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# How to Enhance Brand Value of Smart Service Enterprises Based on Tobin Q: A Financial Perspective Investigation of China's Property Industry

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**Abstract** The development of digital technology and the construction of smart cities urge service enterprises to seek competitive advantages by building smart service brands. However, there are few studies explore the brand value, brand strategies, and corresponding business strategies of smart service providers from the financial perspective. This paper selects listed property companies from China as the sample and explores the value of the smart community service brand of property enterprises based on the observation data. This research introduces the market value measurement index (Tobin q) and discounted cash flow model (DCF) to explore the influence of diversified brand strategies through combining smart brand strategy with naming strategies and business strategies on brand value. The results show that smart community service brand has a significant impact on firms' market value. Compared with the *brand extension* strategy, the adoption of *brand renewal* strategy will significantly affect market value. Further, the development of *smart value-added services* by enterprises will exert a positive impact on their market value. However, the stakeholders are not optimistic about *smart*

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*technical services* by property companies, which could reduce shareholders' expectations of the market value of enterprises.

**Keywords** smart community service; service marketing; brand strategy; digital marketing innovation; financial value Tobin Q

## 1 Introduction

The brand-finance issue has been a vital research field in marketing for the past three decades[1]. Facing fierce changes and competition, branding is becoming more and more a question of survival and an effective approach to achieving a sustainable competitive advantage for enterprises[2]. Branding could enhance customer perceptions and finally translates into the improved financial performance of the enterprise. When an enterprise is branding, there will always be a financial impact[3]. Brands are often seen as the symbolic resources of firms, and marketers make the effort to create unique brand values[4, 5]. Values are believed to be co-created by multiple actors under the service-dominant logic[6], and service providers and customers play different roles in value creation processes[7].

Service providers are growingly focusing on the transformative value, which devotes to promoting the lives of individuals, families, communities, society, or the ecosystem[8]. Digitalization has brought new opportunities to traditional industries (such as the property industry), and the appropriate relevant brand strategies can facilitate enterprises to achieve their expected goals. Further, a well-established brand helps firms to establish sustainable business relationships and contributes to firms' financial performance[9]. Enterprises in traditional industries aim to build or reshape their brands through digital services to seek competitive advantages in the capital market. These firms publicize their digital strategies through websites, apps, enterprise names, and LOGO with "smart" symbols or functions, which is conducive to strengthening their brand image, building customer trust, and opening up a wider market. Two branding strategies, namely *brand extension* and *brand renewal* strategies, are adopted by some property enterprises in China. The former refers to enterprises that use existing brand names to launch new products/services, like two property giants in China, Longhu Property and Vanke, which have named the smart service brand "Longhu Smart Service" and "Wanwu (everything) Cloud City" respectively. While the latter refers to enterprises engaging in the development of smart service by using a new name. For example, another Chinese property company listed in the Fortune 500, Country Garden, developed "Tianshi Cloud", a management system, to form technological smart solutions. Moreover, as for the smart service business, firms usually start "branding" with the basic services, i.e., applying digitalization to traditional basic property services such as smart security, smart parking, online repair reporting, and payment. Based on basic services, some companies will further conduct *smart value-added services* (e.g., community commerce and community healthcare) or *smart technical services* (e.g., technical solutions).

The construction of a smart community integrates all stakeholders into a cooperation mechanism, which helps to realize the mutual symbiotic development based on the common interests of the ecosystem. Creating shareholder value has increasingly become the focus of brand management and brand-related investment decisions of enterprises. Investing in brands is considered as a strategic way to increase the brand value[10]. In the lens of shareholders, brand value is understood as the present value of the expected future cash flows generated by the company's brand investment from the financial perspective[11]. The brand value should be included in the market value of a company[12, 13]. Enterprises could promote brand value by developing new products (or services), adopting a marketing mix strategy, and increasing shareholder wealth by increasing brand equity[14].

Given the importance of branding and brand value, first, compared with service brands, research on branding more often explore brands related to physical goods. However, the differences in the nature of goods and services may lead to a difference in branding[15]. Moreover, service brands are also seen as a resource that contributes to the relationship between employees, the company, and customers. But it should be pointed out that these brand resource processes are dynamic and interactive and involve other stakeholders, so beyond brand-consumer connections, researchers should consider broader perspectives[16]. From the shareholder perspective, they want to see their firms' resources being used in the most efficient way during the brand construction processes, and finally turn into shareholder value[17]. The importance of the brand can be reflected in the firm's financial valuation[18]. However, few studies on service brands pay attention to firms' financial performance results[19]. Second, an emerging research trend has been linking marketing applications to improving the market values of enterprises. Improving enterprise values is a main objective of different marketing strategies[20]. In addition, previous research indicates that usage of digital technology can promote consumer brand engagement[21], brand usage intention[22], patronage intentions, and WOM referral[23] by improving consumer-brand interactions, and these brand market performance indicators are decisive for financial performance[24]. But we still know little about how the diversified strategies with new technologies affect the brand value and financial performance of digital service enterprises, and there is a lack of research on the brand business-level when it refers to diversification[25]. Third, there are two critical perspectives on brand value, one perspective mainly from the consumers' view, while the other emphasizes the financial market reaction[26, 27]. Many researchers have confirmed that brand value has a positive impact on corporate value[28, 29], but the brand value is usually measured conceptually[30] or from consumers' perception[31], and empirical research on how to conceptualize the service brand from the financial perspective of capital market shareholders is still rare.

This paper responds to these limitations by proposing three main research questions: 1) Does smart service brand constructions have a positive impact on brand value? 2) *Brand extension* and *brand renewal* strategies, which one is more effective to increase the brand value under the smart service brand construction? 3) Among the *smart value-added services* and *smart technical services*, which is more beneficial for the increase of the brand value?

The efficient market hypothesis assumes that in an efficient capital market, stock price fluctuation reflects how the market responds to various information. Asset prices accurately reflect the intrinsic value of the company and the high liquidity[32, 33]. Shareholders attach importance to brands because they expect companies to earn future cash flows with little risk[34]. This study is grounded in adopting the efficient market hypothesis theory and extends it to the brand equity of the property company. We convert the future brand value into the present value of smart service firms, evaluate the corporate stock price based on firms' future profitability, and further reflect the market value under the condition that the total number of stocks issued on the market remains unchanged. Employing the conceptual demonstration method[35], the smart service brand value of property companies is conceptualized through the discounted cash flow model (DCF). Hence, based on the financial perspective of shareholders, the smart service brand strategy and brand value are explored.

This research selects listed companies in China's property service industry since digitalization brings new development chances to the traditional property service industry that is lower value-added, and property firms need to implement diversified strategies at both brand and business levels. The study makes contributions from both theoretical and practical aspects. First, from the perspective of shareholders, this study focuses on the financial performance and brand value enhancement brought about by the digital brand and business strategies of service enterprises. Second, we use Tobin q measures to reflect the objective market value of a company's assets including brands. Hence, different from the usual brand value measurement that is based on subjective perception, through this study, the correlation of the cash flow effect and market value effect of the smart service brand can be obtained from a new perspective. This research brings theoretical contributions as well as provides a reference for the practice of smart service enterprises and even smart city constructions.

## 2 Theoretical Background and Hypotheses

### 2.1 Value Evaluation Theory (DCF Model)

Firms use the concept of brand equity to explain the value of a brand to their firm and diverse marketing strategies will lead to various outcomes or bring added value to the enterprise[17]. Brands with significant equity can bring great benefits to firms, and firms need to figure out how brand equity is acquired and its usefulness to the firm[36]. Moreover, Srivastava, et al.[34] point out that the mission of marketing is to develop and manage market-based assets (including brand assets), and leverage such assets by developing the connection between marketing and finance. Day and Fahey[37] find that market-based assets increase shareholder value by accelerating and enhancing cash flow, reducing the volatility and vulnerability of cash flow, and increasing the residual value of cash flow. Ambler[38] assumes that brand equity brings financial value to firms' future profit and cash flow, and the measurement method of brand strength is improved to support shareholders' attention to long-term profitability.

A company's expected financial performance under the stock market assessment is reflected in its price-to-book ratio. When the market value of the stock exceeds its book value, it will create shareholder value; while the market value is driven by the management's ability to make a profitable and visionary investment. When the economic return of an investment is greater than the costs of capital (discount rate), the management strategy will create value[35]. Therefore, the goal of the brand is to seek strategies that maximize the value of cash flows over time and to determine the discounted cash flow (DCF) or the net present value (NPV) of an investment.

The basic idea of the discounted cash flow (DCF) model is that the value of any asset is equal to the sum of the present value of all its future cash flows. To be specific, it evaluates the cash flow that an asset can generate in the future, which is used to predict the economic value of an enterprise[39]. Therefore, this study attempts to use the discounted cash flow model

(DCF) to conceptualize the brand value of smart services of property companies.

$$\text{Brand value} \approx \text{DCF} = \sum \frac{E\left[\Delta \text{NCF}_t\right]}{\left(1+E\left[i\right]\right)^t} = \sum \frac{\Delta \text{Net cash inflow}_t - \Delta \text{Net cash outflow}_t}{\left(1+i\left(\sigma_{\text{CF}}\right)\right)^t}. \quad (1)$$

The model considers brand value to be achieved by comparing the expected incremental future cash flow of brand equity to the expected cost of capital used to build, maintain, and improve brand equity. Equation (1) shows that the value of a brand depends on its creation increment of future cash inflows ($\Delta$ cash inflows), the incremental cash outflows (such as brand construction costs and another brand-related investment) level ($\Delta$ cash outflow), and cash flow volatility and vulnerability (i.e., risk $\sigma_{\text{CF}}$) affect the cost of capital[34]. In an efficient financial market, investors generally set reasonable expectations for the net future cash flow contributions and risks (including brand equity) of listed companies, and incorporate these expectations into the company's stock price[40]. As a result, the market value of a listed company can reflect investors' valuation of its brand and other assets[35].

## 2.2 Brand Value and Tobin q Measurement

Due to the intangible nature of service offerings, brands are believed to be vital for delivering customer value and improving firms' performances[41]. Brands are not only marks or symbols, the marketing purpose of which is to be identified and differentiated. Any enterprise expects the brand mark can be related to a positive value of the company[42]. Even for the service providers, brands contribute to differentiating the offerings and brand equity exists for services[43]. However, it is recognized that branding is a critical marketing activity, but there is still a challenge to substantiate the branding value in financial terms[33]. Moreover, the lack of financial accountability could undermine marketing's credibility[44].

Research indicates a positive linkage between branding activities and firms' financial performance[45]. Brands have financial value because they are able to generate future cash flows[46], through many factors like marketing efficiency, customer loyalty, high margins, brand extension, and licensing opportunities[47]. Even under the service context, the direct service experience is critical for service brand equity building[48]. Furthermore, the current service experience and performance are important to the consumer's future usage levels[26]. Firms with higher brand equity could gain higher market share and price premiums, generating better returns for the company and investors[49]. Hence, building strong brand equity helps to achieve financial sustainability[50] and is important for service enterprises[51].

Marketing activities have an impact on share prices, and brand equity is seen as the capitalized value of the profits that result from associating the brand's name with specific products or services[11]. The earning potential of a firm is determined by the tangible and intangible assets owned by the firm, and brand value is the main source of intangible assets. In other words, strong brands can enhance the wealth of shareholders, achieve a higher profit margin, and decrease costs. In addition, stock prices can reflect the perception of investors of the future cash flow earning capability of a firm[52]. Tobin[53] uses modern financial economics and financial data to explore the issues in the organization, and creatively introduces the q ratio into macro analysis to explore the causal relationship between q and investment. Tobin q measurement is widely accepted and applied in the literature of economics, finance, and marketing.

It could capture the incremental intangible value created by the company for shareholders on the replacement cost of assets[54, 55] and it represents the ratio of a firm's market value to the replacement cost of its assets[56]. The higher the Tobin q ratio is, the higher the premium ability of the company's assets is, and the stronger its value realization ability is[39]. When the ratio is less than 1, it means that there are fewer expected profit opportunities available; when the ratio is greater than 1, it means that the enterprise's market value exceeds its replacement cost and there are more expected investment and profitability opportunities[28]. To sum up, Tobin's q value reflects the cash inflow, cash outflow, and cash flow risk that shareholders expect companies to generate through brands[34]. The theoretical framework is shown in Figure 1.

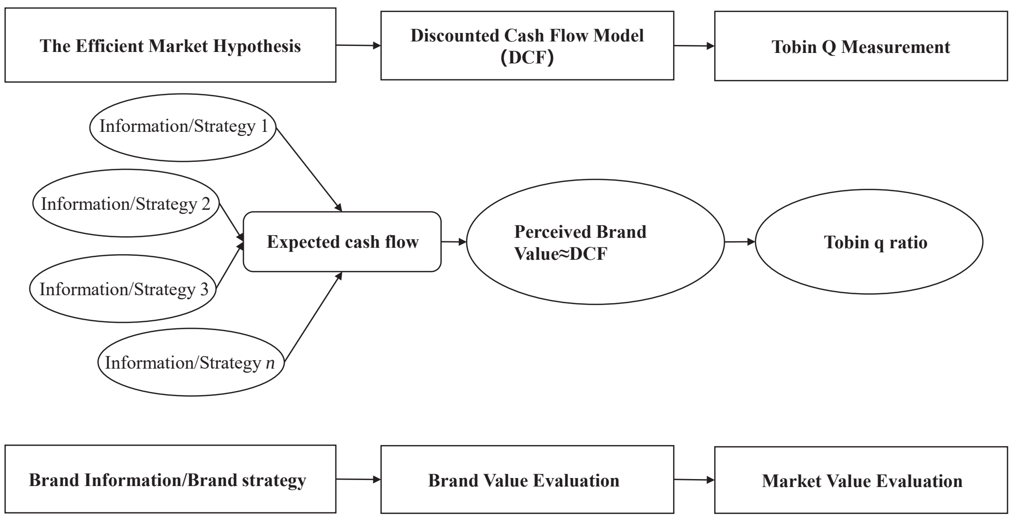


**Figure 1** The theoretical framework

## 2.3 Hypotheses Development

### 2.3.1 Smart Service Brand Construction and Enterprises' Capital Market Value

In the digital trend, service organizations are increasingly developing branded mobile applications to expand service channels[57], which will help enterprises to increase sales, products, and service innovations to achieve different business goals[58]. Smart communities promote the sharing of information and resources to achieve multi-win and enhance social benefits. On the one hand, property service companies need to effectively establish and maintain smart service brands, so that shareholders can make reasonable valuations of brands. On the other hand, brand digitalization platforms help enterprises improve service efficiency and reduce costs as well as provide customers with higher service quality and service experience. Brand platforms connect individuals across multiple equipment channels based on personal experience and accelerate innovation and enterprise value creation together with customers and stakeholders[59]. When organizations provide resources and operational processes, services will occur, and brand communities based on social media can link a large number of consumers easily and at a low cost[7]. The smart service brand platform brings community residents together on a larger community platform, which helps to transform the interaction of community members into the source of brand value creation, making it easier for property companies to obtain new businesses (such as community housekeeping, community business, Internet of Things), reducing the uncertain risk of providing smart community services to customers. Furthermore, the complete equipment, technology, and service process can be transformed into smart service products, which can provide support for the property service enterprises in need and reduce their dependence on labor forces, improve their service quality and efficiency, save the input costs, enrich sources of income, and benefit the future cash flow.

First of all, branding is a long-term process that aims at increasing brand knowledge, favorability, and sales[60]. Brands play an important role in developing their brand awareness and minimizing their perceived risks[61]. Strong brands symbolize the promises of both the products and experience types delivered by the firms. Therefore, it is important for the firm to assure consistent performance that meets customer expectations[62, 63]. Secondly, customer satisfaction depends on service quality, which greatly reduces users' resistance to brand platform applications[57]. Service quality and service experience are important and they can help enterprises create competitive advantages[64]. Thirdly, brand equity contains function and experience components[60]. Positive brand experiences will enhance the relationship between consumers and brands[65], and improve customer satisfaction and brand equity[66]. Smart community service branding brings brand-new experiences to customers and can further establish and enhance customer relations, which is the foundation of brand innovation and value creation. Establishing a smart service brand can increase the service quality, efficiency, and positive interactions between community residents and the property company through the promotion of smart functions such as online payment, service reporting, and online repair requests on the basis of maintaining high offline customers' service satisfaction. To be specific, distinctive brand experiences facilitate brand awareness and brand meaning with current and potential customers, thus increasing brand equity[15]. Therefore, smart service brand constructions affect the cash inflow ability of the enterprises. We hereby propose:

H1: Smart service brands have a positive impact on the market value of enterprises.

### 2.3.2 Brand Strategies and Enterprises' Capital Market Value

Brands not only improve the marketing expenditure efficiency and generate a price premium to be charged, but also provide a platform for introducing new lines or further brand extensions under the brand name[16]. During branding processes, diversification contributes to increased performance, it should be coherently managed and coordinated with new brand strategies[67]. Service enterprises can adopt different brand strategies to promote their services/products and acquire customer loyalty so that the cash flow of the company is not easily affected by competitors' behavior and adverse economic environment. Different brand strategies deliver different signals. Research indicates that branding exerts a critical role in industrial purchase while brand name occupies the highest proportion of the decision compared to the price, dealer, service quality, and experience[68]. When adding new business, a strong brand can make use of untapped growth opportunities through carefully selected brand extension strategies, thus improving the company value[13]. Some companies will introduce *brand renewal strategies* and update the old brand name and content. However, most companies will adopt the original brand but start with a service/product innovation, and promote under the brand that customers are familiar with. Following the original corporate brand, brand extension or brand renewal are different brand strategies that enterprises usually adopt when launching new products/service businesses.

*Brand extension-strategy* has become a critical approach for enterprises to occupy the market and obtain excess profits[69]. *The brand extension* helps save promotion costs as the new brand can leverage the market influence of the original brand to gain recognition and acceptance, which further reduces the perceived risks of consumers[70]. From the perspective of shareholders, the *brand extension* strategy is conducive to reducing consumer cognitive risks and promotion costs. Based on improving the life experience of community residents, *brand extension* is expected to generate relatively stable cash flow.

*Brand renewal strategy* conveys a brand-new value proposition of brands. Under the digital environment of the industry, it will be more flexible and innovative to update the exclusive smart service brand, creating the possibility of providing customized services[71]. *Brand renewal* can limit the reputation cost caused by service innovation failure or just service failure to a single brand, and prevent it from spilling over to other service products, thus reducing the cash flow risk of property service companies[72]. The signaling effect of the brand can reduce the uncertainty of service companies, thus generating greater cash inflow and reducing cash flow risks[35].

In short, *brand extension* and *brand renewal* send different signals, which can reduce the uncertainty from different dimensions, and then generate positive cash flow. However, the relative financial advantages of corporate brands and proprietary smart service brands from the perspective of shareholders ultimately depend on the relative valuation of the important strategic contents from the investors.

H2a: *Brand extension* strategy has a positive impact on the market value of property enterprises.

H2b: *Brand renewal* strategy has a positive impact on the market value of property enterprises.

### 2.3.3 Business Diversification Strategies and Enterprises' Capital Market Value

Branding is an interactive process while firms are committed to facilitating their value propositions. Brand value is confirmed or disconfirmed by the customers in use, customers will make their judgments of value based on the direct service interactions[42], which refers to specific business strategies. Financial performance is the critical measure of business success, and firms are required to be able to justify their value creation activities and investments to shareholders[73]. Firms' business strategies are proven to influence investment efficiency through influencing their financial performances, company decisions, and long-term planning and vision[74].

In response to the constantly changing and competitive business environment, *diversification* strategy has been widely adopted in diverse business fields[75]. Traditional property service enterprises mostly take property fees as the main source of income. Under the condition of reliable service quality, although as a steady income source, property fees are constrained by the limited service field and contents. Thus the growth space of its total income is limited. From a contemporary perspective, brand value was believed to arise continuously through the interactions among the firm, its brands, and all stakeholders[76]. With property service enterprises gradually moving towards the capital market, the increasingly fierce competition requires enterprises to constantly seek new growth opportunities and create more interactions. What's more, with the popularization of smart community construction brought by digital innovation, smart service brands have gradually penetrated traditional business and newly developed business fields, and many property service enterprises have developed diversified businesses around community resources.

From the information disclosed by listed property companies in the market, smart service brand construction starts by establishing some basic services, and transforming traditional basic property services with a digital approach (such as smart parking, smart lighting, online repair reporting, and payment). Furthermore, among the diversification strategies, one is *smart value-added services*, that is, except for the basic smart property businesses, value-added services (such as community commerce, community healthcare, logistics services, and financial services) will be conducted on the smart service platform based on residents' living needs. The other one is *smart technical services*, it is the high-end services that extend the service objects to developers at the front end of the value chain or other companies in the same industry to provide smart community solutions. Business diversification is an important strategic decision variable[35], and greater diversification brings positive financial impact and synergistic technical effects of diversified products.

In general, brand strategies are firms' strategic decisions contributing to building strong brand equity. And researchers have revealed that brand equity has a positive effect on future cash flows and stock price movements. Furthermore, strong brand equity helps to maximize shareholder value and promote brand performance[77]. When the *smart service brand* is involved in more diversified business fields, the brand represents a wider range of professional knowledge, and customers can transfer the quality signal of the company brand to the new value-added service business[78]. Innovation networks, involving multilateral actors across organizational boundaries, help utilize heterogeneous knowledge resources and allow actors to jointly guard against risks through collaborative innovation[79]. This kind of positive quality transfer can guarantee the company's demand for expanding its service business and carrying out service innovation in new markets, thus increasing the company's cash inflow and reducing the cash flow risk. The relationship between smart service brand construction processes and market value from shareholders' perspective is presented in Figure 2, while Figure 3 indicates the relationship between three research questions.

H3a: *Smart value-added services* of property enterprises have a positive impact on the market value of enterprises.

H3b: *Smart technical services* of property enterprises have a positive impact on the market value of enterprises.

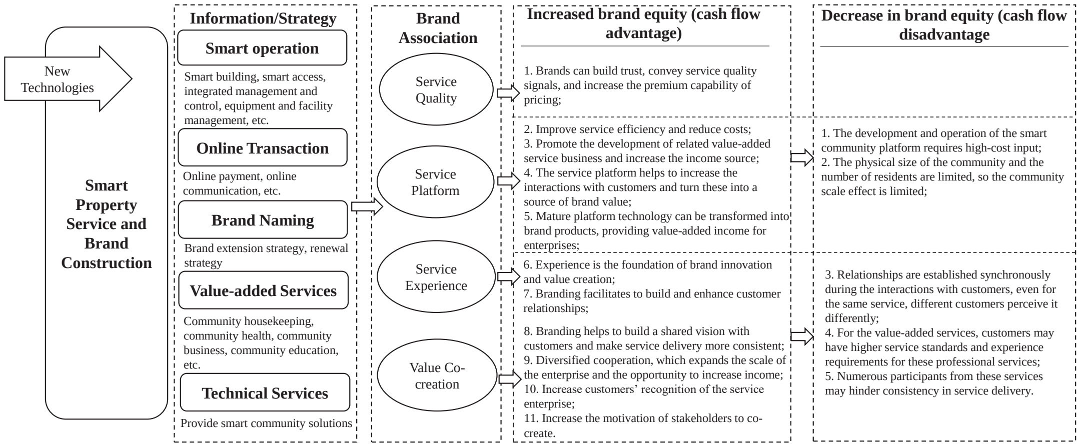


**Figure 2** The relationship between smart service brand construction processes and market value from shareholders' perspective

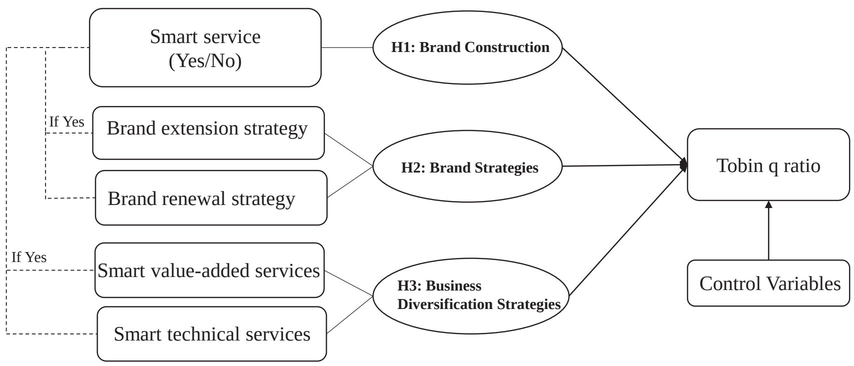


**Figure 3** Research questions on the impact of smart service brand construction on market value

# 3 Method

## 3.1 Sample Selection and Data Sources

In 2018, the operating income of the property service industry was 704.363 billion RMB and the total area of property under management reached 27.93 billion square meters with nearly 10 million employed population. The property service industry presents a rising trend and huge development potential[80]. Under the digitalization trend, some property service enterprises choose to build smart service brands and start with smart basic services such as "smart parking" and "smart security". Furthermore, property service enterprises have gradually penetrated into the community residents' lives and deeply explored as well as expanded new value growth space with value-added services like community commerce, community education, community finance, and community tourism.

The total number of listed property service enterprises in China is limited, and nearly 90% of them belong to the Hong Kong stock market. To explore the value of the smart service brand empirically from the perspective of shareholders, this study selects all the listed property service enterprises on the Hong Kong Stock Exchange in 2019 as the sample (Table 1) for the following reasons.

First, the traditional property service industry is labor-intensive and is always being criticized for its low added value. The development and operation of digital service platforms have created opportunities to open up new businesses, but will also inevitably involve a large number of investments. Besides, the complexity of property enterprises' environment may bring challenges to the creation of brand equity for upgrading smart service brands. Managers have to take more responsibilities for different corresponding investments and bear more pressures[81]. Therefore, the implementation of smart brand construction by property enterprises is bound to have an impact on the perceived value of shareholders.

Second, in terms of service objects, traditional property enterprises mostly serve tangible "things", such as elevators and greening. However, in the digital transformation, property enterprises begin to change their service objects into intangible "people", and the service contents also increased greatly, such as "community family care" and "community buying" during the epidemic closure period and the subsequent development of "community group buying". These novel service activities make the smart community unique when compared with other service industries, and most importantly, the smart service community can contain diversified digital strategies, so it is convenient for researchers to compare and further make a judgment.

Third, the construction of a smart community is actually an important unit of smart city construction. The diversified and refined service nature involved in home living and the higher service efficiency also makes the smart community gradually become a "platform" to integrate residents, service, information, and community assets into a whole to transform physical communities into a smart connected community. Property enterprise service can have a long-term "penetrating" impact on consumers, and its digital strategy has a wider influence range. Property service performance will depend more on the subjective perception, evaluation, and judgment of "people" in the future.

Fourth, as service is intangible in nature, service firms have higher operational costs for extensive customization and adaption compared with other industries. The research results can be different from one industry to another, so the empirical study from a homogenous data sample from the same industry can generate more meaningful findings[82]. It is convenient for us to obtain relatively comprehensive and objective information and data in the property industry, which can be used to judge the impact of cash flow corresponding to smart service brands of listed property companies on market value.

This paper also collects the sample property enterprises' annual reports, and market fundamental index database through the stock exchange official website and Straight Flush official stock trading software. A brand is identified as a distinctive name or symbol[46] through enterprise announcements, websites, industry associations, and industry research reports. We manually collect company data such as smart community service business, brand category, and brand number of each company in the industry, and focus on the aforementioned problems according to these data. In order to check and test the influence of the smart service brand value on the market value, based on the annual report information of 19 listed companies, we further collect the data of enterprise-scale, number of smart brands, number of value-added businesses, income growth rate, and return on equity.

### 3.2 Measurement and Variables

Key variables, their definitions, and data sources are listed in Table 2. This research focuses on following the general definition in brand literature, we investigate the three research questions and code the data based on the analysis of the status quo of 19 smart services, using binary variables to define the variables according to the company website description and company announcement. Based on the chairman's report content, website business introduction, and other information in the enterprise annual report, all companies that explicitly involve professional smart services (e.g., smart parking or smart lighting) are assigned a value of 1, otherwise 0. We check the smart property platforms or app names of the enterprises, to identify *brand extension strategy*. If the name of the platform or app has the same characters as the original brand, such as Xinchengyue firm has the "Xinchengshe APP", then we assign the value of 1, otherwise 0. For *brand renewal strategy*, if the platform or app uses a totally new name like Country Garden introduces the "Tianshi property operational smart solutions", then we assign the value of 1, otherwise 0. However, now there are some enterprises that have just started to do smart basic services, so we assign the value of 0 for both *extension* and *renewal* strategy since they have not referred to the two strategies (note as smart basic service in Table 1).

Regarding business strategies, according to the chairman's report description and financial data in the annual report, for the *smart value-added services*, enterprises that include community life services and business services are given the value of 1. For the *smart technical services*, enterprises listed in the financial income status with smart solutions income are valued 1. The remaining enterprises that do not explicitly involve in these contents are given a value of 0. The coding results and smart service brand examples are shown in Table 1.

For Tobin Q, we employ the Tobin q=(MVE+PS+DEBT)/TA measurement method[83]. MVE is the market value of the company's tradable shares; PS is the value of the preferred stock; DEBT is the market value of the company's net debt, which is the book value of short-term liabilities minus short-term assets plus long-term debts; and TA is the book value of the company's total assets[84]. Moreover, Shi[39] believes that increasing asset scale, enhancing profitability, and profitability efficiency can directly benefit the market value, and considering there are other possible factors that may affect the financial value of smart service brands, we mainly control the indicators of measuring asset scale (market share, value-added businesses number), profitability indicators (revenue growth rate, smart service brand number) and profitability efficiency indicator (return on equity).

Finally, based on the discounted cash flow model (DCF) of brand value, this study carries out an empirical test with the *Guotaijunan* database under the Tobin q measurement method. Table 2 exhibits the variables, data source, and detailed definitions. With the 19 listed property companies of the Hong Kong Stock Exchange as the research objects, we continuously collected 11 groups of observation data from the end of 2019 and the data from January to October 2020, and the number of analysis samples expand to the number of 209. Table 3 shows the descriptive statistics and correlation results for these variables.

**Table 1** Description of sample enterprises

| Company | | Q1: Variable | Q2: Variables | | Q3: Variables | | Smart service brand example |
|---|---|---|---|---|---|---|---|
| **Company name** | **Stock code** | **Smart service brand** | **Brand extension** | **Brand renewal** | **Smart value-added services** | **Smart technical services** | |
| Zhonghai | 02669.HK | 1 | 0 | 1 | 1 | 0 | Youni Internet/Xinghai-IoT |
| Xinchengyue | 01755.HK | 1 | 1 | 0 | 1 | 0 | Xinchengshe APP |
| Country Garden | 06098.HK | 1 | 0 | 1 | 1 | 1 | Tianshi property operational smart solutions |
| GreenTown | 02869.HK | 1 | 0 | 1 | 1 | 1 | Cloud platform/Living service center/Mulinshe |
| A-Living | 03319.HK | 1 | 1 | 0 | 1 | 0 | A-Living-zhilian/A-Living-guanjia |
| Jiazhaoyemeihao | 02168.HK | 1 | 1 | 0 | 1 | 1 | Jiak-smart |
| China Aoyuan | 03662.HK | 1 | 1 | 0 | 1 | 0 | Aoyuejia-APP/Ao-smart/Ao-health/Ao-IoT |
| China Poly | 06049.HK | 1 | 0 | 1 | 1 | 1 | Xin-smart |
| Times Neighborhood | 09928.HK | 1 | 1 | 0 | 1 | 0 | Neighbour-help/Neighbour-Xingxuan |
| Justbon Services | 02606.HK | 1 | 0 | 0 | 1 | 1 | Smart basic service (Smart community-CEM) |
| Color Life Services | 01778.HK | 1 | 1 | 0 | 1 | 0 | Color-cloud/Color-house/Color-parking/Color community |
| Xinyuan | 01895.HK | 1 | 0 | 1 | 1 | 0 | Smart community 3.0/Kangbao cloud platform |
| Ever Sunshine Lifestyle | 01995.HK | 1 | 0 | 0 | 0 | 0 | Smart basic service (smart parking) |
| Hevol Services | 06093.HK | 1 | 0 | 0 | 0 | 0 | Smart basic service (property management platform) |
| Riverine China | 01417.HK | 1 | 0 | 0 | 0 | 0 | Smart basic service (DBM system) |
| Clifford Modern Living | 03686.HK | 1 | 0 | 0 | 0 | 0 | Smart basic service (Power Supervisory System) |
| Binjiang | 03316.HK | 0 | 0 | 0 | 0 | 0 | - |
| Zhong Ao Home | 01538.HK | 0 | 0 | 0 | 0 | 0 | - |
| Yincheng Life | 01922.HK | 0 | 0 | 0 | 0 | 0 | - |

**Table 2** Variables, data source and definitions

| Variables | Data source | Definitions |
|---|---|---|
| Shareholder value Tobin q | GUOTAI JUNAN/ Straight Flush | Tobin q=(MVE+PS+DEBT)/TA=Market value A/Closing total assets, In addition: Market value A = market value of equity + market value of net debt; Market value of equity = closing price ∗ number of tradable shares + net asset of per share ∗ the number of untradable shares; Market value of net debt = Total liabilities − employee payroll payable − taxes payable − Dividends payable − Other payables − deferred income tax liabilities. |
| Smart service brand | Official website | Whether the company promotes smart services (including software, hardware, APP, cloud platform, etc.) |
| Brand extension strategy | Official website | Smart service brand symbol has been extended in combination with the enterprise brand |
| Brand renewal strategy | Official website | A new name has been created for the smart service brand |
| Smart value-added services | Official Announcements | The scope of smart service has expanded the value-added projects such as community life service and community business |
| Smart technical services | Official Announcements | The scope of smart service expands the technical value-added service that provides smart solutions up the value chain or to other enterprises in the industry |
| Number of brands | Official websites | Number of smart service brands launched by the company |
| market share | Annual reports, CREIS | (The property field service area of the company at the end of $T$ period /the Hong Kong stock listed companies' total property field service area at the end of $T$ period)∗100% |
| Number of value-added businesses | Annual report | The number of community value-added businesses launched by the company |
| Revenue growth rate | Annual report | [(Total revenue at the end of $(T+1)$ period − total revenue at the end of $T$ period)/ total revenue at the end of $T$ period ]∗100% |
| Return on equity -ROE | Straight Flush | Return on equity = net profit/net assets |
| Market capitalization | GUOTAI JUNAN/ Straight Flush | Market capitalization refers to the total value of the issued shares of a listed company calculated at the market price, market capitalization = market price per share ∗ total number of issued shares |

**Table 3** Descriptive statistics and correlation of variables

| | Variables | M | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Tobin Q | 2.97 | 1.84 | 1.00 | | | | | | | | | | |
| 2 | Smart service brand | 0.84 | 0.37 | 0.32*** | 1.00 | | | | | | | | | |
| 3 | Brand extension | 0.32 | 0.47 | 0.23** | 0.29*** | 1.00 | | | | | | | | |
| 4 | Brand renewal | 0.26 | 0.44 | 0.27*** | 0.26** | −0.41*** | 1.00 | | | | | | | |
| 5 | Smart value-added services | 0.63 | 0.48 | 0.44*** | 0.57*** | 0.52*** | 0.46*** | 1.00 | | | | | | |
| 6 | Smart technical services | 0.26 | 0.44 | 0.15* | 0.26** | −0.15* | 0.46*** | 0.45*** | 1.00 | | | | | |
| 7 | Brand number | 1.21 | 1.24 | 0.24** | 0.42*** | 0.71*** | −0.01 | 0.74*** | −0.01 | 1.00 | | | | |
| 8 | Market share | 0.05 | 0.06 | 0.16* | 0.25** | 0.24** | 0.32*** | 0.49*** | 0.29*** | 0.48*** | 1.00 | | | |
| 9 | Value-added services number | 3.79 | 1.44 | 0.40*** | 0.14* | 0.02 | 0.25** | 0.27** | 0.59*** | −0.06 | 0.18* | 1.00 | | |
| 10 | Income growth | 0.37 | 0.25 | 0.53*** | 0.06 | 0.12 | −0.11 | −0.04 | 0.02 | −0.14 | 0.002 | 0.07 | 1.00 | |
| 11 | Return on equity | 0.12 | 0.06 | 0.38*** | −0.22* | 0.05 | 0.09 | 0.12 | −0.02 | 0.05 | −0.07 | 0.20** | 0.27** | 1.00 |

Notes: $N = 209$, *$p$ <0.05, **$p$ <0.01, ***$p$ <0.001, Two-tail test; Cronbach's alphas are shown on the diagonal in parentheses.

# 4 Empirical Findings

## 4.1 Regression and Robustness Test

Taking Tobin Q of the sample enterprises as the dependent variable, this paper investigates whether the brand belongs to a smart service brand in Q1, and based on this brand strategy, we explore whether the *brand extension* or *brand renewal* strategy is implemented in the corresponding brand strategies in Q2 and whether the brand carries out the *smart value-added service* and *smart technical service* in Q3. Since Q2 and Q3 are based on Q1 respectively, we generate two interaction terms for Q2: *Smart service brand ∗Brand extension* and *Smart service brand ∗ B rand renewal*, and the other two interaction terms for Q3: *Smart service brand ∗Smart value-added services* and *Smart service brand ∗Smart technical services*. The interaction terms are put into the model as independent variables. We control the brand number, market share, value-added business, income growth, and return on equity respectively, and use the related variables for OLS regression. The results are shown in Table 4. The maximum variance inflation factors for both models (VIFmax $\leq 5.2$) are below the standard cut-off values ($< 10$), which indicates that multicollinearity is not a particular problem in our regressions. For the robustness test, we use another outcome variable "market capitalization", which calculates the total value of a listed company with the market price and the total number of issued shares. The results are shown in Table 5.

**Table 4** Impact of smart service brand on Tobin Q

| | **Q1** | **Q2** | **Q3** |
|---|---|---|---|
| **Market value** | | | |
| Tobin Q | | | |
| **Question Variables** | | | |
| Smart service brand | 1.024*** | 0.427 | 0.576* |
| Smart service brand ∗Brand extension | | 0.303 | |
| Smart service brand ∗Brand renewal | | 1.291*** | |
| Smart service brand ∗Smart value-added services | | | 1.947*** |
| Smart service brand ∗Smart technical services | | | −1.385*** |
| **Control variables** | | | |
| Brand number | 0.374*** | 0.472*** | −0.136 |
| Market share | −1.754 | −5.335** | −1.317 |
| Value-added business number | 0.413*** | 0.378*** | 0.492*** |
| Income growth | 3.512*** | 4.004*** | 3.536*** |
| Return on equity | 6.973*** | 4.307* | 4.301* |
| $N$ | 209 | 209 | 209 |
| $F$ | 45.42*** | 42.13*** | 43.32*** |
| $R^2$ | 0.574 | 0.628 | 0.634 |
| Adjust $R^2$ | 0.562 | 0.613 | 0.619 |

Notes: $N = 209$, *$p$ <0.05, **$p$ <0.01, ***$p$ <0.001.

**Table 5** Impact of smart service brand on market capitalization

| | **Q1** | **Q2** | **Q3** |
|---|---|---|---|
| **Market value** | | | |
| Market Value | | | |
| **Question Variables** | | | |
| Smart service brand | 138.054*** | 47.943 | 74.214* |
| Smart service brand *Brand extension | | −54.035 | |
| Smart service brand *Brand renewal | | 169.733*** | |
| Smart service brand *Smart value-added services | | | 134.344** |
| Smart service brand *Smart technical services | | | 50.245 |
| **Control variables** | | | |
| Brand number | −45.151*** | −0.724 | −72.285*** |
| Market share | 2255.861 | 1642.993*** | 2059.385*** |
| Value-added business number | 32.585*** | 32.057*** | 14.485 |
| Income growth | 372.073*** | 484.694*** | 381.818*** |
| Return on equity | 1020.736*** | 569.128** | 898.431*** |
| $N$ | 209 | 209 | 209 |
| $F$ | 77.65*** | 93.94*** | 69.15*** |
| $R^2$ | 0.697 | 0.790 | 0.735 |
| Adjust $R^2$ | 0.688 | 0.781 | 0.724 |

Notes: $N$ = 209, $*p$ <0.05, $**p$ <0.01, $***p$ <0.001.

### 4.2 Results

The results suggest that it is necessary for listed property service enterprises to carry out smart service brand construction following the trend of digitalization development. Through the development of smart community service ($R^2$= 0.574, $p<$ 0.01), the implementation of smart community brand strategies ($R^2$= 0.628, $p$ < 0.01) and various smart service business strategies ($R^2$= 0.634, $p$ < 0.01) can have a positive impact on the market value of enterprises.

For H1, the implementation of the smart service brand strategy has a significant contribution to market value (coef= 1.024, $p<$ 0.001), indicating that the operation of smart service brand is beneficial for market value, and shareholders have given a positive objective economic value perception to the smart service brand. The robustness test results also confirm H1 (coef= 138.054, $p<$ 0.001); For H2, based on the smart service brand construction, the results show that although the implementation of *brand extension* and *brand renewal* strategies has a positive impact on the market value of enterprises, only the brand renewal strategy regression results are significant (coef = 1.291, $p$ < 0.001). The similar results are also generated in the robustness test (coef= 169.733, $p<$ 0.001). It reveals that the application of *brand renewal* strategy makes a contribution to market value, and shareholders' perception of *brand renewal* strategy reflects higher economic value. The reason why the *brand extension* strategy is not significant could be if the newly established extension brand does not fit the original brand, it would bring about the "brand dilution" effect, which will further damage the public's attitude and perceived quality of the original brand.

The results of H3 test illustrate that the development of *smart value-added services* (coef =

1.947, $p< 0.001$) have a significant positive impact on the market value of property enterprises, while it is interesting to find that *smart technology services* (coef = $-1.385$, $p< 0.001$) strategy has a significantly negative effect on market value. For the robustness test, *smart value-added services* are confirmed (coef = 134.344, $p< 0.01$), while the result of *smart technology services* is not significant. It shows that the development of *smart value-added services* of property service enterprises can make positive contributions to the market value of enterprises, and shareholders have given higher economic value perception to property enterprises through community value-added services and activities. However, for *smart technical services*, this strategy may be used to dissociate the characteristics of labor-intensive service industries embedded in these traditional property enterprises. In the short term, there is a risk of leaping over barriers of upgrading to technological innovation service business and the cash flow risk caused by huge investment in technology development. Shareholders may not recognize or hold doubts about the economic value of the enterprises to launch smart technology service business, which may further affect the shareholders' investment intention.

## 5 Discussion and Conclusion

It explores the impact of smart service and brand building of property service enterprises on the enterprises' market value and echoes the emerging research fields of industry digital innovation development and service marketing in the era of the digital economy. Based on literature research and effective market hypothesis theory, this research refers to discounted cash flow model (DCF) and introduces the Tobin q measurement to construct the impact model of smart service brands on the market value. The proposed model is a comprehensive investigation of the economic value of property service enterprises in carrying out smart service brand construction.

The research reveals that, firstly, the smart service and brand construction of property service enterprises are conducive to improving their service quality, service efficiency, and service ability. Branding helps improve the experience and satisfaction of community residents and enhances the profitability of their inherent businesses. The branding under digitalization further provides space for brands to carry out community value-added services based on community life scene experience. From the perspective of shareholders, this breaks the fixed income mode of property enterprises for many years. At the same time, it can promote the continuous growth of new business income to generate steady cash flow and has a positive impact on the market value of enterprises.

Secondly, the smart service of property enterprises is more beneficial to the cash flow brought by incremental business, these new businesses are different from the original characteristics of property enterprises which mainly serve "things", while they turn more to the service of "people". Therefore, it is particularly important to implement an effective brand naming strategy. Based on the service objects and business contents with great changes, *brand extension* and *brand renewal* can be regarded as effective brand strategies. But shareholders are more optimistic about the financial market value brought by the *brand renewal* strategy.

Thirdly, the coverage and depth of smart service businesses influence the cash flow and cash flow risk of enterprises at the same time. Furthermore, the *smart value-added service* contributes to connecting multiple stakeholders through the smart service platform, promoting the continued growth of its incremental income through diversified service activities, and improving the judgment of shareholders on the enterprise value. Nevertheless, the service object, technology and team requirements of *smart technical services* are a huge challenge for property service enterprises, in the view of shareholders, cash flow risk may exist, which could negatively affect the market value of the enterprise.

Based on the context of China, the study makes theoretical contributions to smart service brand construction, firm value evaluation, and smart city construction. First, since there is an essential difference between services and products, this paper focuses on actual financial performance and we conceptualize the *smart service brand* from the shareholders' perspective to explore the impact of service brand building under digitalization. Second, brand construction is a long-term process and includes different initiatives, especially under the influence of various new technologies. We know little about the impacts of diversified marketing strategies like naming strategy and few studies mention brand business-level strategies. But these factors are very important for customer interaction, brand value, and corporate performance. Based on the characteristics of property companies, this research refines the specific processes of service brand construction and investigates the impact of diverse brand strategies and business strategies on brand value from a financial approach. Third, most previous studies on brand value based on customers' perceptions are conceptual, while in this study we employ Tobin Q variable to measure the realization level of a firm's market value, focusing on the causal relationship between output and investment in order to capture incremental intangible value for shareholders, especially for an intangible asset like brand value. And the robustness test using another indicator also confirms the research results. In the digital environment of the industry, it is the general trend for property enterprises to carry out smart services through the Internet, big data, and the Internet of things. This paper provides corresponding theoretical and empirical support to practical smart service brands and smart cities construction.

As for the practical implications, the financial market is gradually accepting and recognizing property service enterprises to carry out smart services and brand construction. Enterprise managers should carefully choose and implement brand and business strategies, which should be combined with the business characteristics of smart service, possible brand association, and the impact on business profitability. For value-added businesses and activities of *smart service brands*, a *brand renewal* strategy should be adopted as far as possible to avoid cash flow risk caused by business uncertainty. Besides, smart service more relies on digital ways to promote service innovation and create good performances around the main businesses, the research results show that shareholders are not optimistic about the property service enterprises operating *smart technology service* business at present, and its high-cost investment and technical operation risk will damage the enterprise value from the perspective of shareholders. The smart community generates a smart ecosystem for sustainable living, high quality of residents' lives and well-being, which helps to create a harmonious living atmosphere. The smart community is an important unit of a smart city, the research further provides a theoretical and practical reference for the construction of smart cities.

The study also has some limitations to be addressed in future research. On the one hand, limited by the number and time of listed property enterprises, the observation data set used in the model may affect the sensitivity and stability of the model analysis conclusion, especially, conclusions such as the influence of *smart technical services* on the market value need to be enriched with the increasing number of listed enterprises. On the other hand, the construction of smart communities or smart cities in China is still in its infancy, the service platform technology of property service enterprises needs to be further improved, and the business model of smart service is still in continuous exploration. The research on the more extensive impact of smart service brand strategy and business diversification strategy on the market value will be further deepened with the continuous maturity of platform technology and service mode, therefore, it appeals to more diverse perspectives to enrich the research on the market value of *smart service brand* in the financial market.

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