Agent-Next:

PropTech and Future of Real Estate Intermediation

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Executive Summary

Our working definition of PropTech in this project refers to the use of technology to streamline and enhance various aspects of the real estate intermediation industry, including but not limited to property valuation, listing platforms, property management, conveying property rights, and client management.

Based on potential benefits and risks that PropTech may bring about to the real estate intermediation (REI) industry, our team has been tasked by the Department of Real Estate (DRE) to study future scenarios of PropTech and their potential impact on the REI profession as well as DRE's mission and statutory duties.

Property technology, or PropTech, integrates information technology (including hardware, software, and data analytics tools) in the real estate industry. PropTech has impacted the traditional property buying, selling, and management process, making it more efficient and convenient for agents and users.

The project was initiated with the broad goal of understanding the relevance of PropTech to DRE's mission and documenting the current status of PropTech literature. The project concludes with a set of actionable insights and strategic recommendations for updating the regulatory framework.

Major activities of this study include:

1. Review existing literature on PropTech to provide a working definition
2. Understand the role of real estate agents and the licensing exam process
3. Examine more than 15 key PropTech startups
4. Benchmark to gain lessons from other industries that are going through similar challenges.

5. Document equity and inclusion aspects of PropTech
6. Conduct unstructured interviews with more than ten leading industry experts
7. Review the results of the Occupational Analysis Questionnaire (Job Analysis Survey) to identify PropTech-related tasks and skills
8. Develop a conceptual model and future scenarios
9. Conduct a survey of professionals to assess proposed ideas and scenarios
10. Propose a set of short-term and long-term recommendations to DRE

Four scenarios for the future of PropTech are identified based on a literature review, a study of industry trends, and experts' opinions.

Four Possible Scenarios for the Future of Real Estate Intermediation

Scenario I: Enhanced Productivity
Scenario II: New Roles
Scenario III: AI Replacing Some Agents
Scenario IV: Autonomous Digital Industry

- Scenario I (Enhanced Productivity): The productivity of real estate agents will be increased, but they will not be replaced, nor the nature of their jobs will be changed.
- Scenario II (New Roles): envisioning changes to real estate agents' tasks and possibly eliminating specific tasks but not decreasing the number of needed agents in the industry.
- Scenario III (AI Replacing Some Agents): The rise of PropTech leverages technology to streamline transactions. As a result, the number of traditional real estate agents may decrease as online platforms play a more prominent role in connecting buyers and sellers.

- Scenario IV (Autonomous Digital Industry): In this disruptive scenario, the role of human real estate agents is entirely supplanted by digital systems, driven by the emergence of advanced technologies.

Summary of Survey Results The survey of 188 real estate licensees in California suggests that the majority of respondents (66.25%) anticipate significant changes in the real estate industry due to PropTech's advancement in the next five years.

While only a small percentage (3.21%) believe that real estate agents will be replaced entirely with digital systems (Scenario IV), a more substantial portion (31.55%) foresees a reduction in the number of real estate agents needed (Scenario III). A slightly higher percentage (32.09%) expects real estate agents' roles and tasks to be significantly changed but not replaced (Scenario II). Only 33.16% of respondents anticipate increased productivity without changing the nature of agents' jobs (Scenario I).

Our study reveals a dynamic landscape in the real estate industry concerning the adoption of PropTech tools and the preparedness of professionals for technological changes:

- High adoption rate of electronic document management systems and marketing tools
- Moderate current adoption rate of AI-based products but interest in learning it for future adoption
- Concerns about compliance, security, and data privacy as a significant barrier to adopting new PropTech solutions
- Not viewing PropTech as a significant threat to replace real

estate agents

- Broad support for including PropTech in the licensure and continued education processes.
- High-priority continuing education topics include Fundamentals of PropTech, Legal and Ethical Aspects of PropTech, and Effective Use of Generative AI for Real Estate

PropTech solutions empower companies to enhance operational efficiency, lower expenses, and deliver enhanced customer experiences. Moreover, PropTech can democratize the real estate industry, reduce barriers to entry, and make it more accessible to a broader spectrum of individuals. These advantages for the industry create opportunities for the DRE as well.

Opportunities for DRE The main identified opportunities for DRE that emerged due to new PropTech solutions include:

Improved transparency
More efficient education
Use of RegTech

- Improved transparency in the industry to enforce compliance measures more effectively.
- More efficient education and training with AI-based solutions and simulated real-world scenarios.
- Use of regulatory technology (RegTech) for improved compliance and supervisory functions.

Emerging Challenges If algorithms are trained on biased or limited data, they can inadvertently reinforce discriminatory practices or exclude certain groups from accessing housing opportunities. Additionally, reliance on automated decision-making processes in PropTech may reduce human oversight, raising concerns about accountability and the potential for unfair treatment. It is crucial

to incorporate ethical considerations, transparency, and fairness into developing and implementing PropTech solutions to mitigate such risks. Finally, if PropTech disrupts industry structure toward eliminating or reducing the number of human agents by replacing them with digital platforms, there is a risk of unemployment for some licensees and a reduced population of licensees.

Challenges for DRE include the digital gap, new legal and ethical challenges, and the need for an updated compliance framework for consumer protection. One concern is the likely biased algorithms or hidden redlining practices that may perpetuate existing inequalities.

The overarching theme of our study is that PropTech affects **“consumer protection"** and **“consumer services"** aspects of real estate agents’ work. Consumer protection includes significant issues such as data privacy, fairness and biases, misleading information, digital redlining, and model transparency. Consumer service dimensions require real estate agents to have a fiduciary duty to serve their clients’ best interests. Agents who fail to catch up with the progress in PropTech may not deliver the best outcomes for their clients because they are not using the most efficient solutions for advertisement and listing, client management, and market analysis.

The recommendations for the Department of Real Estate (DRE) span short-term, medium-term, and long-term actions to adapt to the changing landscape of PropTech. In the short term (first two years), educational and awareness initiatives are proposed, including enhancing staff knowledge, launching public awareness campaigns, and collaborating with educational institutions for specialized courses. Guidelines and policy development are also recommended,

involving forming a PropTech compliance task force, reviewing existing frameworks, collaborating with PropTech providers, and establishing feedback mechanisms. In the medium and long term (beyond two years), integration of PropTech in licensing exams and continuing education is advised, along with regulatory updates addressing the ethical implications of AI and blockchain. In addition, we recommend that DRE examine ethical monitoring and reinforcement strategies that involve expanding technological infrastructure, investing in AI-driven tools, and collaborating with law enforcement. The last long-term recommendation includes examining jurisdiction expansion possibilities and forming a specialized arbitration body to resolve complex real estate disputes swiftly. These recommendations aim to fortify the DRE's role in regulating PropTech and ensuring the real estate industry's ethical and efficient adaptation to technological advancements.

Finally, we suggest future studies in this area to complement the findings of the current report. A follow-up study is proposed to develop detailed learning objectives and resources for PropTech training. Additionally, a study on domestic compliance trends could explore activities by real estate regulatory bodies in other states, offering insights into a multi-state compliance framework. Another recommended study focuses on the regulatory expectations of PropTech to guide private companies in navigating regulatory risks. Lastly, recognizing the dynamic nature of PropTech, the suggestion is made to update the current study's framework, scenarios, and recommendations every two years periodically. These proposed studies aim to enhance the understanding and regulatory preparedness of the DRE in the evolving realm of PropTech.

1 Introduction

Property Technology (PropTech) represents the innovative integration of various information technology tools—including hardware, software, and data analytics—into the real estate sector. PropTech has impacted the traditional ways of property buying, selling, and management, making it more efficient and convenient for agents and users.

Understanding the underlying factors and developments in PropTech is crucial for the Department of Real Estate (DRE) due to PropTech's significant impact on the real estate sector. PropTech solutions empower companies to enhance operational efficiency, lower expenses, and deliver enhanced customer experiences. Moreover, PropTech has the potential to democratize the real estate industry, reducing barriers and making it more accessible to a broader spectrum of individuals. For this reason, we recommend paying special attention to PropTech's inclusionary opportunities. Additionally, using data analytics within PropTech enables households, developers, and investors to make more informed and insightful decisions, ultimately maximizing their investment opportunities. Overall, PropTech holds the potential to reshape the real estate landscape and drive positive transformations throughout the industry.

However, PropTech also introduces new risks and challenges, such as the potential for biased algorithms and likely implicit redlining practices, which may inadvertently perpetuate existing inequalities. If algorithms are trained on biased or limited data, they can

inadvertently reinforce discriminatory practices or exclude certain groups from accessing housing opportunities. Additionally, reliance on automated decision-making processes in PropTech may lead to reduced human oversight, raising concerns about accountability and the potential for unfair treatment. It is crucial to ensure that ethical considerations, transparency, and fairness are incorporated into developing and implementing PropTech solutions to mitigate such risks. Finally, if PropTech disrupts industry structure toward eliminating or reducing the number of human agents by replacing them with digital platforms, there is a risk of unemployment for some licensees and a reduced population of licensees.

The challenge to adapt and survive in the age of PropTech has already been noted by real estate brokerage firms. The 2021 Profile of Real Estate Firms by the National Association of Realtors (NAR) reports that 47% of real estate firms see “Competition from nontraditional market participants" as their biggest challenge. 41% of firms mention “Keeping up with technology", and 16% cite “Liability in a digital world (contracts, signatures, etc.)" as their biggest challenge.

Given potential benefits and risks that PropTech may bring about to the real estate intermediation (REI) industry, our team has been tasked by the Department of Real Estate (DRE) to study future scenarios of PropTech. This study focuses on the potential benefits and risks PropTech may bring to the real estate intermediation (REI) industry, as well as its impact on the REI profession and DRE’s mission and statutory duties.

This report presents the results of analyzing the current status

and future options for addressing PropTech in the supervisory and regulatory functions of DRE. In addition to the CalPoly team's original data collection and analysis, the research has significantly benefited from discussions with industry experts and DRE staff.

The overarching theme of our analysis is that PropTech affects **"consumer protection"** and **"consumer services"** aspects of real estate agents' work. Consumer protection includes significant issues such as data privacy, fairness and biases, misleading information, digital redlining, and model transparency. Consumer service dimensions require that real estate agents have a fiduciary duty to serve their client's best interests. Agents who fail to catch up with the progress in PropTech may not deliver the best outcomes for their clients because they are not using the most efficient solutions for advertisement and listing, client management, and market analysis.

Several other service industries (including insurance, finance, and legal professions) have been experiencing digital transformation in their service delivery models. Thus, updates in their regulatory, compliance, and supervision frameworks can inform policy updates for DRE. We have included examples of lessons that can be learned from other sectors. Our report concludes by providing short-term and long-term recommendations to DRE.

The report is structured as follows. We first introduce methodologies used in this research in Chapter 2. Section 3 presents a conceptual model and set of scenarios for the future of PropTech and its potential impact on the roles and responsibilities of licensees and DRE. Section 4 discusses the results of a survey sent to a large group of licensees. We discuss the implications of PropTech scenarios for

DRE in Section 5. Section 6 includes recommendations of the study.

Finally, Section 7 summarizes suggestions for additional studies.

2 Methodology of Research

The project team utilized a comprehensive approach to examine the multifaceted impact of PropTech on the future of the real estate industry. Given the novelty of the methodology, it integrates various research methods to provide a thorough understanding of the evolving landscape. The following sections detail the specific methods employed:

1. **Literature Review:**
    - **Scope:** A comprehensive literature review was conducted to establish a foundational understanding of the existing body of knowledge on PropTech and its implications for the real estate sector. The review systematically examined academic journals, industry reports, and relevant publications. The result of the literature review has been reported in this project's Inception Report.
    - **Purpose:** The literature review serves as the basis for identifying key themes, trends, and gaps in the current understanding of PropTech within the real estate context.
2. **Benchmarking:**
    - **Scope:** Benchmarking was employed to gain lessons from other industries that are going through similar challenges.
    - **Purpose:** Benchmarking provides insights into how other industries update their regulatory and compliance frameworks to allow their service providers to leverage technology for maximum impact.
3. **Expert Panels:**

- **Composition:** Multiple interdisciplinary groups of experts were assembled, including real estate professionals, technologists, and regulatory specialists.
- **Method:** Structured expert panels were conducted to gather qualitative insights, expert opinions, and predictions regarding the impact of PropTech on the real estate industry. These sessions facilitated rich discussions on technological advancements, regulatory challenges, and industry adaptation.
- **Purpose:** Expert panels contribute nuanced perspectives, allowing for a holistic understanding of the diverse factors shaping the future of real estate in the context of technological innovation.

4. **Community Survey:**

- **Sampling:** A structured survey was sent to more than 5000 real estate agents to receive their opinions on industry trends and the changes needed in the licensure process.
- **Instrument:** The survey instrument was designed to capture some demographic information such as race, gender, and educational background, information about job title, role, and activities related to the profession, perspective on the future of PropTech, its role in practice, and how regulators should respond to the emerging technological developments. Respondents' participation took approximately 10 minutes.
- **Purpose:** The community survey provides quantitative data to complement qualitative insights, offering a

broader understanding of the prevalent sentiments and experiences within the industry.

5. **Conceptual Model Development:**
    - **Approach:** A conceptual model synthesizing findings from the literature review, benchmarking, expert panels, and community survey was developed. This model serves as a framework for understanding the interplay of technological, economic, and regulatory factors shaping the future of real estate.
    - **Purpose:** The conceptual model enhances the project's analytical framework, illustrating the dynamic relationships and potential pathways through which PropTech influences the real estate landscape.

In combination, these methods offer a comprehensive and multi-dimensional analysis of the impact of PropTech on the real estate industry, aligning with the project's overarching goal of providing actionable insights and strategic recommendations for updating the regulatory framework.

3 Conceptual Model and Scenarios

To conceptualize the future of real estate agents in the presence of PropTech solutions, we consider the major roles and responsibilities of real estate agents and discuss how these roles would be affected or disrupted by PropTech.

Table 1 presents a list of critical services that real estate agents provide, together with the potential substitution of those services through digital solutions.

Table 1: The Impact of PropTech on Various Roles of Real Estate Agents

RE Agent Role	Example of PropTech Substitute	Implications
Market trend analysis	Market analysis tools	Improved efficiency of real estate agents
Price advice	Electronic estimate models	Potential to replace agents by providing direct information to clients.
Property listing	Online platforms	Potential to replace agents by allowing clients to list their homes directly.
Marketing strategies	Social media platforms	Expanding real estate agents' reach.
Property showing	Virtual tours	Potential to both augment or replace agents
Contract negotiation	AI-assistants	Potential to replace agents by allowing clients to negotiate via AI-assistants
Handling closing process	Large language models	Potential to significantly improve the efficiency of agents as well as to replace them with automatic drafting solutions.
Emotional buffer and support to clients	Smart Chatbots	Potential to replace agents.

3.1 What Constraints Will PropTech Relax?

Geography Digital platforms weaken limits of space and geography by allowing professionals to provide services to clients outside of their current location. Real estate agents can also benefit from the same opportunity by working with and intermediating clients who may reside outside their current business location.

Volume of Transactions In a traditional business model, an agent's available time to meet and work on documents determines the number of clients they can handle. PropTech solutions unleash real estate agents' potential by automating several process steps (from appointment setting to contract preparation.)

Team Work and Knowledge-Sharing PropTech can break the traditional barriers to collaboration between agents who are not necessarily working in the same space by facilitating data and knowledge sharing. On the one hand, open communication will improve the informational efficiency of the real estate market. However, it may also increase the risk of collusion among various agents.

Access to Information and Data Analytics A critical impact is that even agents without advanced data analytics and economics skills can obtain highly digestible and relevant information about the market.

Showing/Viewing Times A classic showing process is limited by the time of the day and the schedule of current occupants and potential buyers/tenants. Virtual tours remove this barrier by eliminating the need for the synchronous presence of multiple parties on the property.

Access to Potential Buyers/Tenants The traditional marketing and advertisement channels not only limit the reach of the information to a particular group (e.g., those who physically pass by the property) but also lack personalized and targeted marketing and advertisement. PropTech enables agents to reach a much more

comprehensive range of potential buyers/tenants with a more targeted and customized information set.

3.2 Plausible Scenarios

We discuss four major feasible scenarios for the future of the real estate industry facing progress in PropTech. The scenarios are generated using various inputs, including benchmarking of other industries, industry expert interviews, historical trend analysis, and mapping the progress in ML/AI to the value chain of the real estate profession.

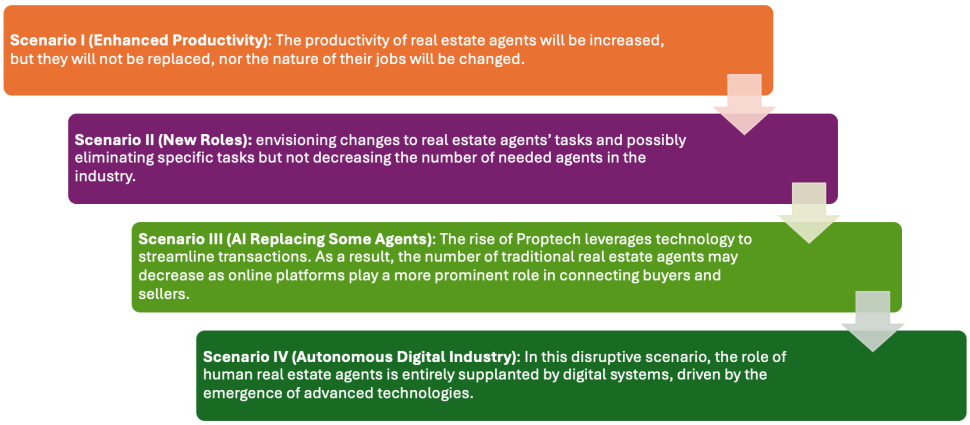

Figure 1: Four Scenarios for Future of Real Estate Profession

3.2.1 Scenario I: Enhanced Productivity

In this scenario, the productivity of real estate agents will be increased, but they will not be replaced, nor will the nature of their jobs be changed. Consequently, PropTech has a relatively minor influence on the real estate industry's structure and conduct. Real estate agents remain central to the process, but they are equipped with advanced technological tools that empower them to provide

more efficient and effective services. Thus, progress in PropTech only makes real estate agents more efficient, but will not replace them. Technological manifestation of this scenario can be:

Enhanced Data Analytics: The use of big data and analytics tools could provide real estate agents with more accurate and insightful information about market trends, property values, and customer preferences. This empowers agents to make more informed decisions and provide better client advice.

Enhanced Client Relationship Management (CRM) Systems: Advanced CRM systems could help agents manage their client interactions more effectively. These systems can provide personalized insights, track client preferences, and automate communication, enhancing the overall customer experience.

3.2.2 Scenario II: New Roles

This scenario envisions some changes to real estate agents' tasks and possibly eliminating specific tasks but not decreasing the number of needed agents in the industry. Thus, while the real estate agents' roles and tasks will be significantly changed, they will not be replaced.

The technological manifestation of this scenario includes all the elements of the previous scenario and adds further technological components, including:

The automation of Routine Tasks: With the integration of advanced technologies like AI and automation, routine and repetitive tasks such as paperwork, data entry, and scheduling

could be automated. This allows real estate agents to focus more on complex and relationship-driven aspects of their work.

Virtual Reality (VR) and Augmented Reality (AR): These technologies could revolutionize property showings. Virtual property tours and augmented reality visualizations might reduce the need for physical visits, saving time for both agents and clients.

Specialization in Niche Markets: As specific routine tasks become automated, real estate agents might choose to specialize in niche markets or offer highly personalized services. This specialization could range from unique property types to specific demographics.

Focus on Negotiation and Consultation: With technology handling more administrative tasks, real estate agents may find themselves spending more time on negotiation, strategy, and providing expert advice to clients. This could strengthen the client-agent relationship.

3.2.3 Scenario III: AI Replacing Some Agents

In this scenario, the rise of PropTech leverages technology to streamline transactions. As a result, the number of traditional real estate agents may decrease as online platforms play a more prominent role in connecting buyers and sellers. We believe this is a likely scenario for the medium-term outlook of the industry. It will result in fewer active agents, but will not fundamentally change the structure of the real estate intermediation industry.

The technological manifestation of this scenario includes all the elements of the previous scenarios and adds further technological components, including:

Online Brokerage Platforms: Online platforms become central hubs for real estate transactions, allowing buyers and sellers to connect directly. These platforms leverage user-friendly interfaces, comprehensive property databases, and advanced search algorithms to streamline the buying and selling process. The shift towards online platforms poses challenges for traditional real estate agents. The demand for their services may decrease as more individuals opt for the convenience and speed of digital platforms.

Integration of IoT, Smart Buildings, and GIS Systems: If IoT, smart buildings, and GIS systems are integrated with listing platforms, potential buyers can receive an accurate, data-driven, and reliable account of the performance of the property and its surrounding environment. Thus, the information asymmetry between buyers and sellers will be eliminated or reduced, and the demand for an expert agent will decrease.

3.2.4 Scenario IV: Autonomous Digital Industry

In this disruptive scenario, the role of human real estate agents is entirely supplanted by digital systems driven by the emergence of advanced technologies. Thus, real estate agents will be replaced entirely with digital systems. Digital platforms become a compelling alternative, providing services traditionally relying on human intermediaries. The technological manifestation of this scenario includes all the elements of the previous scenarios and adds further technological components, including:

Blockchain Technology and Financing Options : Blockchain technology, coupled with flexible financing options, ensures

transparent and secure transactions, offering buyers an easy return policy and diminishing the role of agents in the process. This transformation leads to entirely virtual property transactions, with digital contracts and signatures becoming the norm.

Personalization and AI Assistance: As technology-driven platforms offer user-friendly interfaces, personalized recommendations, and AI assistance, the demand for human agents decreases significantly, prompting a reevaluation of industry roles and skills. The real estate industry is experiencing a shift towards a digitally-driven ecosystem, resulting in increased efficiency and transparency.

Table 2: Roles and Responsibilities of Real Estate Agents in Different Scenarios

Scenarios I and II	Scenario III	Scenario IV
Agents remain central to transactions, utilizing technology for enhanced client services. They leverage digital tools for market analysis, personalized recommendations, and efficient communication.	Online platforms take a prominent role in connecting buyers and sellers. Agents focus on transaction facilitation, negotiation, and expert advice. Their numbers may decrease as online platforms gain prominence.	AI-powered platforms assume many traditional agent functions, potentially reducing the need for human intermediaries. Agents may transition to specialized roles or work within AI-enabled platforms.

3.3 Evolution of Roles

Table 3: Evolution of Real Estate Agent Roles in Different Scenarios

Roles	Scenario I and II	Scenario III	Scenario IV
Listing Agent	Create and manage property listings, utilizing technology for effective online marketing.	Continue to list properties, potentially leveraging advanced online platforms for wider exposure.	AI-enabled platforms may automate the listing process, potentially reducing the need for manual listing agents.
Transaction Facilitator	Facilitate property transactions, leveraging technology for efficiency and client satisfaction.	Continue to facilitate transactions, but with a potential decrease in numbers due to online platforms.	AI-enabled platforms may take on transaction facilitation, potentially reducing the need for human agents in this role.
Market Analyst	Utilize technology for in-depth market analysis, providing clients with valuable insights for informed decisions.	Market analysis remains important, but online platforms may provide some automated analysis tools.	AI-driven platforms may offer advanced market analysis tools, potentially reducing the need for dedicated market analysts.
Negotiation	Leverage negotiation skills to secure favorable client deals, supported by technology for data-driven negotiations.	Negotiation expertise remains crucial, but online platforms may offer some negotiation support tools.	AI-enabled platforms may incorporate advanced negotiation algorithms, potentially augmenting agent expertise.
Personalized Advisor	Provide personalized advice and recommendations to clients based on their needs and preferences.	Continue to offer personalized advice, but online platforms may also provide algorithm-driven recommendations.	AI-enabled platforms may offer highly personalized recommendations based on advanced algorithms and data analysis.
Compliance and Regulations	Stay informed about and navigate complex regulations to ensure transactions comply with legal requirements.	Regulatory expertise remains important, especially in online transactions, which may involve additional compliance considerations.	AI-enabled platforms may incorporate regulatory compliance features, potentially reducing the need for specialized experts.

4 Survey

This section reports the results gathered through a structured survey. The survey was sent to a sample of approximately 5000 licensees, and we received 188 responses in total (after two rounds of reminders).

4.1 Survey Design

The goal of the survey is to measure views of the licensee population on the following topics:

1. Current status of familiarity and adoption of PropTech tool
2. Future scenarios of PropTech and their impact on the profession
3. Suggestions for including PropTech in the licensure process

4.2 Discussion of Selection Bias

Any voluntary survey is subject to the concerns of selection bias in responses. Selection bias refers to the fact that though the survey is sent to a random sample, those entities who deliberately choose to respond (or not respond) may inherently differ from the overall population. Thus, if there is a correlation between the “decision to respond" and “characteristics of respondents", a response bias might be introduced. For example, if younger agents, tech-savvy agents, or less busy agents have a higher response rate, survey results will be biased toward their views rather than the views of

the overall population.

The first step to examine the extent of bias in responses is to compare the observable characteristics of the responses with those of the overall population. This strategy, however, does not fully identify potential bias if the bias is induced through unobservable characteristics.

To run a few observable characteristic checks, we compared the location and gender of respondents, the two characteristics with available data, with those numbers from the overall population.

In terms of gender, while 49% licensees are identified as female, the responses included 45% identifying themselves as female. Thus, the survey might have a small bias toward the male population.

Table 4 shows the percentage of licensees in a few large counties versus the response rate from those counties. We note a slight bias toward higher response rates from agents working in larger counties.[1]

[1] To partially mitigate this bias, we over-represented the weight of the sample from small counties in the survey Emails sent. We also sent an additional reminder only to agents working in small counties.

Table 4: Percentage of Agents in Selected Large Counties

County	Percentage in Sample	Percentage in Responses
Alameda	3.68%	3.08%
Los Angeles	23.31%	26.31%
Orange	8.59%	13.63%
Riverside	5.52%	6.33%
Sacramento	4.91%	3.20%
San Bernardino	4.39%	2.45%
San Diego	7.36%	9.83%
Santa Clara	4.29%	4.16%
Sonoma	4.91%	1.39%
Sum	66.96%	70.38%

Standard techniques, e.g., inverse weighted sampling based on expected response rate, exist to mitigate response biases. However, since the topic of study is novel and little is known about the correlation between licensees and their potential response rate, we cannot fully utilize these techniques.

4.3 Key Insights from Survey Responses

High Adoption of Electronic Document Management Systems (EDMS) and Marketing tools: An overwhelming 85.64% of respondents reported regular use of electronic document management systems such as DocuSign. The widespread use of EDMS indicates a firm reliance on digital platforms for handling paperwork and streamlining transactions. Digital listing platforms (60.64%), market analytics tools (61.17%), virtual tours and staging with drone photography (57.45%), and video production and social media (49.47%) emerged as widely adopted PropTech tools. The

result suggests leveraging analytical, visual, and interactive content to enhance property marketing.

The majority of respondents have used at least three PropTech-related tools.

Question What PropTech tools and solutions do you regularly use in your real estate work?

ANSWER CHOICES	RESPONSES	
None of the above	9.09%	17
Digital listing platforms	60.96%	114
Electronic document management systems (e.g. docusign)	85.56%	160
Market analytics tools	61.50%	115
Video production, and Social media	49.73%	93
AI-based content production (e.g. ChatGPT)	21.93%	41
Virtual tours and staging, drone photography	57.75%	108
Total Respondents: 187		

Figure 2: PropTech Tools and Solutions

Moderate Adoption of AI-Based Content Production: While only 21.8% of respondents use AI-based content production tools like ChatGPT, considering the relatively new emergence of the technology, there is a high likelihood of growth in the integration of generative artificial intelligence for content production.

AI-based solutions (such as ChatGPT and other large language models) are just emerging. We expect to observe a higher penetration rate of AI-based solutions in the next few years.

Technology Adoption Perspective: 25.3% of respondents believe they are ahead of their peers when adopting new technologies. The majority of respondents (57.6%) see themselves as “Just keeping up" with new technology, while only 15% feel that they are “falling behind". The numbers should be interpreted in the context that over 56% of respondents have a bachelor’s degree or higher, and 58.7% have been in the business for more than 20 years, emphasizing the need for continuous learning and adaptation within the real estate

industry.

Question When it comes to new technology, what best describes you?

ANSWER CHOICES	RESPONSES	
Ahead of my peers	25.41%	47
Just keeping up	57.30%	106
Falling behind	15.14%	28
Don't know	2.16%	4
TOTAL		185

Figure 3: Readiness

High Priority Investment Areas: Market analysis and CMA (65.2%), property listing (67.40%), business operations (63.5%), contract preparation, and document management (60.7%) are the areas where respondents are most willing to invest time and resources to acquire new technology, indicating a focus on data-driven decision-making and operational efficiency.

Question Please specify where you're open to investing time and resources to acquire new technology.

ANSWER CHOICES	RESPONSES	
Market analysis and CMA	65.00%	117
Client representation	55.56%	100
Property listing	67.22%	121
Property showing	48.33%	87
Contract preparation and document management	60.56%	109
Business operations (e.g., compliance, networking, branding, and performance management)	63.33%	114
Total Respondents: 180		

Figure 4: New PropTech Tools and Solutions

Barriers and Concerns: Concerns about data privacy and security (47.2%), lack of familiarity with new technology (56.6%), and concerns about initial costs (56.6%) emerge as primary barriers to

the adoption of PropTech solutions, underscoring the importance of addressing these concerns to facilitate widespread adoption. Doubts about the efficiency of new technology were shared among only 25.3% of respondents.

Question What are the primary barriers influencing your willingness to adopt PropTech solutions?

ANSWER CHOICES	RESPONSES	
Concerns about data privacy and security	46.96%	85
Lack of familiarity with new technology	56.91%	103
Risk of integration with existing systems	32.04%	58
Concerns about initial costs	56.35%	102
Resistance among my colleagues	7.73%	14
Doubts about the efficiency of new technology	25.41%	46
Total Respondents: 181		

Figure 5: Barriers

Perceptions of Future Changes: A third of respondents (33.2%) believe that the productivity of real estate agents will increase without significant changes to their roles, reflecting a cautious optimism about the impact of PropTech on the industry. However, most respondents expect significant changes in their industry due to technology. While just 3% of respondents see digital systems completely replacing real estate agents, 31% believe the number of real estate agents needed in the industry will be reduced, and 32% believe real estate agents' roles and tasks will be significantly changed, but they will not be replaced.

Question With PropTech's advancement in the next five years, which of these scenarios is most likely to happen?

Preferred Exam for PropTech Skills: A substantial portion (44.2%) of respondents believe that both the Salesperson Exam and Broker

ANSWER CHOICES	RESPONSES	
The productivity of real estate agents will be increased, but they will not be replaced, nor the nature of their job will be changed.	33.33%	62
The real estate agents roles and tasks will be significantly changed, but they will not be replaced.	32.26%	60
The number of real estate agents needed in the industry will be reduced.	31.18%	58
Real estate agents will be completely replaced with digital systems.	3.23%	6
TOTAL		186

Figure 6: Future Scenarios

Exam are suitable for testing basic PropTech skills, indicating a recognition of the importance of technological proficiency across various roles in real estate intermediation.

Question What is the best exam to test for basic PropTech skills?

ANSWER CHOICES	RESPONSES	
Salesperson Exam	14.62%	25
Broker Exam	8.19%	14
Both	44.44%	76
Neither	32.75%	56
TOTAL		171

Figure 7: Exam

Continuing Education Priorities: Legal responsibilities in PropTech (62.8%), basics of PropTech (56.4%), effective use of generative AI (42.4%), and ethics in PropTech (41.8%) are identified as the top priorities for continuing education, emphasizing the importance of regulatory compliance, foundational knowledge, and data-driven practices in the evolving real estate landscape.

Question What topics would you like to take as your California real estate continuing education?

ANSWER CHOICES	RESPONSES	
Basics of PropTech	56.14%	96
Effective use of listing platforms	33.33%	57
Electronic and document transaction management	37.43%	64
Ethics in Proptech (e.g. bias)	41.52%	71
Legal responsibilities in PropTech (e.g. privacy)	62.57%	107
Customer relationship management	34.50%	59
Virtual tours and staging	20.47%	35
Video production and social media marketing	26.32%	45
Introduction to data analytics	33.33%	57
Effective use of Generative AI (e.g. ChatGPT)	42.69%	73
Other (please specify)	3.51%	6
Total Respondents: 171		

Figure 8: Exam Topics

Mainstream skills in PropTech: The relatively lower interest in topics such as virtual tours and staging (20.4%) and video production and social media marketing (26.2%) for continuing education suggests that individuals either keep themselves updated in these areas or outsource those skills.

Emerging Interest in AI-Based Content Production: The moderate adoption of AI-based content production (21.8%) and the interest in the effective use of Generative AI (42.4%) underscore a growing curiosity and openness among real estate professionals toward leveraging artificial intelligence in content creation and communication.

5 Implications for DRE

5.1 Opportunities

New technologies allow DRE to supervise licensees more effectively and fulfill its mission.

PropTech results in both new challenges (e.g., digital redlining) and opportunities (e.g., RegTech solutions) for DRE.

Improved Transparency and Accessibility: PropTech solutions can potentially improve transparency in the conduct of industry by providing accessible information about real estate transactions, property histories, legal documents, and market conduct. This increased transparency could help regulatory and supervision agencies (including DRE) to enforce compliance measures more effectively.

More Efficient Education and Training: Though online training materials for the licensure process have been available for more than two decades, new AI-based solutions can further improve the depth and efficiency of the training and examination process by allowing current and future licensees to interact with simulated real-world scenarios.

Use of Regulatory Technology Regulatory Technology (RegTech) refers to advanced technology for improved compliance and supervisory functions. The emergence of RegTech is partly a response to the increased complexity of regulatory frameworks and risks of non-compliance. Thus, companies in sectors such as finance and banking aim to use modern technology to better comply with

rules and regulations.

Regulatory Technology may refer to various applications to ensure compliance, from simply better visualization of the compliance data to AI-based process automation and robot-driven tasks. The benefits include better auditability of procedures, higher accuracy and quality of information, compatibility, and consistency between various systems.

RegTech solutions might be employed by both regulatory agencies as well as agents who are subject to regulations. In industries with a concern for market manipulation (e.g., finance and insurance), RegTech solutions can help regulations detect and investigate abnormal behavior. RegTech can also help licensees and regulated firms in those sectors better comply with the regulations.

Figure 9 shows a few examples of RegTech solutions that broker firms and/or DRE may adopt for better compliance with complex laws and regulations and for more effective enforcement.

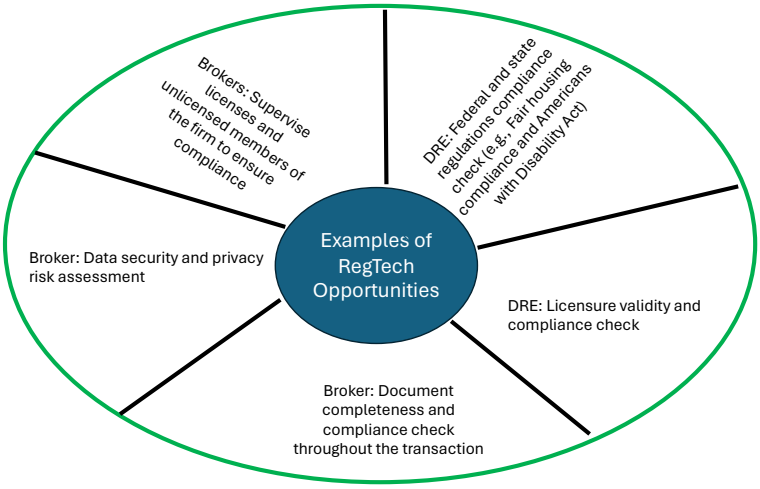

Figure 9: Examples of RegTech Opportunities for DRE and Broker Firms

Based on reports issues by consulting firms, such as Deloitte[2] and EY [3], likely trends in RegTech that can directly affect DRE or Real Estate firms include:

- Integration of compliance components with the standard business process automation, in particular, using AI-based systems that can provide better contextualization for regulations.
- Better consumer protection through automated transaction audits and background checks (e.g., title search)
- Data-driven and automated supervision of fair housing laws
- Compliance risk monitoring systems
- Improved online exam integrity

5.2 Challenges

By changing the way agents and clients interact as well as the methods for representing properties and producing content, PropTech solutions may create new challenges for DRE's statuary responsibilities.

5.2.1 Digital Gap

PropTech solutions may require a significant initial investment in software/hardware and skills for licensees and potential clients. These initial investments will likely result in digital gaps across

[2] https://www2.deloitte.com/content/dam/Deloitte/in/Documents/risk/in-risk-RegTech-Gaining-momentum-noexp.pdf
[3] https://assets.ey.com/content/dam/ey-sites/ey-com/en_us/topics/financial-services/ey-regulatory-technology-regtech.pdf

demographic and location groups. More specifically, some sources of potential digital gap include:

- **Lack of Tech Literacy** Some real estate agents may have limited experience or familiarity with advanced technology tools and platforms, which could hinder agents' ability to effectively adopt and utilize PropTech solutions.
- **Limited Access to Resources** Small or independent real estate agents or agencies may face budget constraints that limit their ability to invest in expensive PropTech tools or platforms.
- **Uneven Adoption Rates** Adoption of PropTech may vary based on factors like location, market demographics, and client preferences. The uneven adoption can create disparities in the industry.
- **Digital Divide in Client Base** Agents with clients with limited access to or familiarity with technology may face challenges in implementing PropTech solutions.
- **Resistance to Change** Long-established agents who are used to traditional methods may resist adopting new technologies, especially if they perceive them as disruptive or time-consuming to learn.
- **Inadequate Training and Support** Insufficient training and support for adopting and using PropTech tools can lead to underutilization or improper implementation.

5.2.2 Responsibilities and Compliance

PropTech solutions may create new legal and jurisdiction boundary challenges for licensees and regulatory agencies.

A significant challenge arises from the rapid evolution of new technologies, often surpassing the rate at which corresponding legal frameworks are established or updated. Real estate agents embracing new solutions may encounter difficulties due to existing regulations inadequately addressing the complexities of these new tools. In particular, inadequate legal frameworks create uncertainty regarding agents‘ responsibilities and liabilities in utilizing PropTech solutions, compounded by ambiguities in laws about data privacy, liability allocation, and contractual obligations.

The integration of PropTech solutions introduces a potential blending of traditional real estate functions with automated processes (e.g., using a virtual staging software.) Utilizing AI algorithms, automated valuation models, contract drafting solutions, or blockchain-based contracts challenges conventional understandings of agency relationships and fiduciary duties. Our survey results suggest that licensees face the complex task of navigating new technological solutions’ ethical and legal obligations.

Determining accountability in scenarios involving system errors, data breaches, fake information, and algorithmic biases becomes intricate, exposing agents to legal risks due to unclear guidelines on liability allocation within technological innovations.

5.2.3 Algorithmic Biases

As real estate agents utilize new AI-based solutions (including Generative AI tools and Large Language Models), there’s a potential for unintended challenges regarding fair housing laws and anti-discriminatory regulations. AI-driven models, while efficiently

handling tasks such as property descriptions and customer interactions, can inadvertently perpetuate biases in historical data or algorithmic design. Due to the datasets they are trained on, potential algorithmic biases embedded in these models might reflect and reinforce patterns of discrimination from past interactions or listings. Such biases relating to race, ethnicity, gender, or other protected characteristics could inadvertently manifest in language generated by these models, potentially conflicting with anti-discrimination regulations.

Integrating AI into real estate practices requires a cautious approach to mitigate algorithmic biases. Real estate agents must critically assess and address biases ingrained within these AI technologies. Scrutinizing training data for biases, implementing algorithms that prioritize fairness, and regularly auditing model outputs to detect and rectify biases are imperative to ensure compliance with fair housing laws. Additionally, fostering diversity in datasets and involving multidisciplinary teams in developing and deploying LLMs can mitigate biases, ensuring that these technologies align with ethical and legal obligations while enhancing operational efficiency in the real estate sector. Striking a balance between leveraging the capabilities of new systems (e.g., LLMs) and upholding fair housing principles remains a paramount concern for real estate professionals integrating these advanced technologies into their practices.

5.2.4 Cross-Border Transactions

The integration of PropTech in the real estate industry has empowered agents to engage in cross-border transactions within

the United States, transcending state boundaries and expanding their market reach. While this advancement presents lucrative opportunities, it is not without its challenges. Navigating the diverse legal and regulatory landscapes across different states demands a comprehensive understanding of inter-state property laws, tax regulations, and compliance requirements. Agents must adapt to varying market practices and potentially contend with state-specific licensing and disclosure mandates. Additionally, effectively communicating and building trust with clients in distant locations requires a strategic and culturally sensitive approach. Coordinating logistics such as property viewings, inspections, and paperwork across state lines demands meticulous planning and organization. While PropTech facilitates cross-state transactions, agents must navigate these unique challenges to successfully navigate and thrive in this extended operational landscape.

5.3 Lessons from Other Industries

Several industries with characteristics similar to real estate intermediation have adopted AI/ML in their practices and revised or updated their professional codes of conduct and compliance frameworks. Examples of such industries include finance, insurance, health care, and legal professions. Like real estate, those industries are also facing new questions and challenges in the cross-border regulation of services, transparency in computational models, algorithmic biases, human supervision, and data privacy. Here are examples of practices that one can learn from other industries.

5.3.1 Sandboxes

A sandbox is a risk-controlled approach that allows new companies, particularly FinTech and Insurance-Tech, to test new products and services in a specific environment (e.g., limited geography or range of services) with relaxed regulatory requirements. This encourages innovation while maintaining consumer protection at the broader level. In real estate, a sandbox approach may include new licensure requirements in experiment zones and markets.

5.3.2 Data Privacy

The General Data Protection Regulation (GDPR)[4] in the European Union, California Consumer Protection Act (CCPA)[5], and similar laws in other jurisdictions impose strict requirements on the collection, processing, and protection of personal data. Recent regulatory updates have significantly changed how companies handle and safeguard user information.

5.3.3 Ethics of AI in Legal Profession

The essential ethical guidelines for AI in legal practice emphasize topics such as transparency and accountability, bias avoidance, human supervision, confidentiality, communication, regular monitoring and testing, competence and education, and informed consent of client.[6]

[4] https://gdpr-info.eu
[5] https://oag.ca.gov/privacy/ccpa
[6] https://www.squirepattonboggs.com/-/media/files/insights/publications/2019/02/legal-ethics-in-the-use-of-artificial-intelligence/legalethics_feb2019.pdf

5.3.4 AI in Insurance

National Association of Insurance Commissioners (NAIC) Principles on Artificial Intelligence (AI) offers a framework and some guiding principles for the ethical and responsible use of AI in the insurance industry. These principles are intended to guide insurers in developing and deploying AI technologies while ensuring compliance with regulatory standards and consumer protection. These recommendations include principles such as respecting the rule of law, avoiding discrimination, being accountable for the output of the AI-based system, and transparency in the operation of the AI system.

6 Recommendations

After analyzing and identifying potential trends/scenarios, emerging challenges and opportunities, views of licensees, and experiences of other industries, we summarize specific recommendations to the Department of Real Estate. The recommendations address new challenges related to Consumer Protection and Consumer Service and update DRE's actions toward fulfilling its mission.

6.1 Summary of Recommendations

Depending on the time horizon and urgency of the need they address, the recommendations are classified as short-term (first two years) and medium and long-term (beyond two years.)

6.2 Short-Term Actions (First Two Years)

6.2.1 Educational and Awareness Initiatives

- Enhance DRE staff's knowledge and expertise in matters related to emerging PropTech technologies and their regulatory requirements.
- Launch a public awareness campaign to inform stakeholders (especially licensees) about recent PropTech solutions, their potential, and potential regulatory changes and compliance requirements. Provide resources, workshops, and online courses to confidently improve consumers' ability to navigate PropTech platforms. Digital literacy empowers consumers to

make informed decisions and reduces the likelihood of falling victim to fraudulent practices.

- Produce an online introductory PropTech course and conduct outreach programs to mitigate digital gaps on the agents' side.
- Collaborate with qualified educational institutions (public and private) to introduce specialized courses in PropTech. The effort can include supporting the development of PropTech courses in two-year, four-year, and graduate-level academic institutions.
- Actively engage with consumer advocacy groups to stay abreast of emerging issues and gather insights into consumer experiences with PropTech platforms.

6.2.2 Develop Guidelines and Policies

- Form a PropTech compliance task force to examine potential deficiencies and update the current compliance framework. Conduct regular assessments focused on the user experience of PropTech platforms. Evaluate the accessibility, usability, and transparency of these platforms from the consumer's perspective. The findings can inform regulatory decisions, ensuring consumers have user-friendly interactions with PropTech tools and can easily understand the processes involved.
- Conduct an updated review of existing regulatory frameworks to identify immediate gaps and areas for refinement
- Foster collaboration between the Department of Real Estate and PropTech providers to ensure a mutual understanding of

regulatory compliance.

- Enforce regulations that require PropTech platforms to provide standardized and easily understandable disclosures to consumers. These disclosures should encompass how data is collected, utilized, and protected and any potential algorithm biases. Standardization ensures consumers have consistent and clear information across different platforms, empowering them to make informed decisions.
- Establish a feedback mechanism to receive opinions from licensees on new compliance and regulatory challenges. Create easily accessible reporting channels for consumers to submit complaints or concerns about PropTech services. The DRE should have a dedicated unit to investigate and address these complaints promptly. Establishing a responsive system empowers consumers and holds PropTech platforms accountable for any potential issues.
- Establish key performance indicators (KPIs) to assess the progress in updating DRE's regulatory and supervision roles.

6.3 Medium and Long-Term Actions (Beyond Two Years)

6.3.1 Integration of PropTech in Licensing Exams and Continuing Education

We propose updating licensing requirements and continuing education content by including new PropTech-related content justified through laws and regulations and the Job Analysis Survey.

The following topics in the continuing education and licensing exams can be considered as potential additions (see Table 5.) Several new PropTech topics can already be included in the current Sales and Broker Exams Tasks. In particular, general categories related to the following tasks/knowledge can be updated to include the use of PropTech solutions:[7]

- Document Management
- Closing Document Preparation
- Utilizing Available Resources for Knowledge of Market Conditions
- Maintaining Client Records
- Promoting Client Property
- Locating Potential Clients
- Managing Real Estate Offices
- Ensuring Proper Use of Technology
- Supervising Licensed and Unlicensed Staff
- Monitoring the Fulfillment of Contracts
- Complying with Reporting Requirements
- Managing Properties

[7] We did not find any direct reference to PropTech in the 2024 Occupational Survey. As the industry practice evolves, future rounds of occupational analysis surveys might inform the updating of contents related to each task.

Table 5: Suggestions for Updating Licensure Process

Topics	Exam		Pre-License and Continuing Education
	Salesperson	Broker	
Basics of PropTech	✓	✓	Include basic topics in Real Estate Practice course + introduce a new CE Course + Add as a new topic to the Nine-hour survey course
Legal and compliance aspects of PropTech		✓	Add to existing Legal Aspects courses
Algorithmic Biases in PropTech		✓	Implicit Bias course, Fair Housing course
Ethics of PropTech	✓	✓	Add to Ethics course
Consumer protection in PropTech (e.g., data privacy)			Add to Consumer Protection series
Consumer service through PropTech (e.g., electronic document management or listing platforms)			Add to Consumer Service series
PropTech System Integrity			Add to Business Management courses for Brokers
PropTech Risks (e.g., data breach)		✓	Add to Risk Management course
Automated Valuation Systems (AVM)	✓	✓	Add to Real Estate Appraisal course
Effective Use of Social Media			Add to elective Marketing course
Virtual reality, drones, and virtual staging			Introduce as a new CE course.
Large Language Models (LLM) and Generative AI for real estate transactions			Introduce as a new CE course.

Table 6 provides samples suggested to be added to Sales and Broker

Exams tasks and content.

Table 6: Examples of New Sales and Broker Exam Tasks Related to PropTech

Sales Exam
Educate clients about the overall process of listing on electronic platforms
Advise clients about online mortgage platforms
Advise clients regarding potential biases in PropTech solutions (e.g., automated valuation systems)
Advise clients on the benefits and limitations of using virtual tours and virtual staging solutions
Broker Exam
Educate clients about the overall process of listing on electronic platforms
Advise clients about online mortgage platforms
Advise clients regarding potential biases in PropTech solutions (e.g., automated valuation systems)
Advise clients on the benefits and limitations of using virtual tours and virtual staging solutions
Train firm real estate licensees on ethics and compliance requirements of PropTech

6.3.2 Regulatory Updates

- Study the need for a new legal framework to address the ethical implications of AI and blockchain in real estate transactions.
- Develop and disseminate updated guidelines on ethical practices and code of conduct for real estate professionals. Guidelines may include frameworks for data security, algorithmic transparency, and consumer rights. The regulations should provide a solid legal foundation for overseeing PropTech activities to ensure ethical practices and protect consumers.
- Develop and implement measures to identify, address, and mitigate any algorithmic biases in PropTech applications. This

is particularly important in real estate to prevent discriminatory outcomes in housing transactions. Regular audits and assessments can help identify and rectify biases, ensuring fair and equitable treatment for all consumers.

- Implement regulations that mandate digital platforms used in real estate adhere to accessibility standards. Well-established standards ensure that the tools are inclusive, catering to individuals with varying levels of digital proficiency, including those with disabilities. Platforms should prioritize features like text-to-speech, easy navigation, and compatibility with assistive technologies.
- Create partnerships with other regulatory bodies to align standards and streamline interdepartmental processes.

6.3.3 Monitoring and Reinforcements

- Expand DRE's technological infrastructure and resources to audit and supervise new automated systems effectively.
- Invest in AI-driven tools and RegTech solutions for proactively monitoring and identifying potential regulatory violations.
- Collaborate with other law enforcement agencies and third parties to identify PropTech real estate misconduct. Implement a system of periodic audits conducted by independent third parties to assess PropTech platforms' compliance with regulations and consumer protection standards. These audits should cover data security, algorithmic transparency, and adherence to ethical practices. Third-party verification enhances credibility and ensures impartial evaluations.

6.3.4 Explore new territories for DRE

- Study potentials for expanding the DRE’s jurisdiction to cover evolving aspects of real estate, such as virtual properties or decentralized finance.
- Establish a specialized arbitration body within the department to resolve complex real estate disputes swiftly
- Develop targeted programs to address specific demographics or communities facing digital disparities. This could involve providing additional support, resources, or training tailored to the needs of these groups.

7 Suggestions for Future Studies by DRE

In this section, we enumerate suggestions for follow-up studies and analysis that can complement the findings of the current report. While we appreciate the importance of those studies, their detailed implementation is beyond the scope of the current project.

1. **Educating PropTech:**
    - Develop a comprehensive curriculum that includes both theoretical and practical aspects of PropTech.
    - Identify key learning objectives for each module, ensuring a well-rounded understanding of the subject matter.
    - Provide a list of recommended resources, including textbooks, online courses, and case studies, to support educators and learners.
2. **Domestic and International Regulatory Trends on PropTech:**
    - Conduct a comparative analysis of Real Estate regulatory frameworks in various states or countries
    - Collaborate with industry experts, regulatory bodies, and PropTech companies to understand their perspectives on regulatory expectations.
    - Investigate potential regulatory gaps
    - Propose strategies to mitigate risks for consumers and agents investing in PropTech
3. **Cybersecurity in PropTech:**

- Investigate the cybersecurity risks associated with adopting PropTech solutions in real estate.
- Analyze potential platform vulnerabilities, data privacy concerns, and the implications of cyber threats on property transactions.
- Propose guidelines and best practices for ensuring the security and integrity of PropTech systems, protecting user data and financial transactions.

4. **PropTech for all:**

    - Explore the role of PropTech in addressing challenges related to affordable housing and housing inequality.
    - Examine how technology can be leveraged to make housing more accessible, reduce costs, and streamline affordable housing initiatives.
    - Assess the social and economic impact of PropTech solutions on diverse communities and propose strategies to ensure inclusivity in adopting these technologies.

5. **Updating Current Study:**

    - Establish a schedule for biannual updates to the study, ensuring that it remains relevant in the face of rapid technological advancements.
    - Incorporate feedback from stakeholders and users to enhance the study's accuracy and applicability.
    - Consider adding a section highlighting emerging trends and technologies in PropTech since the last update.

8 Conclusion

Although the specific nature of coming changes is unclear, there is agreement among professionals and experts that the change is coming to the real estate intermediation industry due to emerging technologies. While a third of respondents foresee increased productivity without significant role changes, a substantial portion anticipates significant shifts in the industry due to technology, with only a tiny fraction envisioning the complete replacement of real estate agents by digital systems.

Our study reveals a dynamic landscape in the real estate industry concerning the adoption of PropTech tools and the preparedness of professionals for technological changes. The high adoption rates of electronic document management systems and various marketing tools suggest the existing reliance on digital platforms for several tasks. Despite the moderate current use of AI-based tools, agents are interested in learning more and adopting emerging AI-based technologies, including generative AI for content creation. Professionals exhibit a range of attitudes toward technology adoption, with a quarter considering themselves ahead, the majority keeping pace, and a small fraction feeling behind, emphasizing the ongoing need for continuous learning.

Market analysis, property listing, and business operations emerge as high-priority investment areas in PropTech, reflecting the demand for data-driven decision-making and operational efficiency. Barriers to adoption, such as data privacy concerns and unfamiliarity with new technology, highlight areas that need attention in education and policymaking domains. Continuing education priorities for agents should also include the importance of legal responsibilities using PropTech tools, basic knowledge of PropTech, and ethical considerations. Observing agents' interest in the PropTech skills examination was

noted, emphasizing the relevance of both the Salesperson and Broker Exams. Finally, the widespread interest in PropTech indicates a growing curiosity and openness among real estate professionals from diverse educational backgrounds, demographics, geographical locations, and primary focus.

We suggest that the Department of Real Estate (DRE) focus on educational initiatives in the next two years, including enhancing staff expertise and launching a public awareness campaign. Collaboration with educational institutions, a new PropTech compliance task force, and establishing feedback mechanisms are recommended for immediate attention.

Looking beyond the initial two years, the DRE should integrate PropTech into licensing exams and continuing education. The integration effort involves updating licensing requirements and adding topics like Algorithmic Biases and Ethics of PropTech. Regulatory updates, including the need for a legal framework for AI and blockchain, measures to address algorithmic biases, and ensuring accessibility standards, are crucial. Additionally, the DRE should consider expanding its jurisdiction, establishing a specialized arbitration body, and implementing targeted programs to address digital disparities in specific demographics or communities.

Finally, we recommend future studies to complement this report, such as a) develop a comprehensive curriculum that includes both theoretical and practical aspects of PropTech, b) conduct a comparative analysis of domestic and international Real Estate regulatory frameworks in relationship with PropTech, and AI in particular, c) investigate the cybersecurity risks associated with the adoption of PropTech solutions in real estate, d) explore the impact PropTech on social justice, and housing affordability, and e) update the current study to include emerging trends and technologies after two years.