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Technologies in Real Estate Development: A Review

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Abstract

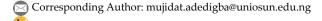
The purpose of this study was to elucidate the role of technology in real estate development. A strong grasp of technology is essential for real estate developers to stay competitive in the real estate industry. If a real estate developer does not understand how technology fits into the real estate development process, they will most likely go out of business. In real estate development, there are limited studies around technology adoption, so it could be difficult for outsiders to find a way into the sector. Literature analysis was employed in this study. The three technologies utilized in the process of developing real estate are construction, finance, and property technologies. Most studies conducted on real estate development explore finance and construction technologies, without clarifying the difference between property, finance, and real estate technology. Few studies have been able to describe real estate technology in a way that promotes creativity and revolution in its development. There are chances to discover how real estate technology is changing the real estate development process.

Keywords: Development, Infrastructure, Internet of things, Real estate, Technology.

1 | Introduction

There is a close nexus between technology, production processes, and human existence [1]. Technology may improve productivity and speed up the process of creating new products. This is especially true for real estate development, which is a complex and time-consuming process. Developers who do not recognize the value of technology in real estate development will lose out to competitors. The usage of technology has the power to improve the quality of output and change the development process; developers who do not comprehend the importance of technology or employ technology in their operations will lag.

Given the benefits of technology and how it will alter the process of developing real estate, developers should be explained how technology is used and functions in the process. In the context of smart cities, real estate developers are the ones who drive the development of infrastructure and real estate, so understanding how technologies impact their work and the current process of development is crucial to understanding ways to





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improve intelligence and leverage technology to change the real estate development process. Adeniran et al. [2] noted that technology has been beneficial in deermining choice of houses.

Most of the works of literature on the real estate development process concentrate more on finance and construction technology, while there are other technologies as well, such as real estate technology. In recent times, literature hardly discusses real estate technology or how its technology differs from other technologies. Therefore, there is a need to elucidate the role of technology in real estate development.

2 | Literature Review

Real estate development

Enhancing the way that land performs as well as managing and transforming land are the goals of real estate development. There are several different types of real estate development, including construction development, land banking, land packing, rehabilitation, operation, and redevelopment. Similar steps are included in every real estate development process, beginning with commencement and research. The practice of buying land for development within a predetermined time frame to increase the land's value is known as landbanking. Developers can increase the value of land by changing the way that property is utilized, as well as by producing development plans and site studies. Land package projects are those that regulate land functions by their potential. Developers must transform a functioning plot of land into useable or habitable real estate before they may develop it for structures.

Renovations can help achieve that. Renovation is the act of restoring or altering the quality of structures to increase the worth of property items that have declined in value. The last kind of real estate development is redeveloping an existing property by changing its operations to the potential that has been determined. There are multiple steps in the development process of a property, and each one must be completed to go on to the next. Real estate development is similar to playing a game [3]. If the developer can finish several steps, real estate development will result in a property product. The developer must go back to the prior step and assess it if they are unable to finish a certain step.

Every step has advantages and disadvantages specific to developers and the environment. The process of producing property items involves the connection of many components and information, as stated by Ariyawansa [4] and Cadman [5]. Depending on the writers' point of view, there are two ways to explain the stage of real estate development. First, scholars and the literature have taken a theoretical approach [6–8]. Property industry practitioners use the second strategy, which is practical [9–13].

Because the theoretical method isolates each activity into a separate stage, it tends to be lengthier and more involved than the practical description of the real estate development phase. In terms of the order or chain of development processes, both approaches are different. In theory, the tasks determine how each stage of real estate development is organized. Essentially, a stage will have many activities that may be completed concurrently and are tied to each other. According to certain authors [10], [14] that provided a practical explanation of the development process, the steps of starting, researching the land, and analyzing the market are all combined in one stage. Due to their interconnectedness and ability to be completed in tandem, these three jobs cannot be divided.

According to ARCA [9], these three activities are part of the land determination step; nevertheless, Yardney [14] refers to it as the pre-financing stage. In the periods of construction and post-construction, the theoretical and practical explanations diverge as well. In more concrete terms, the construction phase is the process of creating a property product. According to the theoretical explanation, all of the planning from the preceding phase is realized during the construction phase. Real estate development, in theory, is the process of generating property items, services, and access infrastructure to increase the value of land. Determining whether to sell or lease the property is the post-construction phase [7–11], [14].

In theory, developers consider property product management, should they choose to handle it independently, in addition to sales and leasing throughout the post-construction period. Since the exit strategy stage offers

three options: leasing, selling, and operating property products, there is still a property management stage in the post-construction phase. The sixteen steps that comprise the real estate development process are beginning, land analysis, land selection, market research, land acquisition, feasibility study, design, planning, financing, licensing, contract negotiation, commitment, implementation, promotion, project completion strategies, and property management. The sixteen stages were divided into pre-construction, construction, and post-construction phases. These three phases were arranged according to development time.

3 | Technology in Real Estate Development Process

Three different kinds of technology can be used in the process of developing real estate:

- I. Real estate tehnology.
- II. Financial technology.
- III. Construction technology.

Each of these three technologies has a specific function in the development process, serving as a tool to support the real estate development process and improve its efficiency, efficiency, and quality. In addition, they have the power to alter the real estate development process. Real estate developers must be aware of and comprehend each technology's applications.

4 | Real Estate Technology, Financial Technology, and Construction Technology

The definition of real estate technology may be given in two different ways. Real estate technology, or PropTech as it is more well known, is viewed as a supporting tool in the first explanation. PropTech refers to the use of strategies, tactics, and instruments that support the real estate industry [15–19]. This statement implies that technology may increase productivity, facilitate work, and enhance efficiency. According to this interpretation, innovation is a result that is defined by the process' efficacy and efficiency [20]. The second definition of real estate technology is any approach, tool, or gadget that can alter the real estate development process [21–23]. According to this interpretation, innovation is a process that is distinguished by a modification of the product development procedure.

Real estate development is being innovated by real estate technology, which brings new ideas to real estate development processes, services, management, and business models. Increasing benefits for customers and real estate developers in the real estate sector are linked to the advantages of utilizing different property technologies [23]. Using real estate technology has both benefits and drawbacks [18]. Real estate technology may help developers attract investors and boost the involvement of actors in the real estate development process.

If developers using real estate technology do not see an increase in performance and creativity with real estate technology, there is a real risk of failure, which will put more pressure on them. Several writers [17], [22] characterize real estate technology as companies with novel product offerings and business strategies in the real estate industry. The business, real estate technology, mediates the process of product marketing and customer communication by using cutting-edge instruments or techniques. Businesses that identify themselves as real estate technology providers typically possess this technology, which makes maintaining and providing services simple, accurate, and efficient. The definition of "real estate technology" is changing since there are too many definitions available.

The concept of real estate technology has been defined by a few writers [24–26]. These groups are organized according to the roles they play in the real estate industry. These areas are all comparable enough to be mapped into technology groupings that provide services, controls, data, transactions, and management. Data group technologies provide data management, retrieval, storage, and visualization. Within a series of transactions, real estate technology refers to the application of technology that makes it easier for suppliers and customers

to exchange goods and services in the real estate industry. Real estate technology is the use of technology to improve the performance of property products via management, procurement, and control of services in the real estate sector. Real estate technology is a key component of the post-construction phase management process in the third category.

Financial technology is one of the technologies utilized in the real estate development process. The employment of technology in transaction processes influences the development of real estate technology, and its finance are closely related fields. The real estate industry's financial advancements that make transactions easier and less costly characterize the second phase of real estate technology development. In 1990, the early development of both technologies was equally influenced by the existence of computers. Financial technology, according to Freedman [27], is a subset of technology used in the financial sector to enable systems for financial product processing, evaluation, and modeling.

Crowdfunding, for instance, emerges as a novel approach or paradigm for product finance. Financial technology facilitates expediting financial transactions and improving both the customer and supplier experiences for goods that employ it [28], [29]. Financial technology, particularly in the real estate sector, may stimulate the creation of new business models and provide innovative approaches. Ten kinds of financial technology are based on the services provided [25], [27], [29]. One way to finance a project, product, or other endeavor is through crowdsourcing, which involves gathering interested investors. Financial technology can draw in investors for the creation of goods, concepts, and financial investments, so it might succeed [28].

Technology that assists consumers, investors, and other financial product users in locating and displaying financial data or in understanding how to utilize financial goods falls into the field of financial information. Within the area of financial information, which includes transaction activity data, financial procedures, and transaction instruction, there is a data search function available [27], [29]. The payment system category is a subset of financial technology that makes it easier for the general public to exchange goods and services quickly, affordably, adaptably, and without the need for middlemen. Technology in the lending system category aids financial service providers in managing loans and offering loan services to customers.

Within the financial technology area, the trading system category helps vendors sell their products or services and acts as a middleman between developers and customers so that transactions may be completed at various times and locations [27]. The selling, renting, and purchasing systems seen in various industries can also be classified under the trading system category, not just the real estate industry. The purpose of the insurance category is to safeguard financial transactions and assets.

Financial technology in the personal finance or wealth management domain assists investors, consumers, and businesses in managing their money, including choosing wisely what to invest in and how much to spend. The financial technology that financial institutions hold and use to conduct their operations includes the capital market category. The category of money transfers makes it easier to transfer money indirectly that is, without needing to meet in person—between people or organizations. Through a distributed database that falls under the category of financial exchange, financial technology enables a procedure that permits digital asset recording and movement on a network without the need for a middleman [25].

One area of technology that facilitates the execution of real estate development planning is construction technology. Data, physical, and service development efforts are aided by construction technology [30]. In data categories, construction technology is crucial as a tool for data transmission, recording, productivity evaluation, planning data and report sharing, data representation, and data communication among development players. Construction technology is covered in the physical category as tools and equipment used in the field during the realization of real estate development, such as machinery. Workplace security, insurance, and upkeep are all included in the construction technology service area.

Intersection in technology

Real estate technology operations can benefit from the guidance of financial technology [25]. The development of real estate technology and financial technology occurs simultaneously and has a mutual

impact on each other, making it difficult to distinguish between the two and confounding many individuals, particularly in the real estate sector. The primary cause of this misunderstanding is the second stage of real estate technology development, also known as real estate technology [25], which is brought about by the introduction of technology into the property sector's capital markets, loans, payments, and financial management systems. It broadens the application of technology in real estate development.

This is a component of financial technology used in the real estate industry. Some writers tend to define all technologies used in the real estate industry, particularly in real estate development, as property technologies, allowing for an overlap in the description of technologies used in the process. Certain real estate technology categories are truly under the financial technology category, according to certain writers [15], [24], [26].

Though they fall into separate categories, real estate technology, and financial technology are comparable when compared in terms of data, transactions, management, service, and control. The ways that real estate technology provides search, presentation, and data processing for development and real estate products including site studies, rental and sale searches for homes, and more showcase the contrasts. Meanwhile, financial technology provides data management, search, and visualization capabilities about financial goods and fields, including loan processing, client information, and so on.

The control, service, and management groups had the same issue. Technology that may mediate their work in providing services, managing, and monitoring property goods with real estate technology in the management, service, and control groups is beneficial to property service providers, property operators, and other property actors. Within the transaction group, real estate technology shares several categories with financial technology. Financial technology in the real estate industry is one of the categories of real estate technology in the transaction category.

Because of its related role, the majority of real estate technology in the transactions group is a component of financial technology. Technologies that assist in making payments and providing money for real estate items that require payment systems include property investment and finance. Though in practice most of this technology employs a trading system and a payment to assist customers deal with real estate developers, brokerage, and leasing property is a technology that helps to supply property goods. Financial technology includes this trade and payment mechanism. In light of this, it is clear that there is a nexus between financial and property technologies in the real estate industry, known as real estate Fintech.

Within the real estate industry, Fintech real estate refers to financial technology. The overlapping fields of real estate technology and financial technology have led to misunderstandings when it comes to terminology usage. According to their respective applications, several writers have started to divide the purview of real estate technology and financial technology [24], [25]. Real estate technology, financial technology, and fintech real estate are mapped out separately using different technological categories. The mapping's goal is to prevent more blunders while referring to technology.

Real estate technology, financial technology, and real estate technology are distinct and independent fields of study. A technology known as "real estate Fintech" facilitates the sale of real estate ownership [25]. Fintech real estate operations involve exchanges or transactions about both physical assets and real estate services. Loans for property financing and portfolio management are two instances of Fintech real estate services. Airbnb has an Android app that facilitates rental transactions and amenities, which is an example of Fintech real estate technology. Without having to meet in person, consumers and property owners may connect via the application and complete transactions.

There is overlap in the technology utilized in some of the items available through the Airbnb app as they feature shared usage systems that fall within the shared economy category. The Airbnb app represents both a technological advancement in property product management and a gadget. Crowdfunding, payment, lending, trading, management, and exchange platforms are the areas under which real estate Fintech falls. One type of technology that aids in money raising, property investment, and finance is crowdfunding. The payment

system category is under the umbrella of real estate Fintech, which is frequently used in the management, sales, and rental processes of real estate goods, services, and insurance.

One kind of real estate Fintech is the lending system, which provides regular funding possibilities to assist in the process of obtaining ownership rights to real estate, finance, and investment assets. Real estate Fintech is a trading system category that streamlines the public bidding procedure for real estate items. Real estate brokers and developers frequently utilize this category. Portfolio management is one of the funding choices for real estate investments that is made possible by the real estate Fintech management system category.

Certain writers, such as ING Economics Department [24] and Sullivan [23], fail to distinguish between the range of activities associated with real estate technology, financial technology, construction technology, and real estate Fintech, making it challenging to distinguish between them. A mapping based on the roles of real estate technology, financial technology, and real estate Fintech would make differentiation between them simpler. Real estate technology is more beneficial in real estate development procedures when it comes to the examination, evaluation, and administration of property assets. Financial technology includes all technological advancements in finance and financial transactions.

Not just the real estate industry is subject to this transaction and finance procedure. When it comes to putting construction planning and management into practice, construction technology is more helpful. Based on kinds and distribution channels, it is highly challenging to discern between different forms of technology used in real estate development. Software and hardware are two ways that property, financial, and construction technologies might be dispersed. There is a tight link between real estate technology and financial technology, and they may be mapped using data, control groups, transactions and management, and services. Mapping the three technologies' respective activity spheres into the real estate development process makes it simple to distinguish between them.

Mapping the technology in the real estate development process

The extent to which technology is used in the process of developing real estate has not received much attention. Three components comprise technology in the process of developing real estate:

- I. Technology as input in production.
- II. Technology with functions of operation and construction.
- III. Technology with the function of management [19].

The first technology group aids in the location, processing, and analysis of data. The second is a technological advancement that facilitates finance, real estate items, and structural development procedures. The administration and functioning of the development process are further aided by this technology. The third category supports the way real estate goods are operated.

Based on the previously mentioned roles and categories of real estate technology, financial technology, and construction technology, other technology groups are involved in the distribution of real estate products to customers. When the planning phase is over and the real estate items are prepared for public sale, these technologies come into action. There are four technology groups involved in the process of real estate development. Technology that aids in the marketing and introduction of real estate goods is referred to as technology with the function of real estate marketing and transactions.

The four technology groups are:

- I. Technology as input in production (Tech 1).
- II. Technology with the functions of operation and construction (Tech 2).
- III. Technology with the function of management (Tech 3).
- IV. Technology with the function of marketing and transaction (Tech 4).

To map out the technologies, the four technological groups provide descriptions of real estate technology, financial technology, and construction technology. The four technical groups are developing their properties at various stages of the process. Tech 1 technology is in the pre-construction phase, Tech 2 is in the construction phase, and Tech 3 and Tech 4 are in the post-construction phase of the real estate development process.

The eight steps of the preconstruction phase include analysis, study, and decision-making for planning, all of which can be aided by technology as a production input (Tech 1). With the help of Tech1, development efficiency may be increased and data processing can be streamlined and expedited for easier decision-making. When utilizing Tech 1 technology, the production factor needs to be adjusted. Tech 2 technology is used as a tool for construction realization, planning, and construction management during the construction process. To create property items, the structural, development, and finance procedures will be completed throughout the construction phase. Tech 3 technology can help with management and operations in the utilization of this property product.

Construction performance, control, and operating procedures are all improved with Tech 3 technology. Real estate developers and other individuals can manage and operate real estate items directly. Property product end customers can also take advantage of Tech 3 technology [19]. Its use during manufacturing might be advantageous to tenants. Real estate developers who handle their property goods will find Tech 3 to be beneficial as well. The developers can employ Tech 4 if they sell their goods and purchase or lease real estate. Tech 4 technology helps with customer transactions, promotion, and public introduction of real estate items.

The functions of real estate technology, construction technology, and financial technology are represented by Tech 1, Tech 2, Tech 3, and Tech 4. Real estate technology includes Tech1 technology, which aids in data collecting as an input for planning and analysis. The property goods search is one of the real estate technology categories in Tech 1, and it's quite useful for studying the market and competitors. Tech 2 technology is a subset of construction technology that facilitates construction management and the construction process. Property technologies like Tech 3 belong in the post-construction stage. At this stage, real estate technology facilitates end users' management of property products. One area Baum presents that discusses technology in property management is smart real estate.

Pre-construction construction may be monitored and optimized by developers through the use of technology like the Internet of Things (IoT). Performance after construction to interact with consumers or renters of real estate goods. By detecting issues early on, the presence of sensor systems in construction can lower the risk of damage and excessive energy usage. This technological product is classified as smart construction or smart real estate. When real estate technology is used to operate property goods, it may often give operators information about construction occupancy, utility problems, tenant demands, and performance data.

The usage value and economic worth of these property items can both rise with the digitalization of activities, which can also optimize the use of space and energy. Tech 4 technology is a subset of Fintech real estate, which is a subset of financial technology. The marketing process and consumer-property developer exchanges are facilitated by this technology. With Tech 4, developers can communicate, negotiate, and complete transactions with customers directly and without the need for a middleman. In the stage of real estate development, real estate technology, construction technology, and financial technology each have their roles and responsibilities.

During the development phase, the mapping of real estate technology, construction technology, and financial technology is done according to the Tech 1, Tech 2, Tech 3, and Tech 4 technological classifications, which are based on the purpose of the technology. The pre-construction phase, which includes design, finance, contract negotiations, agreements, site and market research, land acquisition, feasibility studies, and design, is where real estate technology comes into play. Real estate developers might find it easier to analyze, save, show, collect, and communicate data amongst divisions during the pre-construction stage thanks to real estate technology [31].

Real estate technology lets end customers manage their property goods throughout the post-construction period. Construction technology is now in the process of construction and implementing property goods. When it comes to post-construction exit strategies, financial technology may assist investors in making well-informed decisions on whether to return funds or reap the rewards of realized real estate assets. Within the development process, the domains of real estate technology, construction technology, and financial technology vary as well.

Mapping these three technologies according to their purposes throughout the real estate development stage is the simplest method to tell them apart. It is useless to differentiate real estate technology, construction technology, and financial technology based on their distribution media because they all employ software and hardware as their distribution medium. Real estate technology includes all technologies that are involved in the pre-construction and construction management stages. Financial technology is at the exit strategy stage, whereas construction technology is in the planning implementation stage.

The role of technology

When it comes to real estate development, technology may maximize worker performance and activities. Innovation is viewed as the result of process optimization and development performance. However, technology may also bring about breakthroughs that completely transform the real estate development industry. The influence of this technology is included in the process of innovation, which can alter business models, procedures, and activities related to real estate development [20].

Real estate technology may be used to optimize the usage, sale, and rental of the property while addressing risks and obstacles and raising the standard of performance in the property business [15], [19], [24]. To provide a higher-quality product and better property, developers compete with one another. Developers may outperform their rivals with the help of technology. The rise of digital products and shifting consumption habits are the reasons behind the emergence of real estate technology [22]. In the real estate industry, digitization is thought to make everything easier, from real estate development to property maintenance.

For instance, the availability of Sketchup software and virtual reality, which enable developers to assess designs immediately through three-dimensional representation, has an impact on the documentation process for design. Before a concept is developed, developers and designers may see it in three dimensions thanks to virtual reality visualization. They can conduct environmental studies, look at the condition of the place, and settle disputes before the construction begins [32]. Real estate documentation is under the area of real estate technology, which includes both instances of this technology. Real estate technology can alter the real estate development process during the property management phase. One example of digitization in property management is smart real estate.

Property managers may monitor and administer properties digitally using a system that can give data on energy use, requirements of tenants, occupancy rates, and product security. Without field observation, the supervisory process can be indirectly managed. According to ARUP [33], the use of real estate technology in property management may save operating expenses for similar property products by 25%. The real estate Fintech has the potential to revolutionize the way we interact, communicate, and use real estate goods and services throughout the property marketing process. The essence of this technology is to make every customer action and procedure in the real estate industry easier [34].

Without a face-to-face encounter or middleman, developers and customers may handle transactions and communication. Portfolio management is one area of real estate Fintech that assists investors in choosing financing choices for real estate [26]; with this technology in use, financing, and reference investment decisions may be made using data. Another subset of real estate Fintech is payment systems, which facilitate public property product offerings and act as a middleman in communications between users and property owners. One example is the Airbnb app, which provides rental property items that can be filtered and searched based on requirements, making it easier for renters and property owners to communicate and complete lease agreements.

The control and administration of the real estate development process are made easier by construction technology. Construction technology lowers the possibility of process delays by regulating and controlling the construction process. Microsoft project is one tool used in construction technology for project management. This program can create the schedule, forecast when it will be finished, and estimate the least amount of time that the development substage will take to finish on schedule.

5 | Discussion

Real estate technology, construction technology, and financial technology all play important roles in real estate development, but they are not present at every stage of the process. Real estate technology, as defined by several writers, is the use of technology in the real estate industry. Real estate technology, construction technology, and financial technology are the three categories of technology that may be used in the development process, according to the literature review. Only a few of the technologies that are used in the pre-construction and post-construction phases of property asset management include real estate technology. Financial technology is involved in the post-construction phase's exit plan and construction technology is involved in the implementation phase.

Real estate Fintech, or the spread of financial technology operations in the property industry, is the junction of real estate technology, and financial technology. It was emphasized in a few studies that real estate technology is an inventive approach, a technique, or a tool that can revolutionize the real estate industry's procedures, particularly the process of developing new properties. Real estate technology, then, is an invention that modifies the approach, framework, and procedure of real estate development. Most frequently, real estate technology refers to the application of technology as a tool in the real estate industry. In light of this justification, real estate technology is merely considered a tool capable of enhancing productivity and process effectiveness within the real estate industry.

Mapping the extent of each technology's function inside the real estate development process is the best method for separating property, construction, and financial technologies. Many studies were unable to distinguish between real estate technology and financial technology. Certain authors even committed the error of classifying items that belong in the financial technology category under the incorrect heading in the real estate technology category. In the real estate industry, most writers are unable to distinguish between real estate technology, construction technology, and financial technology. Further research on the implications of real estate technology and how it alters the pre-construction process is possible.

Some studies have uncovered modifications to the real estate development procedure in property management. The emergence of smart real estate goods and the shared economy's technological revolution in property product use are transforming the property management landscape. The growth of smart cities needs to be balanced with improved worker performance and productivity in the process of developing infrastructure and real estate. Technology may help boost performance and productivity at work by acting as a tool or even as a novel approach.

In the process of developing real estate, developers must take three different forms of technology into account: financial, property, and construction technology. The majority of authors defined real estate technology as a firm that uses technology to deliver various products with distinct business strategies. Developers must understand that this third technology is more than just a tool for increasing productivity, effectiveness, and efficiency. This technology includes techniques or ways of operating that have the power to alter business models and real estate development procedures, such as the process of managing properties for smart homes.

6 | Conclusion

The dynamic real estate market is changing dramatically as 2025 gets underway, due to several causes including changes in the global economy and technology breakthroughs. Entrepreneurs must be aware of this and

embrace technology to navigate it, from virtual staging to digital transactions. For customers, agents, and other stakeholders involved in property management, these advances offer increased convenience.

These days, business decisions are made by tech-savvy consumers. They constitute a sizable portion of the market and utilize technology to meet practically all of their demands. While the pandemic hurt certain markets, property technologies and the real estate sector are flourishing. In the real estate industry, the past two years have broken records: ten years ago, there were only 2,000 prop-tech businesses; now, there are over 8,000. These are a few numbers:

- I. The real estate software industry is anticipated to grow to \$12.89 billion by 2025.
- II. Industry insiders claim that 53 per cent of real estate firms already invest in technology.
- III. Multiple listing software is used by 85% of residential firms.
- IV. Ninety percent of real estate companies have an online presence.
- V. Up to 43% of prospective purchasers begin their search online.

Over time, technology's influence on the sector grew. Real estate firms have come to understand the benefits that technological solutions can provide for their enterprise. Real estate challenges that PropTech can help to address are building management, transactions, customer experience, data management and security, marketing, performance tracking, and list management and compliance.

Author Contributions

Mujidat Iyabo Adedigba: conceptualization, data collection, writing original draft.

Adetayo Olaniyi Adeniran: methodology, writing – review & editing, supervision.

Olayemi Babawole Familusi: Literature review, analysis, writing – review & editing.

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Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Adeniran, A. O. (2016). Impacts of the fourth industrial revolution on transportation in the developing nations. *International educational scientific research journal*, 2(11), 56–60.
- [2] Adeniran, A. O., Adeniran, A. A., & Adedigba, M. I. (2024). Choice determinants of housing in Akure, Nigeria. *Journal of contemporary research in social sciences*, 6(1), 39–47.
- [3] Wurtzebach, C. H., & Miles, M. E. (1994). *Modern real estate*. Wiley. https://www.amazon.com/Modern-Real-Estate-Charles-Wurtzebach/dp/0471309516
- [4] Ariyawansa, R. G. (2009). Management of real estate principles of real estate development & management. Department of Estate Management and Valuation, University Sri Jayewardenepura--World Bank HETC/QIG project. https://www.researchgate.net/publication/304580462
- [5] Cadman, D. (2002). Property development. Taylor & Francis. https://doi.org/10.4324/9780203475690

- [6] Fisher, P. (2005). The property development process: case studies from Grainger Town. *Property management*, 23(3), 158–175. DOI:10.1108/02637470510603510
- [7] Kohlhepp, D. B., & Kohlhepp, K. J. (2018). Real estate development matrix. Routledge. https://doi.org/10.1201/9781315180779.
- [8] Newell, G., & Steglick, M. (2006). Assessing the importance of property development risk factors. *Pacific rim property research journal*, 12(1), 22–37. https://doi.org/10.1080/14445921.2006.11104197
- [9] ARCA. (2023). 8 steps to property development success. https://arcabuild.com.au/8-steps-to-propertydevelopment-success/
- [10] Yardney, M. (2019). The property development process. https://michaelyardney.medium.com/the-propertydevelopment-process-2d222c8f9ab9
- [11] MIK ARCHITECTURE. (2023). Real estate development in 5 steps. https://mikarchitecture.com/real-estatedevelopment-in-five-steps/
- [12] Costello, G., & Rowley, S. (2010). The impact of land supply on housing affordability in the Perth metropolitan region. *Pacific rim property research journal*, 16(1), 5–22. DOI:10.1080/14445921.2010.11104292
- [13] Costello, G., & Preller, F. (2010). Property development principles and process an industry analysis. *Pacific rim property research journal*, 16(2), 171–189. DOI:10.1080/14445921.2010.11104300
- [14] Yardney, M. (2010). *How to get started in property development*. Melbourne: Metropole Property Investment Strategists. https://metropole-assets.s3.amazonaws.com/assets/guides/ebook-how-to-get-started-in-property-development.pdf
- [15] JLL Asia Pasific. (2018). *The growing influence of proptech*. https://img.etb2bimg.com/files/retail_files/reports/data_file-clic-1510555199.pdf
- [16] Machinga, R. (2018). *Real estate technology what is proptech and how is it changing the industry*. HLB Int. https://www.hlb.global/real-estate-technology-what-is-proptech-and-how-is-it-changing-the-industry/
- [17] https://renx.ca/proptech-companies-growing-number-value
- [18] Maarbani, S. (2017). Real estate technology: threat or opportunity? White paper: the future of RealTech. https://maarbaniconsulting.com/wp-content/uploads/2017/07/real-estate-technology-white-paper-kpmg-realtech-ventures.pdf
- [19] Vandell, K. D., & Green, R. K. (2010). The impact of technology on commercial real estate. https://realestate.wharton.upenn.edu/wp-content/uploads/2017/03/386.pdf
- [20] Kahn, K. B. (2018). Understanding innovation. Business horizons, 61(3), 453–460. DOI:10.1016/j.bushor.2018.01.011
- [21] KPMG Global PropTech Survey. (2017). Bridging the gap. How the real estate sector can engage with PropTech to bring the built and digital environments together.

 https://assets.kpmg.com/content/dam/kpmg/uk/pdf/2017/11/proptech-bridging-the-gap.pdf
- [22] Lecamus, V. (2017). PropTech: what is it and how to address the new wave of real estate startups. https://medium.com/@vincentlecamus/proptech-what-is-it-and-how-to-address-the-new-wave-of-real-estate-startups-ae9bb52fb128
- [23] Sullivan, B. (2019). *Property technology: disruptor or enabler*. https://www.thailand-business-news.com/property/62181-property-technology-disruptor-enabler
- [24] ING Economics Department. (2018). Technology in the real estate sector: proptech reduces risks and increases value. https://think.ing.com/uploads/reports/ING_EBZ_PropTech-Technology_in_the_real_estate_sector-June_2018_tcm162-148619.pdf
- [25] Baum, A. (2017). *PropTech 3.0: the future of real estate*. University of Oxford. https://www.sbs.ox.ac.uk/news/property-tech-30-ground-breaking-report-looks-future-real-estate
- [26] Pacer, N. (2017). Venture scanner real estate tech report Q1 2017. https://www.slideshare.net/slideshow/venture-scanner-real-estate-tech-report-q1-2017/73047370
- [27] Freedman, R. S. (2006). Introduction to financial technology. Elsevier. https://shop.elsevier.com/books/introduction-to-financial-technology/freedman/978-0-12-370478-8
- [28] Lee, I., & Shin, Y. J. (2018). Fintech: ecosystem, business models, investment decisions, and challenges. *Business horizons*, 61(1), 35–46.

- [29] Gaughan, M. (2017). Commentary: FinTech and the liberation of the community reinvestment act marketplace. *Cityscape: a journal of policy development and research*, 19(2), 187–198. https://www.jstor.org/stable/26328334
- [30] Tatum, C. B. (1988). Classification system for construction technology. *Journal of construction engineering and management*, 114(3), 344–363. DOI:10.1061/(asce)0733-9364(1988)114:3(344)
- [31] Ciriello, R. F., Richter, A., & Schwabe, G. (2017). Digital innovation. Business & information systems engineering, 60(6), 563-569.
- [32] Juan, Y. K., Chen, H. H., & Chi, H. Y. (2018). Developing and evaluating a virtual reality-based navigation system for pre-sale housing sales. *Applied sciences*, 8(6), 952. DOI:10.3390/app8060952
- [33] PR Newswire. (2017). Arup reimagines property in a digital world. ARUP. https://www.prnewswire.com/news-releases/arup-reimagines-property-in-a-digital-world-300482465.html
- [34] Thuillier, A. (2018). *Corporate/start-up collaboration, a fertile garden of innovation*. https://blog.mipimworld.com/innovation/proptech-corporate-start-up-collaboration-a-fertile-garden-of-innovation/