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Housing, Property Technology and Artificial Intelligence: A Conceptual Model of Valuation, Land Administration and Affordability in Rapidly Urbanising Markets

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ABSTRACT

Property technology is entering African housing markets as digital land registries, automated valuation, online rental and sales platforms and algorithmic underwriting, in cities where most land is held under informal or customary tenure and most housing is self-built. This conceptual paper develops a model of what these technologies do to housing access. Drawing on urban land economics and housing theory, on the land-administration and tenure literatures, and on recent research on property technology, digital land governance, automated valuation and housing platforms, it distinguishes three functions the technologies perform, establishing what exists (registration), establishing what it is worth (valuation) and matching supply to demand (platforms), and shows that each can widen or narrow access: registration can secure tenure or enable dispossession, valuation can unlock credit or price out the poor, and platforms can reduce search costs or concentrate rents and discretion. The paper develops a framework in which the affordability and tenure effects of property technology depend on the tenure regime into which it is introduced, the regulatory environment, and who controls the data it generates; derives seven propositions about the conditions under which digitisation improves affordability and tenure security for low-income urban residents; and examines the specific risk of automated valuation trained on formal-market data and applied to informal housing. Nigeria's urban land and housing markets, with Lagos as the anchoring case, ground the analysis. The paper closes with implications for land agencies, housing regulators, platform operators and the research agenda of African housing studies. It concludes that property technology is neither inherently inclusive nor inherently extractive but amplifies the tenure regime, the regulation and the data arrangements it meets, so that these conditions must be built before digitisation can improve affordability and tenure security for the urban majority.

Keywords: housing; property technology; land administration; automated valuation; land registries

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1. INTRODUCTION

Housing in African cities is produced, held and exchanged largely outside the formal systems that property technology was built to digitise. Most urban land is held under customary, informal or contested tenure rather than registered title; most housing is self-built incrementally rather than developer-delivered; most rental arrangements are verbal and most transactions are cash. Infrastructure deficits and informal settlement are the defining features of sub-Saharan African urbanisation (Bettencourt & Marchio, 2025), and informal settlements are growing fastest at the urban periphery (Büttner et al., 2025). Into this setting arrives a wave of property technology, proptech, whose promise is to make land legible through digital registries, to make value knowable through automated valuation, to make housing findable through platforms and to make finance accessible through algorithmic underwriting.

The promise is not empty. Each of these functions addresses a real failure of African housing markets: the insecurity of unregistered tenure, the opacity of value, the cost and unreliability of search, and the near-absence of housing finance for the majority. But each function can also run the other way. Registration has historically preceded dispossession as often as it has secured it. Valuation that makes value knowable also makes it taxable and tradeable, and a market that prices accurately may price the poor out. Platforms that reduce search costs also reorganise discretion, concentrating it in algorithms and the firms that own them. The direction depends not on the technology but on the tenure regime, the regulatory environment and the control of data into which it is introduced.

This conceptual paper develops that argument into a model. It begins with the proptech literature and its critical turn, and then characterises the housing and land markets of rapidly urbanising African cities. It decomposes property technology into the three functions of registration, valuation and matching, examining the ambivalence of each, before presenting the framework and the propositions that follow from it. Particular attention is given to the specific risk of automated valuation trained on formal-market data and applied to informal housing, after which the analysis is anchored in Nigeria and Lagos and its implications drawn out.

The paper's contribution is a function-based decomposition of property technology that explains why the same technology produces inclusion in one market and exclusion in another, a framework linking those outcomes to three contextual conditions, and propositions that can guide both empirical research and the design of digital land and housing systems in African cities.

2. LITERATURE REVIEW

2.1 Property Technology and Its Critics

The proptech field

Property technology is the application of digital platforms, data analytics and artificial intelligence to the ownership, valuation, transaction, financing and management of real property. Its most developed applications are in high-income rental and sales markets. Cocola-Gant and Janoschka (2026) analyse the digital infrastructure behind short-term rental platforms such as Airbnb as a form of proptech that reorganises how housing is supplied, priced and governed, and Kim and Yeon (2025) find measurable effects of short-term rental platforms on housing markets in London. Eskandarpour (2025) shows how proptech platforms reshape discretionary power in the private rental market: decisions that landlords and agents once made case by case are increasingly structured, recommended or made by platform tools. So et al. (2026) examine what landlords say they do when platforms offer algorithmic recommendations and categorical screening criteria, documenting the interaction between human discretion and algorithmic suggestion in tenant selection. Nasreen et al. (2024) use the data generated by real-estate platforms to examine the digital market for low-cost and informal housing, showing that platforms now mediate even the segments of the market where regulations are bypassed.

Automated valuation is the second mature application. Baur et al. (2023) show that machine-learning models can value real estate from property descriptions; Gunes (2024) develops model-agnostic interpretable machine learning for residential valuation; and Despotovic et al. (2026a, 2026b), in a two-part treatment of data-driven valuation, set out the foundations, pipeline and model families of automated valuation models and then the data, uncertainty and governance requirements for their reliable use in practice. The

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second part is notable for its insistence that automated valuation is only as reliable as the data it is trained on and the governance that surrounds it, a point that becomes decisive when the technology is transferred to markets whose data is thin.

Digital land administration

Land administration has its own digitisation literature, more attentive to developing-country conditions. Metaferia et al. (2023) examine the peri-urban cadastre of Addis Ababa and its fit-for-purpose prospects, finding that conventional cadastral approaches cannot keep pace with peri-urban growth and that lighter, incremental approaches are required. Alhola and Gwaindepi (2024) assess two decades of Ghana's land administration project and find that formalisation has had uneven effects on perceived tenure security. Gyan (2025) shows that digital land governance in Ghana is refracted through persistent legal pluralism: customary institutions co-govern land with the state, and digitisation does not resolve the ambiguities of boundaries and authority but reproduces them in a new medium. Manara and Pani (2023) draw lessons on pro-poor land registration from urban Tanzania, showing that interim property rights recognised through institutionally plural arrangements can secure tenure where full title cannot be reached. Byamugisha and Dubosse (2023) make the investment case for tenure security in sub-Saharan Africa, finding high returns on incremental instruments such as land-use certificates and noting the high cost of formal registration. Thiel (2023) analyses Ghana's digital addressing system as a project in constructing national space that extends the state's reach into places it previously could not locate.

The critical turn

The critical literature on smart cities and digital governance in the Global South supplies the frame. Datta (2023) describes a digitalising state that governs through the transition from paper to digital data and through the management of informational peripheries, and warns that exclusion from the digital record is a form of exclusion from the city. Alizadeh and Prasad (2024) and Bandauko and Nutifafa Arku (2023) show that imported digital urbanism serves the formal city and marginalises the informal majority. The proptech literature has not yet been read through this frame for African markets, and the land-administration literature has not yet been connected to the platform and valuation technologies now arriving. This paper attempts both.

2.2 Housing and Land Markets in Rapidly Urbanising Cities

Tenure

The first feature of African urban land markets is that most land is not held under registered freehold or leasehold title. It is held under customary allocation, under informal purchase documented by receipts and witnesses, under long-term occupation without documents, or under state allocation whose paperwork is incomplete. Boanada-Fuchs et al. (2024), estimating the global extent of informal settlements, find data on their location and size to be seriously deficient, and Bettencourt and Marchio (2025) show that informal settlement in sub-Saharan Africa is structurally linked to infrastructure deficit. The consequence for property technology is that the object a digital registry is meant to record, a parcel with a defined boundary and a titled owner, does not exist for most urban land, and must be constructed before it can be digitised. Gyan (2025) and Manara and Pani (2023) show that this construction is a political and institutional act, not a data-entry task.

Production

The second feature is that housing is produced incrementally by households rather than delivered by developers. Akinwande and Hui (2024), analysing informal housing strategies in Lagos, show that effective affordable housing provision in developing economies depends on understanding and supporting the informal strategies through which most housing is actually produced, rather than on formal supply programmes that reach a small fraction of need. Self-built housing has no construction loan, no completion certificate and no standardised attributes, which means that the data on which valuation models depend, recorded transactions, standardised characteristics, comparable sales, is thin or absent.

Exchange and affordability

The third feature is that transactions are largely informal and affordability is deteriorating. Aro et al. (2026), examining inflation-adjusted rental affordability across Lagos, Kumasi and Johor Bahru, find diverging trends in rent-to-income ratios with Lagos among the least affordable. Rental agreements are typically verbal or minimally documented, annual rent is paid in advance, and intermediaries, agents, landlords' representatives,

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community leaders, exercise wide discretion over access. Housing finance reaches a small minority; the majority finance incrementally from savings and informal credit. Olajide and Lawanson (2025) document the forced evictions that punctuate Lagos's housing history and the coalitions that have formed to resist them, a reminder that in such markets the gravest affordability risk is not price but removal.

These features define the setting into which property technology arrives: unregistered tenure, incrementally produced housing, informal exchange, thin data and insecure occupation. The next section examines what each function of the technology does in that setting.

3. CONCEPTUAL FRAMEWORK

3.1 Three Functions and Their Ambivalence

Property technology performs three analytically distinct functions, which the industry bundles but which must be examined separately because each is ambivalent in a different way.

Registration: establishing what exists

Digital land registries, cadastres and addressing systems establish, in a form the state and the market can read, what parcels exist, where their boundaries lie, who holds them and under what right. In African cities this function is both the most valuable and the most dangerous. It is valuable because unregistered tenure is insecure, unmortgageable and vulnerable, and because Byamugisha and Dubosse (2023) show that even incremental tenure instruments yield high returns. It is dangerous because registration decides whose claims are recognised and whose are not, and because, as Olajide and Lawanson (2025) document for Lagos, the state's acquisition of knowledge about a settlement has repeatedly preceded its clearance. Thiel (2023) shows that digital addressing extends state reach; whether that reach protects or exposes depends on what the state does with it. Gyan (2025) shows that digitisation in a plural legal order does not resolve contested claims but encodes one resolution of them, and Alhola and Gwaindepi (2024) show that formalisation does not uniformly increase perceived security. Manara and Pani (2023) and Metaferia et al. (2023) point to the alternative: incremental, fit-for-purpose registration that records interim rights and existing claims rather than only full titles, and that can therefore include the majority rather than only those who can afford to formalise.

Valuation: establishing what it is worth

Automated valuation models estimate the value of property from data on transactions, characteristics and location. Their virtue is that they make value knowable at scale and low cost, which can unlock credit, a lender who can value collateral can lend against it, and can rationalise property taxation. Their danger is threefold. First, a model trained on formal-market transactions and applied to informal housing will systematically misvalue it, because the attributes, comparables and price-formation processes differ; Despotovic et al. (2026b) make the general point that automated valuation is reliable only within the data regime that produced it. Second, a valuation that is accurate can be exclusionary: it reveals that land occupied by the poor is worth more than they could pay, and in doing so creates the case for their displacement, which Olajide and Lawanson (2025) and Bandauko and Nutifafa Arku (2023) show is a live risk on Lagos's waterfront. Third, valuation feeds taxation, and property taxation of previously untaxed informal housing can either fund the services those settlements lack or push residents out, depending on design.

Matching: connecting supply and demand

Platforms match tenants to landlords, buyers to sellers and borrowers to lenders. They reduce search costs, widen the information available to each side and, through ratings and verification, substitute for the trust that informal intermediaries supply. Eskandarpour (2025) and So et al. (2026) show that in doing so they reorganise discretion: decisions once made by individual landlords and agents are structured by platform tools, categorical screening criteria and algorithmic recommendations. In African markets this can reduce the arbitrary and sometimes discriminatory discretion of informal intermediaries, but it can also encode exclusion more systematically, screening by income documentation, employment status or digital footprint that the majority cannot supply, and it concentrates the rents that intermediation generates in platform operators. Nasreen et al. (2024) show that platforms now mediate the low-cost and informal rental segment in a high-income city; Cocola-Gant and Janoschka (2026) and Kim and Yeon (2025) show that short-term rental platforms reshape supply and price. The African analogues, rental listing platforms, agent networks moving online, short-term rental in Lagos, Nairobi and Cape Town, are less studied but follow the same logic.

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The pattern

In each function the technology addresses a real failure, insecure tenure, opaque value, costly search, and in each the remedy can become a new form of the harm: registration that dispossesses, valuation that prices out, platforms that exclude and extract. The direction is not fixed by the technology. It is fixed by the conditions into which the technology is introduced, which the framework now specifies.

3.2 A Framework: Tenure Regime, Regulation and Data Control

The affordability and tenure effect of any property-technology deployment in a rapidly urbanising market is determined by three conditions.

Tenure regime

The first condition is the tenure regime: the mix of registered, customary, informal and contested claims that the technology meets, and the institutional arrangements for recognising them. Where the regime admits incremental and interim rights, as Manara and Pani (2023) describe for Tanzania and Metaferia et al. (2023) propose for Addis Ababa, digital registration can include the majority. Where it recognises only full title, digitisation records the minority and renders the rest invisible or illegal. Gyan (2025) shows that where customary institutions co-govern land, digitisation that ignores them reproduces conflict.

Regulatory environment

The second condition is the regulatory environment: whether there are protections against eviction, limits on the use of registry and valuation data for removal, rules on platform screening and discrimination, and provisions for property-tax relief for low-income occupants. Where such rules exist and are enforced, the dangerous edge of each function is blunted. Where they do not, registration data flows to enforcement, valuation feeds displacement and platforms screen without constraint.

Data control

The third condition is who controls the data the technology generates. Registry data held by the state, valuation data held by vendors and lenders, and platform data held by operators each give their holder power over residents who do not hold it. Masimba (2025) and Muhoja (2026) show that community-generated land and settlement data, held by residents' federations, can be used to negotiate recognition rather than merely to be governed; the same logic applies to the data property technology produces. Despotovic et al. (2026b) emphasise governance as a condition of reliable automated valuation; in rapidly urbanising markets governance includes the question of whose interests the model serves.

Propositions

Proposition 1. Digital land registration improves tenure security for low-income residents only where the tenure regime recognises incremental and interim rights; where it recognises only full title, digitisation reduces the relative security of the unregistered majority by making their exclusion from the record legible and actionable. Proposition 2. The probability that registration enables dispossession rather than security rises with the value gap between current use and alternative use of the land, and is highest for well-located informal settlements such as urban waterfronts. Proposition 3. Automated valuation models trained on formal-market data will systematically misvalue informal housing, and the direction of error will tend to overvalue the land and undervalue the structure, generating both displacement pressure and inadequate compensation. Proposition 4. Valuation-based property taxation of informal housing will improve affordability only where revenue is visibly returned to the taxed settlements as services; otherwise it functions as a displacement instrument. Proposition 5. Housing platforms reduce arbitrary discretion but increase systematic exclusion in proportion to the documentation they require, and in markets where the majority lacks formal income, employment or credit records they will serve the formal minority unless screening is designed for informal profiles. Proposition 6. The share of intermediation rents captured by platform operators rises with platform concentration and falls where public, cooperative or regulated alternatives exist. Proposition 7. For each function, control of the resulting data by residents or their organisations, rather than exclusively by the state, vendors or operators, shifts outcomes toward inclusion; this is the property-technology analogue of the community-enumeration finding in the informal-settlement literature.

The propositions are stated as conditional relationships that empirical research can test and that designers of digital land and housing systems can use as requirements.

4. ANALYSIS AND DISCUSSION

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4.1 The Specific Risk of Automated Valuation

Automated valuation deserves separate treatment because it is the function most directly transformed by artificial intelligence and the one whose failure mode in informal markets is least visible. A valuation model learns the relationship between observable attributes and transaction prices from a training set. In formal markets the training set is large, the attributes are standardised and the price-formation process, competitive bidding among informed buyers with access to finance, is roughly uniform. Baur et al. (2023) and Gunes (2024) show how well such models can perform under these conditions, and Despotovic et al. (2026a) set out the pipeline by which they are built.

In an African city the conditions fail together. The training set, where it exists, consists of formal transactions in the formal city. The attributes of informal housing, incremental construction, mixed materials, unregistered extensions, shared plots, are not in the attribute vocabulary. The price-formation process differs: informal purchases are negotiated among parties with limited information and no finance, and the price embeds tenure risk, community relations and political protection that no model observes. A model trained on the formal city and applied to the informal one will therefore do two things. It will value the land by its location and the formal market's price gradient, which in a well-located settlement produces a high figure; and it will value the structure by attributes it cannot see, which produces a low or missing figure. The combination, valuable land, worthless structure, is the valuation profile that justifies clearance and under-compensation. Proposition 3 states this; Despotovic et al.'s (2026b) warning that automated valuation is reliable only within its data regime explains it; and the eviction histories that Olajide and Lawanson (2025) record show where it leads.

The remedy is not to abandon valuation but to build it differently: to train on informal transactions where they can be documented, to include tenure and community attributes, to report uncertainty explicitly, and to govern the model's use so that a valuation cannot by itself trigger removal. Each of these is a design choice that the framework's three conditions make visible.

4.2 Nigeria and Lagos as an Anchoring Case

Nigeria's urban land market operates under a statutory regime that vests land in state governors and requires a certificate of occupancy and governor's consent for transactions, a system whose cost and delay are widely held to have pushed most urban land transactions into informality. Lagos, the country's largest city and housing market, exhibits every feature described above: a majority of land held outside registered title, incremental self-built housing as the dominant production mode (Akinwande & Hui, 2024), deteriorating rental affordability (Aro et al., 2026), and a history of waterfront evictions and resistance (Olajide & Lawanson, 2025). Lagos State has also been an early adopter of digital land administration, with electronic certificates of occupancy, a geographic information system for land records and a resident registration system, and it hosts a growing proptech sector of listing platforms, agent networks and digital mortgage pilots.

Registration

Lagos's digital land records illustrate Proposition 1 and Proposition 2. The electronic registry records titled parcels in detail and the untitled majority not at all; digitisation has made the formal city more legible without extending recognition to the informal one. On the waterfront, where land values are highest and tenure least secure, the value gap that Proposition 2 identifies is widest, and the state's capacity to see what exists has been used, in the cases Olajide and Lawanson (2025) document, for removal. A fit-for-purpose approach of the kind Metaferia et al. (2023) and Manara and Pani (2023) describe, recording the claims that exist, issuing interim instruments, building toward title, would invert the pattern, and Byamugisha and Dubosse (2023) suggest it would pay for itself.

Valuation and taxation

Lagos State's land-use charge, a property tax assessed on valuation, has been contested since its introduction, and the extension of automated valuation to the informal housing stock would sharpen the contest. Proposition 3 predicts that models trained on the formal transactions of Ikoyi, Victoria Island and Lekki would overvalue the land and undervalue the structures of Makoko, Ajegunle and the peripheral settlements; Proposition 4 predicts that taxation on that basis would displace rather than serve unless revenue returned visibly as drainage, roads and water.

Platforms

Lagos's rental listing platforms and online agent networks illustrate Proposition 5. They reduce the arbitrary discretion and fee extraction of informal

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agents, which tenants welcome, but they screen on documentation, employment letters, bank statements, guarantors, that the majority of the city's workforce, employed informally, cannot supply, and the formal rental stock they list is the stock the majority cannot afford. A platform designed for informal profiles, accepting community references, mobile-money transaction histories, cooperative guarantees, would be a different instrument, and Proposition 6 suggests that it is unlikely to emerge from a concentrated private market without public or cooperative provision.

The possibility

Lagos has the elements of the alternative. The Nigerian Slum/Informal Settlement Federation and allied organisations conduct enumerations that could seed a fit-for-purpose registry. The state's digital land infrastructure could record interim rights as readily as titles. Valuation could be built on informal transaction data and governed so that it informs compensation rather than triggers clearance. Platforms could be regulated or complemented so that informal profiles are served. The framework specifies the conditions; whether they are met is a question of policy and politics, as every eviction and every resistance in the city's history attests.

4.3 Implications

For land agencies

Land agencies digitising their records should decide, before procurement, whether the registry will record only titles or also the interim and customary claims that constitute most urban tenure. The decision determines whether digitisation includes or excludes the majority and whether it secures or endangers them. Fit-for-purpose, incremental approaches are now well documented in the African land-administration literature and should be the default for rapidly urbanising cities.

For housing and tax regulators

Regulators should treat automated valuation of informal housing as a high-risk application requiring validation against informal transaction data, explicit uncertainty reporting and rules preventing valuation from serving as grounds for removal. Property taxation based on such valuation should be linked by statute to service delivery in the taxed settlements. Platform screening should be subject to anti-discrimination rules adapted to informal employment, and platform concentration should be monitored.

For platform operators and lenders

The commercial opportunity in African housing markets lies in serving the informal majority, not in replicating formal-market tools for the formal minority. Platforms and lenders that design for informal profiles, alternative documentation, community verification, incremental finance for self-build, will find a larger market and a stronger social licence than those that import screening criteria from elsewhere.

For research

The propositions can be tested: Proposition 1 by comparing tenure-security outcomes across cities with different registry designs; Proposition 3 by validating automated valuation models against documented informal transactions; Proposition 5 by auditing platform screening against the documentation profiles of urban workforces. The African proptech sector is almost absent from the peer-reviewed literature, which is concentrated on high-income rental and short-term rental markets; the Lagos, Nairobi, Accra and Johannesburg cases need study. And the connection between the land-administration and the proptech literatures, which this paper has begun, needs development.

Limits

The paper is conceptual and evaluates no deployed system. It treats low-income residents as a group with shared interests when owners, tenants, landlords and intermediaries within informal settlements have divergent ones. It draws its proptech evidence largely from high-income markets and its land-administration evidence from a few African countries. And it does not address housing construction technology, which is a separate strand of property technology with its own effects on affordability.

5. CONCLUSION AND RECOMMENDATION

Property technology promises African cities what their housing markets most lack: secure tenure, knowable value, efficient search and accessible finance. Each promise is real, and each can be inverted. Registration can dispossess, valuation can price out, platforms can exclude and extract. This paper has decomposed property technology into the three functions of registration, valuation and matching, shown the ambivalence of each in markets where tenure is unregistered, housing is self-built and exchange is informal, and proposed a framework in which the direction of each function's effect is determined by the tenure regime, the

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regulatory environment and the control of data. It has derived propositions that make the framework testable, examined the specific risk of automated valuation trained on the formal city and applied to the informal one, and anchored the analysis in Lagos.

The conclusion is that property technology in rapidly urbanising markets is neither inherently inclusive nor inherently extractive. It amplifies the tenure regime, the regulation and the data arrangements it meets. Cities that want digitisation to improve affordability and tenure security for the majority must build those conditions first: registries that record the claims that exist, valuation that sees the housing the poor have built, platforms designed for the profiles the poor have, and data held by those the data describes. Where those conditions are absent, the technology will make the formal city more efficient and the informal city more precarious, and it will do so with a precision that paper never had.

6. CONTRIBUTION TO EXISTING KNOWLEDGE

The paper contributes a decomposition of property technology into registration, valuation and matching, and shows that each function can secure tenure or enable dispossession, include or exclude, according to the tenure regime, the regulatory environment and the control of data into which it is introduced.

It further contributes a framework linking these conditions to affordability and tenure outcomes, together with an account of the specific risk of automated valuation trained on formal-market data and applied to informal housing, giving land agencies, regulators and platform operators a basis for ensuring that digitisation improves rather than erodes tenure security for the urban majority.

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