



# Fractional Ownership of Real Estate Assets

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# **1. Problem Identification**

Real estate property investing though one of the most coveted and low-risk investment class, has always been relatively inaccessible for retail investors. Private investors faced some key challenges in real estate investing:

- High investment capital associated with rising private property prices
- Complex process and time consuming to purchase investment properties
- Limited inventory and access to high investment potential properties

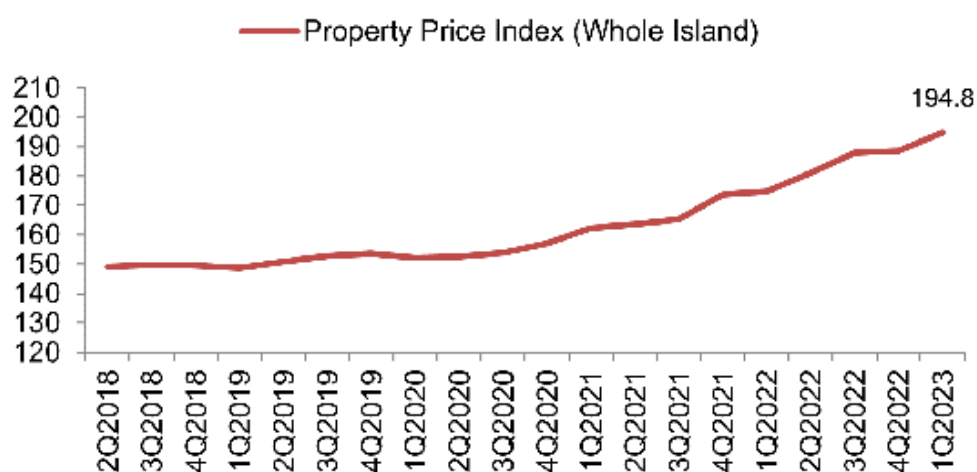
## **1.1 High investment capital associated with rising private property prices**

Singapore's residential property prices continue to rise strongly across all regions (Core Central Region (CCR), Rest of Central Region (RCR) and Outside Central Region (OCR)). In the first quarter of 2023, the private residential property index increased by 11.44 percent as compared to a year earlier, according to Figure 1 below released by the Urban Redevelopment Authority (URA, 2023). A 2023 Urban Land Institute (ULI) study comparing housing prices in the region found that the median private home price in Singapore was 13.7 times the median household income (ULI, 2023). For context, the monthly resident household income is about \$10,099 and properties around \$1.58 million will be considered unaffordable to the median household.

According to the report, Singapore's private sector homes have surpassed Hong Kong SAR as the most expensive in the region with a median price of US\$1.2 million. As a result, more ordinary private investors are locked out of private residential property investment market due to high capital requirements. Local private investors have to pay 25 percent upfront when buying a private residential property for the first time. If it is their second residential property, the cash upfront

would be 55 percent, and the additional buyer's stamp duty would be 20 percent, while for third and subsequent residential property is 30 percent. Furthermore, uncertain macroeconomic environment and high cost of finance have made larger residential real estate investment assets less accessible to private investors, although demand for core properties is likely to remain strong due to rising rentals.

Note: Ratio of the median or average home price to median household income is a standard measure to assess housing affordability, which reflects how many years it takes to purchase a home if one saves one's entire income. Residential property is usually considered unattainable and unaffordable in a city if the ratio goes beyond five.



*Figure 1: Property Price Index of private residential properties*

According to the latest survey on the Real Estate Sentiment Index (RESI) that measures the perceptions and expectations of real estate development and market conditions in Singapore, the Current Sentiment Index remained at 5.3 points in Q2 2023, while the Future Sentiment Index inched up 0.1 points to 4.6 points (NUS, 2023). This underscores the extent of optimism of the private investors that the pricing of new residential launches will rise in the next six months.

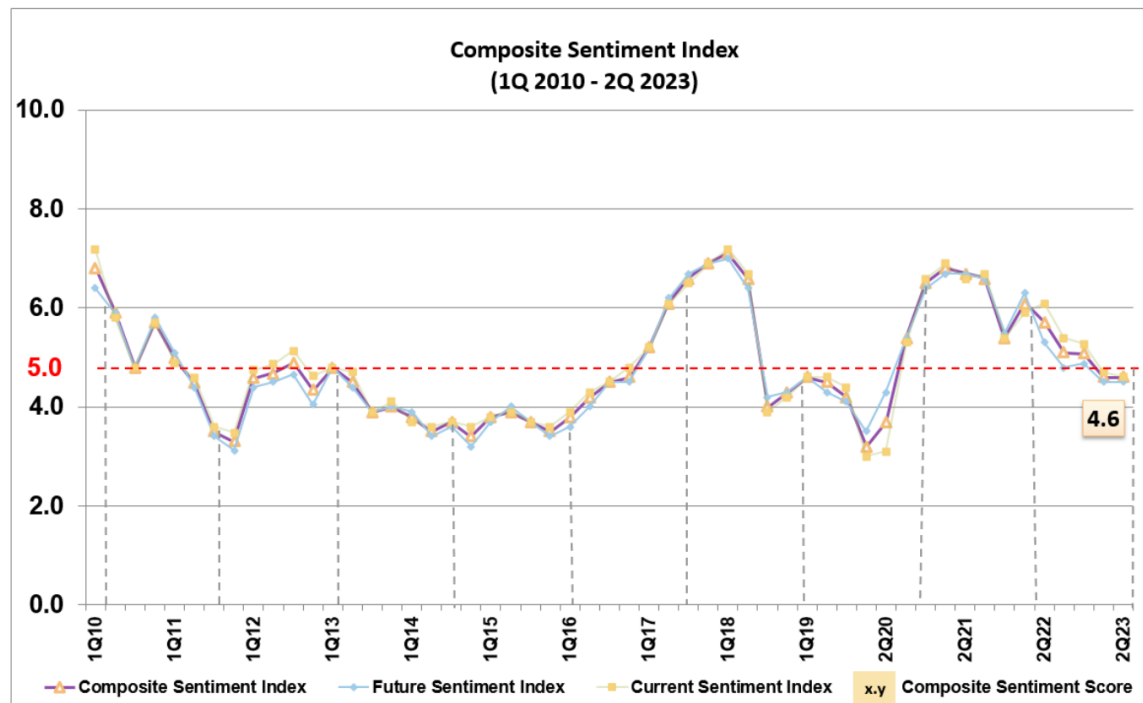


Figure 3: Real Estate Sentiment Index (1Q 2010 – 2Q 2023)

## 1.2 Complex process and time consuming to purchase investment properties

Traditional private property investing is complex, time-consuming and incurs high brokerage and legal charges especially when investing in multiple properties. For rental properties, private investors are burdened by additional efforts and time needed in securing the listing, entering the listing agreement, and ongoing operational and maintenance. In addition, finding the right properties for investment and determining the market value require market intelligence and insights. The old process requires over 14 steps for purchasing a rental property as described in Figure 2 below, and there are six common challenges (indicated with a red 'x' in the figure below) that private investors encountered when investing in a rental property. Furthermore, throughout the buying journey, from property research to property verification, property booking and

registration involved numerous intermediaries and paperwork and a plethora of real estate agents and platforms.

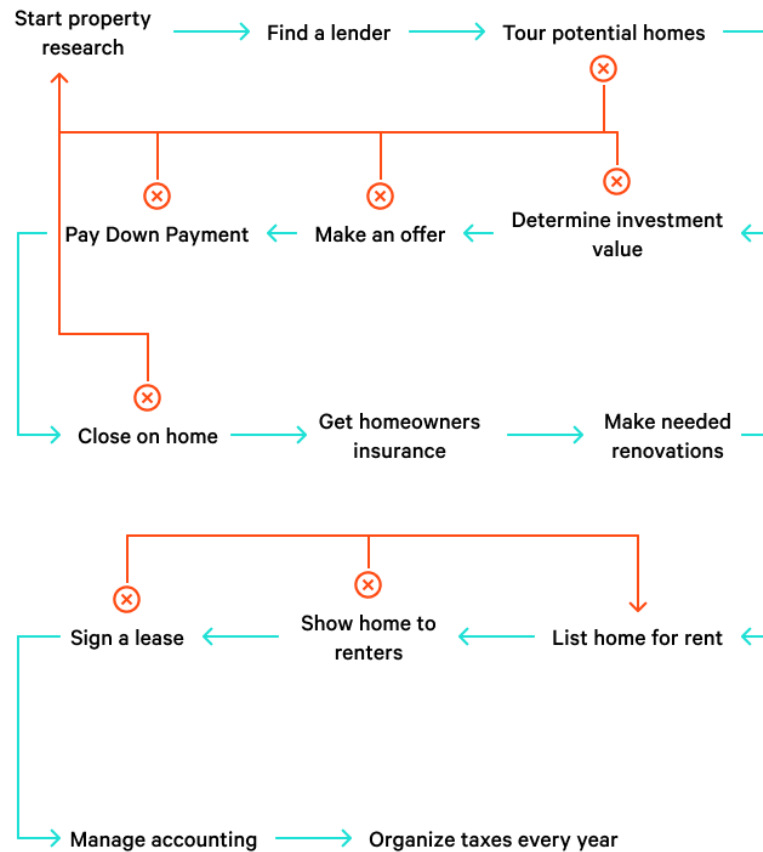
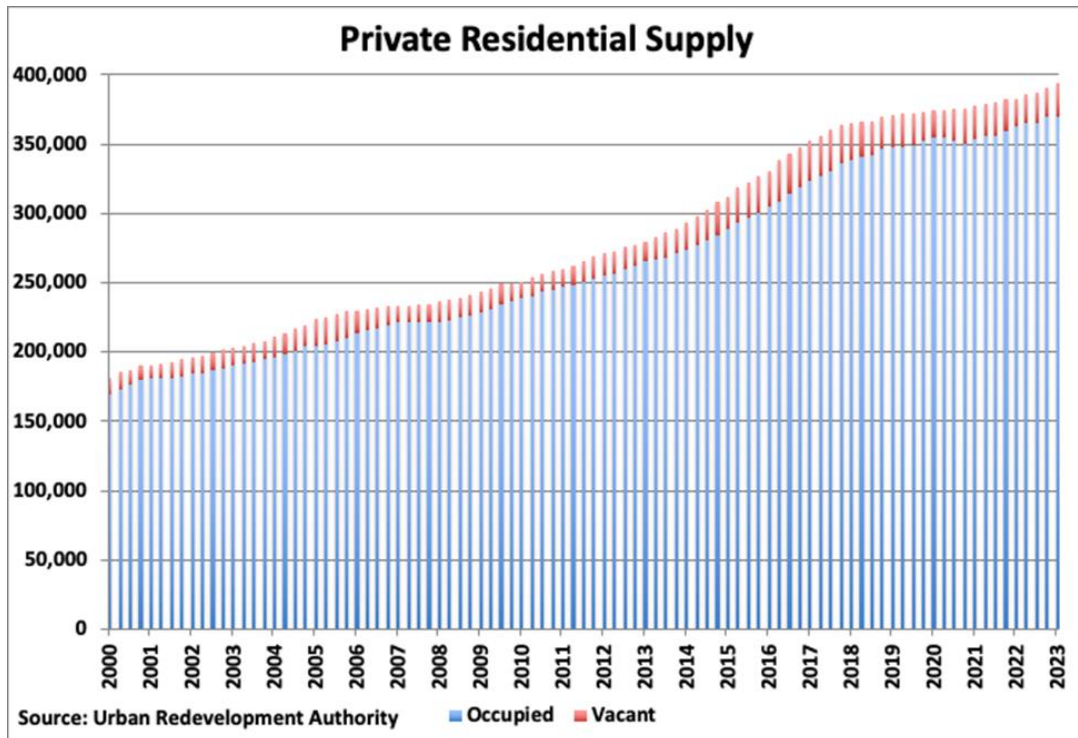


Figure 2: Traditional way to buy rental properties

### 1.3 Limited inventory and access to high investment potential properties

Limited inventory and access to high investment potential properties is becoming a new challenge for private investors, who have to compete with limited institutional investors and private equity firms for the limited supply. Supply has dropped since 2018 and inventory could remain low in the medium-term as property developers are grappling with disruption in the supply chain,

shortage of labour, rising costs resulting from inflationary pressure, high interest rates and stamp duties, as well as reduced saleable floor area due to the harmonisation of floor area computation. The total stock of unsold private residential units islandwide grew 1.9 percent quarter-on-quarter to 16,464 units in 1Q23, following a rise in both the number of completed and uncompleted stock left unsold. Despite the increase, as at 1Q23, the level of unsold stock constituted just 54 percent of the annual average tally of 30,481 units during the pre-COVID period from 2010 to 2019 (JLL, 2023). At the same time, the private residential market is facing increasing demand from private investors for build-to-rent and co-living residential assets. According to Singapore Consumer Sentiment Study H2 2022 by PropertyGuru, 66 percent of young Singaporeans between the ages of 22 to 29 chose renting instead of purchasing a property due to high property prices and high down payment associated with buying a house outright (PropertyGuru, 2022). Factors such as migration and mobility and lifestyle have therefore combined to jump-start a new cycle, with growing demand for fractional real estate ownership as they are keen to explore alternatives like rent-to-own model and co-living concept of shared housing with cheaper rent and common facilities. Thus it makes the market very competitive for private investors and finding properties where they can get profit is hard due to limited residential supply in these formats.



*Figure 3: Singapore Private Residential Supply*

## 2. Market Analysis

### 2.1 Market Overview

There are two main types of ownership representations in the real estate industry: tokens and shares. Shares are commonly referred to Real Estate Investment Trusts (REITs) and funds, while tokens are managed by companies, with or without the use of blockchain technology. This section will explore the market size and potential of these ownership representations.

#### 2.1.1 Real Estate investment trust (REIT)

Real Estate Investment Trusts (REITs) were established in the 1960s and have become popular investment tools for both institutional and retail investors (Nareit, n.d.). REITs are companies that own and operate income-producing properties, including commercial, residential, industrial, or



retail real estate. They have the flexibility to be traded openly on stock markets. The target customers for REITs include retail investors, high-net-worth individuals, and institutions. According to REITAS (2023), Singapore's real estate investment trust (S-REIT) market boasts an impressive landscape, comprising 42 S-REITs and property trusts, collectively valued at S\$101 billion in 2023. It is worth noting that Singapore holds the distinction of having the largest REIT market in Asia, excluding Japan, and is rapidly emerging as a global REIT hub. S-REITs play a vital role in Singapore's stock market, constituting approximately 12% of the overall market capitalization of the Singapore Exchange. Over the past decade, S-REITs have demonstrated consistent growth, with their market capitalization expanding at a compound annual growth rate of 7% (REITAS, 2023).

### **2.1.2 Real Estate Fund**

Real estate funds allocate their investments into shares of real estate corporations and REITs. These funds may take the form of open-end or closed-end structures and can be managed actively or passively. The target customers for real estate funds are similar to REITs and include retail investors, high-net-worth individuals, and institutions. Private real estate investment funds are typically available only to accredited, high-net-worth investors and often require a significant minimum investment. As per the Monetary Authority of Singapore (2011), the total assets under management of real estate funds reached an impressive S\$274 billion, reflecting a remarkable 24% increase from 2010 to 2011. This substantial growth signifies the robustness and attractiveness of the real estate sector as an investment avenue.

### **2.1.3 Fractional investment of real estates**

Fractional investment is a relatively new type of real estate investment that has gained popularity in the past decade. It allows investors to own fractions of a property and primarily targets retail investors. While the market size of fractional investment real estate investment is currently smaller than that of mutual funds and REITs, it is expected to grow rapidly. According to Prophecy Market Insights (2023), the global real estate fractional investment market was valued at approximately USD 44.65 billion in 2022. It is estimated to reach USD 1743.13 billion by 2030, growing at a CAGR of approximately 58.10% between 2023 and 2030. Some companies utilize blockchain technology to ensure the security and reliability of transactions through smart contracts. Prophecy Market Insights (2023) predicts that the real estate tokenization market accounted for \$2.7 billion in 2022 and is estimated to reach \$ 18.2 billion by 2032, with an anticipated CAGR of 19.8%. In Singapore, there are a few platforms, including Kasa, RealVantage, and Fraxtor. According to Kasa (n.d.), in 2020, it has raised over S\$20 million in funding from various investors, including Samsung Ventures, KB Investment, and Mirae Asset Venture Investment.

## **2.2 Market Dynamics**

Porter's five forces are applied to provide a comprehensive overview of the real estate investment market. These forces include competitors, new entrants, suppliers, customers, and substitute products.

### **2.2.1 Potential of new entrants into the industry**

Fractional investment platforms offer several advantages, including reduced regulatory obligations and lower initial capital requirements. These platforms essentially act as intermediaries, facilitating connections between real estate projects and investors. Rather than constructing their own investment portfolios, they prioritize providing a wide range of choices to investors. Consequently,

fractional investment platforms have a diminished need for top-tier financial experts and experience lower operating costs. Nonetheless, these platforms must allocate resources toward developing robust web and mobile platforms, as well as offering attractive discounts to entice new customers.

### **2.2.2 Competition in the industry**

The competition within the fractional investment platform industry is high. Several factors contribute to this high level of competition, making it a challenging environment for market players. One significant factor is the low barriers to entry, which have led to a saturation of platforms in the market. With relatively easy access to technology and resources, numerous companies have entered the industry, creating a crowded and competitive landscape. The abundance of platforms vying for investors' attention and capital intensifies the competition and forces companies to differentiate themselves. Another factor is the limited product differentiation among fractional investment platforms. Many platforms focus on residential land use, offering similar investment opportunities to investors. This lack of diversity and unique offerings leads to fierce competition.

### **2.2.3 Power of suppliers**

The power of suppliers for fractional investment platforms is moderate to high. These platforms depend greatly on the availability and quality of real estate projects provided by property owners or developers. In order to attract and retain suppliers, fractional investment platforms must offer competitive fees, transparent processes, and value-added services. However, fractional investment platforms can reduce their reliance on suppliers by diversifying their portfolios and cultivating long-term relationships with trusted partners.

#### **2.2.4 Power of customers**

Customers in the fractional investment platform industry hold high negotiation power. With a small customer base and intense competition, customers have numerous platform options to choose from and can influence platform strategies. The abundance of choices empowers customers to evaluate and compare services, forcing platforms to offer compelling benefits. Moreover, low customer loyalty in this emerging market requires platforms to work harder to retain customers. To succeed, platforms must prioritize customer satisfaction, offering personalized options, transparent communication, and user-friendly experiences.

#### **2.2.5 Threat of substitute products**

The threat of substitute products in the fractional investment industry is moderate. While REITs and funds can pose strong competition, fractional investment platforms have unique advantages that differentiate them and cater to a slightly different customer base. REITs and funds are established investment vehicles that appeal to investors seeking stability and security. They offer diversified portfolios managed by professionals, providing a level of expertise and broader market exposure. However, fractional investment platforms target investors looking for flexibility and control over their investments. One advantage of fractional investment platforms is their lower cost structure. Operating primarily online and with fewer financial intermediaries, these platforms can offer cost-effective investment options.

### **3. Competitive Analysis**

Several significant firms have arisen in the blockchain-based fractionalizing real estate market. Each one's market positioning is influenced by the probability capabilities and techniques they each possess.

The competitive rivalry in this market is intense, with several platforms vying for market share. Different platforms offer unique value propositions, such as exclusive access to specific properties, user-friendly interfaces, or strong community governance features. Additionally, as the market is still evolving, players are constantly innovating to differentiate themselves and capture a larger share of the Singapore market.

### **Key Players in Singapore:**

Platforms like **Fraxtor** , **Real Vantage**, **Kasa** and others have established a presence in the Singaporean market. These platforms offer a range of fractional ownership opportunities, from residential properties to

### **3.1. Fraxtor**

#### **3.1.1 Model plan**

##### **Unique Value Proposition:**

Fraxtor's innovative fractional ownership model positions it as a pioneer in the real estate investment space. This approach differentiates the company from traditional real estate platforms by providing a more accessible and inclusive investment opportunity.

The model's emphasis on collective ownership addresses a pain point for investors who may not have the capital to fully own high-value properties individually.

##### **Diversification and Risk Mitigation:**

The company's market position is further strengthened by its ability to offer diversification opportunities. Investors are attracted to Fraxtor's platform for the potential to spread their investments across a range of properties, thereby reducing their exposure to market volatility.

This aspect appeals to risk-averse investors and those seeking to achieve a more balanced and resilient investment portfolio.

### **Competitive Advantage through Innovation:**

Fraxtor's market position is fortified by its ability to offer a truly unique and innovative investment model. This gives the company a competitive edge in an industry where differentiation can be challenging.

This innovative approach sets Fraxtor apart from competitors and establishes it as a forward-thinking player in the real estate investment landscape.

## **3.1.2 Market Analysis for Fraxtor: Real Estate Investment Sector**

### **1. Market Overview:**

The real estate investment sector is a substantial and dynamic market, valued in the trillions globally. It encompasses various investment strategies, including rental properties, commercial real estate, and development projects.

### **2. Trends and Dynamics:**

**Rising Property Prices:** In many urban centers, property prices have been steadily increasing, making it challenging for individual investors to enter the market.

Interest in Real Estate Investments: There is a growing interest in real estate as an investment asset class, driven by its potential for long-term appreciation and income generation. Shift towards Alternative Investments: Investors are increasingly exploring alternative investment opportunities beyond traditional stocks and bonds. Real estate is a favored option due to its tangible nature and potential for diversification.

### **3. Challenges in Traditional Real Estate Investment:**

High Capital Requirements: Traditional real estate investment often demands significant upfront capital, limiting accessibility for many potential investors.

Lack of Diversification: Individual investors may face challenges in diversifying their portfolios across multiple properties, increasing exposure to market risks.

#### **3.1.3 Strategies**

They obtained in-principle approval for its Capital Markets Services (CMS) License by the Monetary Authority of Singapore (MAS). The CMS License, once issued, will enable Fraxtor to issue Security Tokens including debentures and collective investment schemes that comprise capital market products. Fraxtor's use case of the Blockchain in real estate is a subset in the digital asset ecosystem. Although it uses Blockchain technology, it differs greatly from cryptocurrencies. The blockchain technology is used to issue real estate interest on a distributed ledger, also known as tokenization. Fraxtor endeavours to automate processes between investors and offerors, increase liquidity, lower capital requirements for investments, improve transparency, and ultimately lead to real-estate democratization.

In the past nine months, Fraxtor had partnered established real estate fund managers such as Q Investment Partners and ZACD Capital to provide investors access to quality investment opportunities with a lower capital outlay. In the following months, Fraxtor has partnered Australian-based SMATS Consortium and Canadian-based ARCH Corporation to provide its coinvestors access to real estate investment opportunities, diversified in geography and risk profiles.

### **3.1.4 Current situation**

#### **1. Increased Demand for Accessible Real Estate Investment:**

Change: There is a noticeable shift in investor preferences towards more accessible and inclusive investment opportunities in the real estate market. This is particularly evident in markets where property prices have surged, making it challenging for individual investors to enter.

Impact on Fraxtor: The increased demand aligns with Fraxtor's value proposition of fractional ownership, potentially driving a surge in user adoption and platform engagement.

#### **2. Technological Advancements in Real Estate Platforms:**

Change: There is a continuous evolution of technology in the real estate industry, with platforms offering enhanced user experiences, advanced analytics, and streamlined investment processes.

Impact on Fraxtor: The competitive landscape may intensify, requiring Fraxtor to maintain a cutting-edge platform to stay ahead. This could involve ongoing investments in technology and user interface enhancements.



### **3. Emerging Market Entrants and Increased Competition:**

Change: The success and potential profitability of fractional ownership models have attracted new entrants into the market. This has led to increased competition in the real estate investment platform space.

Impact on Fraxtor: Fraxtor will need to continually differentiate itself, potentially through unique features, exceptional customer service, or by expanding into niche markets not yet served by competitors.

*Weaknesses:*

- **Market Experience and Track Record:** Depending on its founding date, Fraxtor may have a shorter track record compared to more established competitors. This could potentially raise concerns among risk-averse investors.
- **Regulatory Challenges:** Real estate investment platforms often grapple with regulatory complexities. Compliance with local real estate laws and regulations could be a significant challenge for Fraxtor, especially if they operate in multiple jurisdictions.

## **3.2 RealVantage**

### **3.2.1 Model plan**

All properties are sourced and managed from end-to-end by real estate professionals, so investors need not worry about the practical details and can just sit back and let the professionals manage their real estate investments.

### **3.2.2 Strategies**

All properties are sourced and managed from end-to-end by real estate professionals, so investors need not worry about the nitty-gritty and can just sit back and let the professionals manage their real estate investments. The minimum investment amount is 15,000 in the local currency of where the property is located, which is a lower barrier to entry, especially for retail investors like us. Through RealVantage, investors can start small and gradually build a diversified real estate investment portfolio, which can be one component in a more holistic investment strategy.

Real estate crowdfunding, a groundbreaking approach to raising capital for real estate ventures, is rapidly gaining traction.

This method involves aggregating capital from multiple investors to invest in properties, facilitated by online platforms and technological advancements. This surge in popularity can be attributed to a convergence of technological progress, evolving regulations, and shifting investor preferences.

Below, we delve into the key factors propelling the ascent of real estate crowdfunding platforms.

### **3.2.3 Market and performance analysis**

2021 alone, the company realized four deals, all of which have either met or outperformed the initial projected returns. The average net internal rate of return, or IRR, of these realised deals ranged between 7% per annum to 18% per annum. We also achieved an annualised income distribution of 7.5% per annum for income-generating deals.

RealVantage has invested in 26 deals in Singapore, Australia, the UK and the US. To-date, many retail and accredited investors have collectively entrusted & invested over SGD40 million into deals listed on the platform.

RealVantage also offers more opportunistic deals with higher rates of return. In February, it featured the refurbishment of a last-mile logistics asset in Queens, New York. The targeted internal

rate of return (IRR) was 14% with an investment period of up to four years, and RealVantage investors could get in for a minimum of US\$25,000 (\$34,015). The platform had a funding target of \$1.2 million, which was fully subscribed.

***Strengths:***

- **Asia-Pacific Expertise:** RealVantage's specialization in the Asia-Pacific region grants them a nuanced understanding of local property markets, potentially enabling them to identify lucrative opportunities.
- **Diverse Portfolio Options:** The platform offers various types of real estate investments, including residential, commercial, and industrial properties. This diversity can cater to different investor preferences and risk appetites.
- **Access to Exclusive Deals:** RealVantage may have established relationships with developers, real estate professionals, and property owners, potentially providing access to exclusive and high-quality investment opportunities.

***Weaknesses:***

- **Limited Global Reach:** While RealVantage's regional focus is an asset, it may limit diversification options for investors looking for a more global approach. Investors seeking exposure outside the Asia-Pacific region might need to explore alternative platforms.
- **Market Volatility Sensitivity:** Since RealVantage's primary focus is on real estate, it may be susceptible to economic and market fluctuations. This could affect the performance of investments made through the platform.

### **3.3 Kasa**

### **3.3.1 Model plan:**

Kasa plans to accelerate investment in proprietary technology, building on its existing suite of products and systems that has enabled the company to manage units across various property sizes and locations. By leveraging its platform, Kasa has generated positive operating margins, even amid historic hospitality industry lows, while maintaining exceptional guest experiences at an affordable price point in a way that was never before possible. Now, Kasa will redouble its efforts to streamline operations and minimize onsite overhead through cutting-edge features that focus on community safety, guest support, and the Kasa travel experience at all touchpoints.

### **3.3.2 Strategy**

Kasa obtained a capital markets services licence and a recognised market operator licence from MAS at the end of last year.

The firm has not rolled out any investments in Singapore yet, but Yea believes there is strong pent-up demand among local investors here to participate in the real estate market. “This is especially among Singaporean investors who prefer higher-yield-generating assets,” he says.

Kasa hopes to eventually introduce its Singapore-based investors to Kasa Exchange, which is integrated with its overall ecosystem. It allows investors to unlock liquidity, as well as enables asset owners and other stakeholders to increase their investments, or the number of market participants.

“Kasa investors who subscribe during the IPO will receive some of the fractional shares in that asset, and they can choose to sell that on our market platform at any time,” says Yea. For the asset

owners, it's an attractive proposition, because some may not want to sell their entire stake in the asset. Kasa Exchange allows them to buy back the portion of their assets later.

The secondary market Kasa Exchange allows for the participation of third-party securities houses and private banks as underwriters, market-makers and sales channels, notes Yea.

Kasa Singapore is focusing on investing in recognizable Central Business District and Orchard Road commercial buildings in Singapore and similar to Kasa Korea, it will offer investment opportunities as a single asset rather than grouping several properties into a single basket — like a REIT.

The minimum investment for a retail investor in South Korea to take part in each of Kasa's funding is KRW5,000 (\$5.50). This small amount makes it especially attractive to retirees and young professionals and generates a high volume of secondary transactions on the Kasa Exchange platform.

***Strengths:***

- **Technology-Driven Operations:** Kasa's integration of technology in property management, booking, and guest experience can lead to enhanced efficiency, cost savings, and improved customer satisfaction.
- **Consistent Quality Standards:** Kasa's commitment to maintaining high-quality standards across its properties can build a formidable reputation and lead to high customer satisfaction rates, potentially driving repeat business.
- **Flexibility and Customization:** Kasa's ability to cater to both business and leisure travelers with fully furnished apartments provides a level of flexibility that can appeal to a wide range of guests.

### **3.3.3 Future plans**

The Kasa team is also discovering modern technologies and bringing pragmatic, modern approaches to software development. Micro-services are not just trendy here, but core to our philosophy of scale and maintainable code. They are serverless and cloud agnostic, building for scale of both software performance and our team dynamic. Most recently, they have started investigating micro-frontends to determine how they can help us create clean, flexible code. Ideas come from everyone at Kasa, and welcome anyone with notions of how to make our model better. Open conversations lead to greater innovation.

## **3.4 Cross-Company Insights**

### **Regulatory Adherence as a Critical Factor:**

- All three companies operate in industries that have regulatory complexities. Ensuring strict adherence to local laws and regulations is crucial for long-term success and growth.

### **Customer Trust and Reputation:**

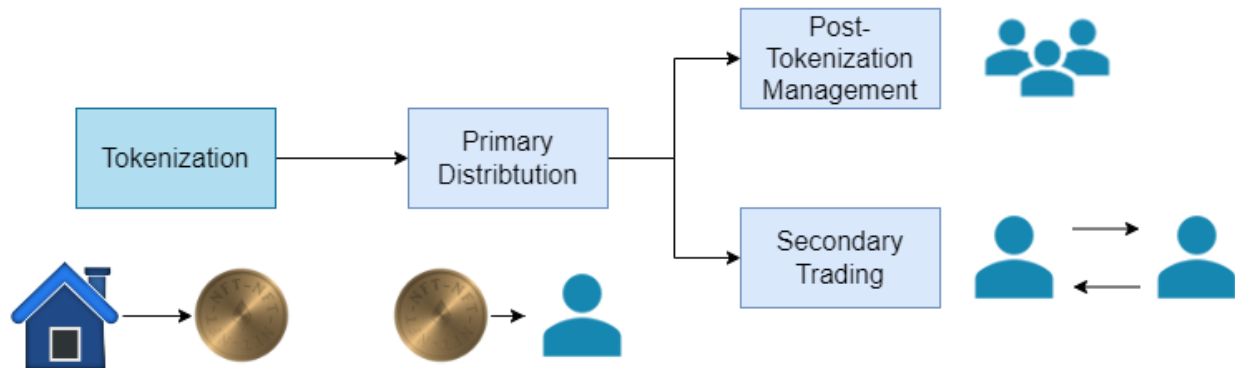
- Building and maintaining trust with customers and investors is paramount for success in the real estate and accommodation sectors. Companies that excel in transparency, reliability, and customer satisfaction are likely to gain a competitive edge.
- Trust is paramount; Fraxtor with investors, RealVantage with project backers, and Kasa with guests. Maintaining quality and responsiveness is critical.

### **Adaptability to Market Shifts:**

- Given the dynamic nature of the real estate and accommodation industries, the ability to adapt to changing market conditions, consumer preferences, and economic trends is a key factor for sustained competitiveness.



tokenization management, and secondary transactions. The lifecycle of real estate tokens is as follows:

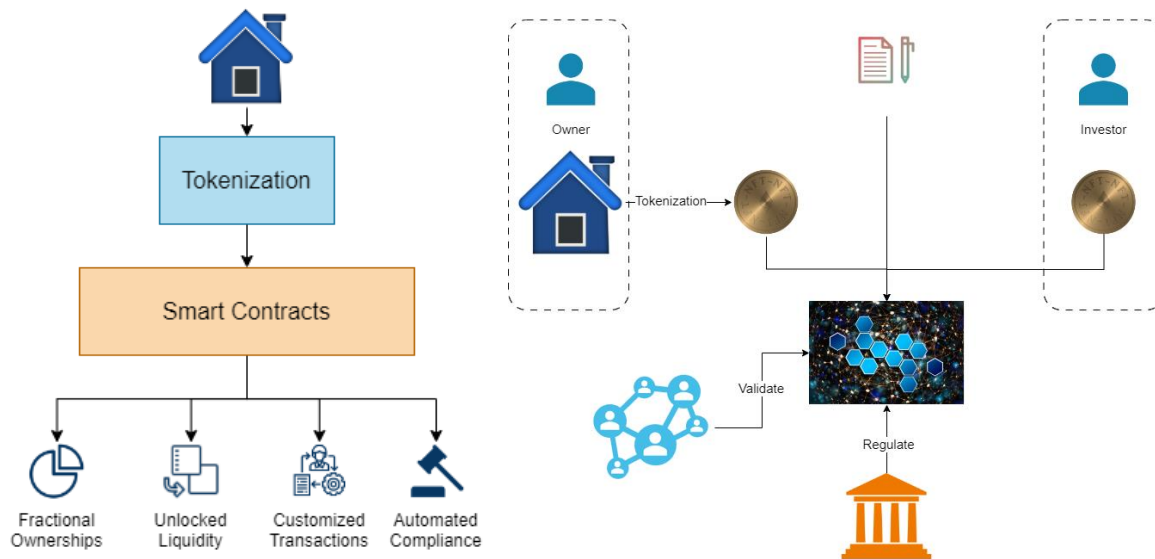


*Figure 5: Spatium Real Estate Token Lifecycle*

After the tokenization process, the smart contracts play essential roles. It can automatically execute the pre-set functions including the fractionalization of real estate ownership, the management procedures (voting) among multiple owners, the transfer of use rights in the tenancy, the customization of transactions, and the implementation of compliance. The functionality of smart contracts is capable of transforming the traditional real estate market and improving liquidity.

There are multiple actors in the blockchain, including owners, investors, networks, and the government. Each actor has its importance in the blockchain community. Owners tokenize their assets on the blockchain and thus provide more available tokens. Investors make transactions on the blockchain to make the blockchain active. Networks of user nodes validate the update of the blockchain to build trust in the blockchain. The government will regulate and monitor the activities on the blockchain.





*Figure 6: Blockchain Ecosystem and Participants*

- AI

AI is crucial in Spatium to satisfy our customers (both owners and investors). For different customer segments, Spatium applies AI in different methods. For real estate developers and current real estate owners, we offer mechanisms for real estate valuation to support their slotting (tokenization) process. This is one of the most popular AI applications in the real estate market – building models to evaluate assets. Many machine learning approaches can be used for this, including artificial neural networks (ANN), regression trees (RT), Support Vector Machines (SVM), k-nearest neighbors (KNN), multi-layer perceptron, boosting (adaptive & gradient), etc. Spatium will use historical real estate market data and platform usage data to build and improve our valuation model supported by AI. Although Spatium gives valuation advice to customers, they can still set the value they are willing to sell their tokens.

The other AI usage in Spatium is a recommendation model targeting real estate investors. Like other e-commerce or exchange platforms, customers of Spatium can view the list of available

tokens for sale via apps or official websites. To give more specific advice to attract potential investors, our platform analyzes the user information they agree to provide to give customized lists. The recommendation process takes a few steps: gathering real estate information (provided by developers or current owners), gathering user information (such as location, investment preference, etc.), building models based on recommendation algorithms (such as Apriori), obtaining specific user information (of the customer who visits the list), returning the recommendation results (the list of available assets). The model creation process is iterative because the total data for training is updated every time there are new usage histories.

- Cloud computing

Cloud computing provides a method to access on-demand computing resources. Since our platform is facing retail investors, we expect the volume of transactions to be high. It's noteworthy that the account data and transaction history will not be stored in the cloud for the sake of data security, but other real estate information and usage data will be expected to be stored, processed, and analyzed in the cloud. To reduce capital costs and enhance the efficiency of computing, we decided to use Cloud computing for the core computing infrastructure, which may also improve the flexibility and availability of our service.

Moreover, when the applications or AI request the data, the cloud will execute the queries under frameworks such as MapReduce. It will also support some simple data analytics for regular operation management. One of the key advantages of using cloud computing is that if the demand for data governance varies from the expected level, it is easier to cut off or expand the usage of cloud computing.

- Feasibility Analysis

To analyze the feasibility of Spatium, we measured the key metrics and conducted break-even analysis and sensitivity analysis. Key metrics measurement include Internal Rate of Return (IRR), Net Present Value (NPV), and Payback Period (PP).

In this part, we assume that Spatium is a ten-year investment which takes the first two years to develop the platform and another two years to reach the full production level. (30% production level in the first production year, 70% production level in the second production year) Other key parameters for analysis are in the following table:

Key parameters for Feasibility Analysis

Name	Number	Unit
Discount rate	10%	
Interest rate	7%	
Sales tax rate	8%	
Value-added tax rate	8%	
Income tax rate	20%	
Infrastructure costs	400	thousands
Compliance and valuation costs	400	thousands
Reserve fees	300	thousands
Marketing costs	1000	thousands
Maintenance costs	400	thousands
Salary	300	thousands
Other costs	100	thousands

Transaction fees	3000	thousands
Slotting fees	219	thousands

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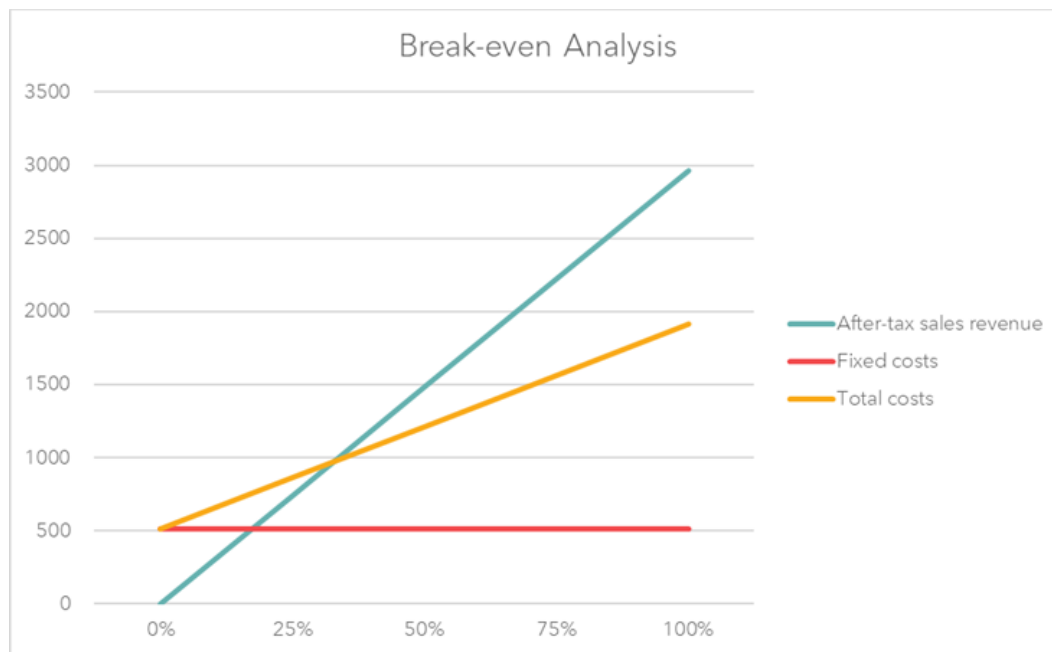
All parameters come from estimation based on the current compliance requirements official statistics and related materials. Among the key parameters, costs are divided into different classes, including infrastructure costs, compliance and valuation costs, marketing costs, maintenance costs, salary, and other costs. Infrastructure costs and compliance costs are fixed costs related to the platform development. The rest are variable costs. The cost estimation is based on Julian Kwan's estimation of the cost of building a tokenization platform. Transaction fees and Slotting fees are two major revenues for Spatium. It's based on the Singapore real estate market statistics in 2021, our expected market share of the total market (5%), the proportion of newly launched real estate transactions, and the percentage we expect to charge for two services (3% for each token transaction, 0.5% for each slotting process).

#### Key Measurement in Feasibility Analysis

	Before-tax	After-tax
IRR	34.43%	30.57%
NPV (thousands)	2163.27	1669.68
Dynamic PP (year)	5.52	5.85
Static PP (year)	5.03	5.21

The table includes two columns for before-tax (before the calculation of income tax) and after-tax measurements. The after-tax IRR is much higher than the discount rate of our analysis, which shows great potential to gain profit. The NPV shows that the value of Spatium is about 1.7

million Singapore dollars, and the Dynamic Payback Period shows that it might take around 6 years to recover the cost.



*Figure 7: Break-even Analysis*

The Break-even analysis shows that the BEP is 36.48% after 10 years of production, which means when the production level is over 37%, the project can start making a profit. This figure varies in different years due to the interest and depreciation costs are different. In the first year of the operating period, the BEP is expected to be around 44%.

Furthermore, the sensitivity analysis shows how the IRR, NPV, and DPP will change if the fixed asset, sales income, and operating cost deviate from our expectations respectively. We may find that even if the parameters deviate by 10%, we can still get a positive NPV over \$500,000, an IRR of around 20%, and a DPP of less than 8 years. It shows that the value of Spatium is robust and has the potential to succeed.

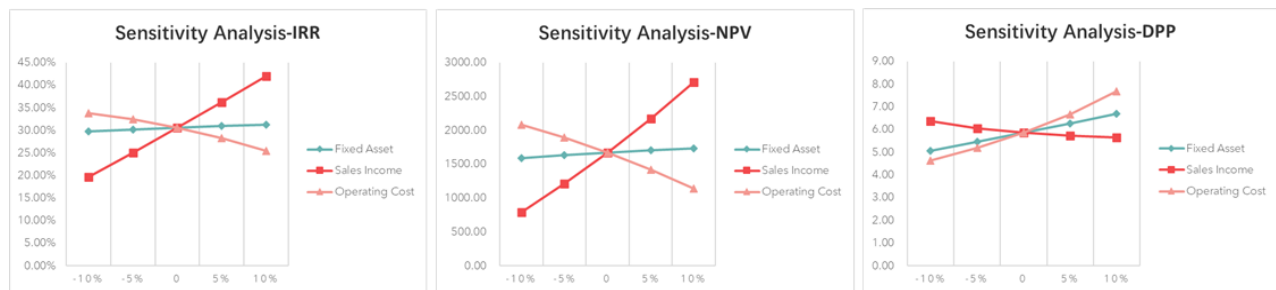


Figure 8: Sensitivity Analysis

## 4.2 Customer Journey

Spatium aims to provide a faster and easier experience for private investors in real estate investing. To accomplish this, Spatium created an investor experience with a seamless customer journey (Figure 4) that reduces the difficulties and simplifies the complex decision-making traditionally associated with real estate investing, starting from property launch in the primary market to real estate ownership, resell in the secondary market, rent out the property as a unit or co-living spaces. In Property Launch stage, investors browse available buy-and-hold, rental and co-living properties pre-vetted based on their appreciation and income potential. In Fractional Ownership stage, investors can choose the types of property to invest based on investments maturity goals (with terms range from short term to midterm to long term and determine how much money they want to invest in each property. In addition to making the investing experience faster and easier in the primary market, Spatium simplifies the customer journey in the secondary market based on the choices of buy-and-hold, rental or co-living properties investor choose for investing. While automating different processes in secondary market (ownership transfer, transactions and payment) to provide a better experience in reselling the property and renting out the property as a single unit or co-living spaces using smart contract, there are two other main areas that Spatium

focuses on in the customer journey: providing a frictionless end-to-end asset ownership and asset rental through a digital twin of the physical and virtual property, from property launch with site and virtual viewing experience to design and decorate the property digital twin property space using both physical and digital assets that can either be owned or rent. Similar to the dynamics of traditional real estate, the platform helps property owners earn yield and rent fees from owned assets (such as furniture items, art works and other items) with predetermined conditions that are negotiated with renters and enforced by smart contracts. *Sample screenshots (taken from fraction.io app)*

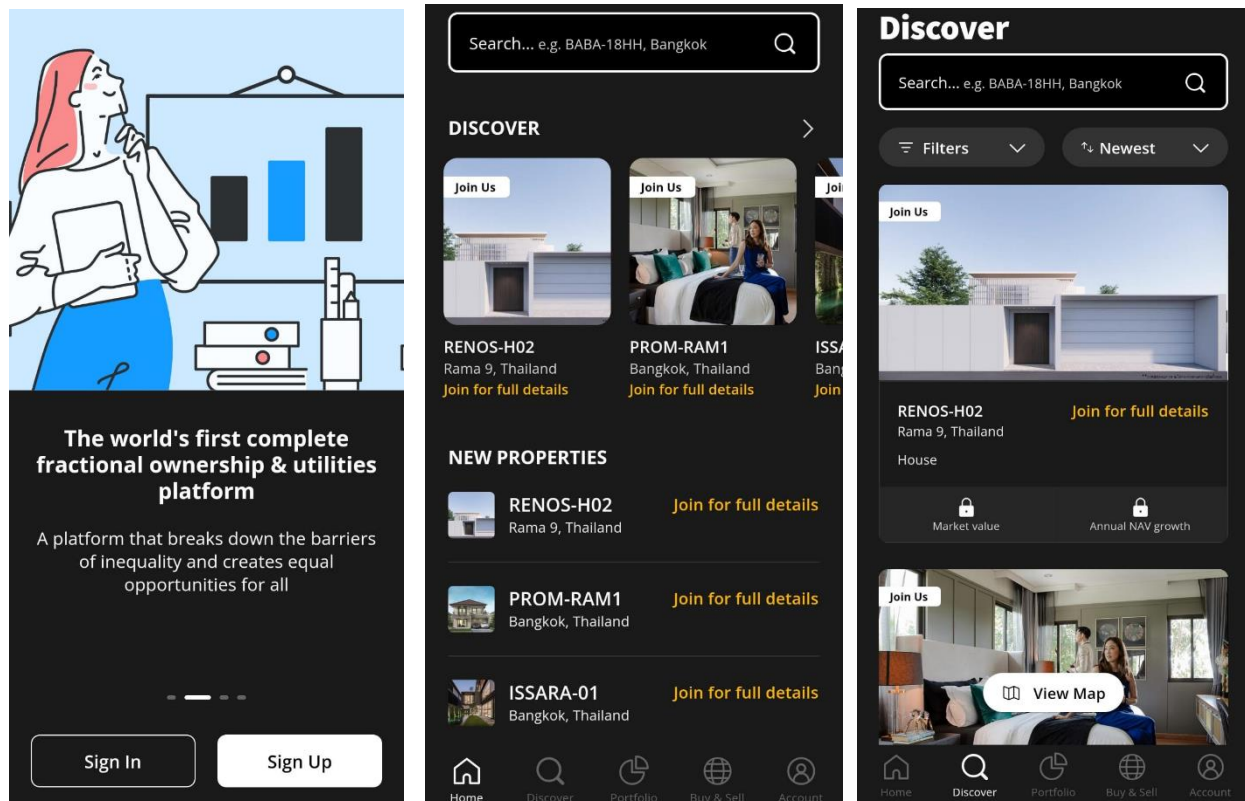
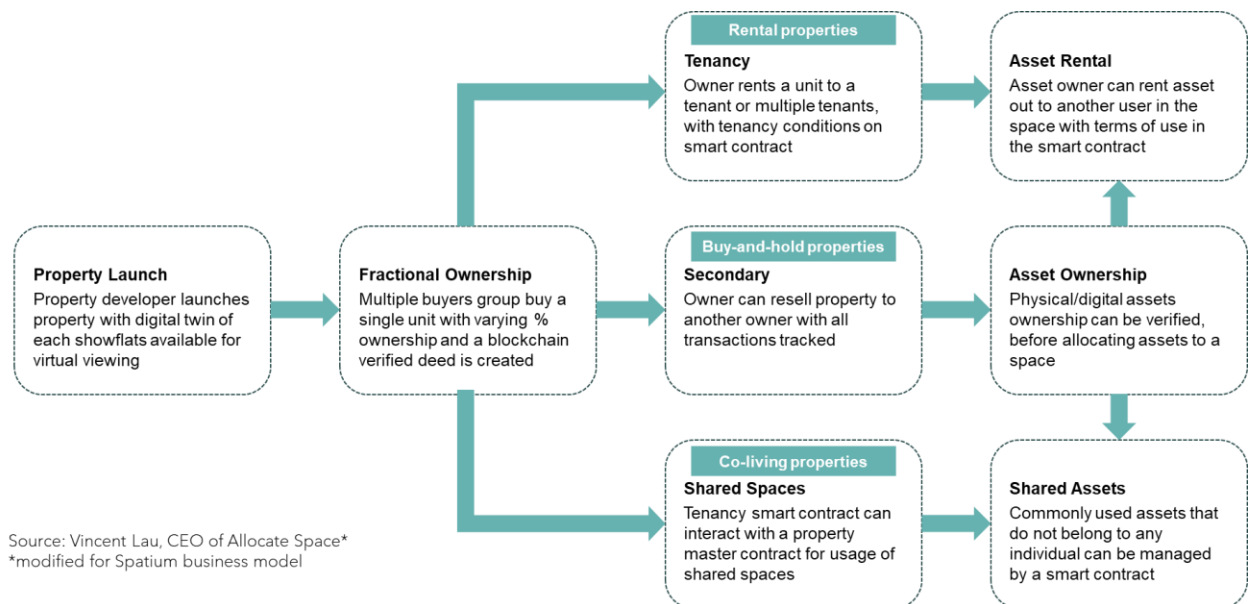




Figure 9: Mobile App UX/UI





*Figure 10: Spatium Customer Journey*

### **4.3. Value Proposition**

Spatium is a fractional ownership platform for real estate assets that democratizes access to investment for everyone, as well as seamlessly linking ownership and utilities in a way the existing real estate market is unable to do by simplifying the process, reducing intermediaries and lowering capital outlay for investors to invest in real estate.

The goal is to make real estate investing more accessible to ordinary private investors and broaden financial inclusion by enabling private investors' easy access to real estate investments with a digital platform for fractional ownership. By investing using Spatium platform, users will be able to enjoy convenience and peace of mind in real estate investing, generate income to hedge against rising inflation as residential property is considered to be the safest asset class, minimize risks investing in a single high value property by spreading the risk across multiple properties, and grow their portfolio while keeping the potential for returns high.

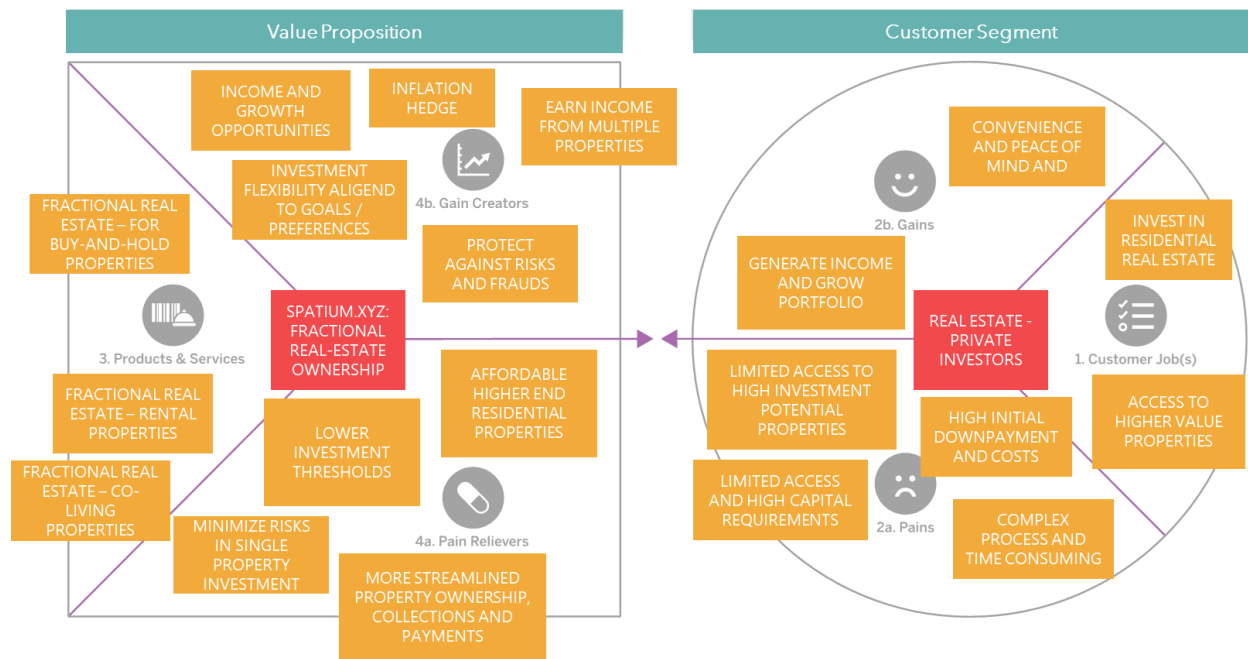


Figure 11: Spatium Value Proposition Canvas

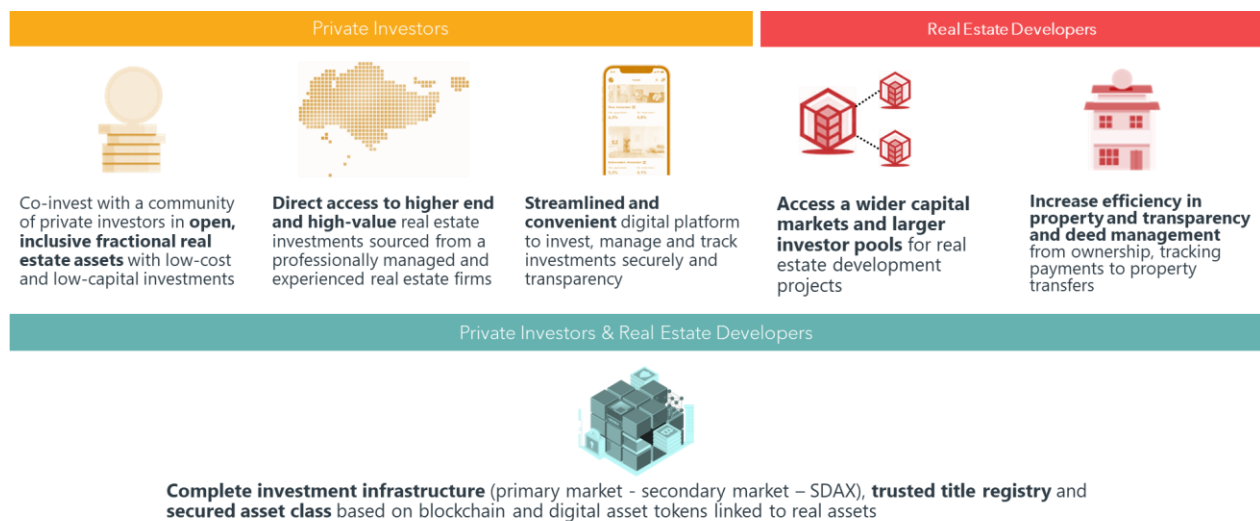
For private investors, the platform provides the following benefits:

- Co-invest with a community of private investors in open, inclusive fractional real estate assets with low-cost and low-capital investments
- Direct access to higher end and high-value real estate investments sourced from a professionally managed and experienced real estate firms to ensure that private investors are making the right decisions on high potential real estate markets, analysis of properties and efficient operations of a property
- Streamlined and convenient digital platform to invest, manage and track investments securely and transparently

For real estate developers, the platform provides the following benefits:

- Access a wider capital markets and larger investor pools for real estate development projects
- Increase efficiency in property and transparency and deed management from ownership, tracking payments to property transfers

Both private investors and real estate developers shares the benefit of a complete investment infrastructure (primary market - secondary market – Singapore Digital Asset Exchange (SDAX)), trusted title registry and secured asset class based on blockchain and digital asset tokens linked to real assets



*Figure 12: Benefits of Spatium Platform*

#### 4.4. Current Regulatory Landscape

The fractional real estate (FRE) sector comes under the capital markets, and there are different licenses granted for various activities that the companies intend to perform. Of which, the following are the licenses that Spatium has to obtain and the requirements that it has to satisfy.

**Capital Markets Services License (CMSL):** Spatium intends to operate in the FRE sector which at its core involves collection of funds from multiple parties to make investments in Singapore's capital markets must hold the Capital Market Services License (CMSL) regulated under the Securities and Futures Act of 2001. Capital Market products, by definition, includes securities, units in collective investment schemes (CIS), over the counter (OTC) derivatives, exchange-traded derivatives and spot foreign exchange for the purposes of leveraged foreign exchange trading. Also, individuals conducting regulated activities on behalf of CMS Licensees need to be appointed as representatives.

Out of the many regulated activities under CMSL, Spatium would be classified under the

**“Dealing in the Capital Markets products”.**

Out of the different types of CMS License holders performing specific functions, Spatium performs the functions of **Broker Dealer** and **SCF Operator (Securities based Crowd funding)** and hence will be required to obtain the CMS License under the above two stated types. There are different capital requirements for these license types that we have to satisfy with.

Transactions in Fractional Real Estate involves collection of funds from multiple parties to make property investment and hence has to comply with the regulatory requirements and **Code on**

### **Collective Investment Schemes (CIS).**

Offers or issues of digital tokens are regulated by MAS if the digital tokens are capital markets products under the Securities and Futures Act 2001 (SFA). Spatium issues and maintains digital tokens which in turn are mapped to the ownership of the properties. Of the intermediaries that are observed by MAS, our platform will be considered a **“primary platform”**.

Also, the laws on the Prevention of Money Laundering and Countering the Financing of Terrorism (“AML/CFT requirements”) will apply if the person is deemed to be an intermediary conducting one or more of the regulated activities under the capital markets license under the SFA.

**Accredited Investors:** Under the current regulatory conditions, only the accredited investors can invest in the FRE sector. Accredited investors are assumed to be better informed, and better able to access resources to protect their own interests, therefore they require less regulatory protection. Investors who agree to be treated as accredited investors will forgo the benefit of certain regulatory safeguards that apply to retail investors.

## **5. Lean Business Model Canvas**

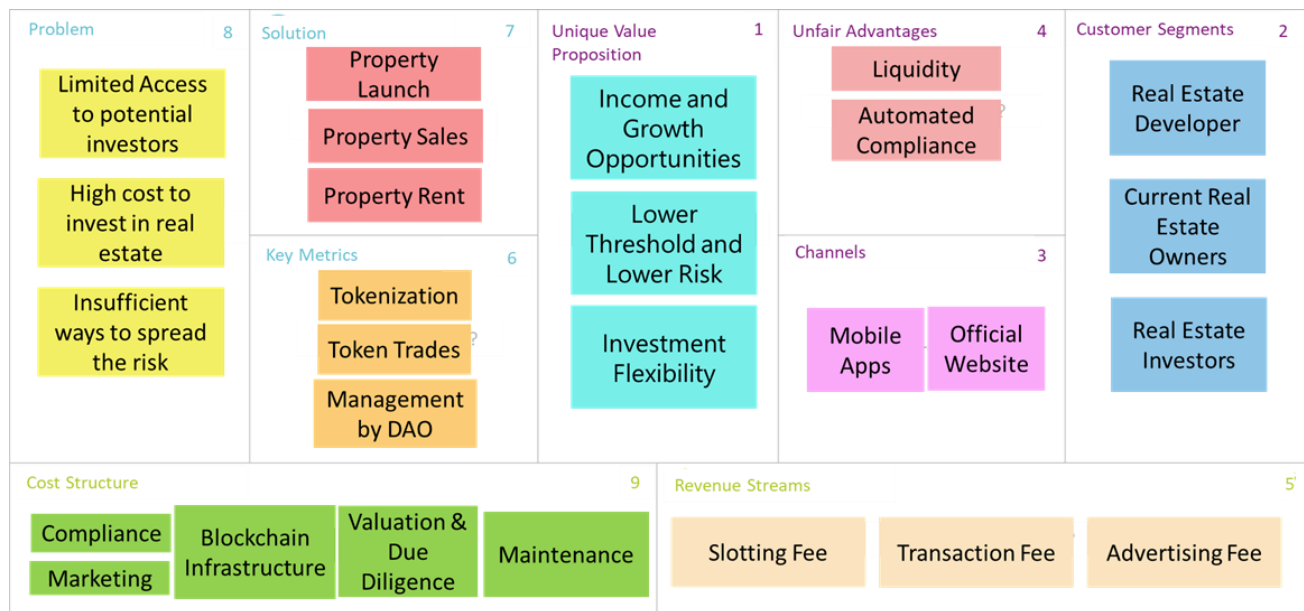


Figure 13: Spatium Business Model Canvas

To illustrate the business model of Spatium, we came up with a lean business model canvas. The elements of the lean business model canvas include Problem, Solution, Key Metrics, Unique Value Proposition, Unfair Advantages, Channels, Customer Segments, Cost Structure, and Revenue Streams. Here are the details of these elements:

- Problem:

- Limited Access to potential investors – entry of small retail investors to the real estate market is limited due to cost barriers;
- High cost to invest in real estate – full ownership of one real estate is usually high even for high-net-worth investors, not to mention small investors;
- Insufficient ways to spread the risk – investors can hardly spread their risks in purchasing different real estate assets because of their high costs.

- Solution:

- a. Property Launch – real estate developers use the platform to launch their properties;
- b. Property Sales – investors have options to purchase the whole unit or a fractional share of real estate;
- c. Property Rent – owners vote to decide the tenancy and the rent will be allocated based on the proportions of each owner.

- Key Metrics:

- a. Tokenization – transforms the real estate into digital tokens through tokenization;
- b. Token Trades – enables investors to trade their real estate tokens via the platform;
- c. Management by DAO – provides secure and friendly environments for owners to manage their assets.

- Unique Value Propositions:

- a. Income and Growth Opportunities – investors have the chance to receive returns from tenancy and the growth of asset values;
- b. Lower Threshold and Lower Risk – fractional ownerships lower the cost barrier and reduce the risk for real estate investment;
- c. Investment Flexibility – investors enjoy more flexibility in creating their real estate portfolios with fractional ownerships.

- Unfair Advantages:

- a. Liquidity – fractional ownership tokens provide great liquidity to the real estate market to our customers;

b. Automated Compliance – transactions are under automated compliance and regulations of the government with the help of smart contracts;

c. Customized Transaction – fractional ownerships enable the customization of each transaction.

- Customer Segments:

a. Real Estate Developers – launch newly-developed real estate assets;

b. Current Real Estate Owners – tokenize their assets on the platform;

c. Real Estate Investors – purchase & sell their tokens and manage their assets.

- Channels:

Mobile Apps & Official Website – customer access our service by apps or websites.

- Cost Structure:

a. Compliance cost – work with compliance experts to ensure compliance;

b. Blockchain Infrastructure – token designs and blockchain development;

c. Valuation & Due Diligence – cooperate with valuation analysts;

d. Marketing cost – branding, digital marketing, and event participation;

e. Maintenance cost – ongoing compliance and maintenance of the blockchain.

- Revenue Streams:

a. Slotting fee – for developers and current owners to tokenize their assets;

b. Transaction fee – for investors to make token transactions;

c. Advertising fee – for some owners who want to advertise their assets.



## 6. Future Outlook

The ultimate goal of Spatium is to democratize investments in all real-estate assets thereby making it accessible to retail investors. So, we hope the future developments of Spatium will span across the following broad categories:

**Expansion to the retail investors:** Under prevailing financial regulations, only accredited investors recognized by MAS can take part in real estate fractional investment schemes offered by platforms such as Fraxtor and even Kasa. An accredited investor is someone with a gross income of at least \$200,000 annually over the last few years, or a joint income of at least \$300,000 with a spouse or partner. With evolving regulatory frameworks and technology innovations, Spatium will be able to serve the retail investors in the future.

**Expansion to other real estate properties:** For now, Spatium concentrates only on investment in residential properties but this could be extended to industrial, commercial and other specialized projects like data centers and infrastructure projects in the future.

**Transparent voting mechanisms:** Since any property in the FRE sector is owned by multiple shareholders, any decision regarding the property management like selling, maintenance, renovation, upgradation, repairs and replacement and all property management activities can be performed only after a consensus decision by all the shareholders. Use of digital transformation to integrate all the stakeholders of FRE from the owners, property management companies, the agents and the tenants could help make the decisions regarding every aspect of property management transparent and efficient.

**Fast and efficient transfer of ownership:** Transfer of ownership of real assets is still a procedure heavy process. Transfer of FRE tokens with the evolution of blockchain technology and smart contracts could be made more cost efficient and safe. In a long run, this could become as easy as buying and selling stocks today.

**Application of AI and Analytics:** As mentioned, the main reason for not allowing retail investors to invest FRE today is that they might not be fully aware of the implications and the workings of fractional investing. AI could greatly help in tailoring the investment suggestions to the users based on their individual profiles of their financial goals and expectations.

We believe that FRE are the future of real-estate investment because of the technological, regulatory and social changes that are affecting the real estate market.

**Trust and awareness of blockchain and decentralized tokens:** Awareness on blockchain and decentralized tokens has increased in recent times. This could be seen from the popularity of tokenized securities in exchanges like SDAX. It is only a matter of time before this applies to real estate assets. Not just in Singapore, blockchain and distributed ledger technologies (DLTs) are adopted in many developed economies for transparency and efficiency.

**Rapidly increasing real-estate prices:** The real estate market is extremely costly for new entrants. FRE in part solves this problem. Singapore has around 90% home ownership. So, the next real-estate investing will not be for them to reside, but for investment. Fractional real estate investing would be the obvious choice because of the discussed advantages that it brings like minimum entry barriers, ease of transaction execution, ability to have a diversified real-estate portfolio, the deterministic nature that the real-estate token offers when compared to the existing REIT funds.

Even for those who already own assets, FRE provides the opportunity of diversification for their investments.

**Real Estate is still one of the most stable investment vehicles:** With the popularity of the real estate investment, fractional investing has long been possible through REIT. The reason why REIT is not as popular is because it acts more like an investment fund and doesn't translate the capital gains directly to the investors. FRE provides much more transparency to real estate investment as the investors get to choose the specific assets and drive direct benefits out of their investments.

**Regulatory framework maturing:** MAS announced a collaborative initiative called Project Guardian to “explore the economic potential and value-adding use cases of asset tokenization”. According to MAS, tokenization allows high-value financial and real economy assets to be fractionalized and exchanged over the Internet on a peer-to-peer basis. When applied in the context of financial services, this kind of smart contract opens the door to decentralized finance (DeFi), where financial transactions like borrowing, lending, and trading activities can occur on the blockchain. This would also cut down on the number of intermediaries throughout the process.

MAS' Project Guardian currently focuses on pilot use cases in four main areas: open and interoperable networks, building a trusted network, asset tokenization and institutional-grade DeFi protocols. At the moment, it does not cover real estate.

DeFi can be a valuable tool for fundraising; however, it's important that the capital raised through DeFi is directed towards regulated and compliant ventures or investments. Real estate is one of the best asset-backed securities available. it would only be a matter of time before Project

Guardian expands to cover certain real estate investment products. If tokenization is more widely embraced and a robust and open network is established in Singapore, it would transform the growth of capital-intensive assets, including real estate transactions, in the future.

**Acculturation of people to fractional real estate investing:** Most people still buy real-estate assets in full ownership. The mindset of people to look at real-estate assets from a purely investment perspective would bring about this change. Governments facilitating the legal and regulatory framework and making the sector more deterministic and predictable for all the use cases will slowly make people trust the FRE sector.

**Interoperability between platforms:** Facilitates different fractional ownership platforms to communicate with each other. Also, interoperability between various institutions involved like the credit companies, Singapore Land Authority (SLA) etc. would lead to efficient fractional real-estate ownership and management.

## **7. Conclusion**

Fractional real estate investing represents a transformative shift in the way retail investors engage with the real estate market. By allowing individuals to collectively invest in properties, it significantly lowers the financial barriers to entry, enabling a wider demographic to access the market. This model fosters diversification, spreading risk across multiple properties, and potentially leading to more stable returns. Additionally, fractional ownership enhances liquidity, offering investors the flexibility to buy and sell shares in real-time. Premium properties and global markets become more accessible, providing exposure to high-value assets and diverse geographical locations. The approach also reduces management burdens, with platforms often handling day-to-day property operations. While regulatory compliance adds a layer of oversight, challenges such as co-owner conflicts and market fluctuations necessitate careful consideration. Overall, fractional real estate investing is poised to democratize real estate, revolutionizing investment strategies and expanding opportunities for a broader investor base.

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