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PropTech in the Saudi real estate market: Case studies of NEOM and Qiddiya

Soumaya Hechmi[1]*
[1]Department of Finance, College of Business, Imam Mohammad Ibn Saud Islamic University (IMSIU), Riyadh, Saudi Arabia; sbhechmi@imamu.edu.sa (S.H.).

Abstract: This study offers a comprehensive analysis of the rapid expansion of Property Technology (PropTech) in Saudi Arabia, positioning it as a strategic enabler for the nation's Vision 2030 objectives of economic diversification and digital transformation. Utilizing a mixed-methods approach centered on in-depth case studies of the NEOM and Qiddiya giga-projects, this research is further supported by market analysis, technical appraisals, and policy assessment. The investigation focuses on critical dimensions, including technological deployment strategies, global benchmarking, projected socioeconomic impacts, and systemic implementation barriers. Findings highlight Saudi Arabia's distinct capacity for mass adoption of PropTech, driven by unprecedented government incentives and sovereign wealth fund investment. Conversely, the study also identifies persistent challenges, such as regulatory lag, cybersecurity vulnerabilities in interconnected systems, and infrastructural gaps that could hinder inclusive access. This paper contributes to smart urbanism literature by demonstrating how resource-rich economies can leverage technology for urban development. Finally, it offers concrete, actionable recommendations for policymakers aimed at navigating the complexities of Saudi Arabia's rapidly evolving real estate technology landscape and ensuring its sustainable growth.

Keywords: *Digital transformation, Giga-projects, PropTech, Smart urbanism, Vision 2030.*

1. Introduction

A silent revolution is taking place in the global real estate industry: property technology (PropTech), a new breed of start-ups combining real estate and technology, artificial intelligence (AI), blockchain, the Internet of Things (IoT), and big data, is transforming anything into a smart device. These technologies are transforming legacy practices throughout the real estate value chain, such as AI-based property valuation, blockchain-supported transactions, smart building management systems, and VR-aided design. This tectonic shift in technology has especially strong relevance in Saudi Arabia, where it is a strategic enabler for the country's Vision 2030 plan around diversification of the economy, digital transformation, and sustainable urban development.

Driven by vast government support and an ambitious pipeline of giga-projects, PropTech has become one of the most exciting areas in the Kingdom for digital investment. Prestige projects like NEOM and Qiddiya, meanwhile, offer a glimpse of the future of urban tech in the form of everything from digital twin city modeling to robotic construction methods. They are not just showcases of Saudi Arabia's embrace of technology, but they also put the kingdom on the path to potentially vie for a leading role in smart urban solutions globally. The scale and pace of PropTech adoption in the Kingdom present unique opportunities to study how emerging technologies can reshape urban environments in resource-rich, rapidly developing economies.

This paper aims to review the current position and future pathway of PropTech in Saudi Arabia, and its application within large giga-projects. The paper examines the extent to which such technological applications will facilitate the Kingdom's wider targets of economic diversification and sustainable urban

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* Correspondence: sbhechmi@imamu.edu.sa

development, and weighs its challenges and constraints in fast laying of PropTech. Through an examination of Saudi Arabia's unique stance on technology-enabled urban development, this analysis is intended to help shed light on the changing nature of property invention and smart city founding within the Middle East and other markets. Policy makers, city planners, and investors who want to explore the potential and risks of massive PropTech deployment in developing markets will find the results especially useful.

2. Literature Review

Artificial intelligence–driven predictive maintenance systems reduce downtime by 40% and maintenance costs by 20%, while increasing equipment lifespan by 30% at NEOM [1]. The author in Molęda et al. [2] confirms that predictive maintenance improves operational efficiency in smart buildings.

Digital twins provide virtual representations of physical assets, enabling real-time monitoring and diagnostics. Their integration with AI has demonstrated significant ROI in smart city applications. Namely, predictive analytics employed in European smart buildings achieved a reduction of 35% in emergency services demand and an increase of 22% in tenant satisfaction [3]. Furthermore, in Saudi Arabia, NEOM's predictive models combine machine learning techniques with weather and usage data to save up to 25% on HVAC energy use [4].

Saudi Arabia is testing robotic 3-D printing for homes, an experiment that could change the way our world is built and how we live in it. Worldwide, this method can result in a cost savings of 78% and reduce environmental impact [5, 6].

More than 20 houses have been 3D printed with concrete in Riyadh, and the government will rely on 3D printing for 1,500 homes by 2030 [7]. That aligns with efforts under the wider Vision 2030 initiative to ramp up construction automation and rein in housing deficits. Additionally, CO_2 emissions for 3D-printed buildings can be up to 50% lower than for conventional buildings [8, 9].

Integration of BIM and Augmented Reality will improve real-time monitoring and coordination. These can result in a 25% reduction in planning errors and automated compliance [10, 11].

Globally, BIM-enabled project delivery systems lowered rework costs by 11% on average and reduced project duration by 7–15% [12, 13]. In Saudi Arabia, AR mobile solutions have made worker training more efficient, translating to better safety and task performance in mega-construction projects such as Qiddiya and NEOM [14].

3. Saudi PropTech Market Overview

The Saudi PropTech market is expected to grow at a rate of 12.7% through 2030, driven by the need for smart cities, e-governance, and real-time property management [15]. Urbanization (over 84% urban population), government-led initiatives like the Sakani housing initiative, and private PropTech incubators like 'Tanmiah' are the major drivers. IoT-based utility services and blockchain-based land registries are also becoming core applications.

As seen in Figure 1, the latest estimates indicate that the Saudi PropTech market will expand from nearly USD 2.1 billion in 2022 to over USD 8 billion by 2030, at a compound annual growth rate (CAGR) of 12.7% [15]. The expansion is part of Saudi Arabia's Vision 2030 to transform Riyadh, NEOM, and Qiddiya cities into global smart cities. The national digital transition initiative of the government, coupled with large-scale real estate development and rising numbers of investors, provides strong momentum.

Moreover, smart leasing platforms, predictive maintenance platforms, AR/VR property walkthrough platforms, and AI valuation platforms are being adopted at a rapid pace. Governmental platforms such as Sakani, which facilitated homeownership for more than 600,000 families through 2023, continue to support PropTech adoption with embedded land access and regulatory support.

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Furthermore, the 84.3% urbanization rate, one of the highest in the MENA region, increases the need for efficient, technology-based housing and infrastructure initiatives. The PropTech boom is not only supported by investors but also by the Public Investment Fund (PIF), which is actively investing funds in AI, 3D printing, and digital twin technologies in urban developments.

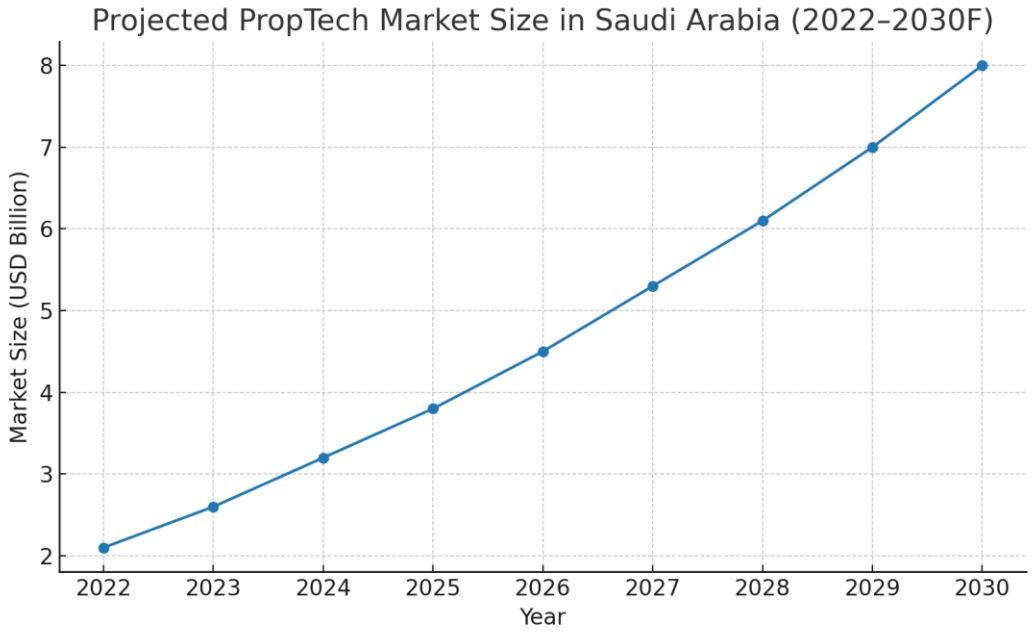

Figure 1.
Projected PropTech Market Size in Saudi Arabia (2022–2030F).
Source: TechSci Research, 2024.

4. Case Studies

4.1. NEOM – The Smart City Catalyst

NEOM, a $500 billion giga-project [16], is Saudi Arabia's digital urbanism flagship and a cornerstone of Vision 2030. Designed as a 170-kilometer-long linear city ("The Line") [16], NEOM integrates cutting-edge technologies such as digital twins, drone logistics, and 5G-enabled AI infrastructure [17] into its planning to design a zero-carbon, car-free urban environment.

4.1.1. Key PropTech Innovations in NEOM

- Automated Building Inspections: AI-powered drones and robotics are used for real-time structural assessments [16].
- Predictive Maintenance: IoT sensors monitor infrastructure health [18].
- Immersive AR/VR Planning: Augmented reality tools are employed for project visualization [16].
- Smart Utilities: AI-driven energy and water management systems [19].

4.1.2. Economic and Social Impact

- Job Creation: NEOM is expected to generate 380,000 jobs by 2030 [17].
- Global Benchmark: Partnerships with firms like Siemens and Alibaba Cloud [16].

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4.1.3. Challenges and Future Prospects

- Scalability: Replicating NEOM's model may face challenges.
- Data Security: Cybersecurity risks in interconnected systems.
- Sustainability Proof: Independent verification needed for zero-carbon claims [20].

4.2. Qiddiya – Smart Entertainment & Infrastructure

Qiddiya, which is owned by the Public Investment Fund's (PIF) Vision 2030 portfolio holdings [21], is a trailblazing combination of PropTech and entertainment infrastructure. Located near Riyadh, this $40 billion mega-development [22] encompasses several groundbreaking technologies:

4.2.1. Key PropTech Applications in Qiddiya

- Smart Crowd Management: Real-time monitoring through AI-powered sensors and IoT devices optimizes visitor flow and enhances safety [21].
- Modular 3D-Printed Construction: Prefabricated components minimize build time and reduce material waste by 25.85% [23].
- AI-Driven Project Management: Machine learning algorithms streamline procurement and logistics, reducing costs by 15% annually [24].

4.2.2. Economic and Social Impact

- Visitor Projections: Anticipates five to forty thousand visitors, positioning it as a global entertainment hub [25].
- Employment Generation: Will create +25,000 permanent jobs, with 40% reserved for Saudi nationals [25].
- Sustainability Goals: Targets LEED Gold certification for all major venues [21].
- Economic Contribution: Contributing approximately SAR17 Bn to the Saudi economy each year by 2030 [25].

4.2.3. Challenges and Innovations

- Scalability**:** Testing modular designs for future Saudi giga-projects.
- Data Integration**:** Developing unified IoT platforms for venue operations [26].
- Visitor Experience**:** Implementing mixed-reality attractions powered by 5G [27].

4.3. Comparative Analysis: NEOM vs. Qiddiya- PropTech Applications and Socioeconomic Impact

NEOM and Qiddiya are Saudi Arabia's dual plans for technology-driven urban transformation, with NEOM aimed at the magnitude of urban overhauls and Qiddiya focused on tech-intelligent entertainment hubs. While both apply leading-edge PropTech solutions, the two are vastly different in scope, intent, and technological emphasis.

A comparative analysis of NEOM and Qiddiya, detailed in Table 1, highlights their contrasting technological focuses: urban-scale transformation versus experience-driven innovation.

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Table 1.
Comparative Analysis.

Attribute	NEOM	Qiddiya
Primary Vision	Futuristic smart city with AI-driven governance	Global entertainment and sports hub
Area	26,500 km²	334 km²
Projected Jobs	460,000 by 2030	325,000 by 2030
GDP Contribution	$48 billion annually	$36 billion annually
Key PropTech Focus	AI city management, digital twins, IoT utilities	Smart crowd analytics, AR/VR entertainment
Sustainability Goals	100% renewable energy, zero-carbon mobility	LEED Gold certification for venues
Stakeholder Engagement	International Tech Partnerships (Siemens, Alibaba)	Local job creation (40% Saudi workforce)
Innovation Transfer	Global knowledge hub for smart cities	Regional entertainment technology leader
Challenges	Scalability, cybersecurity risks	Visitor experience optimization, data integration

- Urban vs. Entertainment PropTech
- NEOM exemplifies "urban-scale digital transformation" with AI governance models that could redefine future cities [16].
- Qiddiya represents "experience-driven PropTech", blending IoT and immersive tech for tourism [25].
- Economic Diversification
- NEOM contributes to high-tech job creation (AI, robotics).
- Qiddiya focuses on tourism-driven employment (hospitality, event management).
- Sustainability Benchmarking
- NEOM's zero-carbon strategy aims to power the city entirely with renewable energy, eliminate car-based emissions through a car-free design, and preserve 95% of natural land, setting a global benchmark for sustainable urban development [20].
- In Qiddiya City, energy consumption will be minimized, and water waste will be reduced by up to 90% [28].
- Technological Synergies
- Both projects use 5G and IoT, but NEOM prioritizes autonomous systems, while Qiddiya emphasizes real-time crowd analytics.

5. International Benchmarking: Saudi Arabia's PropTech Position in the Global Landscape

Saudi Arabia's PropTech sector has clear strengths in digital infrastructure supported by the government, but falls behind leaders like Singapore and the UK in terms of regulatory flexibility and startup ecosystems. A global benchmarking exercise, presented in Table 2, reveals Saudi Arabia's distinct advantages in large-scale deployment while identifying gaps in its startup ecosystem and regulatory frameworks compared to more mature markets.

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Table 2.
Comparative PropTech Benchmarking (2024).

Country	Market Size (USD B)	CAGR	Government Support	Key Strengths	Notable Projects
Saudi Arabia	0.86	19.1%	**Strong** (Vision 2030, PIF funding)	- Large-scale giga-projects - IoT integration in NEOM/Qiddiya	NEOM, The Line, Qiddiya, Red Sea Project
UAE	1.10	14.6%	**High** (Smart Dubai Initiative)	- Blockchain adoption - Proptech accelerators (DIFC FinTech Hive)	Masdar City, Expo City Dubai
UK	5.0	8.5%	**Moderate** (Open Banking policies)	- Blockchain land registries - Proptech VC ecosystem	London Smart City, Thames Freeport
Singapore	2.4	10.2%	**Very High** (Smart Nation, IMDA sandboxes)	- AI-driven urban planning - Leading fintech integration	Punggol Digital District, Jurong Lake

Saudi Arabia possesses significant advantages in large-scale giga-projects and sovereign wealth fund backing but faces challenges in regulatory delays and a less mature startup ecosystem compared to leaders like the UAE, UK, and Singapore. The UAE excels in rapid blockchain adoption and attractive tax-free zones, while the UK offers a mature proptech investment landscape and innovative regulatory pilots. Singapore stands out with its AI-driven governance and strong public-private R&D collaboration, presenting a valuable model for Saudi Arabia to emulate in fostering innovation and regulatory agility.

6. Risks and Limitations of PropTech in Saudi Arabia

The rapid, government-mandated adoption of PropTech in Saudi Arabia presents significant opportunities for economic diversification, urban efficiency, and global technological leadership. However, this rapid pace also introduces profound key risks and systemic limitations. These challenges, if unaddressed, could undermine the sustainability of these investments, create new forms of digital and social inequality, and ultimately impact the long-term success and return on investment of the Kingdom's ambitious Vision 2030 projects.

6.1. Key Risks

Table 3 outlines the principal risk categories facing the Saudi PropTech sector, detailing specific threats ranging from cybersecurity to regulatory fragmentation.

Table 3.
Key Risks of PropTech in Saudi Arabia.

Risk Category	Description
Cybersecurity Threats	Increased connectivity through IoT and AI systems expands attack surfaces, with potential for data breaches and infrastructure hacking.
Regulatory Fragmentation	Emerging technologies like blockchain-based contracts and drone logistics operate in legal gray areas due to lagging policy frameworks [29].
Foreign Dependency	Heavy reliance on imported PropTech solutions may stifle local innovation and create maintenance vulnerabilities.
Implementation Barriers	High capital requirements for smart infrastructure could delay ROI and strain project budgets.

6.2. Systemic Limitations

Beyond the immediate risks outlined in Table 3, Table 4 summarizes the broader systemic limitations, such as infrastructure and environmental costs, that pose long-term challenges to the sector's development.

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Table 4.
Systematic Limitations of PropTech in Saudi Arabia.

Limitation	Impact
Infrastructure Gaps	Uneven 5G coverage and power grid reliability outside urban hubs constrain deployment.
Cultural Adoption	Resistance to digitized real estate processes persists among older demographics and rural populations.
Environmental Costs	Energy demands of data-intensive PropTech systems conflict with sustainability targets [30].

7. Conclusion and Policy Implications

The rise of PropTech in Saudi Arabia represents a central transformation in the real estate industry, challenging traditional methods of designing, building, managing, and transferring real estate. With its record capital from the Public Investment Fund and very strong government policies under Vision 2030, the Kingdom is well-positioned to be a global pioneer in the development of smart cities. Flagship projects like NEOM and Qiddiya embody Saudi Arabia's vision of building next-generation urban landscapes that integrate the latest technologies such as IoT, AI, and blockchain. These giga-projects serve as living laboratories for city management innovations, from digital twins to automated construction techniques, providing invaluable data and proof-of-concept for the global PropTech community.

This study has systematically examined the PropTech phenomenon within the unique context of Saudi Arabia's ambitious development agenda. By analyzing the specific applications, socioeconomic impacts, and inherent challenges within NEOM and Qiddiya, this research provides a critical assessment of how technologically endowed economies can leverage PropTech for rapid urban transformation. The findings underscore that Saudi Arabia's model, characterized by top-down government support, giga-project scale, and a focus on future-ready infrastructure, offers a distinct pathway for PropTech adoption, differing from the more organic, startup-driven evolution seen in mature markets.

While Saudi Arabia's PropTech sector has stunning growth, several critical issues must be resolved to drive sustainable expansion. The current regulatory regime is trailing rapid technology advancement, particularly in areas like drone logistics, AI contract administration, and data privacy frameworks for smart buildings. Shortages in digital infrastructure, especially across rural areas, have the potential to create a "digital divide" and hinder nationwide adoption of digital property solutions. In addition, the significant energy demands of data-intensive PropTech platforms, such as those powering digital twins and AI-driven analytics, present potential contradictions with the Kingdom's sustainability ambitions. Cybersecurity vulnerabilities in increasingly interconnected constructed environments also pose significant threats that must be addressed to protect both critical infrastructure and citizen data.

To sustain momentum and solidify its position as a global PropTech leader, Saudi policymakers should concentrate on the following strategic initiatives:

1. Developing regulatory sandboxes: Establishing specific PropTech sandboxes would promote innovation while keeping risks in check, particularly for startups developing innovative solutions in blockchain-based transactions and autonomous site logistics. These sandboxes would allow for real-world testing under a temporary, relaxed regulatory framework.
2. National Digital Land Registry: Implementing a nationwide, blockchain-based land registry system, inspired by the models tested in NEOM, could revolutionize transaction speed, transparency, and reduce fraud across the entire real estate sector.
3. Cybersecurity and Data Governance Frameworks: Developing PropTech-dedicated cybersecurity guidelines and clear data governance standards will be crucial to protect sensitive property data, ensure user privacy, and safeguard key urban infrastructure from cyber-attacks.
4. Strategic incentives for adoption: Introducing targeted incentives such as tax credits, grants, or preferential financing for developers who adopt certified green construction technologies (e.g., 3D printing, AI-powered energy management) can induce broader private sector uptake beyond the giga-projects.

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5. Workforce Reskilling Programs: Investing in comprehensive education and vocational training programs is essential to building a local talent pool capable of supporting and advancing the PropTech ecosystem, thereby reducing long-term dependency on foreign expertise.

The Kingdom's PropTech journey is a sign of a broader transformation in its economy and society. By solving the immediate challenges of regulatory agility, infrastructure equity, and cybersecurity, and by implementing these forward-thinking policies, Saudi Arabia can create a smart urban development model that unites technological innovation with sustainability, security, and shared growth. The insights from NEOM and Qiddiya will not only shape the future of Saudi cities but also offer a replicable blueprint for other nations embarking on similar digital transformation journeys. The next decade will be critical in determining whether the Kingdom can realize its true potential to redefine real estate for the digital era and establish itself as a global hub for PropTech innovation.

Transparency:

The author confirms that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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