud
- Scenario 3: Use-Cases in the Metaverse

In the following, specific examples are outlined to explain the potential of blockchain applications in real estate.

3.2. *Blockchain-based Investment Opportunities*

Today, private investors experience notable financial barriers when trying to enter specific real estate transactions. For example, considering the situation from the seller's perspective, selling a share of a house in the context of equity release options can be challenging. The individual is likely to experience several barriers, such as relatively high transaction costs along with a spectrum of uncertainties concerning contractual arrangements. From the buyer's standpoint, private investors also encounter relatively high transaction expenses when engaging in direct investments in land or real estate assets. These include statutory fees and commissions, amounting to around 8-15% of the down payment. Furthermore, discussions about tax regulations in political forums introduce additional uncertainties, particularly concerning how real estate holding periods are treated for tax purposes. Consequently, pursuing real estate diversification comes with significant costs; alternatively, it can be accomplished through participation in a real estate investment trust (REIT) or investments in publicly traded real estate companies.

The blockchain idea we advocate describes the partial sale of land or real estate as a tangible asset investment accessible to a personalized budget. This process works by dividing the collectibles into many small shares or pieces. In the context of blockchain, these shares are called tokens and enable transactions at any volume, price, and at any time. All individuals can trade whatever asset is of their interest without significant transaction costs. In Germany, an alternative approach to the token sale of land or real estate is currently only being adopted by a few companies, such as Wertfaktor and Deutsche Leibrenten. Nonetheless, the high transaction fees remain a burden for private individuals. Although, the technical feasibility could be within reach through the democratic characteristics of blockchain.

Meanwhile, companies such as Timeless, Finexity, or Chrono24 already offer asset investment opportunities in the German market, such as oldtimers or watches.

Then why not provide land and real estate? Regulations in the United States partially leave more freedom, and competition is increasing. For instance, Lofty Marketplace offers tokens in cash-flowing rental properties starting at $50 for a single investment (Lofty.ai 2022).

In the context of blockchain and smart contracts, such investments enable asset transactions at any volume, price, and time. This can disrupt the well-known real estate environment and boost the competition. Furthermore, these transactions can be embedded in the context of equity release products, locally referred to as "Immobilienverrentung," which the authors consider a major solution to the severe retirement issue.

Bringing together the potential of blockchain technology and the exploration of equity release options offers investment strategies that enhance the overall quality of life and elevate the living standards of individuals who possess valuable properties but have limited liquidity due to a low income or a low pension. Now, choosing various equity-release products, such as the reverse mortgage or the partial sale of an asset established by the blockchain application, can further help these individuals with new options to ensure liquidity once retirement lies ahead. For example, retirees can find additional potential buyers, particularly if they sell their property while remaining in their residence. Considering the investor's perspective, an avenue emerges for advancing portfolio diversification.

Looking beyond blockchain, it is anticipated that the idea of equity-release products will attract increasing attention. This is especially notable due to ongoing discussions about the vulnerabilities within the retirement system. This brings us to the second example of using the blockchain and smart contracts to facilitate and improve real estate transactions.

3.3. Blockchain-based Land Titles

The land registry system in Germany, known as the "Grundbuchamt," is an essential department in any governmental system. This register stores the records of land ownership. The record can then be used as proof of entitlement, ensuring fraud prevention and a smooth transition. For instance, in Germany, an industrialized country, individuals can rely on government bodies to trust property ownership. Meanwhile, in less developed countries, for example, Bangladesh, Georgia, Ghana, or Honduras, the registry systems already experienced substantial problems. Centralized systems in those countries have partially proven unreliable and prone to corruption, leaving individuals vulnerable to unlawful land thieves (OECD 2019; Alam et al. 2022). For example, one property may be sold to more than one buyer using inaccurate or corrupted data systems.

Meanwhile, in the future, governments can use a nationwide blockchain-based land registry system. The blockchain tracks all transactions with a timestamped digital signature and stores the data in a connected and distributed network. This

decentralized system prevents fraud and thievery by stipulating contracts, ownerships, GPS coordinates, satellite pictures, and further documentation.

The blockchain can also be used in advanced economies. Notaries profit from notarizing and certifying legal transactions, evidence, and signatures. In Germany, notary fees for acquiring a house are between 1% and 2% of the purchase price. At first sight, this seems like a poor way to ensure the redistribution of wealth as it primarily benefits a small group of lawyers and notaries.. Today, blockchain technology offers, in theory, a system to skip the intermediary or make them more competitive in terms of their services. Smart contracts offer a mechanism that enables the execution of predetermined actions when the contractual terms are met. This makes the notary redundant because no third party must mediate or validate transactions. The ownership will be transferred once the payment is made. There is no possibility to manipulate the contract conditions or cancel the smart contract. This leads to potential savings for individuals regarding notary fees and administrative overhead.

This last chapter briefly touches upon an omnipresent issue in the media, the metaverse.

3.4. The Metaverse

Lastly, we delve into a third example of investment opportunities tied to the intersection of blockchain and real estate transactions. This particular example is arguably the most theoretical among those discussed.

The Metaverse has been subject to many discussions since its introduction in 2021 by Mark Zuckerberg. Digital, futuristic concepts are said to restructure our well-known day-to-day lives while manifesting as new realities. From today's perspective, it can be said that the metaverse represents a digital version of the "real world" by providing online platforms that enhance the experience for individuals and businesses.

In this digital world, everyone is entitled to buy digital property or assets and call it their own. Two prominent examples of the metaverse experience are "Decentraland" and "The Sandbox." People can enter these digital worlds by using, for instance, specific crypto wallets such as MetaMask or Coinbase Wallet. The login process is closely associated with the so-called single-sign-on (SSO) process, commonly known as the login with Facebook or Apple. Also, logging in via a wallet is required since a digital world needs digital currencies to buy, for example, properties in the metaverse.

The metaverse presents a wide array of opportunities. In a future digital world, individuals can collaborate even better in a virtual space. This, for instance, disrupts and newly defines the idea of a home office. Individuals can virtually sit together in a virtual office while working from any place in the world. Today, Meta and other companies are working to introduce further artificial environments, including products and services. Individuals may be able to visit virtual stores to view and even

digitally experience specific services and products. This defines a new form of customer experience. Automotive brands may offer the digital experience of driving a new car model or fashion companies offer a unique perspective on online shopping. The entire experience, including the processing of a sale, can directly occur within the metaverse. This further connects the virtual realm with the physical world (CBS News 2022).

From an entrepreneurial perspective, the metaverse creates space for valuable business models, including new products and services. Regarding the purchase of property or real estate in the context of the metaverse, investors can speculate on land prices in this virtual environment. Individuals can then earn passive rental income from leased land in the metaverse. According to CBS News, the three other major platforms in meta real estate - Decentraland, Somnium Space, and Cryptovoxels - together own nearly 269,000 parcels of digital real estate, and the demand increases while prices rise (ibid.).

Even traditional banks are currently entering the metaverse and buying properties to "build" digital banking stores. JP Morgan was the first bank to purchase property in Decentraland and is now working on introducing the "Onyx-Lounge" to offer advisory services for tech-savvy customers. The American bank sees a business potential of over one trillion USD (Oxford Business Review 2021). In a nutshell, real estate from a metaverse point-of-view states an exciting development in the context of blockchain technology. However, it is in the early days and must prove its technical stability and global acceptance.

4. Conclusion

In an attempt to address noteworthy societal concerns such as old-age poverty and retirement pension, this paper explores real estate use cases within the context of blockchain technology. The objective was to widen and enhance the present landscape of literacy literature by conducting an interdisciplinary literature review.

First, the paper focused on literacy disciplines, particularly financial and real estate literacy, including equity release. Given the concerns and the importance of the real estate industry, the argument is put forth that real estate literacy deserves greater recognition as a distinct research discipline. Furthermore, it is argued that a comprehensive understanding of the real estate market, which involves knowledge of equity release options, can improve retirement concerns. Beyond the realm of blockchain, equity release products are expected to gain growing prominence in the times ahead.

The given paper then provides a perspective on digital transformations, focusing on blockchain technology. It addresses the essential characteristics of blockchain technology and the idea of smart contracts. As blockchain promises to prevent fraud, increase trust and transparency, and save time and money by eliminating intermediaries, it is one of the most promising technologies of the early

years of the 21st century. At the core, this research showcases blockchain use cases that pave the way for the future of real estate. As shown, blockchain offers a range of applications for the real estate industry, including creating new investment opportunities through asset tokenization. In parallel, blockchain provides avenues for democratizing real estate investments by streamlining transactions and lowering associated costs.

Lastly, the metaverse also offers opportunities regarding a new real estate market. As illustrated, today, a few fintech companies are embracing the metaverse and traditional businesses such as banks and fashion manufacturers. This shows that virtual reality has expanded substantially beyond the world of gaming, although the metaverse is still in its nascent stages. The success of both established and new business models in the metaverse depends on their ability to effectively offer their services and products in this new virtual world.

Regarding the changing environment, further investigation of how new technologies can support existing businesses will be helpful to generate. These studies may also explain how new processes can be used and embedded in existing structures and what risks and limitations may arise. Future research may also explore the acceptance of real estate tokenization from the perspective of sellers and buyers. Lastly, educational institutions assume a crucial role in supporting literacy disciplines. Ultimately, elevating literacy levels to maintain a country's economic leadership is paramount.

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