Tech Advancements in Real Estate: A Comprehensive Review & Analysis

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The degree of technological advancement in the early part of the 21st century has mysteriously left footprints in different industries, but the real estate sector is no exception. The sector carefully handles digital instability, which the convergence of many technologies can trace. The paper will concentrate on research demonstrating how PropTech modifies purchasing, selling, and managing our property. It further examines a few models that explicitly depict the impact of innovation in significant locations by delving deep into Artificial Intelligence (AI) that has transformed the bidding system[1] as the model computations can often assist in breaking down the bulk amount of information to get an accurate value, discover what will happen to the market and come with the possible best bidding types. The system, however, solves multi-dimensional problems; it allows customers to get ahead of others in competing sectors and makes well-informed decisions. Now, think of this AI device that brings forward information such as similar traits, regional economic situations, and facts that can be verified to decide which offer conforms with your dream home. 3D maps and virtual tours are alternative ways that permit users to perceive the features differently. Its purpose is to be a worldwide system so all homeowners worldwide and their visitors can view the houses from different angles and at their convenience. This is touted to be an efficient and effective system that would cater to a worldwide market by allowing potential buyers worldwide to see homes physically. PropTech provides several benefits for buyers, sellers, and property managers.[2] As innovation advances, we may assume

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[1] Fahi Ullah et al., 'A Systematic Review of Smart Real Estate Technology: Drivers of, and Barriers to, the Use of Digital Disruptive Technologies and Online Platforms' (2018) 10(9) Sustainability <https://www.mdpi.com/2071-1050/10/9/3142> accessed 01 July 2024

[2] *Ibid*

that far more innovative arrangements will emerge, shaping the final fate of how humans interact with the universe of land.

Keywords: *proptech, smart homes, artificial intelligence, virtual reality, IOT.*

INTRODUCTION

AI, holographic, and 3D modelling[3] are the most common technologies that now have to be the creative fuel that turns the old-fashioned reality into a mirror; the new face of real estate is almost the same as it was a few years back. This paper is committed to evaluating the effect of technological progress in the Internet of Things (IoT), Artificial Intelligence and advanced analytics that shakes the foundations of the property market, including acquisition, sale and management. The abbreviation PropTech stands for the blending of technology and property. The property market now must be open to the revolutionary trends caused by this technology. This function thus brings the future closer and makes people create new technologies with their minds and test their effectiveness in real-life situations.

Though some tools, like online data assets, have been included in buying and managing land, this is only a tiny part of the agent that has been replaced by information technology. Still, this technology is now the most important one that changed this lifestyle completely. AI granted to conduct complicated pattern recognition manoeuvres and turn valuable data from such a daunting volume as information about property valuations, the current market and the most desired proposal leads to developing a new business approach to real estate. Now, trade, where once the data compilation purpose was the same, for which either seller or buyer was workforce, but based on intuition and analytical manual elaborate reports.

Data-driven decision-making is being preferred by many as the category of those who want to place their decisions strategically and with care is rising. A human-like system powered by AI is adaptable. It is like a mysterious advisor capable of suggesting imaginative approaches and foreseeing and analysing tendencies, which is crucial in the constantly developing property

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[3] Ulf Schnars et al., *Digital Holography and Wavefront Sensing: Principles, Techniques and Applications* (2nd edn, Springer 2015)

market. The tendencies seen in Holo videos and deep tours have engendered a different view of modelling. The presentation and the exploration of the property are also among the revolutionary progressions.

By offering such technologies, even if the viewer is miles away, they can get a complete virtual tour, and it feels as if they were there in person. In this respect, the implementation of VR does not need to be in reality because the technology can replace and overcome its absence. Now, holographic technology and three-dimensional tours will very likely aid the buyers in perceiving the property's structure and artistic design. For instance, the flat images can never give either depth or sharpness.

The blockchain AI component to holography and 3d modelling [4]in the real estate business is not only about the ease of viewing or better understanding of various spaces; it defines new ways of how everyone will behave across the entire industry. The systems of intelligent property management are using AI to optimise operations. In contrast, virtual reality sets changing how properties market and inspect the future are still determining real estate. This process of such interactions, artificial intelligence, and convenience is the factor that mainly decides what the industry will be like. Throughout the paper, we will discuss how these blockchain technologies affect property transactions, property management and market dynamics[5]. The ready report, which addresses both positive and negative aspects of PropTech, in the end, will give leads for several stakeholders to act appropriately in the face of these technological changes[6]. This paper is all about a rigorous investigation and analysis. It tries to show us the disruptive role of technology in the real estate business so we can acknowledge that we are in an era represented by features like efficiency, intelligence, and accessibility.

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[4] John S. Baen and Randall S. Guttery, 'The Coming Downsizing of Real Estate: Implications of Technology' (1997) 3(1) Journal of Real Estate Portfolio Management 1-18 <https://www.jstor.org/stable/44154392> accessed 01 July 2024

[5] Andrew Baum, 'PropTech 3.0: the future of real estate' (*University of Oxford Research*, April 2017) <https://www.sbs.ox.ac.uk/sites/default/files/2018-07/PropTech3.0.pdf> accessed 01 July 2024

[6] Graeme Newell, 'The changing real estate market transparency in the European real estate markets' (2016) 34(4) Journal of Property Investment & Finance 407-420 <https://doi.org/10.1108/JPIF-07-2015-0053> accessed 01 July 2024

The stunning success of the computer revolution in our century, which changed how we imagine a housing sphere, is now marked by new types of inventions and the typical breaking of the rules. The AI, holography, and 3D design technologies are therefore bringing in fresh concepts of owning and marketing the property and eventually revolutionising management conceptualisation.[7] The abovementioned defines the prospective future of real estate, which tries to simultaneously address the advancements and risks of the challenges and, in the end, look for the notions to increase ownership.

BACKGROUND

Technological replacement of conventional real estate methods has been neither eternal nor abrupt but relatively gradual and persistent, characterised by fast digital technologies. Meanwhile, the introduction of Artificial Intelligence, especially 3D immersive technologies, has overtaken the traditional ways of art presentation, becoming persistent but being used. PropTech, an acronym for the mix of 'property' and 'technology,' is the encompassing denomination for the current suite of technologies that solve the old real estate inefficiencies and create new ways of interacting in this sector. The upheaval brought about by these technologies is tangible. It encapsulates a broad spectrum ranging from AI-empowered algorithms to spot-on property evaluations to virtual hologram tours, which even prospective buyers across the globe can use for academic reasons they wish to buy.

Even though it is clear that PropTech helps optimise real estate operations, accessibility and ease of transactions, the fast incline of PropTech brings with it applicable legal taming of cutting-edge technology within the real estate domain is interrelated with the established legal frameworks; thus, p; painful consideration of the resulting legal challenges and prospects is required. The legal implications should also be pondered upon because data privacy, intellectual property rights, and regulatory compliance should also be addressed to balance law and technology. Consequently, there is more than just an academic reason to investigate these technologies from a legal point of view since it will help know the potential problems and avoid

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[7] Alan-Miguel Valdez et al., 'Roadmaps to utopia' (2018) 55(15) Urban Studies 3385-3403
<https://www.jstor.org/stable/26533029> accessed 01 July 2024

frictions within the emerging PropTech environment[8].

OBJECTIVE

- In this paper, by examining the legal environment surrounding the continuously growing technologies in the real estate sector, we will delve into the legal issues that hover around PropTech developments.

- The objectives of the paper are twofold: first of all, to illustrate the mechanism of transformations of technologies like AI, Holographic, and 3D representations on real estate transactions, and secondly, to deal with the corresponding legal challenges and the framework of laws that government has integrated from this technology into real protect services.

- This scholarly inquiry aims to support stakeholders by giving them knowledge of tools and strategies for leveraging PropTech advancements while maintaining the law and reducing risks.

LITERATURE REVIEW

AI and Machine Learning in Real Estate Investment (Viriato)

Johnathan Conway Viriato,[9] in their research article, talked about the emergence of artificial intelligence (AI) and machine learning (ML) in the real estate industry and how their applications are revolutionising the way investors make decisions and analyse investments. Directly coming from the sector that has always been sceptical regarding technology adoption, proptech, the area that harnesses the power of extensive data analytics systems and thrives now on cutting-edge solutions, will not surprise us anymore.

The findings of the thesis show clearly that AI and ML technology have an impact on provisions of services in the real estate market, and the decisions that there are more than 100 real estate tech companies now work with AI or ML on their projects, which is a turn of the tide of this

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[8] Evgeny Pankratov et al., 'The blockchain technology in real estate sector: Experience and prospects' (IOP Conference Series: Materials Science and Engineering, 2020)

[9] Jennifer Conway Viriato, 'AI and Machine Learning in Real Estate Investment' (2019) 45(7) The Journal of Portfolio Management 43-54 <https://jpm.pm-research.com/content/45/7/43.abstract> accessed 01 July 2024

industry. With a plethora of reliable data sources and the ability of advanced analytics to make data science accessible to many in the investor and real estate management profession, a fundamental change in how state assets are understood, evaluated and divided is expected.

The paper explores the different options of AI and ML that are being applied in the real estate world, such as in analysing market statistics, increasing through automation, and making more accurate decisions through discussions with venture investors, entrepreneurs, and expert advisors in the industry and the real estate agents, the author helps to create a holistic picture about torrent state and the application of these this technology through examination of the latest developments, data and perspectives of the industry, this paper proves to be a wellspring of knowledge for readers about the reshaping of AI and ML in real estate investment. The outcomes discussed in this work carry significant consequences for investment and real estate practitioners as this would demand the incorporation of technology and new strategies into decision-making ratios so they are strategically positioned to compete in the changing landscape of the real estate industry.

LITERATURE GAP

The literature on PropTech's impact on the real estate sector reveals notable gaps. Firstly, there is a need for more extensive, long-term studies addressing the economic repercussions of PropTech innovations, leaving a gap in understanding their sustained effects. Geographically, research predominantly centres on advanced markets, neglecting the diversity and potential of emerging economies, thereby needing more perspective[10]. Additionally, a technological bias exists, overemphasising specific advancements while omitting a broader exploration of PropTech's spectrum. Lastly, the social and environmental implications of PropTech remain underexplored, indicating a critical area for future inquiry.

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[10] Tim Dixon, 'The impact of information and communications technology on commercial real estate in the new economy' (2005) 23(6) Journal of Property Investment & Finance 480-493 <http://dx.doi.org/10.1108/14635780510626529> accessed 01 July 2024

DEFINITION AND SCOPE OF PROPTECH

Definition - ProptTech, which combines the words 'property' and 'technology', uses information technology to enable people and companies to search for properties, purchase or sell them and manage their real estate assets. PropTech has started to grow in importance as it brings digital changes to the real estate market, where this was previously a 'paperwork' industry—# Spanning from fundamentals listing websites to up-to-the-minute multiplatform systems involving AI for data processing and decision-making.

Scope of PropTech - The Scope of PropTech as a cutting-edge technology is widespread and multidimensional, impacting almost every area of the real estate sector.

1. Operational Management: Automation and IoT and gadgets-enabled enhancement of property management, enhancing efficient maintenance, energy management, and tenant interaction.[11]

2. Customer Engagement: For more engaging property viewings, one can implement AR (Augmented Reality) and VR (Virtual Reality) technology, accompanied by CRM (Customer Relationship Management) systems, to ensure that marketing and sales messages are tailored according to customer behaviour.

3. Transactional Processes: Facilitating buyers, sellers, and renters with digital platforms that provide direct listing, e-signatures, and remote closures, among others. The property sector is developing at a very speedy pace towards the synergies of PropTech, the property and technology merger. This growing ecosystem is valuable for the RE industry and will positively impact its operation and investment choices.

Kim, J., & Cho, Y. (2020). A Study on Proptech-based Smart City and Smart Village Common Technology Demand.[12]

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[11] Nikolai Siniak et al., 'The impact of proptech on real estate industry growth' (IOP Conference Series: Materials Science and Engineering, June 2020)

[12] Jaehwan Kim and Yongkyung Cho, 'A Study on Proptech-based Smart City and Smart Village Common Technology Demand' (2020) 13(2) International Journal of Hybrid Information Technology 79-84 <http://dx.doi.org/10.21742/ijhit.2020.13.2.07> accessed 01 July 2024

- **Investment and Financing:** Artificial intelligence-based platforms, as well as technology (fintech), provide the users with forecasting capabilities for investments and sim the funding and mortgage processes, automating these components of the transactions.

- **Market Analysis and Data Services:** Feature big data and AI technologies that can trace markets' trends in their entirety for more precise property appraisals, meeting decision-makers' needs in the investment opportunities area and risk management.

- **Liquidity:** Technology, as a representative example, is blockchain, which allows real estate tokenization that makes the market more liquid and easily accessible to many manors outside the class.

- **Transparency:** Unlike traditional platforms, PropTech surfaces all the complex real estate data with fair deals transactions, taking away the opaqueness' mystery of' from investment decisions' realm[13].

- **Efficiency:** Automating administrative jobs and digitalisation processes along with data analysis is now doing the job in which people previously wasted unnecessary time and money in real estate transactions.

- **Accessibility:** The levelling of the real estate information access and transaction channels courtesy of PropTech systems has similarly led to a broader playing field where a small-scale retailer/ buyer gets an equal share of resources and information that more prominent organisations (s) also have.

Lastly, it could be argued that developments hard to image in real estate have been created by PropTech, which paves the way for evolution, ensuring emergence and there is more affordability, consequently enabling the property to have a path to go up to a higher level as the most significant global economic sector.

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[13] Jim Clayton et al., 'The world's oldest asset class enters the 21st century: how technology is transforming real estate investment' (2019) 45(7) Journal of Portfolio Management 14-23 <http://dx.doi.org/10.3905/jpm.2019.45.7.014> accessed 01 July 2024

4. The Evolution of Real Estate Technology: Property markets have been through an enormous technological transformation, from primitive data inputting to grid-based property listing to the application of the latest tech that leads to the reformation of the market.[14]

- **Early Innovations:** In the late twentieth century, the real estate industry adopted technical renovation, which combined manual and paper and blocked data collection and storage databases. Such transformation allowed additional efficiency and convenience; the voice control function is a typical example.

- **The Internet Era:** The advent of the Internet at the end of the '90s/begi'90sng of the 2000s was backed up by tremendous growth in theories and the consciences for real estate technology. The Internet property inclusions became 'normal' and all wannabe buyers were granted in-depth property information for the first time in real estate history. In this era, virtual tours enabled real estate developers to reach potential buyers for their properties. At the same time, e-conveyancing was also adopted to improve legal procedures surrounding sector transactions.

- **Current State: Transformative Technologies:** Nowadays, the real estate industry tends to keep up with technology, along with the attraction of the best innovative arrangements that change established practices. AI has now come in ranks with intelligence as it enables the exploration of consumer spending habits and market trends more sophisticatedly with more accurate and predictable data.[15]

Hence, combining blockchain technology and intelligence contracts created a unique security and practical performance system for real estate transactions. Blockchain as a record ledger is available and holds the property transactions as the record is transparent and secure. At the same time, smart contracts are used to create the animation of real estate deals, thus reducing the possibility of disputes. The combination of AI and IoT will make the next revolution in the history of real estate technology after smart and intelligent cities. These innovations have,

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[14] *Ibid*

[15] Venkatesh, 'Recent Trends in Real Estate Marketing in India' (2008) 6(2) ICFAI Journal of Services Marketing

hitherto, greatly heightened the industry's security efficiency and cy and even analytical capabilities, setting new standards

5. Technological Overview: The real estate industry has witnessed unparalleled transformationalism because of the introduction of property technology (Proptech). The shift is majorly caused by Artificial Intelligence (AI), Augmented reality (AR), Virtual reality (VR), and holographic technologies that re-visit the ways property is bought, sold, and managed. This introductory part provides insights into these breakthrough technologies and focuses on the regulations implicated with their integrations in the real estate market.

AR/VR in Real Estate:[16] Augmented Reality (AR) and Virtual Reality (VR) technology are currently making waves in the prop viewings and purchasing experiences. AR integrates digital objects into real space primarily via the smartphone lens, whereas VR gives an entirely virtual experience in the physical environment. These devices allow possible buyers to take virtual tours of the properties, therefore saving them time and resources for both buyers and agents.[17]

Applications and Benefits: AR/VR technologies make it possible to create virtual stages, architectural visualisations, and interactive property tours, allowing buyers to see rebuilding and furnishing as if in real living moments. These virtual tours add to the convenience of touring properties from anywhere, opening up the buyer base to those on other continents.

Current Legal Considerations: The central legal aspect covers privacy, data protection, and intellectual ownership. Examples of such laws, like the GDPR in the Soviet Union, control the gathering and processing of personal data while these digital interactions occur. Intellectual property laws also serve as a protective measure for the exclusive designs and content that go into AR/VR experiences.

AI-driven Bidding: AI-assisted bidding platforms employ machine learning techniques to create meaningful datasets for informed bidding decision-making and fairness. AI algorithms

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[16] Ashish Gupta et al., 'Significance of real estate fund management in India' (2017) 25(1) Journal of Real Estate Literature 141-168 <https://doi.org/10.1080/10835547.2017.12090445> accessed 01 July 2024

[17] Albert Saiz, 'Bricks, mortar, and proptech: The economics of IT in brokerage, space utilization and commercial real estate finance' (2020) 38(4) Journal of Property Investment & Finance 327-347 <https://www.emerald.com/insight/content/doi/10.1108/JPIF-10-2019-0139/full/html> accessed 01 July 2024

can sort through old data, market trends, and buying history for accurate recommended bid prices. Nonetheless, the integrity of these suggestions relies on the bias-free nature of data presented to the system.

Legal Safeguards: Current laws like the Fair Housing Act in the United States are designed to eliminate the problem of discrimination when buying or renting a house. Similarly, AI-based systems must also adhere to the regulations to ensure that their suggestions are not biased in nature[18]. Furthermore, these legal systems include transparency and accountability measures to avoid manipulative operations whenever the AI offers services in various jurisdictions.

HOLOGRAPHIC TOURS

Holographic technology can project a 3-dimensional reproduction into space; thus, this technology[19] does not need special viewing devices. With this solution, the user can enter and explore the virtual object from all angles and, therefore, have a more interactive experience than with other 3D models.

Technology and Interaction: Similar to AR/VR, you do not need extra gadgets to see the three-dimensional representations illuminated by light projection technology. Interactivity with these holograms improves how you experience property tours, creating a new dimension.

Copyright Issues and Privacy Concerns: The art and craftsmanship of creating holographic images are affected as there are copyright laws that can help prevent copyright infringement for unauthorised use or reproduction of such images. Other intricacies arise about interiors taking detailed shots, which must be preceded by permission and vetted under the privacy law.

New Emerging Technologies: Besides AI, AR/VR, and holographic tours, technologies such as blockchain, which is suitable for authenticating history, and IoT, which is used in smart homes, are the main trends concerning the future of real estate.

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[18] Baum (n 5)

[19] Joe Shaw, 'Platform real estate: Theory and practice of new urban real estate markets' (2020) 41(8) Urban Geography 1037-1064 <https://doi.org/10.1080/02723638.2018.1524653> accessed 02 July 2024

LEGAL OVERVIEW AND CHALLENGES POSED BY EMERGING TECHNOLOGIES

The integration of uprising technologies such as Property Tech [PropTech] has drastically revolutionised real estate by enhancing the efficiency and accessibility of buying, selling, and managing properties. AI and Holographic/3D representations are among the innovations that have revolutionised the real estate market, offering a dynamic and innovative real estate market. Nevertheless, rapid technological advancements additionally result in a set of legal challenges that need to be carefully considered to guarantee the sustainable progression of PropTech. Privacy and Data Protection, Intellectual Property Rights, Consumer Protection, and Liability Issues: This paper discusses some critical legal issues these technologies face.

Privacy and Data Protection: Implementing AI in the real estate branch includes collecting, saving, and processing large amounts of personal data, such as financial records, individual types of identification, and likes. This raises privacy issues and the need to implement stringent international data protection laws such as the GDPR in Europe. GDPR rules have been implemented by businesses with stricter measures to keep data protected, provide transparency in data processing activities, and ensure data subjects have control over their personal information. While the task for PropTech companies is to implement robust data protection systems that comply with GDPR and similar regulations worldwide, they still need to use data to offer personalised services.

Intellectual Property Rights: In PropTech, especially in AI algorithms and the creation of holographic/3D content, there are serious problems regarding intellectual property (IP) rights. Software and digital content are protected by copyright law. Still, the legal framework should evolve to define intellectual property rights and technology that power PropTech solutions suitably. Further, virtual models for marketing and virtual tours should be used.

PropTech innovations, particularly in developing AI algorithms and holographic/3D content, raise complex issues regarding Intellectual Property (IP) rights. Software and digital content are

protected under copyright law[20], but the legal framework must evolve to adequately protect the proprietary technology and algorithms powering PropTech solutions. Additionally, creating and using virtual models in real estate marketing and virtual tours crafting a framework for the new copyright law that defines rights and ownership over virtual properties play a vital role. Legal aspects connected to the proper assignment and the protection of IP rights may require further legal advice and the establishment of some unique legal acts corresponding to the digital changes in real estate.

Consumer Protection: The authenticity of the technology processes, such as augmented reality, presents a problem for consumer protection. While these technologies provide buyers with a virtual space for discovery, there's a risk of misleading representations when the virtual content does not match the actual properties. Such an imbalance would invite disputes and filings to consumer protection statutes, requiring precise standards and guidelines for AR/VR surveys in the real estate domain to protect consumer rights from fraud or misrepresentation.

Liability Issues: Since AI is mainly responsible for the decision-making process involving real estate transactions, from property valuations to the prediction of market trends, liability concerns are the main issue[21]. Unsound artificial intelligence (AI) assessment or advice can cause financial loss or mayhem, provoking malpractice and liability issues. Additionally, with immersive activities, holographic material may cause mental or physical damages that may lead the makers of this holographic content to be liable in a court of law. Establishing apparent liability issues, particularly when the technology fails, or a mistake is made, is essential for adopting this technology into the real estate market.

Given that PropTech is transforming the real estate industry, legal frameworks still need to be implemented to address the challenges of developing these new technologies. These issues related to Privacy and Data Protection, Intellectual Property Rights, Consumer Protection, and Liability Issues are significant for creating and maintaining technological progress/innovations

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[20] Christopher W. Starr et al., 'The rise of PropTech: Emerging industrial technologies and their impact on real estate' (2020) 39(2) Journal of Property Investment & Finance 157-169 <http://dx.doi.org/10.1108/JPIF-08-2020-0090> accessed 02 July 2024
[21] Baum (n 5)

where there is the necessity of regulatory compliance and protection of all stakeholders and encouragement of trust among the digital society.

DEVELOPING A LEGAL FRAMEWORK FOR TECHNOLOGY INTEGRATION IN REAL ESTATE

Integrating technology into the real estate sector, while offering myriad benefits, also presents unique challenges necessitating a robust legal framework[22]. As real estate technology evolves, regulatory bodies are tasked with ensuring that technological advancements such as Artificial Intelligence (AI), Augmented Reality (AR), and Virtual Reality (VR) are implemented in a way that safeguards consumer rights, ensures data protection, and maintains accuracy. Furthermore, the transnational nature of technology calls for international cooperation to create cohesive standards that manage cross-border data flows and technology deployment.

Regulatory Proposals –

Ensuring Technology Accuracy: Regulations must mandate stringent testing and verification of technology-based tools[23] used in real estate to ensure their accuracy and reliability. This is particularly crucial for AI-driven valuation models, AR property tours, and other applications[24] where inaccuracies could lead to significant financial losses or misinformation. Establishing a certification process for these technologies could ensure compliance with accuracy standards.

Protecting Consumer Rights: Legal provisions should address issues related to consumer rights in the digital real estate market. This includes the right to transparent information, opt-out of specific data uses, and protection against unfair digital practices. Regulations should mandate clear disclosures of the technological mechanisms underlying property listings, valuations, and transactions, empowering consumers with the information needed to make informed decisions.

Safeguarding Data: As real estate technologies collect vast amounts of personal data, stringent

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[22] Rosa M. Garcia-Teruel, 'Legal challenges and opportunities of blockchain technology in the real estate sector' (2020) 12(2) Journal of Property, Planning and Environmental Law 129-145 <http://dx.doi.org/10.1108/JPPEL-07-2019-0039> accessed 02 July 2024

[23] Kerry Vandell and Richard K. Green, 'The impact of technology on commercial real estate' (2020) Urban Land Economics Research

[24] Garcia-Teruel (n 22)

data protection regulations are imperative. Laws similar to the EU's General Data Protection Regulation (GDPR) should be considered, focusing on consent, data minimisation, and the right to data portability. Additionally, specific guidelines on storing, using, and sharing real estate data can help protect against breaches and misuse.

Ethical Considerations -

Guidelines for Developers and Users: Ethical guidelines for the development and use of AR, VR, and AI in real estate should emphasise respect for user privacy, accuracy of information, and non-discriminatory practices. Developers should aim for transparency in how these technologies function and the limitations they possess[25]. Ethical use also means ensuring these technologies do not contribute to unfair market practices or exacerbate housing inequalities.

AI Ethics in Real Estate: Special attention should be paid to the ethical deployment of AI, ensuring algorithms are designed to prevent biases related to race, gender, or socioeconomic status. Regular audits should be conducted to identify and correct any biases these systems may propagate.

International Cooperation -

Legal Standards and Cooperation: The cross-border nature of technological innovations necessitates international legal standards and cooperative frameworks. Harmonising regulations across jurisdictions can facilitate the global development and deployment of real estate technologies, ensuring they respect international data privacy and consumer protection laws.

Data Flow Management: An international agreement on data flows, especially concerning real estate transactions and property data, could help manage the risks associated with data sovereignty and privacy. Such cooperation would support the seamless, secure exchange of information across borders, which is critical for the global real estate market.

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[25] Andrew Saull et al., 'Can digital technologies speed up real estate transactions?' (2020) 38(4) Journal of Property Investment & Finance 349-361 <https://www.emerald.com/insight/content/doi/10.1108/JPIF-09-2019-0131/full/html?skipTracking=true> accessed 02 July 2024

In conclusion, developing a comprehensive legal framework for technology integration in real estate involves a multifaceted approach, addressing accuracy, consumer protection, data privacy, ethical use, and international collaboration. Balancing innovation with these regulatory and ethical considerations will be crucial in fostering a real estate environment that is not only technologically advanced but also secure, equitable, and respectful of individual rights and international norms.

CONCLUSION

The advent of transformational technologies, collectively termed PropTech, has turned upside down the notions of doing business in real estate, creating enormous benefits in greater efficiency, control and enhanced decision-making. Although the technological revolution brought a new dimension to legal procedures, which now contains a labyrinthine situation, the proper approach is crucial to guarantee the duree and responsible deployment of these technologies.

Data processing and collection are the main prop-tech privacy challenges due to large volumes of personal data collected from various sources. Data privacy protection, a legal instrument like GDPR (General Data Protection Regulation), should be strictly observed across the board to make collecting, saving and using confidential information possible, transparent and subject to the consent of the data subjects. Nonetheless, the complex topics around intellectual property rights, including algorithms and contents of AR/VR technologies and holographic representations, need to be monitored with strict legal measures to enforce the innovations that made these PropTech solutions work.

Technology regarding property valuation includes AI, real estate through AR/VR, and holograms. As a result, consumer protection has become more significant in these manners. Regulatory bodies shall lead the way in drafting implementable indigenous standards to safeguard buyers from scams, correct exaggerations, and ensure that the physical properties match the respective virtual properties. Moreover, this technology suffers from the possibility of failures or wrong decisions due to AI systems; hence, apparent legal issues need to be outlined

to protect the entire universe of people from monetary and legal exposure[26].

Nurturing Global Cooperation and Harmony: Through the global business nature of real estate, data and technology flow across international borders. This calls for agreements among various countries on the standards of their laws. Working together on collective structures for data management, technology deployment, and customer protection will be the driving potential vehicle for a smooth PropTech incorporation into the business environment.

Balancing Innovation and Regulation: The selfless act will eventually be compensated when the real estate market has overcome this turnover and embraces technology-centred innovation. This compensation will legally alter the evicted tenants, allowing them to remain in their apartments with due process law. The authorities should be dedicated to adopting a positive approach, constantly monitoring the process and pointing out problems and new revelations as the market changes dynamically. Thus, the legislation is updated. Therefore, natural habits will become influential aspects that will be used to determine whether or not these technologies will be released into the world to safeguard the interests and rights of all parties.

This legal field is a sensitive area, and strict processes are during the process, simultaneously giving the end user all the perks, the environment can provide. This is possible using the PropTech application, which deals with multiple legal issues like data security, intellectual property, consumer rights, and liabilities. Its regional nature fosters this global cooperation among nations to help the real estate industry use digital technologies in compliance with the rule of law and the concepts of fairness, safety, and economic feasibility.

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[26] Avi Spielman, 'Blockchain: digitally rebuilding the real estate industry' (D'Phil Theses, Massachusetts Institute of Technology 2016)