



The Effect of Technology on Real Estate

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ARTICLE INFO	ABSTRACT
Published online: 08 October 2024	Numerous businesses and models have been profoundly disrupted by technological advancements, and the pace of these disruptions is accelerating exponentially. The real estate industry, particularly in Africa, is no exception. This sector has witnessed substantial growth in recent years, with technology playing a pivotal role in its transformation. Technological innovations have revolutionised the methods by which properties are bought, sold, rented, and managed, thereby enhancing efficiency and cost-effectiveness across the board. In rapidly developing African countries, real estate constitutes a significant component of investment portfolios, underscoring its importance and impact on the economic landscape. The real estate sector has traditionally been perceived as a stable investment class, seemingly resistant to the rapid adoption of new technologies. However, since the COVID-19 pandemic, the rate of technological adoption has significantly increased, with more individuals flocking to the Internet daily for the added comfort and convenience it provides. This surge has inspired a growing number of companies to aspire to become the next major industry disruptors. The confluence of advanced technologies and the pandemic-induced push towards digital solutions has fostered an increased willingness to develop and embrace emerging real estate technologies, fundamentally altering the landscape of the industry
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INTRODUCTION

Technology is the element that disrupts almost every facet of the industry and changing the traditional business model. Real estate industry is no exception to this new element and it starting to change the conduct of how business process being implemented in the whole supply chain of the industry. It may become a threat to the present industry player who failed to adapt to the new business model and at the same time create opportunities for the start-up that are innovating new technology that is efficient and at a fraction of the cost.

Similar to the way FinTech focuses on the use of technology in finance, PropTech uses digital innovation to address the needs of the property industry (TechTarget, 2018). In a Forbes article, Mike Shapiro (2022) the co-founder and Managing Director of Plunk a real estate and technology company described PropTech as “the underlying technology that real estate professionals, underwriters, developers, property managers, title companies, banks and others use to manage and improve real estate transactions from start to finish”.

Years ago, it wasn't uncommon to come across extensive usage of Excel-type spreadsheets for tracking and managing data, but what that lacked was interconnectedness and complexity to pick on nuisances required to fully utilize the of data to assert the true value of a property (Shapiro, 2022). Artificial intelligence and big data solve these problems, they help property developers, investors and real estate companies make better informed decisions giving them the ability to account for minute details for better pricing (Appic softwares, 2024). Virtual Reality (VR) and Blockchain are the newly emerging Technology that looks promising and might be the next big disruptors, VR is revolutionizing the way properties are marketed and viewed, while Blockchain technology is making significant inroads into real estate by enhancing transparency, security, and efficiency (Zimmerman, 2024).

History and Evolution of Real Estate

Real estate was a legal term to identify a royal grant of estate land. The term "real estate" emerged in the 17th century, its roots can be traced to Early Modern English. The term "real"

originates from the Latin word "realis," signifying existence, actuality, or genuineness. Similarly, "estate" is an English adaptation of the Old French "estat," denoting status or condition. Contemporary usage of "estate" encompasses owned property comprising houses or land. It is a comprehensive version of one's property that consists of real estate (Akinlabi, 2023).

Early History

For nearly half of human history, our ancestors were nomadic, following the four-legged food sources in their respective regions. They left behind only trace evidence of their existence, such as cave drawings, stone tools, and other artefacts. Gradually, over the period between 30,000 BC and 15,000 BC, these hunter-gatherer societies began to transition towards agrarian lifestyles. However, this shift was not universal, and some hunter-gatherer communities persist to this day. This transformation marked a significant move towards agrarian society and the inception of homeownership, as people began to establish settlements. In this article, we explore the origins of this pivotal investment, the emergence of homeownership, and the evolution of real estate in America up to the present day.

As civilizations advanced, so too did the intricacies of real estate transactions and property ownership. Ancient societies, including Mesopotamia, Egypt, and Greece, established foundational systems for property ownership and land distribution, as well as primitive forms of real estate taxation. These early frameworks facilitated the management and transfer of land and property within their respective societies, laying the groundwork for more sophisticated legal and economic structures.

The Roman Empire significantly enhanced these concepts by codifying laws that meticulously governed property rights and transfers. Roman law introduced various principles and practices that became cornerstones of property law, such as the distinction between movable and immovable property, legal mechanisms for the transfer of ownership, and the protection of property rights (Alvik, 2018). These legal innovations were instrumental in shaping the property systems not only within the Roman Empire but also in influencing the development of legal systems in Europe and beyond.

The Roman legal framework's influence extended throughout the Middle Ages and into the modern era, as European countries adopted and adapted Roman principles to suit their own socio-economic contexts. The legacy of these ancient systems is evident in contemporary property law, which continues to draw upon the foundational concepts established by early civilizations. Thus, the evolution of real estate transactions and ownership reflects a continuous process of refinement and adaptation, informed by the legal and administrative advancements of ancient societies.

Middle Ages and the Rise of Feudalism

The Middle Ages saw the rise of feudalism in Europe, the word 'feudalism' derives from the medieval Latin terms *feudalis*, meaning fee, and *feodum*, meaning fief. The feudal system, wherein land was granted as a form of payment for military service, traces its origins to the Roman manorial system and the 8th-century Frankish kingdom. The Roman system compensated workers with protection while residing on vast estates. Similarly, the Frankish king bestowed land for life (benefice) upon loyal nobles as a reward for their service (Cartwright, 2024).

During the Middle Ages, Europe witnessed the emergence of feudalism, a socio-economic structure wherein land ownership was predominantly concentrated in the hands of the nobility. Under this system, land was granted to tenants in exchange for various forms of service or rent, creating a hierarchical framework of land tenure. The feudal model established a complex relationship between lords and vassals, shaping the economic and social landscape of medieval Europe. As the feudal system gradually evolved, it laid the groundwork for the development of more modern notions of private property and individual land ownership. The dissolution of feudal bonds and the emergence of market economies fostered an environment where land could be owned, bought, and sold by individuals, independent of the rigid feudal hierarchy. This transition marked a significant shift towards the recognition of private property rights and the commodification of land.

The advent of the Industrial Revolution in the late 18th and early 19th centuries further accelerated these changes. The rapid industrialization and technological advancements of this period spurred unprecedented urbanization, as vast numbers of people migrated to cities in search of employment opportunities. This mass urban migration significantly increased the demand for residential and commercial real estate, transforming the urban landscape.

The burgeoning cities required extensive development of housing, infrastructure, and commercial properties to accommodate the growing urban population. This surge in demand led to the proliferation of real estate markets, the establishment of property development industries, and the introduction of new architectural and engineering practices. Consequently, the Industrial Revolution not only revolutionised the economic and social structures of the time but also fundamentally reshaped the dynamics of real estate, solidifying the concepts of private property and land ownership in the modern era.

The Evolution of Real Estate in Nigeria

The Nigerian real estate sector has undergone a remarkable evolution, transitioning into a dynamic and vibrant industry. The roots of the real estate business in Nigeria can be traced back to the pre-colonial era. Traditional societies practiced

land ownership and allocation, albeit with different systems and customs across regions. With the arrival of colonial powers, land management systems underwent significant changes as the British introduced formal land ownership registration and land tenure systems (NaijaHouses, 2023).

Post colonization Nigeria experienced a rapid process of urbanisation, driven by a steadily increasing population. This demographic surge significantly amplified the demand for housing and urban infrastructure, propelling the real estate industry into a phase of substantial development. In response to the burgeoning needs of the expanding urban populace, private developers began to play an increasingly pivotal role in the real estate market. These developers sought to address the housing demand by initiating numerous residential and commercial projects across various urban centres. Their efforts contributed to the gradual emergence of a more structured real estate industry in Nigeria.

Concurrently, the Nigerian government recognised the pressing need to alleviate the housing shortage and took proactive measures to address this issue. The establishment of state housing corporations and the implementation of government-sponsored housing schemes were among the key strategies employed to mitigate the housing deficit. These initiatives aimed to provide affordable housing solutions and enhance urban living conditions for the growing population. Despite these efforts, the scale of housing demand consistently outpaced the available supply. The rapid pace of urbanisation, coupled with economic and infrastructural challenges, presented significant obstacles to bridging the housing gap. Consequently, the real estate industry faced ongoing pressures to innovate and expand, striving to meet the ever-increasing demands of Nigeria's urban population.

The oil boom of the 1970s heralded a period of significant economic prosperity for Nigeria, resulting in pronounced urbanisation and an unprecedented surge in property development. The substantial influx of oil revenues stimulated a burgeoning demand for luxury housing, commercial office spaces, and retail centres, reflecting the nation's newfound affluence. This era witnessed the emergence of upscale neighbourhoods and gated communities, designed to accommodate the burgeoning elite class that the oil wealth had engendered. These affluent enclaves epitomised the socio-economic transformations sweeping across the country, characterised by their opulent residences and sophisticated amenities. This period marked a pivotal chapter in the nation's development narrative, laying the groundwork for continued urban and economic expansion in the ensuing decades.

The 1980s witnessed a significant shift in the real estate landscape as the Nigerian government introduced structural adjustment policies, leading to economic liberalization and privatization (NaijaHouses, 2023). Private developers increasingly assumed a central role in addressing the housing needs of the Nigerian populace, especially within urban

centres. In tandem with this shift, the Nigerian government instituted various laws and regulations aimed at ensuring transparency, professionalism, and consumer protection in real estate transactions. The creation of professional bodies, most notably the Nigerian Institution of Estate Surveyors and Valuers (NIESV), played a crucial role in the professionalisation of the industry. These entities were instrumental in elevating the standards of practice within the sector, thereby enhancing the credibility of real estate practitioners. This professionalisation fostered greater trust among buyers, sellers, and investors, contributing to a more reliable and robust real estate market in Nigeria.

The Nigerian government has implemented several housing policies aimed at alleviating the housing shortage and enhancing affordability. Initiatives like the National Housing Fund (NHF) scheme, the Federal Mortgage Bank of Nigeria (FMBN), and partnerships between public and private sectors for large-scale housing projects have facilitated private sector engagement and broadened access to housing finance across the country. In addition, the introduction of Real Estate Investment Trusts (REITs) has been pivotal in mobilising capital for real estate development in Nigeria. REITs serve as a vehicle for individual investors to participate in the real estate market by investing in income-generating properties such as residential, commercial, and industrial assets. This innovative approach has bolstered the expansion of the real estate sector and enhanced market liquidity, thereby fostering economic growth and development.

The evolution of Nigeria's real estate sector has been marked by substantial growth and transformation, shaped by a blend of government interventions and private sector initiatives. Over the years, this industry has adapted dynamically to accommodate the evolving needs of an expanding population. Through a combination of policy reforms and strategic investments, stakeholders have endeavoured to confront challenges while seizing emerging opportunities. With ongoing efforts to address challenges and capitalize on opportunities, the real estate business in Nigeria continues to contribute to economic development and improved living standards.

Current Technological Trends in Real Estate

Real estate technology is an expansive term encompassing various emerging technologies, ranging from property management software to smart home devices, and numerous tools facilitated by the Internet of Things (IoT). These technologies share the common goal of simplifying and enhancing the processes of sourcing deals, processing transactions, managing properties, and delivering customer services. Artificial intelligence and big data enable real estate professionals to more accurately value properties. Additionally, innovative technologies such as Virtual Reality and blockchain hold the promise of revolutionising the listing

and viewing of properties, while also enhancing the transparency and security of property purchases and rentals.

PropTech and Internet of Things (IoT)

Emerging technologies are profoundly transforming various sectors, and the real estate industry is no exception. Property Technology, or PropTech, is at the forefront of this revolution, introducing innovative solutions that streamline and enhance property management, transactions, and user experiences. One significant advancement within PropTech is the integration of smart home technology and the Internet of Things (IoT), which facilitates seamless connectivity and automation within residential spaces, thereby improving convenience and energy efficiency. PropTech consists of three major market segments Smart home, sharing real estate and real estate FinTech.

Smart home refers to a convenient home setup where appliances and devices which are interconnect through the internet can be controlled remotely, allowing the owner to for example control the lights and temperature of his home from work (Hayes, 2024). Smart homes can be integrated into existing properties; however, to achieve optimal value and functionality, provisions for such technology are best incorporated during the construction phase. This approach allows for more comprehensive and extensive capabilities, subsequently enhancing the overall value of the property.

The implementation of real estate technology significantly streamlines the processes involved in sharing or renting real estate assets, including land, offices, storage facilities, and residential apartments; Such technologies facilitate various aspects of property management, enhancing efficiency and convenience for both property owners and tenants (TechTarget, 2018). For instance, the introduction of automated online payment systems enables tenants of retail spaces within buildings owned by property management companies to seamlessly process their rental payments. Furthermore, the integration of real estate technology can also enable the optimization of resource allocation, improved financial management, and data-driven decision-making, ultimately contributing to the enhanced performance and profitability of real estate assets.

Real estate fintech is transforming the traditional real estate sector by combining cutting-edge technologies and financial innovations to streamline operations and drive unprecedented growth potential (Gakwaya, 2023). The boom in fintech innovation began during the 2007/2008 financial crisis, significantly disrupting the financial services industry and eventually the boom extended its reach to Africa with emerges of companies like Remita and eTranzact 2014/2016 (Muoto, 2022). High-tech advancements in banking facilitated faster, cheaper, and more flexible transactions, fundamentally transforming the financial services landscape; Consumers across all generations have embraced this trend towards more convenient personal finance solutions and now

expect such efficiency as standard. In contrast, the real estate industry has remained entrenched in traditional practices, from marketing strategies to contract negotiations and closings, even as other economic sectors have rapidly adopted modern technology. With the status quo maintained, there was little impetus for change in the real estate sector.

Machine Learning and Big Data

Previously real estate organizations and professionals would make decisions based on professional experience and historical trends (Appic softwares, 2024). Artificial intelligence and machine learning are revolutionizing various fields, including real estate. Artificial intelligence, a simulation of human intelligence in machines, empowers machines to think and act like humans. In the real estate this involves using Generative Artificial Intelligence with natural language processing to understand customer inquiries and provide relevant responses, and predictive analytics to forecast market trends. Machine Learning involves training models on historical data to predict property prices, recommend properties to potential buyers based on their preferences, and analyse market trends. It can also include anomaly detection to identify fraudulent or unusual market activities.

Generative Artificial Intelligence is a creative and open-ended form of Artificial intelligence, is maturing and transforming the industry. It allows customization of existing tools for real estate-specific tasks, such as lightning-speed opportunity identification, innovative building and interior design, marketing material creation, and enhancing customer journeys while opening new revenue stream. Fitzpatrick et al. (2023) in a McKinsey article estimates that Gen AI as a tool could enhance and generate 61% return on investment or more in value for the real estate industry. Generative Artificial Intelligence enhances decision-making by analysing vast amounts of data, it provides tools like conversational chatbots answer questions and remove doubt from customer decisions and It helps curate personalized recommendations for buyers, renters, and investors.

Real estate professionals can now use Artificial intelligence powered tools to analyse market conditions, evaluate property values, and identify investment opportunities with greater precision. By harnessing predictive analytics, businesses can make more informed decisions, mitigate risks, and optimize their strategies to stay ahead in a competitive market (National Association of Realtors, 2023). These tools can sift through vast amounts of data, including historical sales, economic indicators, and demographic trends, to provide real-time insights into current market conditions allowing real estate professionals to data-driven decisions.

Further contribute to the industry's evolution by enabling predictive analytics, personalised marketing strategies, and efficient property management. These technologies revolutionizing the real estate industry by analysing vast

amounts of data to identifying market trends, optimising pricing strategies, and even predict maintenance needs, thereby reducing operational costs and improving overall efficiency. Finally, big data and analytics are empowering real estate professionals with insights derived from extensive data sets, enabling informed decision-making and strategic planning. The convergence of these emerging technologies is not only revolutionising the real estate sector but also setting new standards for innovation and efficiency across the industry.

Virtual Reality and BlockChain Technology

Virtual and augmented reality are reshaping the way properties are marketed and experienced, allowing potential buyers and tenants to explore homes and commercial spaces remotely in immersive 3D environments. This technological leap reduces the need for physical visits and accelerates decision-making processes. Blockchain and smart contracts are also gaining traction, offering secure, transparent, and efficient methods for conducting real estate transactions, thus minimising the risks associated with fraud and enhancing the integrity of the property market.

Virtual Reality is a technology that creates a simulated environment, allowing users to interact with 3D worlds that mimic real-life or imagined scenarios. This immersive experience is achieved through VR headsets, sensors, and software that track the user's movements and adjust the visual and auditory feedback accordingly. Virtual Reality is changing the landscape with Virtual Tours, Architectural Visualization, and Staging and Customization (Zimmerman, 2024). Virtual Reality technology facilitates immersive virtual tours of properties, enabling prospective buyers to remotely explore and interact with the spatial layout of a given property from the convenience of their own homes. This democratizes access and enhance decision-making by enabling users to visualize spaces before physically visiting them.

The application of Virtual Reality technology in architectural visualization enables property developers to present forthcoming projects in a remarkably realistic and immersive manner. Realistic Previews, Virtual Reality enables developers to showcase their vision in a highly detailed and accurate manner. By creating virtual walkthroughs, potential buyers can virtually step into the future property, experiencing its layout, spatial dimensions, and design aesthetics. This realistic preview fosters a deeper understanding of the space, enhancing buyer confidence. Traditionally, Real estate Developers relied on blueprints, 2D renderings, and static images to showcase properties to prospective buyers. Virtual Reality changes this paradigm by offering an interactive and dynamic experience. Buyers can explore different rooms, view finishes, and even assess natural lighting all before any physical construction occurs.

Early engagement through VR encourages informed decision-making.

Additionally, Virtual Reality experiences serve as a compelling marketing tools. Real estate Developers especially the ones that sell Land on a massive scale can create captivating presentations for potential buyers, showcasing not only the physical attributes but also the lifestyle associated with the property. Pre-sales events can leverage Virtual Reality to generate interest and secure commitments from buyers before construction milestones. Architectural visualization through VR revolutionizes how we perceive and engage with real estate. As this technology matures, it will continue to shape pre-sales strategies, investment decisions, and the overall real estate landscape.

Blockchain is a distributed and decentralized digital ledger that enables the recording of transactions across numerous computers, ensuring that once recorded, these transactions cannot be modified or altered retrospectively. Blockchain technology, best known for its use in cryptocurrencies, is making big inroads into real estate by improving transparency, security, and efficiency (Zimmerman, 2024). Blockchain Technology is changing the real estate landscape by being a Platforms and Marketplaces, Removing Intermediaries during the purchase of a Property, Faster liquidity, Fractional Ownership, Improved security through decentralization and trimming down the cost of buying down a property.

Real estate technology has traditionally been primarily concerned with listings and with connecting buyers and sellers. However, blockchain introduces new ways to trade real estate and can enable trading platforms and online marketplaces to support real estate transactions more comprehensively (Liebkind, 2020). As a platform, blockchain ensures that all transactions are recorded in an immutable ledger, enhancing trust and reducing the risk of fraud. This secure environment allows for the verification of property titles, streamlining the process of buying and selling properties by eliminating the need for intermediaries such as lawyers and notaries. The Technology also facilitates peer-to-peer transactions, enabling buyers and sellers to interact directly. Smart contracts, a key feature of blockchain, automatically execute agreements when predefined conditions are met, reducing the time and cost associated with traditional real estate transactions.

Blockchain technology is fundamentally transforming the real estate sector by eliminating the need for intermediaries during property transactions. The Technology is doing away with Brokers, lawyers, and banks as an important part of the real estate ecosystem there by removing additional costs, delays, and complexities. Platforms built on Blockchain can eventually assume functions such as listings, payments, and legal documentation. The elimination of intermediaries result in increased financial benefits for both buyers and sellers by reducing the commissions and fees levied by these

middlemen. This also makes the process much quicker as the back-and-forth between these middlemen gets cut (Liebkind, 2020). Consequently, blockchain is fostering a more efficient and cost-effective real estate market, thereby enhancing overall market accessibility and trust.

Real estate has traditionally been characterized as an illiquid asset due to the extended duration required for its sale to be finalized (Liebkind, 2020). In contrast, cryptocurrencies and tokens can, in theory, be quickly exchanged for fiat currencies through various exchanges, offering a higher degree of liquidity. Real estate tokens, built on blockchain technology, enable fractional ownership and liquidity. A property can be divided into smaller units represented by tokens. Unlike waiting for a single buyer who can afford the entire property, sellers can now readily trade these tokens. Each token represents a share of ownership, allowing sellers to unlock value without selling the entire property. This innovative approach enhances the liquidity and flexibility of real estate transactions.

The integration of Virtual Reality and Blockchain technology is revolutionising the real estate sector. Virtual Reality facilitates immersive property tours, architectural visualisation, and pre-sale marketing strategies, offering potential buyers and tenants an unprecedented level of engagement and informed decision-making. This technology enhances accessibility and efficiency in property viewing, contributing to more confident investment decisions. Concurrently, Blockchain technology introduces a paradigm shift in property transactions by ensuring transparency, security, and efficiency. Through decentralised ledgers and smart contracts, Blockchain reduces the need for intermediaries, streamlines transaction processes, and enhances market trust. Furthermore, the concept of real estate tokenisation promotes liquidity and fractional ownership, making real estate investments more flexible and accessible. Collectively, these advancements are not only transforming traditional real estate practices but also setting new standards for innovation and efficiency in the industry. As these technologies continue to evolve, their impact on the real estate market will likely expand, fostering a more dynamic and resilient sector.

CHALLENGES AND LIMITATIONS

Challenges and Limitations of this Technologies are Data Privacy and Cybersecurity, the integration of PropTech, IoT, machine learning, big data, virtual reality, and blockchain technology in real estate brings significant challenges in data privacy. Handling sensitive personal and financial information is a fundamental concern, as real estate transactions often involve extensive data collection and processing. Ensuring compliance with regulations such as the General Data Protection Regulation (GDPR) requires continuous effort and resources. Furthermore, the risk of data breaches remains high, posing severe consequences including

financial losses, legal actions, and reputational damage. Additionally, ensuring that employees are well-trained in data privacy practices and managing the integration of new technologies that may expose firms to further privacy risks are critical tasks.

Cybersecurity presents another major challenge for the real estate industry as it becomes increasingly susceptible to cyberattacks like phishing, ransomware, and data breaches. These threats can result in substantial financial and reputational damage. Protecting sensitive information, including personal identification details, financial records, and proprietary business data, is paramount. Regulatory compliance with data protection laws requires constant monitoring and adaptation. Moreover, as cyber threats evolve, real estate companies must stay vigilant and implement effective countermeasures. Ensuring employees are aware of cybersecurity best practices is crucial, given that human error is a significant risk factor.

The adoption of new technologies such as IoT, AI, and cloud computing introduces additional cybersecurity and data privacy vulnerabilities. Real estate firms must secure these technologies to prevent potential breaches. Collaboration with third-party vendors, who may have access to sensitive data, also necessitates strict adherence to data privacy standards. Managing these complex dynamics while maintaining robust security measures across all platforms is essential for safeguarding sensitive information and protecting the integrity of the real estate industry.

Data Privacy in Real Estate

- **Handling Sensitive Information:** Real estate transactions involve collecting and processing a large amount of sensitive personal and financial data. Ensuring the protection and confidentiality of this information is a significant challenge.
- **Compliance with Regulations:** Adhering to data privacy regulations, such as the General Data Protection Regulation (GDPR) and various local laws, requires ongoing effort and resources. Real estate firms must continually update their practices to remain compliant and avoid penalties.
- **Risk of Data Breaches:** Data breaches can result in severe consequences, including financial loss, legal actions, and damage to reputation. The industry faces constant threats from cybercriminals aiming to exploit vulnerabilities in data security systems.
- **Employee Training and Awareness:** Adhering to data privacy best practices and fostering employee awareness of the significance of safeguarding sensitive information is paramount. Human error persists as a substantial risk factor in data breaches.
- **Technology Integration:** Incorporating new technologies like cloud computing, IoT, and AI can expose real estate firms to additional data privacy

risks. It is essential to implement robust security measures to safeguard data across these platforms.

- **Third-Party Vendors:** Real estate firms often work with various third-party vendors who may have access to sensitive data. Ensuring that these vendors adhere to strict data privacy standards is a critical challenge.

Cybersecurity Risk in Real Estate

- **Increasing Threat of Cyber Attacks:** The real estate industry is increasingly vulnerable to cyberattacks, including phishing, ransomware, and data breaches. These attacks can lead to significant financial losses, legal liabilities, and reputational damage.
- **Protecting Sensitive Information:** Real estate transactions involve the exchange of sensitive information such as personal identification details, financial records, and proprietary business data. Safeguarding this information from unauthorized access and theft is a major challenge.
- **Regulatory Compliance:** Compliance with various data protection regulations, such as GDPR and local privacy laws, requires continuous monitoring and adaptation. Real estate firms must ensure they meet these standards to avoid penalties and protect client information.
- **Evolving Cyber Threats:** Cyber threats are constantly evolving, with hackers developing new methods to breach security systems. Keeping up with the latest threats and implementing effective countermeasures is an ongoing challenge for real estate companies.
- **Employee Awareness and Training:** Human error remains a significant risk factor in cybersecurity. Ensuring that employees are well-trained in cybersecurity best practices and are aware of potential threats is crucial to maintaining robust security.
- **Integration of New Technologies:** Adopting new technologies like IoT, AI, and cloud computing can introduce additional vulnerabilities. Real estate firms must carefully manage and secure these technologies to prevent new avenues of attack.

CONCLUSION

Summary of Key Findings

Technological advancements have significantly transformed the real estate industry, enhancing property searches, listings, and management through digital platforms. Innovations like PropTech, Internet of Things (IoT) and VR have improved design accuracy and project efficiency. Big data and AI are driving informed decision-making and personalized customer experiences. Blockchain is increasing transaction transparency and security, while smart technologies are

streamlining property management. However, stakeholders must address cybersecurity, data privacy, and sustainable development challenges to fully leverage these technological benefits.

Reflection on the Overall Impact of Technology on Real Estate

Technology has profoundly reshaped the real estate industry, bringing about transformative changes that have enhanced efficiency, transparency, and customer satisfaction. The integration of advanced technologies such as AI, big data, VR, and blockchain has revolutionized property searches, design processes, and transaction management. These innovations have not only streamlined operations but also provided deeper insights and more personalized experiences for clients.

The shift to digital platforms and smart technologies has improved property management and maintenance, making it easier to address tenant needs and maintain building systems. Advanced data analytics have empowered investors and developers to make more strategic decisions by facilitating a deeper understanding of market dynamics and consumer preferences. Nevertheless, the accelerated adoption of technology has introduced new challenges. Cybersecurity threats and data privacy concerns have become increasingly prominent, necessitating robust measures to safeguard sensitive information. Additionally, the emphasis on sustainable development highlights the need for eco-friendly practices and materials in future projects.

Overall, technology has brought immense benefits to the real estate industry, driving innovation and improving the way properties are bought, sold, and managed. By continuing to embrace and adapt to these advancements, the real estate sector can navigate future challenges and continue to thrive in an evolving landscape.

Recommendations for Real Estate Stakeholders

Embrace new technologies like AI, VR, and blockchain to enhance efficiency and customer experiences. Prioritize robust cybersecurity measures and compliance with data privacy regulations. Invest in employee training and sustainable practices to stay competitive and meet evolving market demands.

Final Thoughts on Future Development in Real Estate

The future of real estate will be shaped by continuous technological innovation, a growing focus on sustainability, and evolving consumer expectations. Advancements in AI, VR, and blockchain will further streamline operations and enhance the buying and selling experience. Sustainable development practices will become more critical, addressing environmental concerns and regulatory demands. The industry must remain adaptable and forward-thinking to successfully navigate these changes and leverage new growth opportunities.

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