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ROLES OF PROPTech IN ENHANCING OPERATIONAL EFFICIENCY OF REAL ESTATE DEVELOPERS

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Keywords	Abstract
PropTech, Real Estate, One sample t-test.	PropTech has emerged as a transformative force in real estate development by introducing digital tools that enhances operational efficiency. These applications improve the efficiency of processes, add precision, and enable data-driven decision-making during the project life cycle. This paper is motivated by the increasing need to comprehend how digital transformation can enhance efficiency of operations in the fast changing real estate industry. This paper evaluates the role of PropTech in enhancing operation efficiency of real estate developers. The results of the one-sample t-test indicate that all factors associated with PropTech have statistically significant effect, which means that the respondents agree strongly regarding their effectiveness. The paper concludes that PropTech plays an important role to facilitate operations, delays, accuracy, and overall performance in real-estate construction.

1. INTRODUCTION

The enormous pace of adoption of digital technologies collectively referred to as PropTech - is transforming the way real estate developers plan, construct, operate and monetise property assets, with direct implications on the operational effectiveness throughout the project lifecycle. PropTech encompasses a wide set of tools “(BIM, IoT, AI/ML, digital twins, blockchain, AR/VR, cloud platforms and analytics”, which can turn tangible objects and paper-based procedures into data-



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driven services and make decisions faster, predictive maintenance and automatically controlled workflows (Naeem, Rana, and Nasir, 2023). PropTech provides developers with real-time insight of building costs drivers and utilisation of resources by making building parts turn into a stream of perpetually updated data, which is a requirement to streamline scheduling, have more accurate control of budgets and minimise on-site rework (CBRE India, 2021).

The PropTech gains of operational efficiency are achieved at various interdependent levels. Building Information Modelling (BIM) and 3D scanning are used during design and pre-construction to minimise design clashes and increase the speed of coordination between consultants, thereby reducing downstream change orders and wasted labour on site (Naeem et al., 2023). Robotics, drones and automated progress monitoring used in the construction industry can reduce inspection time and enhance productivity by allowing supervision of the remote site and carrying out quantity takeoffs (Naeem et al., 2023). In the case of finished assets, IoT sensors and cloud-based facility management systems deliver real-time performance feedback (energy, HVAC, occupancy), allowing predictive maintenance and real-time energy optimisation, which minimise operating costs and lifetime of assets (Tan and Miller, 2023).

In addition to direct cost and time savings, PropTech also leads to the standardisation of processes, regulatory compliance and transparency - which are especially relevant in the Indian context, where the recent reforms and digitisation drives focus on enhancing transparency and formal records in real estate (Anarock & NAREDCO, 2024). The barriers to scale PropTech solutions are further reduced by government focus on digital infrastructure and on interoperable digital systems, since government digitisation efforts provide data backbones that are standardised and that developers can plug in their land records, approvals and payments (NITI Aayog, 2021). Cloud-native software, AI-driven analytics and smart building platforms are also cited in industry reports as the first levers with the help of which developers can derive quantifiable operational value, whether it is the minimisation of time-to-market or the enhancement of asset utilisation or tenant retention (CBRE India, 2021).

Although there are evident advantages, integration and organisational barriers as mentioned in literature mitigate the efficiency dividend. Vendor fragmentation, absence of shared data standards, skills shortages in developer teams, and security issues in cybersecurity and initial cost are significant limitations to widespread adoption (Tan and Miller, 2023; Naeem et al, 2023). The solutions to these should be a mix of strategic decisions by developers (choice of interoperable platforms, investment in staff skills) and favorable governmental policy (data standards, incentives on digital retrofits). Once these conditions are fulfilled, PropTech not only facilitates the optimization of individual processes, but also systemic ones, more predictable cash flows, reduced lifecycle costs and improved alignment between construction and operational targets, assisting the developers to transform technology investments into a lasting operational advantage.

Overall, PropTech is not just a collection of point solutions, it is an integrative strategy, which digitises workflows and assets to achieve faster, cheaper and smarter development results. Both



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empirical and review literature reveals that in cases where developers are integrating digital design, automation of construction monitoring and data-driven operations, they are able to realize significant change in schedule reliability, cost control and operational resilience although technological fragmentation and capability gaps must be actively managed (Naeem et al., 2023; Tan and Miller, 2023; CBRE India, 2021; Anarock and NAREDCO, 2024; NITI Aayog, 2021).

2. REVIEW OF LITERATURE

Kalliomäki, P. (2025)

Analysed in their research and about adopting mixed methods approach for investigating which tools of PropTech is the most effective one for the companies engaged in real estate to apply. It was found that tools like AI powered marketing tools, AI agents, and workflow automation software for improving satisfaction among the customers and internal efficiency.

Syed, A. (2024)

Pinpointed in their research which revolved around the perspective benefits of adopting the PropTech and the sharing of the benefits to other stakeholders. The PropTech development can be applied in the current real estate industry (REI) in various ways. This does not only provide an exciting and lucrative avenue to the investors since such innovative instruments also assist the landlords, buyers and sellers to improve their property journeys. It simply implies that PropTech can help both users and companies to be profitable.

Munasinghe, H. & Munasinghe, L. (2024)

Determined in their research which is designed to bring some understanding of the prevailing digitalisation situation in the residential real estate sector (RES), analysis of the technical innovation, and the influence on different market factors. The results point to the disruptive nature of PropTech in the residential REI, which has radically transformed the way things used to be done, and made operations more efficient.

Tan, Z. & Miller, N. (2023)

Focused in their research study about digitalization of operations and maintenance work of buildings which enables continuous surveillance, automation, as well as efficiency improvements for sustainability of the environment and PropTech startups are accelerating the digitalization of building. The findings derived from the research indicates providing insights for the emerging digital PropTech startups and monetizing the value creation sustainability.

Starr, C., Saginor, J., et al. (2021)

Explored in their research about the application of PropTech to the commercial real estate sector turning it into Industry 4.0. It was found that the application of PropTech is rapidly the changing technologies of Industry 4.0 disrupt and transform the real estate industry today.

Siniak, N., Kauko, T., et al. (2020)

Reviewed the situation with respect to emergence of a phenomenon which is also called as PropTech. Amidst the changing scenarios, the shift in the real estate technologies are able in changing the dynamics of the system and in improving openness in the real estate market. The



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findings highlighted the benefits of PropTech for strategies related to territorial growth and territorial competition.

Saiz, A. (2020)

Identified in their research study that focused on three significant avenues for diffusing of IT in the sector of “commercial real estate: sales & online brokerage, Fintech in mortgage & equity funding”, as well as commoditization of space. The outcome indicated that the market for housing is skeptical regarding possibilities of new technologies which facilitates market disintermediation.

3. OBJECTIVES OF THE STUDY

1. To examine how PropTech improves operational efficiency in real estate development.
2. To give suggestions that the real estate developers can use to successfully implement PropTech solutions to enhance operational efficiency.

Hypothesis:

H0: PropTech has no significant impact on the operational efficiency of real estate developers.

H1: PropTech has a significant impact on the operational efficiency of real estate developers.

4. RESEARCH METHODOLOGY

The research design was descriptive, both primary and secondary data was collected. The technique used in the current study is non-probability purposive sampling. The sample size was 75 real estate experts and developers, and the sample size is adequate as it is in line with the recommendation by Faul et al., who suggest a minimum of 45 participants to be used in parametric one-sample t-test. The test was used to analyse the data with the help of R Studio. This research methodology follows ethical research practices that Pirani (2024a) recommends, and it provides transparency and integrity in the collection of data. The rationale behind the choice of the test is based on the statistical decision-making model discussed by Pirani (2024b), which highlights the appropriateness of the parametric methods in case of sample distribution satisfying the necessary conditions.

Data Analysis and Interpretation:

Table No: 1 one sample t test

Items	t – statistics	P – value	Results
Improved Project Planning & Scheduling	20.98	0.000	Significant
Real-Time Project Monitoring	21.90	0.000	Significant
Efficient Material & Inventory Control	24.44	0.000	Significant
Automation to Reduce Project Delays	21.77	0.000	Significant
Better Financial Management & Cost Tracking	23.44	0.000	Significant
Predictive Maintenance for Buildings	20.45	0.000	Significant



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Enhanced Customer Relationship Management	20.12	0.000	Significant
Efficient Sales & Marketing Processes	23.11	0.000	Significant
Improved Transparency & Regulatory Compliance	24.65	0.000	Significant
Data-Driven Decision Making	22.89	0.000	Significant
Reduced Operational Errors via Automation	21.77	0.000	Significant
Improved Team Collaboration	21.76	0.000	Significant

The one-sample t-test results show that all twelve PropTech-related factors have very high t-statistics (ranging from 20.12 to 24.65) and p-values of 0.000, which are far below the 0.05 significance level. This indicates that the mean responses for each item are significantly higher than the test value, confirming strong agreement among respondents. Improved Project Planning & Scheduling

Real-Time Project Monitoring, Efficient Material & Inventory Control, Automation to Reduce Project Delays, Better Financial Management & Cost Tracking, and Predictive Maintenance for Buildings, Enhanced Customer Relationship Management, Efficient Sales & Marketing Processes, Improved Transparency & Regulatory Compliance, Data-Driven Decision Making, Reduced Operational Errors via Automation, and Improved Team Collaboration are significant impact of real estate developers

5. CONCLUSION

The results are very clear that PropTech has a great role in improving the efficiency of real estate developers in all the key functional areas. Strong agreement in the answers was on the fact that PropTech solutions result in higher quality project planning, real-time monitoring, enhanced material control, automation-related delays minimization, and more precise financial monitoring. They also recognized significant returns in predictive maintenance, customer relationship management, and sales efficiency, compliance management, data-driven decision-making and error reduction, as well as team collaboration. On the whole, the high t-statistics and very low p-values prove the fact that PropTech is recognized as the effective transformational tool which simplifies operations, reduces manual inefficiencies, enhances transparency, and raises the level of operation processes of the real estate development.

6. SUGGESTIONS

The real estate developers could take into account integrated PropTech solutions, which would combine project management, financial tracking, and customer communication to streamline the processes. Scalable digital solutions that developers may consider by minimizing delays and increasing accuracy are also possible, e.g., BIM, IoT-based monitoring systems, and automated scheduling tools. The staff training and digital literacy investment can assist the teams in making efficient use of these technologies and decrease the resistance to operations. Moreover, developers can work with technological suppliers to tailor PropTech tools to the size and complexity of the



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project and guarantee maximum benefits. Enhanced data governance and cybersecurity strategies can also aid in successful and effective digital adoption at all levels of development.

7. AUTHOR(S) CONTRIBUTION

The writers affirm that they have no connections to, or engagement with, any group or body that provides financial or non-financial assistance for the topics or resources covered in this manuscript.

8. CONFLICTS OF INTEREST

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

9. PLAGIARISM POLICY

All authors declare that any kind of violation of plagiarism, copyright and ethical matters will take care by all authors. Journal and editors are not liable for aforesaid matters.

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