

TOCHI EXCHANGE: DISINTERMEDIATING REAL ESTATE USING AGENTIC SYSTEMS

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ABSTRACT. *This whitepaper examines the structural frictions that have long plagued real estate markets, namely information asymmetry, non-standardized inspections, monopolistic remuneration, and an overabundance of intermediaries. We develop quantitative models of transaction duration and cost to characterize illiquidity and the limits of For-Sale-By-Owner self-enablement. We explore how parallelization potential and misaligned incentives undermine price discovery and challenge the applicability of the Efficient Market Hypothesis in property transactions. Recent regulatory shifts, including the 2024 NAR settlement, have exposed vulnerabilities in entrenched broker-led systems, creating an opening for technological disruption. In response, we introduce Tochi: a platform that combines real-time digital auctioning, agentic AI powered by large language models, high-fidelity 3D mapping, and an API-driven architecture to streamline every subprocess, from listings and marketing to standardized inspections, underwriting, and closing. By collapsing transaction times and costs toward theoretical minima, Tochi empowers buyers and sellers to transact directly, democratizing access to real-time data and approximating EMH conditions for real estate.*

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Introduction

Real estate has historically been characterized by information asymmetry, high transaction costs, and illiquidity, compared to public equity markets. Buyers and sellers frequently rely on brokers to access market information and facilitate transactions. However, the advent of democratized syndicated real estate data, agentic systems through commoditized Large Language Models (LLM), algorithmic property valuations, 3D mapping technology, and real-time digital auctioning has the potential to reduce these frictions significantly. This paper addresses a new chapter in real estate markets, that these technological shifts can improve price discovery, enhance market efficiency, and liquidity transformation and move the real estate market closer to the ideals posited by the Efficient Market Hypothesis (EMH) through the consolidation of these technologies.

1. Illiquidity and Self-Enablement of Real Estate

Our relationship with territory and the management of our rights to said territory is the cornerstone of economics and exchange itself. For most of human history, land was controlled by a select few: tribal leaders, monarchs, religious institutions, and feudal lords, who held ownership as a means of power rather than economic productivity. In ancient civilizations like Mesopotamia, Egypt, and Rome, some legal frameworks for private land ownership existed, but access was largely restricted to elites. During the medieval period, feudalism further entrenched this system, as land was granted in exchange for military service, leaving commoners with little to no ownership rights. The first major shift came with the decline of feudalism in the early modern era (1500s–1800s), when enclosure movements in Europe privatized common lands, and European-led colonial expansion provided land grants to settlers in the Americas. The Industrial

Revolution (18th–19th century) accelerated this transformation by creating alternative sources of wealth beyond agriculture, allowing land to be traded as a commodity rather than a tool of feudal obligation. Legal reforms like the Napoleonic Code (1804) and the U.S. Constitution (1787) established property rights as fundamental economic principles, while the emergence of mortgage markets enabled ordinary people to buy land for the first time.

The 19th and 20th centuries saw the final dismantling of feudal land monopolies, as democratic revolutions, land reforms, and economic liberalization spread property rights to the middle and working classes. The abolition of serfdom (Russia 1861, Austria 1848, Prussia 1807) and the Homestead Acts (USA 1862) were pivotal in breaking aristocratic control over land. After World War II, many nations implemented land redistribution policies to correct colonial-era inequalities, further democratizing property ownership. Today, property rights are legally protected in most economies, and real estate has become a key investment class, accessible through mortgages, real estate investment trusts (REITS), and financial markets. A trend was observed in the decentralization of power to the masses and a democratization of the asset class. Although land ownership is no longer the sole determinant of wealth and power, it remains a critical and multifaceted component of the modern economy, albeit now more liberated from its historical constraints.

By 2023, the real estate market accounted for nearly one-fifth of the United States' gross domestic product (GDP) contribution. The average duration required to complete a real estate transaction ranged between eight and sixteen weeks (56–112 days), with the median transaction time estimated at approximately 11 weeks. This timeframe is highly variable, spanning from as few as four weeks under optimal conditions to as many as 20 weeks in less favourable circumstances. The duration of real estate transactions is also contingent upon various factors, including the type of property, be it residential, commercial, multifamily, or otherwise. Approximately 4.09 million existing homes were sold, including single-family residences, condominiums, and cooperative housing units. This figure represents a significant decline from the 6.12 million transactions recorded in 2021. Moreover, in 2024, For Sale By Owner (FSBO) transactions accounted for 6% of all home sales. This phenomenon is likely attributable to the Zero-Interest Rate Policy (ZIRP), which has driven transaction activity. Consequently, it serves as a valuable indicator for delineating a healthy operational range influenced by nominal interest rates.

Given these data points, we are provided with two critical variables that encapsulate the liquidity and self-enablement challenge in real estate:

1. The average duration required to complete a transaction, denoted by:

$$\overline{T}_{RE}$$

2. The proportion of For Sale By Owner (FSBO) transactions, denoted by:

$$p_{FSBO}$$

Typical range of transaction duration:

$$\bar{T}_{RE,2023} \in [4, 16] \text{ weeks} \quad (56 \leq \bar{T}_{RE,2023} \leq 112 \text{ days})$$

Median transaction duration:

$$\text{Median}(\bar{T}_{RE,2023}) \approx 11 \text{ weeks}$$

The upper bound is theoretically unbounded in unfavourable conditions:

$$T_{RE,2023} \in [4, \infty) \text{ weeks}$$

For Sale By Owner (FSBO) transactions in 2024:

$$p_{FSBO,2024} = 0.06 \quad (6\%)$$

For liquidity transformation and self-enablement within the real estate asset class to occur, the following conditions must be met:

- The transaction duration must approach zero, eliminating temporal friction and the associated costs of delay:

$$T_{RE} \rightarrow 0$$

- The FSBO proportion must approach 100%, signalling a shift towards complete self-enablement in transactions:

$$p_{FSBO} \rightarrow 1$$

This gives a quantitative foundation to understand the illiquidity and self-enablement problem for the real estate asset class, allowing us to investigate and model the problem further and project the results of solutions. The following step in modelling the problem is acknowledging the make-up of these confounding variables that define our problem. In the case of transaction duration, we know that the total time it takes to process a transaction is the sum of all subprocesses that go into the transaction.

Modelled as follows:

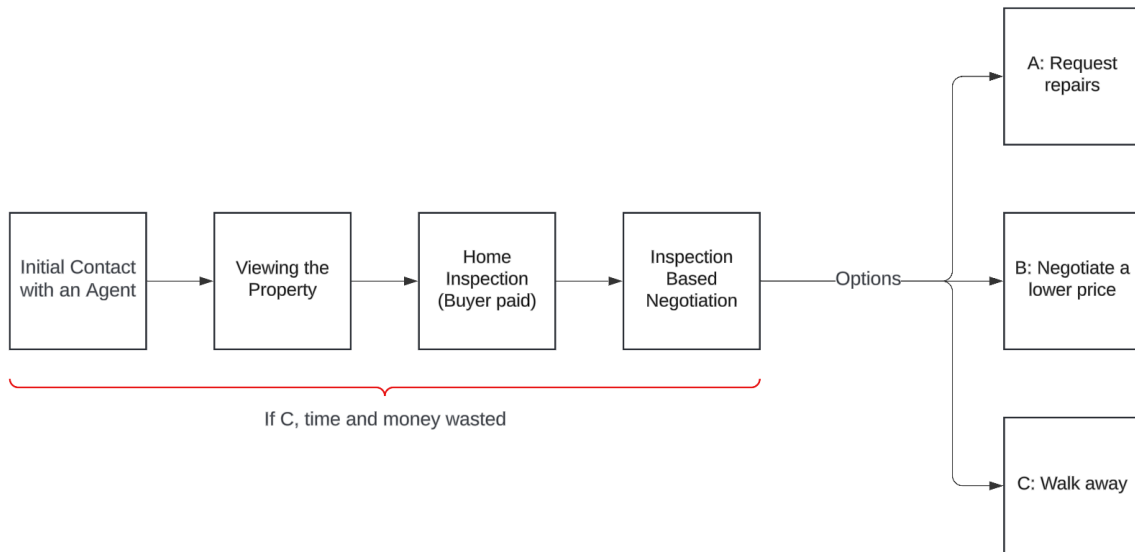
$$T_{RE} = \sum_{i=1}^n T_i \text{ Where } T_i \text{ is the duration of the } i\text{-th subprocess.}$$

2. Non-Standardized Defect-Inclusive Property Inspections

Traditionally, one of the main subprocesses in the real estate transaction process is property inspections to uncover defects that play into the negotiation. Inspections are a critical necessity to getting to the real value of a property. We can denote the subprocesses with the following variable:

$$T_{Inspection}$$

A diagram below will outline the workflow of the traditional subprocess.



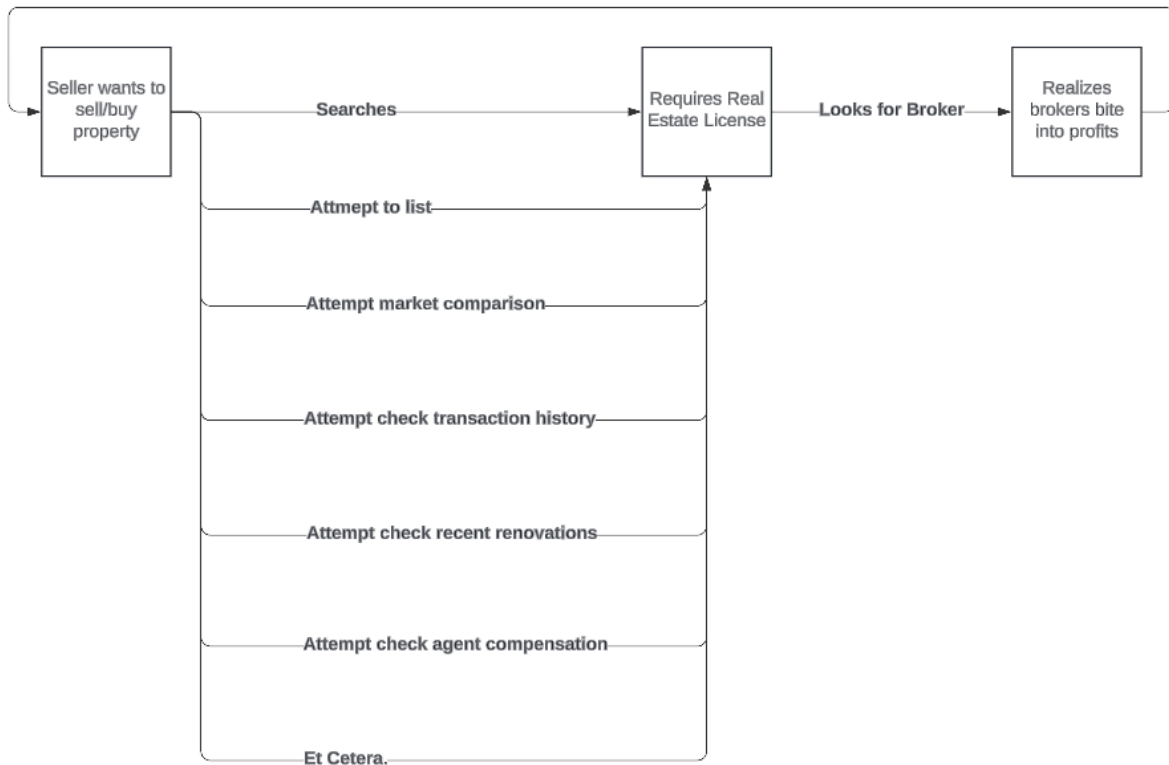
In recent years, pre-listing inspection reports have been performed to help with this process. However, due to conflicts of interest and non-transparent processes, buyers are still inclined to perform inspections on their behalf.

3. Information Asymmetry

North American real estate, especially in the form of homeownership, emerges as the most prevalent investment asset class. In 2021, approximately 62% of U.S. households owned their primary residence. Residential real estate represents the largest asset class in terms of overall value, surpassing both the S&P 500 and all publicly listed companies. As of June 2023, the U.S. residential real estate market was valued at approximately \$43.5 trillion, compared to \$36.7 trillion for the S&P 500 and \$40 trillion for all U.S. public companies. These figures underscore the profound concentration of wealth within homeownership, thereby establishing real estate as a cornerstone of individual net worth in the region.

In North America, an adult citizen, armed with a Social Security number and a legal residential address, can simply download an app, provide an email address and proof of identity, link a bank account, and, within the same day, purchase public market securities or engage in derivative trading. Concurrently, these individuals can access websites that offer in-depth data and analysis from leading public investors, resources that would have been unimaginable to the average Wall Street participant in 1980. This level of transparency and accessibility is afforded to other alternative investment categories such as cryptocurrencies, digital assets, derivatives, commodities, and private equity. In stark contrast, real estate, despite its classification within the alternative investment category and its status as North America's largest asset class outside of infrastructure, remains encumbered by a system that relies on brokers, appraisers, and inspectors who maintain a near-monopoly over the critical market information necessary for thorough analysis. Geographic dispersion of properties and heterogeneous asset features (e.g., architectural idiosyncrasies) further obscure accurate property valuations.

A diagram below will outline the mechanics of a buyer or seller attempting to participate in the market independently.



These factors apply significant downward pressure on the For Sale By Owner (FSBO) transactions portion of the North American economy.

4. Monopolistic Effects and Outdated Remuneration Structures

In North America, the two primary real estate associations, the National Association of Realtors (NAR) and the Canadian Real Estate Association (CREA), collaborate in a monopolistic symbiotic relationship that serves as the de facto regulatory authority for the Major Listing Service (MLS) in their respective countries. This system effectively operates as a North American real estate cartel, exerting significant control over market information.

The monopolistic structure of the real estate market in North America exerts significant anti-competitive pressure, which severely impacts the incentive structure within the industry. This dominance by real estate associations has created an environment where innovation is stifled, and traditional, high-commission models persist. This lack of competition leads to a misalignment of interests, where agents are incentivized to maintain high commissions rather than innovating to reduce costs for consumers. The result is a market where the interests of brokers are prioritized over those of buyers and sellers, perpetuating high transaction costs and reducing overall market efficiency. This entrenched monopolistic stance has historically led to anti-competitive practices, ultimately harming consumers. As demonstrated in the recent NAR

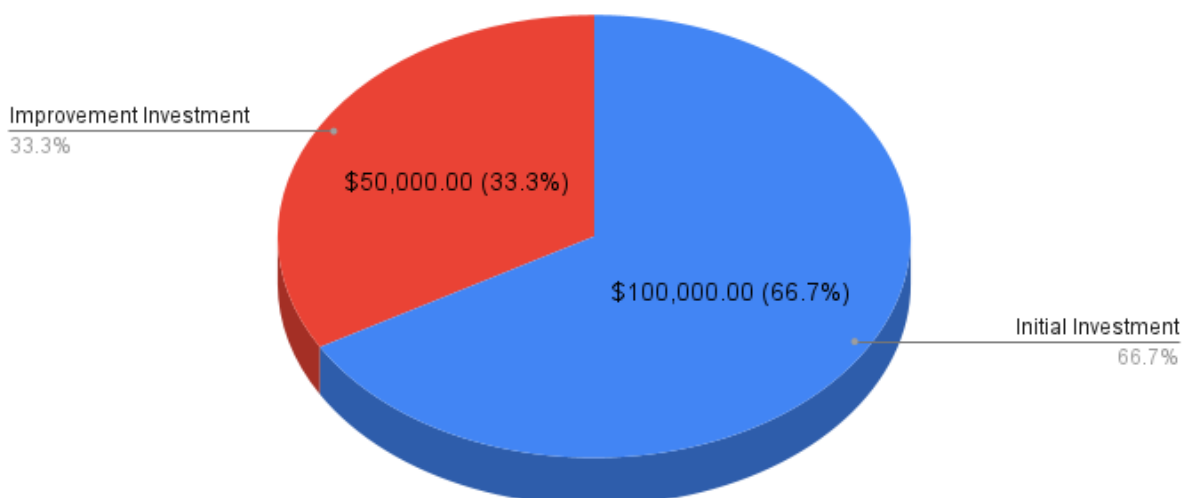
class action lawsuit, which alleged that NAR and several large brokerages conspired to force home sellers to pay inflated, non-negotiable commissions, typically around 6%, through a practice known as the cooperative compensation rule. After a jury found the defendants liable in October 2023, NAR agreed in March 2024 to settle by paying \$418 million over four years and to change its practices. These changes include stopping the public display of buyer-agent compensation on MLS listings and requiring buyers to sign written agreements with their agents before touring homes.

The outdated remuneration structure in the real estate industry further compounds the issues stemming from its monopolistic and anti-competitive nature. Traditional commission-based compensation, where agents earn a percentage of the sale price, often leads to inflated costs for consumers. This remuneration model has remained largely unchanged, despite advancements in technology and changing market dynamics. As a result, there's a persistent misalignment between the services provided and the actual value delivered. This outdated structure discourages more efficient, performance-based compensation models that could better align agents' interests with those of buyers and sellers, ultimately perpetuating inefficiencies in the market.

Furthermore, imposing a fee calculated as a percentage of the total value on the largest asset class, when considering both its valuation and distribution, is inherently absurd and outdated, particularly given its direct impact on individual profit margins, as illustrated in the following example.

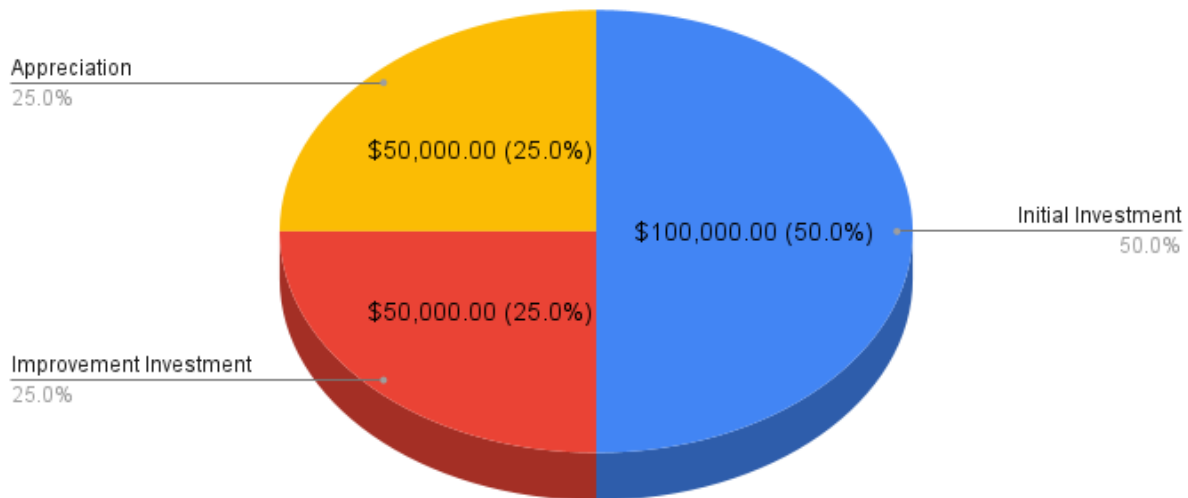
Imagine you're an investor who purchased a property for \$100,000 and invested another \$50,000, making your total cost basis \$150,000.

Property Market Value



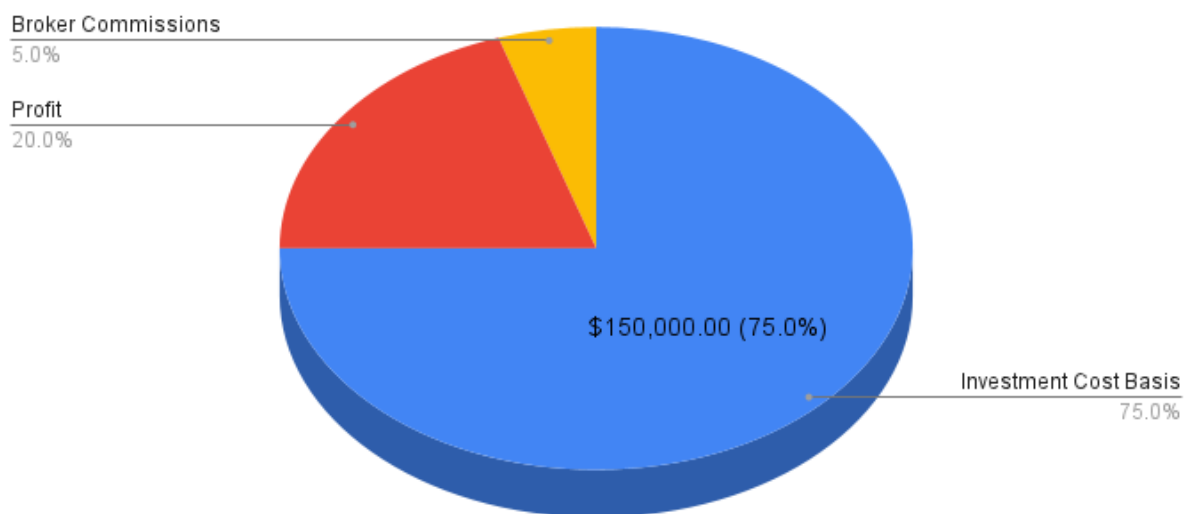
Over time, the market value appreciates to \$200,000.

Property Market Value (Post-Appreciation)



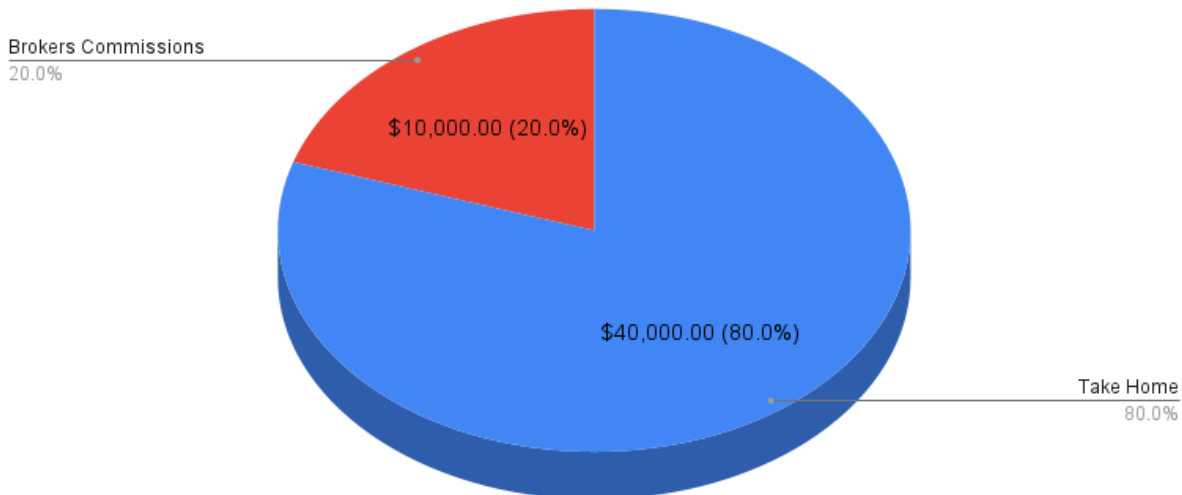
When you decide to sell, the real estate brokers, who charge a 5% commission, demand \$10,000 from your profits.

Final Transaction Makeup (Post Appreciated Sale)



Which may be perceived as only taking 5%, but is taking 20% of your profit in the form of appreciation.

Profits Makeup (Post Appreciated Sale)



The brokers effectively control the flow of information and access to potential buyers, making their role indispensable. To list a property, you must go through a broker because they have exclusive access to the MLS, which is crucial for reaching buyers. This mandatory dependency not only reduces your realized profit but also represents an inescapable reliance on their control over the transaction process. This highlights the economic inefficiency and the power imbalance in the real estate market. A monopoly that is yet to be challenged and disturbed.

5. 3Ms Problem: Many Middle Men

Real estate, as an asset class, is inherently complex and multifaceted, involving diverse disciplines in its construction, management, and transaction processes. Within a single transaction, a multitude of professionals, brokers, lenders, stagers, surveyors, lawyers, government agencies, inspectors, appraisers, and photographers each contribute critical services. Although these roles are distinct, with their own timelines and compensation structures, they are typically coordinated through the broker's network, which facilitates the progression of the transaction at every stage.

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Brokers serve as the linchpin of the transaction, operating on a commission-based model that typically ranges between 5% and 6% of the home's sale price, which is often split between the listing and buyer's agents. Their role spans the entire process, from property listing to closing, with an average timeline of two to three months. During this period, the property remains on the market for approximately 50 to 60 days before going under contract, followed by an additional 44 days required for mortgage approval and finalization. The broker's ability to orchestrate various professionals, particularly stagers, photographers, inspectors, and appraisers, is essential in expediting the process and maximizing the property's marketability.

Parallel to the broker's efforts, mortgage lenders play a critical role in financing the transaction. Their involvement introduces a distinct yet interwoven timeline, as loan origination and underwriting typically require between 30 and 50 days to complete. Lender fees generally range from 2% to 5% of the loan amount, encompassing origination charges, underwriting, and various administrative costs. While the buyer secures financing, stagers and photographers work to enhance the property's visual appeal. Staging, a process that costs between \$800 and \$2,800, is often completed in one to two days, with an additional week required if furniture rentals or logistics are involved. Professional real estate photography, which generally costs between \$110 and \$600, follows immediately after staging and is essential for marketing the listing effectively. With an industry-standard turnaround time of 24 to 48 hours for edited photos, these preparatory services ensure the property is positioned optimally before it is listed.

Once an offer is accepted, the transaction shifts towards due diligence and regulatory compliance, requiring the expertise of surveyors, inspectors, appraisers, and attorneys. Surveyors, who assess property boundaries and land features at costs ranging from \$380 to \$750, complete their work within a few days to two weeks. Simultaneously, home inspectors conduct evaluations within a two to four-hour on-site visit, providing a detailed report within one to three days for \$300 to \$800. Appraisers, whose assessments are integral to the lender's valuation process, complete their evaluations in a similar timeframe, with costs ranging from \$300 to \$600. While these professionals operate independently, their findings collectively influence price negotiations, financing terms, and potential contingencies within the purchase agreement.

Legal professionals and government agencies introduce another layer of complexity to the transaction. Real estate attorneys, who charge between \$750 and \$3,000 depending on transaction complexity, oversee contract review, title searches, and closing documentation. Their involvement typically spans three to six weeks, aligning with the broader timeline of mortgage approval and regulatory processing. Government agencies, responsible for deed recording and transfer taxes, impose additional financial and administrative considerations. Recording fees,

typically ranging from \$50 to \$200, are minor compared to transfer taxes, which vary from 0.01% to 4% of the property's sale price depending on the jurisdiction. While the recording process can be completed within hours or days of closing, the full processing of government filings can extend for several weeks.

Given the multitude of interdependent roles and the variability in transaction complexity, the overall duration of a real estate transaction ranges between 154 and 250 days, or approximately 5.5 to 8.5 months. However, strategic overlap in key services, such as concurrent scheduling of inspections, appraisals, and survey work, alongside parallel legal and financial processing, can compress this timeline by four to six weeks, reducing the total transaction period to an estimated 120 to 210 days. This optimization underscores the importance of coordination between brokers, lenders, and legal professionals in expediting the process while maintaining due diligence. Ultimately, the successful execution of a real estate transaction is a testament to the intricate yet highly structured nature of the industry, where efficiency, regulatory compliance, and financial prudence converge to facilitate one of the most significant financial decisions in an individual's lifetime.

Real estate transactions, while structured, remain inherently complex due to the number of interdependent actors and processes involved. Unlike asset classes that are highly liquid and tradeable with minimal intermediary involvement, real estate transactions necessitate a sequence of evaluations, approvals, and verifications, each contributing to the temporal friction associated with property transfers. This complexity results in extended transaction durations, spanning multiple weeks to months, and necessitates financial outlays across various professional services, each introducing distinct cost components.

The primary subprocesses involved in a standard real estate transaction include:

Brokerage & Listing: T_1

Mortgage Financing & Approval: T_2

Home Staging & Photography: T_3

Surveying & Title Verification: T_4

Legal Processing & Due Diligence: T_5

Government Documentation & Deed Recording: T_6

Inspection & Appraisal: T_7

Closing & Finalization: T_8

The duration of each subprocess follows a distribution dependent on market conditions, service efficiency, and regulatory environments. Under optimal circumstances, transaction durations approach the lower bound, where maximum concurrency between processes minimizes overall

time. In contrast, under adverse conditions (e.g., lending delays, appraisal bottlenecks, or government backlog), transaction times exhibit heavy-tailed behaviour, extending toward significantly higher durations.

6. Cost Structure of Real Estate Transactions

The total financial burden of a transaction, denoted as C_{RE} , is similarly decomposable as the sum of individual service costs:

$$C_{RE} = \sum_{i=1}^n C_i$$

Where C_i represents the cost of the i -th service. Given the range of costs across service categories, we define the cost bounds as:

$$C_{RE}^{min} = \sum_{i=1}^n C_i^{min}, C_{RE}^{max} = \sum_{i=1}^n C_i^{max}$$

Where:

$$22,690 \leq C_{RE} \leq 39,250$$

These cost constraints highlight the capital-intensive nature of real estate transactions, reinforcing their relative illiquidity compared to financial assets that trade with near-zero transaction costs.

7. Parallelization Potential and Transaction Optimization

While some subprocesses operate sequentially due to dependency constraints (e.g., mortgage approval must precede final closing), others may be executed in parallel, reducing total transaction duration:

$$T_{RE}^{optimized} = \max(T_{parallel}) + \sum T_{sequential}$$

Where $T_{parallel}$ represents the concurrent subprocesses, and $T_{sequential}$ represents those that must occur in a dependent sequence. The theoretical lower bound for transaction completion, assuming perfect concurrency in overlapping processes, is:

$$T_{RE}^{optimized} \approx 120 \text{ days (approx. 4 months)}$$

Whereas the upper bound remains at:

$$T_{RE}^{max} \in [250, \infty) \text{ days}$$

By modelling these subprocess dependencies, we identify the primary bottlenecks in mortgage processing, legal review, and government documentation as the main sources of transaction inefficiency.

8. Efficient-Market Hypothesis, Price Discovery, and Market Efficiency

In real estate markets, information asymmetry and information monopolies critically undermine liquidity and price discovery, core tenets of an efficient market as described by the Efficient Market Hypothesis (EMH). Under EMH, asset prices are expected to fully reflect all available information, enabling market participants to make rational, informed decisions. However, the current structure of the real estate market systematically impedes this ideal.

Real estate is distinguished by its inherent heterogeneity, where each asset possesses unique attributes that complicate standardized valuation. Unlike the highly transparent and continuously traded public equity markets, real estate suffers from fragmented and non-standardized information. In practice, market participants ranging from individual buyers and sellers to institutional investors often lack access to comprehensive, real-time data on property conditions, market trends, and regional economic indicators. This dearth of accessible, high-quality information creates an environment where transaction participants are forced to rely on intermediaries who control critical market insights.

Mathematically, information asymmetry (α) in a market can be represented as:

$$\alpha = \frac{|I_b - I_s|}{I_b + I_s}$$

Where I_b is the set of available information to buyers, and I_s is the set of available information to sellers.

When $\alpha \rightarrow 0$ information symmetry is achieved, promoting efficiency.

However, in real estate markets, α remains significantly greater than zero due to intermediaries controlling and limiting access to I_b and I_s .

9. Monopolistic Control and Its Impact on Price Discovery

A small cadre of brokers, appraisers, and proprietary listing services effectively monopolizes the flow of market information. This concentration results in information monopolies that distort the price discovery process. When brokers and other intermediaries act as gatekeepers, they filter and sometimes withhold pertinent data, leading to systematic mispricing. The resultant inefficiencies are twofold: first, assets are often valued based on incomplete or biased information, and second, the opaque nature of data dissemination fosters an environment where market signals are delayed or entirely obscured. Consequently, property prices may deviate substantially from their intrinsic economic values, perpetuating inefficiencies in capital allocation.

10. Illiquidity as a Direct Consequence

The inefficiencies generated by information asymmetry and monopolistic practices directly contribute to market illiquidity. In a market where prices do not accurately reflect underlying fundamentals, transactions take longer to complete, and the cost of trading increases. This extended transaction duration, compounded by high fees and the involvement of numerous intermediaries, creates significant temporal friction. Unlike public equities, which can be rapidly traded with near-zero transaction costs, real estate remains ensnared in lengthy processes that deter market fluidity and inhibit the swift reallocation of assets in response to market signals.

11. Challenging the EMH in Real Estate

The stark deviation from EMH expectations in real estate markets underscores a fundamental disconnect: while the hypothesis presumes that all available information is efficiently integrated into asset prices, the monopolistic control over information in real estate leads to persistent gaps in data transparency. This results in adverse selection and moral hazard, where market participants make suboptimal decisions based on incomplete or skewed information. In turn, the market fails to self-correct as information remains hoarded by entrenched intermediaries rather than being disseminated broadly and equitably.

12. Regulatory Threats

NAR and CREA are very strict on MLS use. FSBO listings are not allowed to be listed together with MLS listings based on their policies. Zillow went through a legal case having to justify the way they listed FSBO properties. By listing FSBO properties separately, the listings resulted in 80% fewer impressions than non-FSBO listings. This often forces FSBO listers to go with a listing agent to get access to the MLS, but at a major hit in profit. This opens a major opportunity for a company to offer platform-backed MLS listings at competitive listing rates. Real estate giants like Zillow, undergoing regulatory pushback, allow technology companies in the space to know where we can push boundaries and where we can't.

MLS has a very strict yet cut-out process for getting access to MLS APIs, usually involving a vendor agreement between the technical developer, a real estate brokerage, and the API provider. (MLS directly or third-party) These regulations force technical developers to partner up with brokerages or start a brokerage to develop technology.

13. Solutions

Addressing these inefficiencies necessitates a paradigm shift toward democratized, real-time data flows and disintermediated market structures. By leveraging technological advancements, such as auction systems, agentic platforms powered by large language models, and standardized inspection and financial reporting, the real estate market can move closer to the ideals of EMH. Such innovations reduce information asymmetry, lower transaction costs, and enhance liquidity by empowering individual market participants with the data needed to make optimal decisions.

14. Disrupting Monopolies Through Innovation

Monopolies are typically disrupted through a combination of regulatory intervention, market innovation, and increased competition. Regulatory bodies can impose measures to break up monopolistic entities, enforce fair competition, and reduce barriers to entry. Innovation, often driven by technological advancements, introduces new business models that can challenge the status quo, offering consumers better choices and lower costs. Additionally, fostering a competitive environment by lowering entry barriers can enable smaller players to thrive and erode the dominance of established monopolies. These disruptions can lead to a more dynamic market, where innovation and consumer choice drive progress.

15. NAR Settlement and Disruption to the Status Quo

Recent legal actions against the National Association of Realtors (NAR) have led to a landmark \$418 million settlement, with federal findings indicating that the organization, in concert with large real estate brokerages, conspired to artificially inflate agent commissions. Under the traditional model, sellers pay a commission (typically 6% of the home's sale price) that is split roughly equally between the seller's agent and the buyer's agent. This structure, though long established, has been criticized for creating a "hidden tax" on home transactions, distorting incentives, and potentially inflating real estate prices. The settlement is poised to force a structural change: buyers may soon be required to negotiate and directly pay their agent's commission. This catalyzed debate regarding the fairness, transparency, and efficiency of this system. Notably, the settlement mandates that buyers will now be responsible for compensating their agents, a shift that challenges long-standing practices and opens the door for technological innovations and alternative fee structures.

16. Tochi Exchange Platform

The market needs a place where market participants can find, buy, sell, rent, and analyze real estate assets in a streamlined manner. I propose Tochi, a platform that addresses these problems with an innovation-driven approach to challenging the status quo. In the following sections, I will outline and describe the platform's implementation and how it will solve the issues described. I will also address why now is the best time to build it.

17. Technological Perfect Storm

We are three years into the world of Large Language Models (LLMs) with context windows that can fit complete Christian bibles in a single API call. With the introduction of Retrieval-Augmented Generation (RAG), Cache-Augmented Generation (CAG), and *Anthropic's* Model Context Protocol (MCP), we begin to allow these Large Language Models to have real-world context and frameworks to develop AI agents that can work autonomously. These frameworks start to address the inherent nature of these models, which are inherently probabilistic. Working with probabilistic models in a world that relies on deterministic systems is not pragmatic if intended actions are not executed. You wouldn't want your kiosk at a retail store to not check you out 1 in 100 uses. Getting the error rates of the action intended to be executed to approach zero to make the system as deterministic as possible. These frameworks and achievements in the field allow us to build an agentic future where information workers like real estate brokers will be replaced by agents that will, in real time, be able to recommend properties, give comparative analysis better than the best brokers in North America, and help facilitate the whole transaction.

An agentic wave is coming for information workers along with the Software as a Service (SaaS) business model. The world transitioned from notebooks to spreadsheets, spreadsheets to vertical-SaaS, and now, for its final transition, vertical-SaaS to agents. The onset of all of these transitions sparked a golden age of innovation. Now is the time to innovate and push this transition, and the markets know it. If we look at the amount of liquidity flowing from institutional investors to startups to develop agents and AI-assisted platforms, we will see that the market knows that this is the imminent future, and it's coming fast. When paired with the lack of innovation in a market like real estate and all its regulatory hurdles, it's a no-brainer that the time is now.

If we look at a market with parallel regulatory models for brokerages like public equity brokers. We can see that even in recent years, with the success of companies like Robinhood, WeBull, WealthSimple, InteractiveBrokers, and TD Ameritrade. These companies created a new category: the trading platform. Where retail investors can buy, sell, trade, and manage their public equities on a single platform, profiting off low transaction fees, larger distribution than traditional brokerages, and retail investor autonomy. The closest the real estate markets came to similar innovations was the creation of property listing websites that get you in touch with a listing broker and property management SaaS products that charge on a per-property basis. Tochi will be the first platform that asset owners can use to buy, sell, rent, and manage their assets. Users will be able to perform quantitative and technical analysis on real estate markets, the way public equity and forex investors can in today's world.

A major difficulty with markets like real estate, where asset value heavily depends on tangible attributes, is that buyers naturally prefer seeing the asset's actual condition firsthand, including any potential flaws. Traditionally, this has meant scheduling in-person property viewings, which can be time-consuming and inconvenient for both parties. However, recent advancements in spatial computing, photogrammetry, and machine learning algorithms have significantly transformed this process. Companies like Matterport and DJI have pioneered accessible technologies that enable high-resolution, immersive 3D mapping of properties. Thanks to these innovations, potential buyers can now effortlessly conduct detailed virtual tours from the comfort of their homes. Furthermore, these companies offer tools to professional photographers and affordable DIY camera kits, empowering property owners and agents to easily capture and create accurate 3D digital models of their spaces in as little as 30 minutes. Leveraging these technologies and doubling down on this cost-effective solution to provide people with the ability to perform virtual open houses with frequently asked questions answered in real-time can be the final straw left in the real estate transaction process that allows buyers to view homes without needing to go to said property.

18. API Backbone

The technology space is changing every day, and data capture has empowered firms' decision-making to allow them to weather any economic or regulatory condition. Having an API-driven platform will allow us to take advantage of these trends by becoming the scaffold for products and solutions. Data capture will empower the firm's ability to quantitatively measure the effect that product features have on T_{RE} and C_{RE} associated with the product.

By segregating subprocesses in the pipeline, for example:

Let's say we notice subprocesses $T_{1-4} < T_{5-8}$ which are causing sellers to abandon transactions. We can immediately address these concerns before they escalate by pushing resources towards T_{5-8} from T_{1-4} .

Having an API-driven platform in the financial technology sector, especially when handling transactions of a certain type of asset, has been proven by firms like Stripe, Adyen, Alpaca, and Plaid. Companies like Stripe benefited the most by being able to acquire businesses and easily integrate them into their infrastructure. This infrastructure is necessary, especially when working with an asset like real estate with many moving parts, like Major Listing Service (MLS) APIs, anti-money laundering protocol handling, inspection handling, offer handling, trust account handling, title service handling, etc.

19. Listings

Initially, on the front end, users will be prompted with the opportunity to search for properties with the ability to use traditional filtering and sorting, but with advanced filtering and sorting not offered by firms like Zillow and Realtor.com. Alternatively, users will be able to toggle an AI chat mode, where users can describe what they're looking for in a property. Whether it's economic or aesthetic preferences, users can search for properties that fit their needs and wants using natural language in the same manner you would talk to a broker. Users will be enabled with the ability to perform comparative analysis on property data points and ratios to ensure they find the best listing for them. Similar to that of TradingView. Users will be asked to create an account, where they will be asked about their intentions with the platform. Depending on whether the user is a buyer, seller, renter, manager, lender, inspector, or agent, they will be provided with a dashboard with the tooling for their needs. Sellers and landlords will be taken through a pipeline of getting their properties onto the platform, while buyers and renters will be taken through a pipeline of their negotiables and non-negotiables.

20. Dashboards

Upon account creation, users will be treated based on their participation in the real estate transaction process. Brokers helping with the transactions will be provided a dashboard that allows them to see the terms and conditions of the deal. Inspectors will be able to provide their inspection reports, which are seen by other stakeholders in the transaction process. Appraisers will be able to provide their appraisal documentation and update information within the transaction. Marketers will be able to update marketing assets and schedule home staging for marketing purposes. Asset holders will be able to give acceptable times to come to the property for photography. Third-party members will always be optional, the goal is to have a platform where you have only 3 members in the process: the buyer, the seller, and the software provider that processes the transaction. If a buyer wants to get pre-approval from their mortgage agent, they will be able to do that and then upload their pre-approval letter to confirm funding. If a buyer wants to have their title processed by their lawyer, they will be able to do that and still get confirmation through APIs to title searches to confirm the work of third parties and keep property managed on the platform. The dashboard will allow users to manage favourite properties, desired locations and attributes that the user wants in a property. Payment methods and tax documents will always be accessible on the platform and will be a great place to keep resources regarding their assets. Upon negotiating deals in real life, users will be able to print dockets or share portfolio information. Survey and inspection information and rights to users' portfolios will be able to be tracked on the platform, and will allow easy marketing when wanting to swap or liquidate assets.

21. Transactions

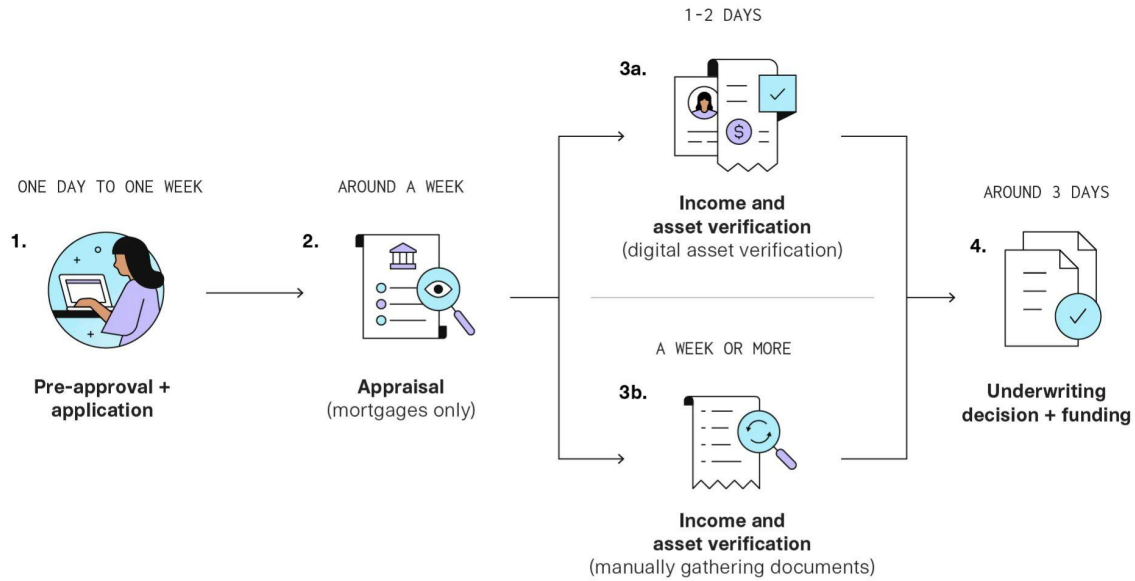
Once a property begins the listing process, within the dashboard, you will find the Transactions section, where you will see all current transactions. Users will be able to click into a transaction, where they will see all invited members. (Real estate brokers, inspectors, lawyers, mortgage brokers, marketers, movers, etc.) There you will see the phase of the transaction, recommendations, impressions, clicks, advertising boosts options, market comparisons, chats, offers, terms, etc.

22. Standardization of Transactions

Traditionally, sellers rely on the best practices of the broker to ensure maximum value and a fast transaction. Although sellers could take pictures of their property, fill in their property information and list the property. Buyers, especially buyers using debt capital for the purchase, which accounts for 70% of buyers, are asked by their lenders to have appraisals and inspections performed to complete underwriting. Therefore, to minimize T_2 transactions must be standardized to complete. In the same way,

2 public companies have their financials audited annually to ensure the information that accounts for the real value of the assets is legitimate. So too should properties be inspected and appraised to ensure the assets' real value is legitimate. By using fintech underwriting APIs like Plaid, we can offer a standard process that allows lenders to advertise their mortgage offerings, complete digital automated underwriting and allow everyday people to invest in private mortgage funds. The platform will allow for streamlined communication for lender conditioning, rate locking, and achieving the best rates and terms based on the buyer's needs. Ensuring that before and when the closing phase begins, buyers and sellers can adjust down payments, lenders, and/or invite cosigners to the Transaction. See diagram of traditional loan underwriting timeline below:

The loan underwriting timeline



Standardizing transactions to ensure transactions meet requirements like appraisal and inspection reports that go along with the listing will allow a plethora of selling capabilities that wouldn't be possible without it. Some examples are functions like "Soft Listings," where users on the platform can keep their property listed to see what the market is willing to offer, despite not looking to sell the property. These functions allow for liquidity gains due to 1 in 3 asset owners being willing to sell their property if an offer is provided, but this doesn't occur due to traditional frictions associated with selling a property. Inspections, Surveys, and Appraisals are the core determinants of properties' objective price points. Any implication would impact listing price points and negotiations drastically. Enabling these users on the platform to perform cut-throat and detailed reporting accompanying listings in a standard format would reduce $T_{1,4,5}$ and second-order effects on T_{RE} .

23. Marketers (Stagers, Photographers, Open Housing, 3D Modellers)

Marketing a property has changed dramatically since the onset of the internet. With the development of 3D modelling advancements, thanks to companies like Matterport, buyers no longer have to go to open houses to check out a property. Instead, properties are modelled in a single day and uploaded online to accompany listings, giving a live walkthrough experience in the comfort of your home. The platform will allow users to order 3D modelling equipment to perform the modelling. Upon completion, users will be able to simply ship back equipment and have their model uploaded to the platform. The platform will provide guided staging, photo, and video recommendations. Allowing for a complete walkthrough experience, ensuring users are marketing properties using industry-tested techniques. At any point, if a user wishes to invite a marketer(s) to do work on their behalf, they will be able to invite and schedule work just like any other third-party stakeholder. Upon uploading asset data, the platform will provide curated information to meet the desires of those looking through properties. Property photos, videos and models undergo description labelling to ensure aesthetic qualities of the property are represented and meet the desired buyers/renters.

24. Brokers

Although transactions will be streamlined and enabled through an AI Agent, some market participants will want to save time or default to traditional brokers. Users will be able to invite brokers to their transactions. Brokers invited to the platform will be able to manage client relationships and be able to negotiate on behalf of their clients. They will have access to the same details as their clients in real time. Brokers can make requests and invite third-party stakeholders as if they were working privately. These brokers will be compensated through surcharge premiums for doing work on the part of buyers/sellers. Allowing for a traditional transaction experience with integrated support and tooling.

25. Closing: Title, Insurance, and Surveyors

During the closing of a transaction, a lawyer would complete a title search and review any outstanding liens, mortgage transitions, easements/ conveyances, deed transfers, permits and tax compliance, etc. Including facilitation of title insurance to cover any of these records which need to be settled for a transaction to complete and protect against any claims. Every state in the US outside of Connecticut, Mississippi, Alabama, Georgia, and South Carolina passed legislation regarding Remote Online Closings. Allowing the platform to partner with title companies to have the process streamlined and allow for automatic review, insurance underwriting and transfer of property. Transactions once closing is reached and terms are agreed upon and financing is settled, title search and automatic filings and renewal would be completed, where any outstanding balances are covered before transfer. Accompanying surveyors will be invited on the platform to

schedule and upload reporting for the associated transactions upon request, similar to other stakeholder users.

Eventually leading to an in-house solution for title servicing and Remote Online closings, allowing us to further drive $T_{4,5,6}$ and C_{RE} towards zero. Allowing for a clean API and SDK to be provided for other innovators in the space.

26. Regulatory Apparatus

Every transaction must be conducted by a licensed brokerage headed by a designated Broker of Record, who bears ultimate responsibility for supervising agents, maintaining trust-account audits, and ensuring compliance with all jurisdictional rules. Brokers must hold active licences in the province or state where a property is located; operating across borders requires either reciprocal licensing or formal co-brokerage agreements. Moreover, continuing education is not optional; licensees must complete mandated professional development credits before each renewal cycle to remain in good standing.

Underlying every trade facilitation are stringent fiduciary duties set out in the CREA and NAR Codes of Ethics. From the very first substantive interaction, clients (as opposed to customers) must be formally designated through signed agency-disclosure forms, establishing duties of loyalty, confidentiality, full disclosure, and reasonable care. Antitrust provisions further prohibit any form of commission-fixing or price-collusion among members, and violations can trigger severe penalties. To backstop these obligations, errors & omissions insurance with regulator-specified minimum coverage levels is compulsory, and all transaction files, including contracts, disclosures, and correspondence, must be retained for a prescribed period (commonly five to seven years) to support audits and dispute resolution.

Financial integrity is enforced through segregated trust accounting and detailed recordkeeping. Client deposits and fees are held in dedicated trust accounts, reconciled monthly, and overseen by the Broker of Record. This system both safeguards consumer funds and creates an auditable trail that regulators can inspect. In parallel, real-estate brokerages are designated reporting entities under Canada's FINTRAC and the U.S. FinCen frameworks: any suspicious activity, especially involving sums over CAD/USD 10000, must be reported, and rigorous "Know Your Client" (KYC) protocols are applied to verify identities and sources of funds. Privacy laws such as PIPEDA in Canada, eIDAS in Europe, and various state-level acts in the U.S. dictate strict standards for collecting, storing, and securing personal data; vendor agreements with technology providers must explicitly address data-handling practices and breach-notification procedures.

Marketing and data usage are likewise tightly controlled. All advertising, whether print, digital, or social, must display the exact registered name of the brokerage, licence numbers, and

comply with “truth in advertising” principles. When using MLS feeds, vendor agreements must precisely define permitted uses, update frequencies, and data-ownership rights to ensure compliance with CREA/NAR restrictions. At the transaction level, digital signatures executed under E-SIGN (in the U.S.) or PIPEDA/eIDAS (in Canada/EU) are legally binding, provided they are managed through approved platforms that retain robust audit trails.

Dispute resolution follows formal pathways: CREA and NAR maintain mandatory arbitration or ethics-hearing processes for contract and conduct complaints, and brokerages are expected to have in-house procedures to log and escalate issues promptly. Finally, any third-party technology provider must enter into a tripartite vendor agreement signed by the Brokerage, the Technology Provider, and the Vendor delineating liabilities, service-level commitments, maintenance responsibilities, and support obligations. To preserve clarity and compliance, for-sale-by-owner (FSBO) listings must be strictly segregated from brokered MLS listings, with separate workflows, disclosures, and recordkeeping protocols.

27. Remuneration Model

Remuneration can be split up into two categories: traditional and modern. The traditional model revolves around the grandfathering in disrupted industries model, leveraging distribution and economies of scale through the platform. These remunerations would be in the form of transaction, loan finding, and title filing fees. In these models, rates on fees would be tuned to find a profit maximization function as rates compete down in the industry, approaching zero or flat cost plus models are introduced. Some of the modern remuneration models will include smart marketing, Interest on Trust Account (IOTAs) or software as a subscription for enterprise commercial capabilities and transaction intermediary users. (Appraisers, Inspectors, Marketers, etc.) The return through modern remuneration models are dependent on policy lock-ins and user experience trade-offs on the platform. While it may be beneficial to allow listings to be boosted using smart targeting, it's best to tune listing search to find the best property based on the wants of the buyer. IOTAs and subscriptions are easier to implement and project remunerations, having been tested by the markets.

Conclusion

In sum, real estate’s historic illiquidity and opacity are not immutable. Through rigorous analysis of transaction subprocesses and cost structures, this paper has demonstrated how technological innovations through agentic systems, standardized data flows, and auction mechanics can disintermediate legacy brokers and monolithic MLS frameworks. The Tochi platform embodies this vision, uniting modular APIs for listings, inspections, financing, marketing, and closing into a cohesive ecosystem that drives transaction times toward zero and costs toward flat-fee baselines. Regulatory developments now favour greater transparency and direct buyer-agent

engagement, further lowering barriers to entry for digital solutions. As Tochi moves from prototype to production, pilot integrations with regional MLS APIs, lender underwriters, and title services will validate its capacity to deliver truly liquid, efficient, and equitable real estate markets. The era of democratized property exchange is upon us. Tochi offers the blueprint for realizing it.