

## DESIGN STANDARDIZATION BY AIRBNB MULTI-UNIT HOSTS: Professionalization in the Sharing Economy

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### Abstract

Increased professionalism in the short-term rental market has enabled multi-unit hosts to replicate design features across their listings to increase efficiency; however, this standardization represents a huge risk caused by decreased flexibility. We identify the impacts of functional and aesthetic design standardization on guest experience and satisfaction using Airbnb as a case study. The findings show that design standardization impacts guest experience and satisfaction asymmetrically. The results provide implications for tourism place design by articulating the structural relationships of standardized design on guest experiences within the typically unstandardized home-sharing market. This study contributes to design literature by studying design from a strategic level and adds knowledge to standardization literature by testing customer-side outcomes within a micro-entrepreneurship context.

**Keywords:** Short-term rental; Functional & aesthetic design; Design standardization; Guest experience & satisfaction; Machine learning

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### Abstract

Increased professionalism in the short-term rental market has enabled multi-unit hosts to replicate design features across their listings to increase efficiency; however, this standardization represents a huge risk caused by decreased flexibility. We identify the impacts of functional and aesthetic design standardization on guest experience and satisfaction using Airbnb as a case study. The findings show that design standardization impacts guest experience and satisfaction asymmetrically. The results provide implications for tourism place design by articulating the structural relationships of standardized design on guest experiences within the typically unstandardized home-sharing market. This study contributes to design literature by studying design from a strategic level and adds knowledge to standardization literature by testing customer-side outcomes within a micro-entrepreneurship context.

### 1. INTRODUCTION

The short-term rental market has flourished in the past decade by enabling individuals to monetize underutilized real estate assets. The success of this innovation in the lodging market has, in turn, led to the professionalization and commercialization of an increasing number of multi-unit hosts. That is, hosts managing two or more listings (Dogru, Mody, Suess, Line, & Bonn, 2020) have the opportunity to increase revenue dramatically. However, more listings also pose a challenge of maintaining a successful operation across multiple listings, as the expansion of listings can result in lower efficiency and inferior quality, thus potentially harming listing performance and guest satisfaction (Bulchand-Gidumal, Melián-González, & López-Valcárcel, 2019; Xie & Mao, 2017). Within this context, multi-unit hosts often employ several product design strategies to improve the efficiency of their listings while aiming to maintain guest satisfaction.

Design is an important issue in the travel business spanning from overarching design thinking to specific physical elements (Xiang, Stienmetz, & Fesenmaier, 2021). Given the recent tourism design literature emphasizing high-level design orientations and intangible aspects (Vogt, Andereck, & Pham, 2020; Volo, 2021), this paper focuses on physical place design, specifically appearance and function of a rental listing. Most of the studies related to short-term rental design have examined the use of specific design elements, such as wireless Internet, free parking, and room color mode, but have not considered the coordination of these elements within and between units (Dogru & Pekin, 2017; Rahimi, Liu, & Andris, 2016). In practice, many multi-unit hosts plan their listings as a whole and intentionally make the same or similar design choices for their listings. In this study, we characterize the resulting consistency of design features across multiple listings managed by the same host as design standardization of short-term rental listings. This standardization enables hosts to address supply-side low efficiency issues brought by an increasing number of listings.

Indeed, product standardization is a well-known tool to increase operational efficiency in various industries, including hotels, by lowering costs and providing consistent quality (Anderson,

Fornell, & Rust, 1997; Kasiri, Cheng, Sambasivan, & Sidin, 2017). For example, product standardization by a multi-unit host can result in faster responses due to text templates that apply to all listings. Similarly, design elements such as having the same coffee maker or wall art at all listings allow for economies of scale in purchasing and maintenance, which can be passed on to guests in the form of discounts (Farrell & Saloner, 1985; Tassej, 2000). However, design standardization may also negatively affect guest experiences. That is, highly standardized listings have a risk of rigidity which hinders innovation and fast adaptation to dynamic customer demands. Indeed, standardized responses have the potential to substantially reduce authenticity in interaction, while upgrading the same amenity or style feature can be costly due to replacement at all listings simultaneously. Thus, the tension between efficiency and flexibility leads to uncertainty in the guest-side outcomes of design standardization (Liker, Collins, & Hull, 1999).

In this study, we aim to examine the relationship between design standardization and guest satisfaction in the short-term rental context with the goal of better understanding the customer-side outcomes of design standardization in a context where businesses are small and guests hold heterogeneous product preferences. With this goal in mind, we address the following two questions: (1) What is the extent to which standardizing design has taken place among short-term rental hosts? (2) Does standardizing design affect guest experience, or guest satisfaction, or both? To address these questions, we use publicly available Airbnb data to measure standardization of aesthetic and functional design in online listings of multi-unit hosts and its impact on guest experience and satisfaction.

This study offers theoretical, methodological, and practical contributions. First, it enriches the design literature in the tourism domain by studying physical place plans from a strategic lens. Second, it contributes to standardization literature by examining the degree to which it affects customer-side outcomes. In particular, this study offers important insights into the asymmetric impacts of aesthetic and functional design on guest experience aspects and, as such, provides a deeper understanding of the impacts of product standardization. Another contribution to standardization literature is the focus on small businesses with few opportunities to achieve economies of scale. Finally, from a methodological perspective, this study leverages machine learning to quantify design standardization. The findings provide useful guidance for short-term rental hosts.

## **2. RESEARCH BACKGROUND**

### **2.1. Design**

Design is a widely discussed issue in multiple disciplines, including architecture, manufacturing, marketing, management, and psychology (e.g., Cross, 1982; Hevner & Chatterjee, 2010; Ravasi & Stigliani, 2012). In the hospitality and tourism context, design is broadly defined as “a way of thinking, which is a basic process driving innovation and new ways for supporting the creation of customer value” (Fesenmaier & Xiang, 2016, p. 4). Xiang et al. (2021) further conceptualize tourism design as a framework composed of three levels: tourist response, place design principal factors, and design thinking, which aim to understand and shape the tourist experience. One stream of the tourism design literature discusses high-level design thinking, like eco-friendly, sustainable, or creative orientations (Dolnicar, 2020; Richards, 2020; Vogt et al., 2020). In terms

of the design of microelements, the literature focuses on various aspects related to marketing and communication, such as destination image, stories, tourists' emotions, and perceptions; however, it lacks the consideration of elements related to physical place design (e.g., Moscardo, 2020; Volo, 2021). In this paper, we concentrate on the design of the servicescape of short-term rental listings. Recent tourism and hospitality studies examine symbolic and style elements such as décor, color, layout, and lighting (Mattila & Gao, 2017; Rahimi et al., 2016). These studies demonstrate that the arrangement of several servicescape elements significantly influences guests' cognitive, affective, and behavioral responses (Nawi, Hashim, Shahril, & Hamid, 2019).

There are multiple ways to categorize physical design. A common approach is to distinguish between functional design and aesthetic design (Baker, 1986; Walsh, 1996), where functional design is related to utilitarian elements and how well they meet customers' practical needs (Baek & Ok, 2017; Bloch, 1995). Aesthetic design, on the other hand, refers to the visual elements which often constitute brightness, style, color, theme, layout, and symbols (Suh, Moon, Han, & Ham, 2015). In the short-term rental context, functional design can be measured by the provision of amenities such as Wi-Fi, kitchen, and parking, as these elements closely connect to guest experience, satisfaction, and repurchase intention (Cheng & Jin, 2019; Tussyadiah, 2016). Aesthetic design is the inclusion and arrangement of style elements and has been shown to play an important role in shaping guest emotions and satisfaction (Rahimi et al., 2016; Song, Suess, Mody, & Dogru, 2020).

Design-related studies provide evidence for the impacts of functional and aesthetic design factors within diverse tourism sectors (e.g., Lockwood & Pyun, 2019). In the short-term rental context, most studies have considered design elements such as amenities, layout, and decoration style to understand which attributes are welcomed by the guests (Dogru & Pekin, 2017; Rahimi et al., 2016). A few studies investigate design from an experiential perspective, such as "feeling at home" (Suess, Kang, Dogru, & Mody, 2020) or "customer orientation" (Mattner & Peters, 2019). Further, these studies overwhelmingly emphasize customer demand while neglecting strategic issues such as standardization faced by the host that is needed to optimize operational efficiency.

## **2.2. Standardization**

Standardization has been extensively investigated in management and marketing research (e.g., David & Rothwell, 1996; Farrell & Saloner, 1985). It refers to the process of maintaining uniformity and consistency among different iterations of a particular service, manufacturing process, product component, or strategy. In the hospitality industry Ritzer (1992) first conceptualized "McDonaldization" in the food and beverage sector when investigating the namesake restaurant chain. Standardization strategy has penetrated almost every aspect of the hospitality business, including work routines, training programs, pricing strategy, and the design of the physical environment. As such, it is common for hotel firms to furnish rooms of a specific brand with the same facilities and decorate them in a consistent aesthetic style.

The impacts of standardization remain controversial due to the tension between efficiency and flexibility with mixed results. Standardization has served as an effective tool to improve supply-side efficiency for a long time. Homogeneous products and mass production can offer efficiency, calculability, predictability, and increased control. Thus, when managing multiple units,

operators can benefit from economies of scale by standardizing. The benefits of standardization include guaranteeing service quality, reducing costs, facilitating organizational learning, and boosting firm performance (Anderson et al., 1997; Kasiri et al., 2017). However, the effectiveness of standardization varies with contextual factors, e.g., business size (Axelrod, Mitchell, Thomas, Bennett, & Bruderer, 1995; Rakić, Milošević, & Filipović, 2021). Hotels, especially large chains, are longtime practitioners of standardization because they are big enough to take advantage of it. For example, standardized property and room design allow for streamlined housekeeping and bulk purchasing of maintenance materials which reduces operating costs that can be passed on to guests. However, most short-term rental hosts have small businesses. As such, they might not benefit as much as hotels from standardization because the business size might not be sufficient to reach economies of scale.

At the same time, organizations that employ standardization strategies might be competitively vulnerable due to lower flexibility, which can hinder innovation and slow down responses to varying customer needs (Farrell & Saloner, 1985; Liker et al., 1999). Unlike traditional hotels, guests consume short-term rental listings for more diverse demands such as low costs, privacy, household amenities, and authentic interactions. Also, guest expectations changed significantly over the last decade with a broader acceptance of this new accommodation type (Lee, Tse, Zhang, & Ma, 2019). These trends in the marketplace require hosts to be more flexible to meet near-term guest needs. With this background, the central question addressed in this research examines whether design standardization can fit the unique context of short-term rental with small business sizes and heterogeneous guest demands.

### **2.3. Guest experience and satisfaction**

It is generally accepted that guest satisfaction plays a critical role in business success in the form of boosting repurchase intention, developing loyalty, increasing revenue (Kwok & Xie, 2019; Liang, Choi, & Joppe, 2018), and guaranteeing long-term success (Leoni, 2020). Czepiel, Rosenberg, and Akerele (1974) conceptualized customer satisfaction as the sum of a customer's subjective reactions toward a product or service. However, satisfaction only provides a superficial understanding. An increase or a decrease in satisfaction only indicates how well a service is executed but fails to explain why. On the other hand, guest experience denotes customers' internal responses to various interactions with firms during all stages of the consumption process (Meyer & Schwager, 2007; Verhoef et al., 2009). It embeds richer information by capturing customers' perceptions in multiple discrete aspects. Deconstructing satisfaction into multiple experience dimensions as its antecedents can explain the mechanisms of guest satisfaction and avenues for improvement (e.g., Altunel & Erkurt, 2015; Srivastava & Kaul, 2014).

In the short-term rental context, four main dimensions of experience have been investigated: amenity, host, location, and value for money. Amenity refers to guest experiences related to room amenities, comfort, cleanliness, food and beverage supply, parking, and security (Joseph & Varghese, 2019). Hosts cover guest experiences of host-guest interactions both in-person and remotely for inquiries, customer support, check-in and -out, and additional destination information provision (Cheng & Jin, 2019; Sutherland & Kiatkawsin, 2020). Location involves factors including transportation, convenience, accessibility, neighborhood environment, and surrounding views (Xu, 2020; Zhang, 2019). Finally, guests' perceptions of value and price

constitute value for money (Joseph & Varghese, 2019).

### 3. CONCEPTUAL FRAMEWORK AND HYPOTHESES

The proposed conceptual framework provides the structure of our study as we examine the direct and indirect impacts of design standardization on guest satisfaction (see Figure 1). Each component is discussed below.

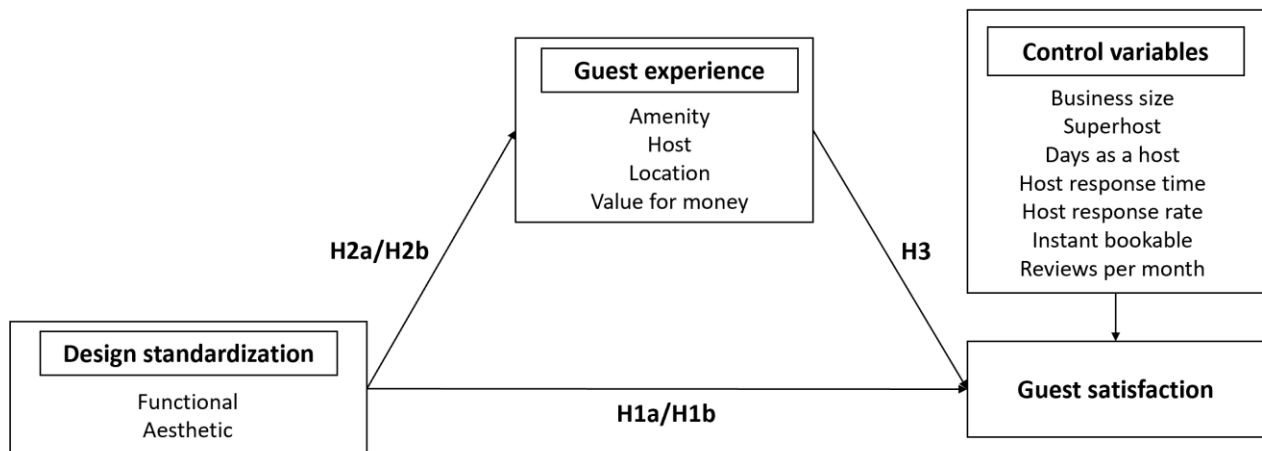


Figure 1. Conceptual framework relating design, guest experience, and guest satisfaction

#### 3.1. Effects of design standardization

In this study, we define design standardization as the consistency of design features across multiple listings managed by the same host. We argue that standardizing design enables a host to develop a brand and cater to the same type of clients across all listings. Within this context, design elements critical for short-term rental success include aesthetic features such as the degree to which home-like decorations are provided, such as color themes, stylish furniture, and wall/floor covering (Suess et al., 2020), as well as functional features such as safety facilities, comfortable beds, shower, bathroom, pool, and kitchen (Cheng & Jin, 2019; Yu, Cheng, Yu, Tan, & Li, 2020).

We further argue that listings with a standardized design will offer superior services at lower costs, which in turn, can improve customer experience and satisfaction and expedite responses to guest inquiries. In particular, standardizing product features reduces complexity and enhances workflow (Price & Lu, 2013). This makes it easier and less error-prone for the host to restock standardized listings for the next guest and carry out maintenance, thus contributing to better amenity experiences (Um & Chung, 2021). This is especially the case for short-term rental listings, which have been found to have high diversity and complexity in amenities due to a lack of standards (Yu et al., 2020). Also, reduced complexity enables hosts to respond to guest inquiries faster as there is no need to identify which listing offers which amenities in what style, which is an essential factor of host-interaction experience (Sutherland & Kiatkawsin, 2020; Zhu, Cheng, & Wong, 2019).

Last, standardized listings are more cost-effective as similar resources are required for each

listing, thus allowing economies of scale. Lower costs will enable hosts to offer their listings at a lower price than their competitors. Collectively, fewer service failures, faster responses to inquiries, and a lower price contribute to better customer value experiences (Festila & Müller, 2017).

However, it also argued that standardizing design reduces a host's ability to adapt to changing customer demands. Thus, standardization may result in hosts offering an outdated product, representing a mismatch between offering and demand (Xiao, 2021). Also, to maintain a high degree of design standardization, like having a swimming pool in each listing, hosts need to compromise on location choices. For example, they may exclude some convenient locations due to lacking wanted amenities or layouts. The trade-off between standardization and other strategies harms corresponding guest experiences.

Considering the potential impacts of functional and aesthetic design standardization on guest experience, we hypothesize that:

- H1a:** Functional design standardization affects guest experience in the short-term rental context.  
**H1b:** Aesthetic design standardization affects guest experience in the short-term rental context.

Design standardization, such as providing consistent functionalities or using symbolic color schemes, is an effective branding tool widely used in many industries (Andersson & Warell, 2015; Baek & Ok, 2017; Walsh, 1996). In the short-term rental context, luxury amenities, design fashion, and color patterns serve as powerful storytelling tools that allow hosts to create a brand (Farmaki, Spanou, & Christou, 2021; Rahimi et al., 2016). We anticipate that, as an effective branding tool, keeping the consistency of functional and aesthetic designs across all listings increases guests' brand recognition, boosts trust, and improves overall satisfaction.

Design standardization also implies differences in other aspects that ultimately changes customer satisfaction. It reflects a host's awareness of using strategic tools and willingness to learn from successful attempts. Regardless of the quality of design standardization strategies, starting to standardize already indicates the hosts' entrepreneurial orientation.

Entrepreneurial orientation is a key concept when operators are crafting strategies in the hopes of doing something new and exploiting opportunities that other organizations cannot exploit (Ketchen & Short, 2012). The efforts put into changing the chaotic nature of listings in the short-term rental accommodation market indicate the micro providers' competitive aggressiveness and autonomy. The monetary and intellectual investments are directly connected to better outcomes, including improved customer satisfaction (Chokesikarin, 2014; Núñez-Pomar, Prado-Gascó, Sanz, Hervás, & Moreno, 2016). Therefore, we propose the following hypotheses:

- H2a:** Functional design standardization affects guest satisfaction in the short-term rental context.  
**H2b:** Aesthetic design standardization affects guest satisfaction in the short-term rental context.

### **3.2. Relationship between guest experience and satisfaction**

The relationships between the dimensions of guest experience and guest satisfaction are well studied in the tourism and hospitality literature. This research (e.g., Tussyadiah, 2016) finds that

amenity, host interaction, location, and value for money play crucial roles in guests' overall satisfaction levels. More recently, Alrawadieh, Dinçer, and Dinçer (2020) confirmed that listing location, host attitude, and listing facilities are key factors of customer satisfaction. Also, Tussyadiah (2016) and Möhlmann (2015) found that cost savings compared to traditional accommodation options positively influence satisfaction. In this study, we examine the relationships between the experience dimensions of amenity, host interaction, location, value for money, and overall guest satisfaction. As such, it is hypothesized that:

**H3:** Guest experience is significantly related to guest satisfaction in the short-term rental context.

## 4. METHODOLOGY

### 4.1. Data

This study uses secondary monthly data aggregated by quarters for several cities; this data is publicly available on [insideairbnb.com](https://insideairbnb.com) and includes comprehensive information on Airbnb listings, including amenities, cover photos, and online reviews. The focus of this study is on standardization across listings by multi-unit hosts; as such, we obtained data only for hosts with at least two listings. Furthermore, we limit the collection to 28 US cities to eliminate cultural or regulatory differences across countries. Last, the data reflect those places available from July 2018 to December 2019, as information for most US cities was not uniformly available until July 2018 and excluded listing closures after December 2019 due to COVID-19. After removing data with missing values, 74,251 observations are kept for further analysis.

### 4.2. Assessing design standardization

Figure 2 outlines the process followed to test the above hypotheses: these include data sourcing, cleaning, and analysis.

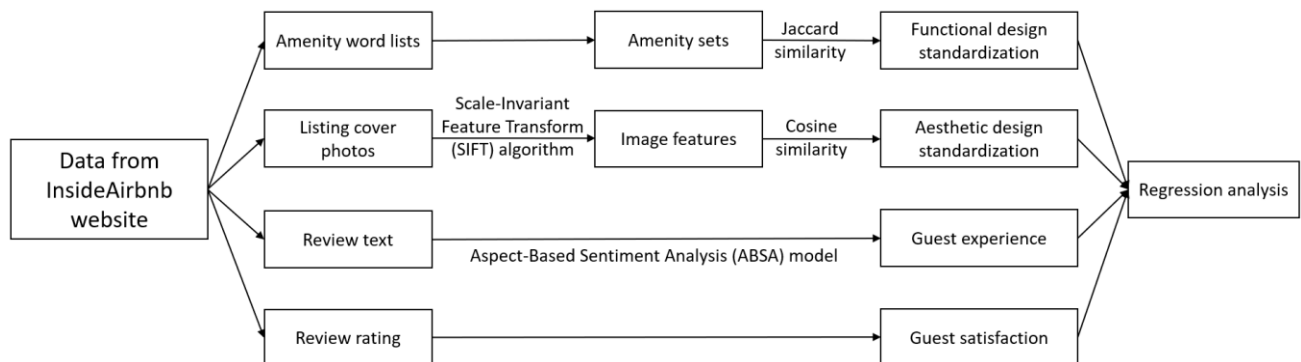


Figure 2: Data analysis process

Functional design refers to the utilitarian elements of a product (Bloch, 1995) and includes a list of amenities such as Wi-Fi, etc. The degree of functional design standardization for multi-unit hosts is measured by comparing the similarity of one listing's amenity set to all other listings managed by the same host. The Jaccard Similarity Score is a commonly applied method to

measure the similarities between sets.  $FunctionalSim_{a,b}$  of two listings  $a$  and  $b$  is defined as the size of the intersection ( $A_a \cap A_b$ ) divided by the size of the union ( $A_a \cup A_b$ ) (see Figure 3). Here,  $A_a$  and  $A_b$  denote the amenity set offered in listing  $a$  and  $b$  respectively.

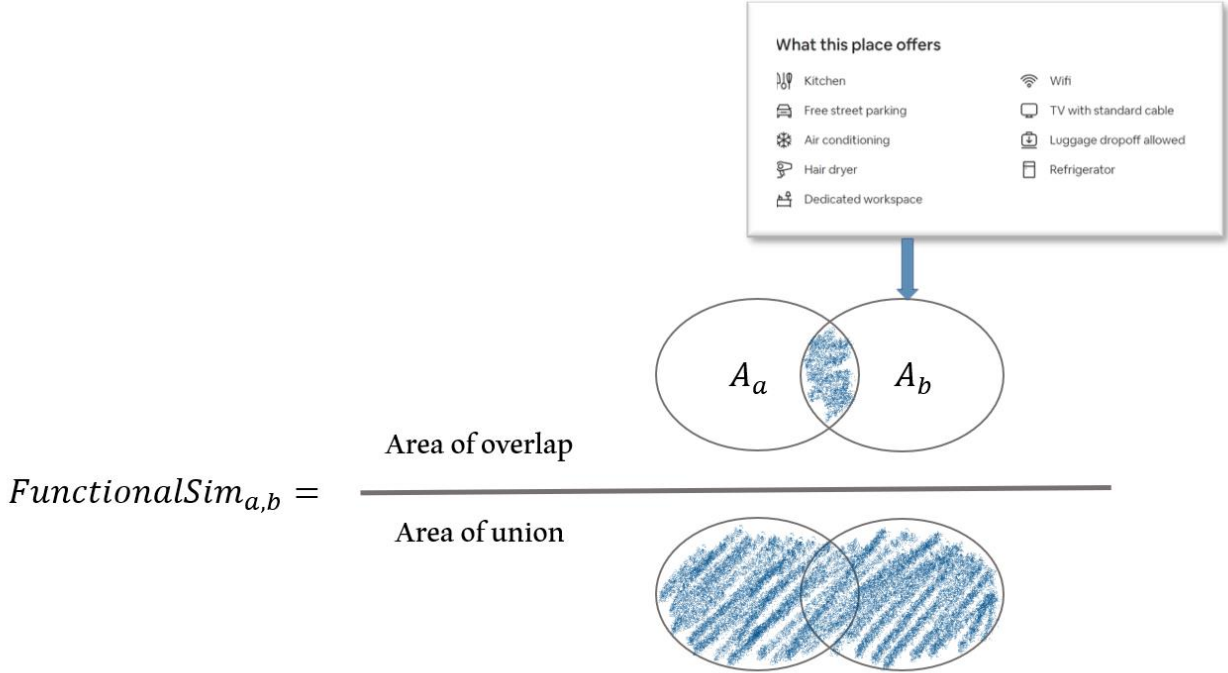


Figure 3: Functional design similarity between listing  $a$  and listing  $b$  calculation

Given  $n$  listings managed by multi-unit host  $h$  in time period  $t$ , an average similarity score is calculated for all listing pairs for each quarter, as shown below:

$$FunctionalStd_{ht} = avg(FunctionalSim_{1,2} + FunctionalSim_{1,3} + \dots + FunctionalSim_{n-1,n})$$

The aesthetic design standardization degree is the similarity of aesthetic design features of listings managed by the same host. We extract image features from listing cover photos with the colored Scale-Invariant Feature Transform (SIFT) algorithm, which analyzes structure features with a high tolerance for changes in scale, rotation, shear, and position (Abdel-Hakim & Farag, 2006; Ke & Sukthankar, 2004). This approach enables us to capture and compare image components between two pictures, although the components' position, angle, and brightness differ. The effectiveness of this algorithm in measuring visual similarity has been validated in previous studies (e.g., Bekhet, Hassaballah, Ahmed, & Ahmed, 2019).

After feature extraction, listing photos are transformed into numerical vectors. Then, cosine similarity is used to assess the input vectors' similarity, where  $AestheticSim_{a,b}$  represents the similarity score between two input photo vectors,  $\vec{P}_a$  and  $\vec{P}_b$  (the cover photos of listing  $a$  and  $b$ ). It is calculated by the following formula:

$$AestheticSim_{a,b} = \frac{\vec{P}_a \cdot \vec{P}_b}{\|\vec{P}_a\| \cdot \|\vec{P}_b\|}$$

At a specific time  $t$ , a multi-unit host  $h$  manages  $n$  listings, each with one cover photo. The average of these similarity scores is calculated quarterly and used as the design standardization degree to indicate how similar the host's listings are, as shown below:

$$AestheticStd_{ht} = avg(AestheticSim_{1,2} + AestheticSim_{1,3} + \dots + AestheticSim_{n-1,n})$$

### 4.3. Assessing guest experience

To capture guest experiences in terms of amenities, host interaction, location, and value for money, we calculate sentiment scores from online reviews using an Aspect-Based Sentiment Analysis (ABSA) model. This text analysis technique categorizes data by predefined aspects (i.e., topic) and identifies the sentiment attributed to each one (Thet, Na, & Khoo, 2010). There are four main steps in aspect-based sentiment analysis: (1) data preprocessing, (2) entity identification, (3) aspect categorization, and (4) sentiment detection.

Following this approach, all non-English reviews and numbers are removed; the remaining words are converted to lower case and were lemmatized, and stop words such as “the” or “a” were removed. Then, we apply a part-of-speech tagger available in a Python library to identify the noun phrases. The algorithm assumes that noun entities contain explicit expressions about specific aspects. Next, we develop a domain-specific aspect dictionary to classify the noun entities into the four aspects relevant to this study, following the method proposed by Lan (2019). To construct this dictionary, we first select seed words in four aspects based on previous Airbnb online review mining studies (Joseph & Varghese, 2019; Tussyadiah & Zach, 2017; Zhang, 2019), then expand the dictionary with synonyms according to the word meaning similarity score obtained from the WordNet database. WordNet is a large lexical database of English language containing 117,000 synsets of words (Miller, 1995). Table 1 lists some example words in this domain-specific dictionary in relation to the four aspects of guest experience.

Table 1: Example terms from the aspect dictionary

Amenity	Host	Location	Value for Money
House	Communication	Area	Price
Room	Check-in	Street	Tips
Apartment	Question	Bay	Money
Bed	Inquiry	Station	Bonus
Kitchen	Care	Walk	Budget
Parking	Response	City	Rental
Bathroom	Welcome	Distance	Extra
Studio	Message	Shop	Cost
Bed	Suggestion	Town	Fee
Shower	Hostess	Downtown	Refund
Bedroom	Owner	Transport	Bill
Unit	Help	Airport	Spending
Backyard	Concern	Train	Cheap

In the final step, we apply TextBlob, a Python sentiment analysis library (Deng, Liu, Dai, & Li, 2019; Zheng, Wu, Law, Qiu, & Wu, 2021), to compute sentence-level sentiment scores. This score serves as the sentiment polarity degree of all aspects appearing in the sentence. The validity of sentiment scores from TextBlob is supported by comparing it to human coding (Kasson, Singh, Huang, Wu, & Cavazos-Rehg, 2021). Following these steps, every online review can belong to multiple aspects, and the corresponding aspect-level sentiment scores are recorded (see example in Figure 4).

The review data is then analyzed for each quarter, whereby we use the timestamp of each review to assign the quarter. We use quarterly batches as monthly data is too sparse, with only about 15% of hosts receiving at least one review within a month. If in one quarter a host receives several reviews, one aspect might appear several times with different sentiment scores; in this circumstance, an average score is calculated to indicate guest evaluation.

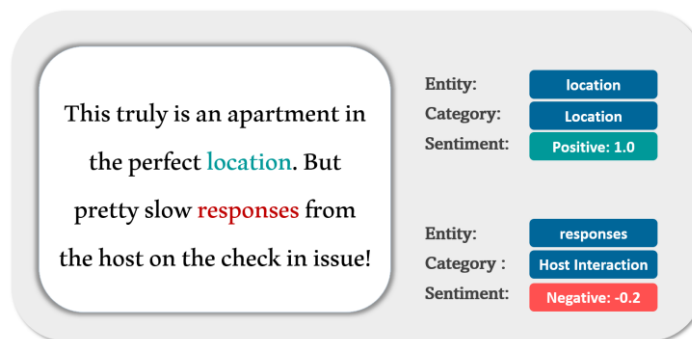


Figure 4: Extracted aspect-level sentiment score using Aspect-Based Sentiment Analysis (ABSA)

#### 4.4. Assessing guest satisfaction

Following many accommodation studies, we utilize the rating score posted with the online review text as the indicator of the guests' overall satisfaction degree (Gu & Ye, 2014; Zhu, Lin,

Zhang, H., Zach, F. J., & Xiang, Z. (2022). Design standardization by Airbnb multi-unit hosts: Professionalization in the Sharing Economy. *Annals of Tourism Research*  
doi: [10.1016/j.annals.2022.103523](https://doi.org/10.1016/j.annals.2022.103523)

& Cheng, 2020). Specifically, we compute the weighted average score for each host quarterly by taking each listing's review volume as weight.

#### 4.5. Control variables

As standardization improves the efficiency of larger operators, we include the number of listings managed by the same host as a control variable. To enhance the validity of our study, we also control for Superhost (a badge awarded by Airbnb for top-performing hosts), days as a host, host response time, host response rate, instant bookability, and review per month as these variables are closely correlated with customer experience and satisfaction (Ju, Back, Choi, & Lee, 2019; Thaichon, Surachartkumtonkun, Singhal, & Alabastro, 2020). It is thought that being a host longer, providing a shorter response time and higher response rate, providing instantly bookable listings, and having more reviews per month are likely to be more professional and launch design standardization strategies. Hence, excluding such factors may cause severe endogeneity problems (Abdallah, Goergen, & O'Sullivan, 2015). Finally, we include dummy variables for quarters and cities to hold constant differences across cities and trends in the visitor markets (Ju et al., 2019).

Table 2 provides a summary of all variables used in this study. We remove observations with functional and aesthetic design standardization scores equal to 1 as preliminary analysis showed that such listings are typically copies of another listing. Indeed, some multi-unit hosts post the same online information, including photos for each listing, even if the listings are different. In this step, 363 observations are excluded.

Table 2: Study variables

Category	Variable	Definition	Scale
Dependent Variable	Guest satisfaction	Guest-posted review score	0 to 100
Independent Variables – design standardization	Functional design standardization	Inter-listing amenity similarity score	0 to 1
	Aesthetic design standardization	Inter-listing cover photo similarity score	-1 to 1
Mediators – guest experience	Amenity experience	Sentiment score of amenity experience	-1 to 1
	Host experience	Sentiment score of host interaction experience	-1 to 1
	Location experience	Sentiment score of location experience	-1 to 1
	Value experience	Sentiment score of value for money experience	-1 to 1
Control Variables	Business size	Number of listings managed by the host	2 to 2028
	Superhost	Whether the host has a Superhost badge	0/1
	Days as a host	Number of days since becoming a host	
	Response time	Speed of response to guests' inquiries, with values of 1 = within an hour; 2 = within a few hours; 3 = within a day; 4 = a few days or more	
	Response rate	The rate of new inquiries and reservation requests a host responded to	0 to 100
	Instant bookability	Whether the listings can be booked instantly	0/1
	Reviews per month	Number of reviews a host received per month	

Table 3 displays details of Airbnb business sizes. Among all multi-unit hosts, nearly 77% of

them manage five or fewer listings. All data is analyzed by quarter, so we have six quarters in total, namely 2018 quarter 3 through 2019 quarter 4. The number of host observations in each quarter is shown in Table 4. There are 73,888 host-quarter observations in total.

Table 3: Business sizes in the Airbnb context

Business size	2	3	4	5	>5
No. of hosts	28,210	15,188	8,447	4,915	17,121
Percentage of hosts	38.18%	20.56%	11.43%	6.65%	23.17%

Table 4: Number of multi-unit hosts per quarter

2018 Q3	2018 Q4	2019 Q1	2019 Q2	2019 Q3	2019 Q4
11,816	9,565	10,570	14,885	14,592	12,460

#### 4.6. Regression analysis

The relationships between standardization, guest experience, and satisfaction are analyzed using seemingly unrelated regression (SUR). There are three reasons for selecting this approach: First, the seemingly unrelated regression model can estimate multiple equations simultaneously, which enables a comparison of the strength of different standardization impacts on different experience dimensions (Davidson & MacKinnon, 1993). Second, the seemingly unrelated regression model can avoid the estimation bias caused by the correlation between equation error terms (Shen, Hu, & Ulmer, 2015). This is necessary to prevent the issue of omitted variables affecting guest experience and satisfaction at the same time. Third, the validity of seemingly unrelated regression has been tested on big, unbalanced panel data in previous studies (Shen et al., 2015). We do not adopt a structural equation model (SEM), although it seems to fit the multi-stage nature for the following reasons: (1) structural equation model requires variables to be latent while we have directly observed variables; and (2) seemingly unrelated regression provides a better fit for hierarchical regression by addressing error correlation issues (Ki, Lee, & Kim, 2017).

The Seemingly Unrelated Regression (SUR) model contains a set of individual equations listed below:

$$\begin{aligned}
 AE &= \beta_0 + \beta_1 FDS + \beta_2 ADS + \beta_3 Controls + \beta_4 TimeDummy + \beta_5 CityDummy + \varepsilon \\
 HE &= \beta_0 + \beta_1 FDS + \beta_2 ADS + \beta_3 Controls + \beta_4 TimeDummy + \beta_5 CityDummy + \varepsilon \\
 LE &= \beta_0 + \beta_1 FDS + \beta_2 ADS + \beta_3 Controls + \beta_4 TimeDummy + \beta_5 CityDummy + \varepsilon \\
 VE &= \beta_0 + \beta_1 FDS + \beta_2 ADS + \beta_3 Controls + \beta_4 TimeDummy + \beta_5 CityDummy + \varepsilon \\
 GS &= \beta_0 + \beta_1 FDS + \beta_2 ADS + \beta_3 AE + \beta_4 HE + \beta_5 LE + \beta_6 VE + \beta_7 Controls + \beta_8 TimeDummy + \\
 &\quad \beta_9 CityDummy + \varepsilon
 \end{aligned}$$

Note: *AE* = Amenity Experience, *HE* = Host Experience, *LE* = Location Experience, *VE* = Value Experience, *FDS* = Functional Design Standardization, *ADS* = Aesthetic Design Standardization, *GS* = Guest Satisfaction, *Controls* = control variables, *TimeDummy* = Quarters, *CityDummy* = Cities,  $\beta$  = coefficients for independent variables,  $\varepsilon$  = error term.

## 5. RESULTS

### 5.1. Trend of design standardization by multi-unit hosts

Our first research question addresses the extent to which standardizing design has taken place among Airbnb hosts. Figure 5 depicts the changes in US multi-unit hosts' design standardization degree for the study period indexed to July 2018. We index the scores as the two degrees are measured on different scales: functional from 0 to 1 and aesthetic from -1 to 1. It shows a steady increase in the functional standardization degree throughout the study period, with an overall increase of nearly 8%. The aesthetic standardization degree offers more fluctuation and a sharp increase starting with August 2019. Overall, it increases by 5.5%. This chart indicates that multi-unit hosts increase standardization of their listings during the study period, wherein functional design standardization is more pronounced.

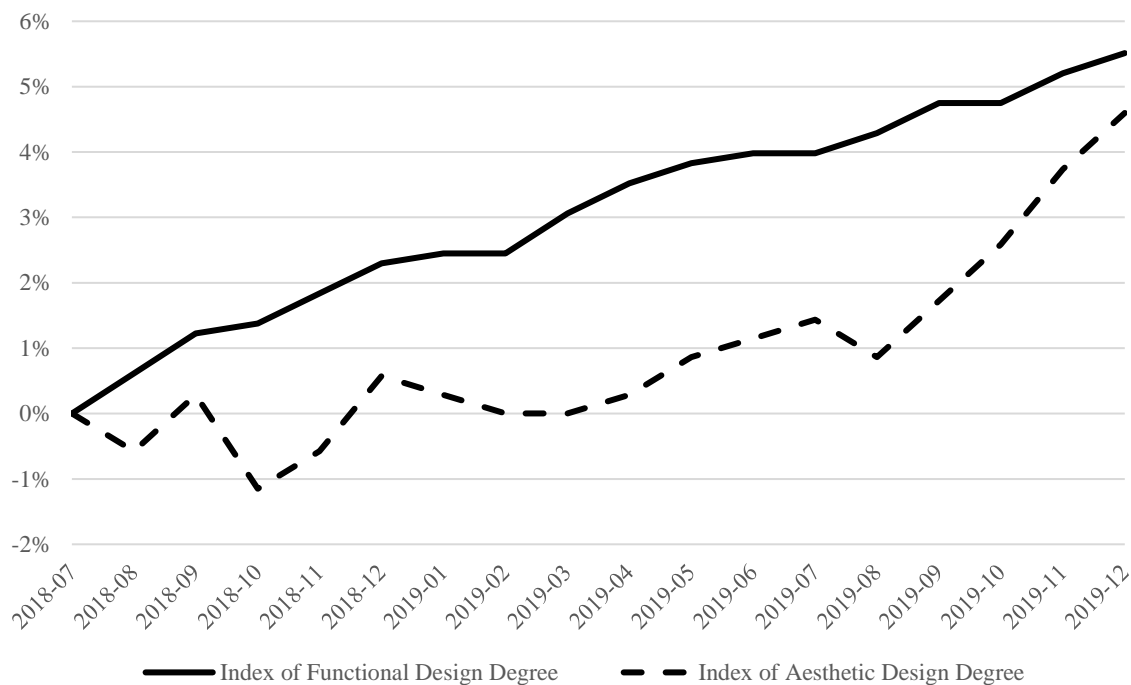


Figure 5: Monthly index of design scores pegged to July 2018 scores. Scores are indexed as they operate on different scales; functional design (0 to 1), aesthetic design (-1 to 1)

### 5.2. Hypothesis testing

Table 5 displays the summary statistics of the variables for the final 73,888 observations used in the regression analysis. The correlation table is in the appendix (Table S1). Guest satisfaction has a high mean value and a low standard deviation. The standard deviation scores for the four guest experiences (amenity, host, location, and value) are also low. It means that even a slight improvement of experience or satisfaction, for example through standardization, is gratifying.

The Breusch-Pagan test is conducted to assess the robustness of the results. It tests the correlation between residuals of separate equations. The result ( $\text{Chi}^2 = 10252.32$ ,  $p = 0.000$ ) indicates the advantage of seemingly unrelated regression (SUR) model over running the regression equations separately (Breusch & Pagan, 1980; Peremans & Van Aelst, 2018).

Table 5: Summary statistics (N=73,888)

	Mean	Std. Dev.	Min	Max
Guest satisfaction	94.84	4.27	20	100
Functional design standardization	0.69	0.17	0	1
Aesthetic design standardization	0.32	0.31	-0.69	1
Amenity experience	0.33	0.11	-1	1
Host experience	0.36	0.14	-0.96	1
Location experience	0.37	0.13	-0.90	1
Value experience	0.18	0.16	-1	1
Business size	7.51	37.26	2	2028
Superhost	0.50	0.50	0	1
Days as a host	2,319.80	801.13	708	4,877
Response time	1.15	0.43	1	4
Response rate	98.33	5.33	4	100
Instant bookability	0.58	0.44	0	1
Reviews per month	3.03	2.04	0.03	45.08

Our second research question asks how design standardization affects guest satisfaction and is assessed using 73,888 host-quarter observations, i.e., observations for all hosts in quarterly data. Given the different measurement scales of the variables, we standardize all variables for further regression to avoid bias. Table 6 shows a summary of the results of the mediation tests calculated using the seemingly unrelated regression model. We first estimate a baseline regression model on the dependent variable guest satisfaction, which includes only control variables resulting in an  $R^2$  value of 0.341 (see Table 6). Then, to examine mediation effects, we regress guest satisfaction on two design standardization dimensions. A slight increase in model fit is observed ( $R^2 = 0.342$ ). The significant coefficients of functional and aesthetic design standardization ground for further mediation tests. We also regress guest satisfaction on the four experience aspects. Amenity, host, and value-for-money experiences are validated to influence guest satisfaction significantly.

In the full model, seemingly unrelated regression estimates all equations simultaneously, resulting in an  $R^2$  of 0.417 for guest satisfaction, which is the highest among all models. The highest  $\text{Chi}^2$  value also indicates that adding standardization scores and host experience aspects results in a better model fit. The first four columns of the full model indicate how design standardization affects guest experience dimensions. The last column displays the determining impacts on guest satisfaction and, thus, identifies both the direct and indirect effects of functional and aesthetic design standardization on guest satisfaction.

The estimates for the four experience aspects have lower  $R^2$  values, ranging from 0.040 to 0.113. This is because it is difficult to predict online review sentiment scores with limited listing information.

The results show that both functional design standardization ( $b = 0.007$ ,  $p = 0.04$ ) and aesthetic design standardization ( $b = 0.021$ ,  $p < 0.000$ ) positively impact amenity experience. Next, functional and aesthetic design standardization appears to impact host interaction and value for money experience differently, wherein aesthetic design standardization has a positive effect on

host experience (b=0.029, p<0.000) and value experience (b=0.020, p<0.000). In contrast, functional design standardization has a negative effect on host experience (b=-0.025, p<0.000) and value experience (b=-0.037, p<0.000). Function design standardization affects location experience negatively (b = -0.007, p = 0.04), while aesthetic design standardization has an insignificant coefficient. Thus, based on these findings, our hypotheses 1a and 1b are supported.

Both functional and aesthetic design standardization have significant positive coefficients, i.e., 0.017 (p<0.000) and 0.021 (p<0.000) with guest satisfaction, indicating that these two standardization dimensions directly impact guest satisfaction which cannot be explained by experience. Hence, hypotheses 2a and 2b are supported. Finally, the results indicate that three experience dimensions, amenity, host, and value for money, significantly affect guest satisfaction. Thus, hypothesis 3 is also supported.

The analysis also shows that some control variables, such as business size, Superhost, and reviews per month, are significantly correlated with all aspects of customer experience and guest satisfaction. In particular, business size has a negative impact on guest satisfaction and three experience dimensions: amenity, host interaction, and value for money, but a positive impact on location experience. Days as a host influence all experience dimensions. Two host response dimensions significantly affect overall satisfaction. Host response time closely relates to amenity and value for money experiences, while host response rate impacts experience dimensions except for value for money. At the same time, instant bookability affects amenity, host, value-for-money experiences, and overall satisfaction. According to the quarter dummy variable results, it appears that guest experience and satisfaction significantly change by season.

Table 6: Seemingly unrelated regression results

Dependent variable>>>	Baseline model			Full model				
	Guest satisfaction			Amenity experience	Host experience	Location experience	Value experience	Guest satisfaction
Functional design standardization		0.016***		0.007*	-0.025***	-0.007*	-0.037***	0.017***
Aesthetic design standardization		0.029***		0.021***	0.029***	0.002	0.020***	0.021***
Amenity experience			0.224***					0.223***
Host experience			0.145***					0.145***
Location experience			-0.004					-0.003
Value experience			-0.038***					-0.038***
<b>Control variables</b>								
Business size	-0.027***	-0.028***	-0.015***	-0.009**	-0.079***	0.014***	-0.043***	-0.016***
Superhost	0.495***	0.494***	0.417***	0.220***	0.177***	0.050***	-0.091***	0.416***
Days as a host	0.013***	0.018***	0.001	0.023***	0.041***	0.076***	-0.037***	0.005

Response time	0.018***	0.018***	0.023***	-0.016***	-0.006	0.004	0.023***	0.023***
Response rate	0.095***	0.094***	0.077***	0.039***	0.063***	-0.009*	-0.004	0.076***
Instant bookability	-0.077***	-0.078***	-0.066***	-0.022***	-0.049***	0.002	-0.008*	-0.066***
Review per month	0.043***	0.043***	0.006*	0.096***	0.147***	0.137***	0.139***	0.006
Quarter 1 (2018 Q3)	0.029***	0.030***	0.010**	0.043***	0.070***	-0.001	0.016***	0.011**
Quarter 2 (2018 Q4)	0.022***	0.023***	0.016***	0.014**	0.032***	0.006	0.023***	0.016***
Quarter 3 (2019 Q1)	0.027***	0.027***	0.018***	0.021***	0.038***	0.012**	0.026***	0.018***
Quarter 4 (2019 Q2)	0.036***	0.037***	0.019***	0.046***	0.051***	0.028***	0.010*	0.020***
Quarter 5 (2019 Q3)	0.012**	0.012**	-0.000	0.032***	0.030***	0.009	-0.008	0.000
Quarter 6 (2019 Q4)	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted
<b>Intercept</b>	0.228***	0.229***	0.183***	0.231***	-0.038	0.101**	0.011	0.184***
<b>Observations</b>	73,888	73,888	73,888	73,888	73,888	73,888	73,888	73,888
<b>R<sup>2</sup></b>	0.341	0.342	0.416	0.113	0.103	0.066	0.040	0.417
<b>Adjusted R<sup>2</sup></b>	0.340	0.341	0.416	0.112	0.102	0.066	0.040	0.417
<b>Chi<sup>2</sup></b>	38150.39***	38356.68**	52649.81***	9378.81***	8475.06***	5244.26***	3098.05***	52822.16***

Note: \* p<0.05, \*\*p<0.01, \*\*\*p<0.001; City dummies are excluded in the result table.

## 6. DISCUSSION

This study explores the effectiveness of design standardization as a strategy in the short-term rental market and contributes to the literature on design and standardization. The tourism design literature mainly focuses on either macro-level design by treating the destination or guest experience as a whole or micro-level design regarding the efficacy of specific elements. Little attention has been paid to the strategic view of implementing different design components and to the effectiveness of standardization due to the tension between efficiency and flexibility. As such, this study examines the impact of standardizing functional and aesthetic design on guest satisfaction and multiple experience aspects within the context of micro providers and heterogeneous demands.

First, our findings on how business size affects customer experience and satisfaction align with previous studies (Bulchand-Gidumal et al., 2019; Xie & Mao, 2017). A larger number of listings managed by a single host will likely result in inferior service quality and hence lower guest evaluation. One exception is the positive impact of business size on guest location experience. One potential reason is that a host who has more listings is more experienced in location strategy, which is consistent with existing literature (Xie & Mao, 2019). Given the quality problem coming with the growing business size, our findings of functional and aesthetic design standardization are in line with our expectations. Overall, two dimensions of standardization positively affect guest satisfaction (hypotheses 1a and 1b) and are consistent with previous literature (Anderson et al., 1997; Kasiri et al., 2017). The benefits of this hotel-like feature also reinforce the idea that Airbnb is more professional and posing threats to the industry incumbents’

performance, market value, and competing strategies (Bianco, Zach, & Singal, 2022; Chang & Sokol, 2022; Yang, Nieto García, Viglia, & Nicolau, 2022; Zach, Nicolau, & Sharma, 2020). The findings also indicate that aesthetic design standardization significantly influences guest experience (hypotheses 2a and 2b). However, the impact of functional design standardization varies with different experience aspects: it affects amenity experience positively but influences host and value experience negatively. The positive effect on the amenity experience might stem from customers' tendency to have low expectations for short-term rental amenities due to a lack of common standards (Yu et al., 2020). Standardization likely improves efficiency; as such, for hosts including the same amenities in all listings, it is easier to manage and maintain them than for hosts with differing amenities across their listings. Therefore, listings managed by the host engaging in standardization exceed customer general expectations and receive positive feedback.

A possible explanation for why functional design standardization negatively impacts host experience is that the standardized workflow along with standardized functional design may harm the authenticity of interaction. The reason for the negative relationship between functional standardization and location experience could be that if a host wants to keep the consistency of some specific amenities, like free parking, he/she may need to sacrifice other benefits, like convenience or neighborhood environment. The relationship between functional design standardization and value for money is also negative. Guests' value perception depends on the comparison between quality and actual price. Even though guests who consumed functionally standardized listings have higher overall satisfaction and better amenity experiences, the price of such a listing might be higher. As suggested in previous studies, hosts with higher guest satisfaction ratings tend to charge higher prices (Gutt & Herrmann, 2015). An alternative explanation is that the general short-term rental business size is too small to reach cost efficiency because the impact of increasing standardization on cost-effectiveness is mixed (Kekre & Srinivasan, 1990).

The results of this study also indicate that aesthetic design standardization positively impacts all experience aspects except location. This finding suggests that an increase in visual quality can improve customers' judgments of all aspects due to the halo effect (Nisbett & Wilson, 1977). Finally, the relationships between the aesthetic design standardization dimensions and location experience are insignificant. This is reasonable as determinants of location experience such as accessibility, neighborhood, and transportation options are independent of listing interior design style. We also validate that guest experience aspects are strong predictors of satisfaction (hypothesis 3).

This study provides theoretical, methodological, and empirical contributions to design research from a strategy perspective. In particular, this study adds to the tourism design literature by introducing discussions of physical place design in the context of host-level strategy, i.e., standardization. While previous studies investigate decision processes and outcomes of choices for specific design elements, our study demonstrates that keeping design choices consistent across multiple listings also affects guest experience. This study starts the conversation of design standardization in the short-term rental context. Future studies should extend this work by answering how design standardization evolves with the platform lifecycle, what factors drive hosts to pursue standardization strategies, and how design standardization influences monetary outcomes.

We also add nuances to this understanding of guest experiences by assessing the degree of standardization along two design dimensions: functional and aesthetic. The positive and negative impacts of standardization on guest experiences document the relative importance of functional and aesthetic design regarding guest experience and satisfaction and, importantly, demonstrate that standardization has both benefits and shortcomings. The results also question the benefits of standardization stemming from economies of scale, which is widely acknowledged in traditional industries. How design standardization effectiveness changes with host business size deserve further examination.

Methodologically, this study contributes to the literature by introducing a new way to operationalize aesthetic design standardization with machine learning techniques. These techniques can be further applied to broader topics involving rich visual content in hospitality and tourism contexts. A managerial implication of our findings is that short-term rental hosts may need to consider the trade-offs between standardizing functional and aesthetic design to improve efficiency. These investments are often costly and require consideration of the tension between efficiency and flexibility with the goal of improving guest satisfaction. However, our findings suggest that it is better to standardize both functional and aesthetic design if most customers complain about amenities. On the other hand, standardizing only aesthetic design is a better choice to improve host interaction and value experience.

## **7. CONCLUSIONS, LIMITATIONS, AND FUTURE RESEARCH**

This study examines the effect of design standardization on guest experiences and guest satisfaction within the short-term rental context. It contributes to tourism literature by documenting the relationships of standardization strategy in two types of physical design and various aspects of guest experience using a theory-driven, analytically based approach. Our study has some limitations that should be addressed in future research. In particular, our study captures only observable features based on the secondary data obtained from [insideairbnb.com](https://www.insideairbnb.com). However, given the complex nature of tourism design which comprises a broader range of components, future research could examine how standardizing other features, such as ambiance and technology application, influences guest experience and satisfaction.

Our study focuses on three key constructs, design standardization, guest experience, and satisfaction. We recommend future work to investigate additional concepts such as relative standardization level of competitors and contextual factors to enrich the understanding of design standardization strategies. Additionally, while this study measures the similarity among the listings managed by the same host, future research should evaluate the design similarity across multiple hosts in the same geographical area. Such an inter-host similarity can be considered an imitation operation, which can influence both focal and rival firms. Indeed, there is a copycat tendency in many business sectors, including travel, for example, among ski resorts (Zach, Schnitzer, & Falk, 2021). Further research may consider using inter-host similarity and other measures to identify the role of imitation in shaping competitive dynamics and innovation strategies in the short-term rental market. Last, we encourage further work to validate these relationships in more diverse settings and contexts like hotels, restaurants, or other sectors beyond tourism.

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