Residents’ Sustainable City Evaluation, Satisfaction and Loyalty: Integrating Importance-Performance Analysis and Structural Equation Modelling

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Abstract: There has been an increase in research on sustainable urban development, especially in recent years, and importance-performance analysis (IPA) is one of the popular methods applied in sustainable development research. However, few have integrated IPA with structural equation modelling (SEM). This study developed and tested an integrated IPA and SEM approach to measuring the effects of the perceived importance of sustainable city dimensions and the perceived performance of a city on resident satisfaction and loyalty. A total of 388 survey responses were collected from the residents of Shanghai and analyzed using the integrated IPA-SEM approach. The results show that resident satisfaction mediates the relationship between overall perceived performance and resident loyalty, while the relationship between overall perceived importance and resident loyalty is mediated by both overall perceived performance and resident satisfaction. The findings from the SEM are in line with the IPA’s concept in that, to ensure resident satisfaction and loyalty, the quadrant that requires the most attention is Q1, while Q2 stands as the target quadrant. Implications and future research directions are proposed based on the findings.

Keywords: sustainable development; sustainable city evaluation; resident satisfaction; resident loyalty; sustainable city indicators; urban sustainability; importance-performance analysis (IPA); structural equation modelling (SEM); integrated approach

1. Introduction

The subject of sustainable urban development or sustainable city has been increasingly studied in recent years [1,2]. Many countries face challenges brought about by the rising urban populations due to urbanization, as more than half of the world’s population is reported to be currently residing in cities, and it is projected that 68% of the population will live in the cities by 2050 [3]. There are issues in accommodating the needs of urban residents such as housing, public infrastructure, clean environment, safety, employment, and other basic needs for comfortable living in a city with limited resources [3]. Therefore, sustainable urban development research is becoming more and more crucial nowadays in order to facilitate the sustainable growth of cities, ideally through integrated and balanced development in the cities’ economic, social, environmental, and cultural dimensions.

Sustainable development, as defined by the United Nations (UN), is “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” [4]. A sustainable city is one that “enables all its citizens to meet their own needs and to enhance their well-being, without degrading the natural world or the lives of other people, now or in the future” [5]. The UN developed the 2030 Agenda for Sustainable Development in 2015, which comprises 17 Sustainable Development Goals (SDGs) to guide nations in developing policies and action plans for sustainable development, including for cities [6]. The theme of the ninth World Urban Forum, “Cities 2030, Cities for All”, signals the promotion of sustainable and inclusive development of cities.
achievable by the year 2030 [7]. In other words, cities should be sustainable economically, socially, and environmentally for the equal benefit and wellbeing of all present and future residents. Efforts to assist countries examine and monitor their urban development progress would help to ensure the sustainable growth of cities toward the achievement of the goals [7,8].

Importance-performance analysis (IPA), an analytical technique for assessing the importance and performance of attributes, has been applied in numerous urban development studies [9–14]. The use of IPA allows multiple sustainable city attributes to be measured on the importance and performance scales, such as the attributes of urban green space [13], transport innovation sustainability [12], tourism destination sustainability [10], and so on, making it a suitable method for adoption in research involving sustainable development indicators. IPA is a useful method for identifying the development areas that require the most (and the least) attention for optimized development initiatives. Results from the IPA could help the authorities to make overall, balanced development plans to achieve sustainability. Nevertheless, the analysis’ measurements by way of using four importance and performance quadrants may not be sufficient or accurate enough to demonstrate the development situations of an entity such as a city, which oftentimes could be more complicated than that. Therefore, urban researchers have combined IPA with other methods to increase the quality of their findings, such as with analytic hierarchy performance (AHP) [11,12,14], structural equation modelling (SEM) [10,15], correspondence analysis [16], and so on. While Deng and Pierskalla [10] studied the impacts of IPA quadrants on tourist satisfaction and loyalty using SEM, none have integrated IPA and SEM to study the relationships between perceived importance, perceived performance, resident satisfaction, and resident loyalty.

This research examines residents’ evaluation of a city with regard to the sustainable development dimensions as well as their satisfaction and loyalty toward the city. The objective of this study was to develop and test an integrated IPA and SEM approach to measuring the effects of perceived importance of sustainable urban development dimensions and perceived performance of a city on resident satisfaction and loyalty. Survey data were collected from 388 residents of Shanghai and analyzed using the integrated IPA-SEM approach. Implications and recommendations for urban development are provided based on the findings.

2. Literature Review
2.1. Residents’ Sustainable City Evaluation

Extant research on sustainable urban development has found numerous measures for assessing urban sustainability based on various attributes of cities, such as public transportation, safety, pollution, green spaces, employment, and more [17–22]. Multiple studies have examined the sustainability of cities using subjective indicators involving the residents’ evaluations of the cities’ sustainable development attributes [17,22–25]. While objective indicators such as employment rate, average income, green space provision, air quality index, and others, could provide insights into the sustainability of cities from the angle of national statistics, they may not accurately explain or signify the people’s perceptions about the cities. Urban residents’ firsthand accounts of the cities they live in are important for decision making in urban development matters [17,26]. For example, the European Commission conducts the Eurobarometer survey on quality of life among residents of European cities every three years to investigate the residents’ views and satisfactions with the cities for development purposes [27]. In Asia for instance, the Chinese and Malaysian governments uphold the principle of putting people first in their urban development pursuits [28,29].

Economic development itself may be a sign of urban prosperity, but social and environmental issues that often rise along with urban growth, such as housing affordability, pollution, and traffic congestion, among others, could deteriorate the residents’ quality of life [3,14,22]. Therefore, it is important to gauge the urban residents’ holistic views of their city of residence in order to ensure that their wellbeing and satisfaction are met. Economic
factors such as cost of living, income, and employment opportunities are vital indicators of urban residents’ economic wellbeing [19,22,30]. Social attributes such as safety and security of residents, transportation, health facilities, and other public infrastructure are also necessary aspects of urban development [17,21,23]. Environmental qualities pertaining to air, water, noise, and land in the city could also determine the wellbeing of the urban residents [14,19,27]. Last but not least, cultural aspects such as cultural heritage preservation and cultural facilities could have impact on the urban residents as well [17,18,22]. This study examined Shanghai residents’ perceived importance and perceived performance of the city based on the four dimensions of sustainable city attributes, i.e., economic, social, environmental, and cultural, as well as the residents’ satisfaction and loyalty toward the city.

2.2. Resident Satisfaction

As customer satisfaction is a customer’s assessment of a consumed product or service [31], resident satisfaction can be defined as a resident’s evaluation of his/her residential community or place. An urban resident would be satisfied if the performance of his/her city of residence met or surpassed his/her expectations and dissatisfied if otherwise, similar to the response of the regular consumers of products and services [32]. A city’s competitive or distinctive advantages that set it apart from other places could also determine the residents’ satisfaction [32,33]. Extant urban studies have identified factors that could affect resident satisfaction, e.g., safety, housing, public transport, and educational facilities [22]; population density, aesthetic quality, public spaces, and neighborhood attachment [24]; and job opportunities, urban diversity, natural environment, and cost of living [33]. In view of the increasing challenges faced by cities nowadays due to rapid urbanization [2,3], a city’s good performance in sustainable development could help to distinguish it from others in the minds of the people by way of promotions of the sustainability of the city and the wellbeing of the residents. In this study, urban attributes are investigated in a reflective model to represent the respective sustainable development dimensions they belong to. For example, factors related to urban green spaces and pollution constitute the environmental dimension while factors regarding cost of living and economic opportunities make up the economic dimension. It is assumed here that the perceived performance of a city in terms of its sustainable city attributes could impact the residents’ quality of life and eventually their satisfaction with the city. Therefore, the following hypothesis was developed:

**Hypothesis 1 (H1).** Perceived performance in sustainable city attributes has a positive relationship with resident satisfaction.

IPA is a tool used to gauge the extent to which a product/service’s performance meets the expectations of its users or consumers [13]. In the context of this study, residents’ perceived importance of sustainable city attributes denotes their expectations from their city of residence in terms of its performance in those attributes. Based on expectation confirmation theory, performance that fails to meet or exceed expectations can lead to disconfirmation of beliefs, which causes dissatisfaction [34–36]; thus, the higher the residents’ expectations, the harder it would be for the expectations to be met in order to satisfy the residents. While perceived importance itself may not have a direct relationship with satisfaction, perceived performance could mediate the effect of expectations on satisfaction [34–37] in the sense that if the urban residents perceived a particular attribute as being important, and at the same time the city performed well in that attribute to fulfill the residents’ expectations, the residents would be satisfied. On the other hand, perceived performance in a particular attribute could have little impact on satisfaction if perceived importance of that attribute is low [10]. Hence, it is hypothesized that:

**Hypothesis 2 (H2).** Perceived performance mediates the relationship between perceived importance of sustainable city attributes and resident satisfaction.
2.3. Resident Loyalty

A person’s loyalty toward a brand or a company may be manifested in terms of his/her preference for the brand over others, intention to continue buying the brand, and willingness to recommend the brand to others [38,39]. In this study, resident loyalty refers to the urban residents’ loyalty intention toward their city of residence, measurable by their intention to recommend the city and intention to stay in the city. Zenker and Petersen [40] proposed residents’ intention to stay and positive word-of-mouth intention as positive place behavior that is an outcome of favorable experiences with the city they live in. Residents’ willingness to recommend their city and to encourage others to visit the city signify support and loyalty to the city [25]. In line with the social exchange theory by Homans [41], residents’ behavioral intentions are a form of exchange with the perceived benefits that the city provides versus costs. For example, if an urban resident perceived an uncontrolled, high level of congestion in a city due to over-tourism or high population density, this would constitute a perceived cost or negative impact [18], a factor that could reduce the resident’s loyalty toward the city.

Customer satisfaction has often been found to be positively related to loyalty [38,39]. Satisfaction with a place usually has a positive influence on loyalty, i.e., intentions to recommend and revisit or stay at the place [10,25,42,43]. While previous studies on resident loyalty have mostly investigated factors related to place attachment among residents [25,40,42], none have examined the effects of residents’ perceptions in the context of sustainable urban development on resident loyalty, with satisfaction as the mediator. As satisfaction with a place has been found to have mediating effects between perceptions of the place and loyalty toward the place [21,40,43], it is assumed here that perceptions of problems with the economic, social, environmental, and cultural attributes of a city would lead to the dissatisfaction of residents and subsequently to a decrease in resident loyalty. By understanding the residents’ points of view, a city can be improved to cater to the residents better and be sustainable in the long run. The hypotheses below were formulated accordingly:

Hypothesis 3a (H3a). Resident satisfaction has a positive relationship with resident loyalty.

Hypothesis 3b (H3b). Resident satisfaction mediates the relationship between perceived performance and resident loyalty.

Hypothesis 3c (H3c). Resident satisfaction mediates the relationship between perceived importance and resident loyalty.

3. Methods

3.1. Development of Survey Instrument

The questionnaire for this study was built using relevant measurement items adopted from previous literature. Items for the sustainable development attributes were adapted from Afacan [17], Andereck and Nyaupane [18], Lee and Xue [21], Senlier et al. [22], European Commission [27], and van Kamp et al. [30], and arranged according to economic, social, environmental, and cultural dimensions. Respondents were asked to rate the importance of the sustainable city attributes on an importance scale from 1 = not at all important to 5 = extremely important, as well as to rate the performance of Shanghai in terms of the attributes on a scale of 1 = poor to 5 = excellent. Items for resident satisfaction and loyalty were adapted from Zenker et al. [33] and Zeithaml et al. [39], respectively. Both resident satisfaction and loyalty were measured using a 5-point scale from 1 = strongly disagree to 5 = strongly agree.

The draft questionnaire was reviewed by a few experts in the field and some revisions were made following their feedback. A pilot study was performed on the residents to investigate the reliability of the measures. A sample size of 30 for the pilot study was computed using a 95% confidence level with a 0.90 probability of problems not appearing
in the study [44]. Since the accuracy of greatest lower bound to reliability (GLB) surpassed Cronbach’s alpha [45], GLB was calculated on the data collected from the pilot study using R, and an outcome of 0.92 implied that the measurement set was reliable.

The questionnaire, which was prepared in English, was translated into the Chinese language to form a second version to suit the local Chinese respondents. The translated questionnaire was then back translated into English and compared with the original version for accuracy checks. Two different bilingual translators worked on the forward and back translations respectively to ensure translation quality. A pre-test of the questionnaire was performed on several Chinese nationals to confirm its face validity.

3.2. Survey Area

Shanghai, a megacity located on the east coast of China, was selected for this study. It is one of the four provincial-level municipalities in the country that are directly administered by the central government, the State Council of China. Shanghai covers a total area of 6340.5 km² divided into 16 districts [46] that constitute four types of areas: central urban area, semi urban-suburban area, suburb, and remote suburb. With a population of 25.58 million, Shanghai is the most populated city in China and the third largest city by population in the world [47]. As mentioned earlier, many cities worldwide face issues in accommodating the needs of their residents due to rising urban populations against resource limitations. Thus, it is especially important for a large and growing city like Shanghai to ensure its sustainability in order to be able to meet the needs of both the present and the future residents as urbanization persists.

Formerly a small fishing village by the Huangpu River, Shanghai has grown over the years into a modern metropolis today. The city has been the center for economic development in China since becoming a port city post-Opium War during the 19th century [48], and its gross domestic product has been increasing year after year for the past few decades [46]. Even though Shanghai is performing well economically, research has found that the city has not fared equally well in other aspects of development, particularly the environmental dimension [21,48,49], which could pose threats to the residents’ wellbeing. A sustainable entity should have balanced growth in all development dimensions. Therefore, assessments of the sustainability performance of Shanghai are needed to facilitate the city’s policy planning and actions toward becoming a sustainable city.

3.3. Data Collection and Analysis

A cluster sampling approach was employed to distribute the survey randomly to clusters of residents in Shanghai identified based on the city’s areas and districts to ensure that residents of all districts were included in the survey and that the cluster sizes were proportionate to the centralities of the urban areas from the city center to remote suburb. The minimum sample size was determined using a 95% confidence interval with 50% estimated variance and 5% margin of error, which was 385. Due to the occurrence of the COVID-19 pandemic during the research process, the survey of this study had to be distributed online. About 770 online questionnaires were administered by the authors to the residents through two of the most popular social networking and instant messaging sites in China, WeChat and QQ, from 26 January to 12 February 2021. A total of 388 completed forms were received and a 50.4% response rate was achieved.

Exploratory factor analysis (EFA) of the importance scores was conducted using principal component analysis with promax rotation using SPSS Statistics. Promax is an oblique rotation that permits factors to be correlated [50]. Confirmatory factor analysis (CFA) was performed on SPSS Amos to test the fit of the measurement and structural models of the research, while the structural relationships of the variables were established using SEM. The bootstrapping technique in Amos, including user-defined estimands, was employed to determine the significance of the mediating effects.

An IPA grid was formulated using the means of the importance and performance scores of the attributes measured. The grand means of the respective scores were set as
crosshairs in the grid, following which four quadrants were developed, with Q1 (“concentrate here”) being the high-importance and low-performance quadrant, Q2 (“keep up the good work”) being the high-importance and high-performance quadrant, Q3 (“low priority”) being the low-importance and low-performance quadrant, and Q4 (“possible overkill”) being the low-importance and high-performance quadrant.

4. Results

Regarding the respondents’ demographics, 52.6% of them were females and 47.4% were males. About their age groups, 33.5% were between 20 and 29 years old, 32.2% were between 40 and 59, 23.7% were between 30 and 39, 5.9% were 60 years old and above, while 4.6% were below 20. A majority had attained a bachelor’s degree (47.9%), followed by a master’s degree (32.7%), and a diploma (10.3%). Chinese nationals made up 68.3% of the respondents while 31.7% were non-Chinese nationals. Almost half of them (46.7%) had lived in Shanghai for more than 10 years. The respondents included residents from all 16 districts in the city with 43.3% of them being in central urban area.

Table 1 shows that the most important sustainable city dimension as perceived by the respondents was the environmental dimension (M = 4.35), followed by the social dimension (M = 4.27) and the economic dimension (M = 4.26). In contrast, the residents did not find the cultural dimension that important (M = 3.75). Pertaining to Shanghai’s performance in the minds of the residents, the city performed the best in the social dimension (M = 3.76), followed by the cultural dimension (M = 3.72), economic dimension (M = 3.49), and lastly, the environmental dimension (M = 3.46). The residents were fairly satisfied and loyal toward the city (M = 4.04 and 3.83 respectively). The IPA grid in Figure 1 illustrates the importance and performance scores of the sustainable city attributes.

![IPA grid](image)

Figure 1. IPA grid. SC = Social dimension; EN = Environmental dimension; EC = Economic dimension; CL = Cultural dimension.
Table 1. Means and standard deviations.

| Dimension | Importance | Performance |
|-----------|------------|-------------|
|           | Mean       | SD          | Mean       | SD          |
| **Social dimension** |            |             |            |             |
| Safety and security in the city (F1) | 4.69 | 0.72 | 4.41 | 0.66 |
| Quality of housing conditions and necessary amenities (F2) | 4.52 | 0.69 | 3.68 | 0.86 |
| Quality of health care facilities and services (F3) | 4.62 | 0.67 | 3.79 | 0.81 |
| Quality of educational facilities and services (F4) | 4.42 | 0.77 | 3.96 | 0.79 |
| Adequacy of recreational and sports facilities (F5) | 3.89 | 0.87 | 3.82 | 0.85 |
| Convenient locations of retail shops and restaurants (F6) | 3.89 | 0.90 | 4.19 | 0.76 |
| Public transportation system and access to places in the city (F7) | 4.55 | 0.72 | 4.33 | 0.75 |
| Control of traffic congestion (F8) | 4.19 | 0.85 | 2.81 | 1.01 |
| Control of crowdedness of people (F9) | 3.66 | 1.07 | 2.79 | 1.01 |
| **Environmental dimension** | 4.35 | 0.60 | 4.46 | 0.70 |
| Control of air pollution (F10) | 4.50 | 0.79 | 3.18 | 0.98 |
| Control of noise pollution (F11) | 4.26 | 0.87 | 3.22 | 0.99 |
| Control of water pollution (F12) | 4.67 | 0.63 | 3.36 | 0.94 |
| Management of waste, e.g., rubbish and sewage (F13) | 4.51 | 0.72 | 3.66 | 0.89 |
| Preservation of natural areas (F14) | 4.25 | 0.89 | 3.55 | 0.85 |
| Adequacy of green and open spaces, e.g., parks and gardens (F15) | 4.18 | 0.82 | 3.62 | 0.89 |
| Maintenance of streets and buildings (F16) | 4.09 | 0.83 | 3.64 | 0.87 |
| **Economic dimension** | 4.26 | 0.61 | 3.49 | 0.69 |
| Monthly income adequacy (F17) | 4.35 | 0.77 | 3.48 | 0.93 |
| Cost of living affordability (F18) | 4.52 | 0.65 | 2.97 | 1.03 |
| Adequacy of affordable houses (F19) | 4.18 | 0.88 | 2.71 | 1.04 |
| Economic performance of the city (F20) | 4.20 | 0.80 | 4.07 | 0.83 |
| Diversity of economy/businesses in the city (F21) | 4.02 | 0.90 | 3.98 | 0.82 |
| Abundance of employment opportunities (F22) | 4.29 | 0.78 | 3.74 | 0.85 |
| **Cultural dimension** | 3.75 | 0.85 | 3.72 | 0.70 |
| Preservation of cultural heritage and sites (F23) | 4.01 | 0.96 | 3.76 | 0.85 |
| Strengths of community identity and sense of belonging (F24) | 3.65 | 1.03 | 3.35 | 0.96 |
| Adequacy of cultural facilities, e.g., museum, theater, etc. (F25) | 3.71 | 1.02 | 3.86 | 0.82 |
| Abundance of cultural entertainments and activities (F26) | 3.62 | 1.01 | 3.90 | 0.86 |

| Mean | SD |
|------|----|
| **Resident satisfaction** | 4.04 | 0.74 |
| Overall, I am satisfied with this city | 4.05 | 0.77 |
| In general, I like living in this city | 4.04 | 0.85 |
| **Resident loyalty** | 3.83 | 0.81 |
| I would recommend this city to others | 3.93 | 0.88 |
| I would encourage friends and family to come to this city | 3.81 | 0.98 |
| I would prefer living in this city than in other places | 3.73 | 1.04 |
| I intend to continue living in this city in the future | 3.82 | 0.98 |

The Kaiser–Meyer–Olkin value of the data set was 0.92 and Bartlett’s test of sphericity was significant at \( p < 0.001 \), indicating that the data were appropriate for factor analysis. Referring to Table 2, five importance variables (IM1 to IM5) and six performance variables (PE1 to PE6) were formulated from the EFA with each factor’s loading being above the acceptable level of 0.50; the same went for satisfaction and loyalty, for which separate factor analyses were run. Several factors were excluded from the model due to low loadings—namely, four importance factors, two from the social dimension (F7 and F9) and one each from the environmental and economic dimensions (F16 and F21), as well as seven performance factors, three from the social dimension (F1, F5, and F7), one each from the environmental and economic dimensions (F13 and F17), and two from the cultural dimension (F23 and F24). A second-round EFA of the identified dimensions under importance and performance were conducted, and the result showed that the dimensions fitted both variables well.
Table 2. Factor analysis outcomes.

| Importance | PE1: Social | PE2: Environmental 1 | PE3: Environmental 2 | PE4: Economic 1 | PE5: Economic 2 | PE6: Cultural |
|------------|-------------|-----------------------|----------------------|-----------------|-----------------|---------------|
| IM1: Social 1 | 0.760 \(a\) | 0.773 \(a\) | 0.760 \(a\) | 0.510 \(a\) | 0.726 \(a\) | 0.669 \(a\) |
| F1         | 0.673       | F2                     | F8 \(b\)             | F18             | F19             | F23           |
| F2         | 0.782       | F3                     | F9 \(b\)             | F20             | F21             | F25           |
| F3         | 0.802       | F4                     |                      | F22             |                 |               |
| F4         | 0.603       | F6                     |                      |                 |                 |               |
| IM2: Social 2 | 0.805 \(a\) |                      |                     |                 |                 |               |
| F5         | 0.601       | F8 \(b\)              |                      |                 |                 |               |
| F6         | 0.931       | F9 \(b\)              |                      |                 |                 |               |
| F8         | 0.588       | F10                    |                      |                 |                 |               |
| IM3: Environmental | 0.825 \(a\) | F11                   |                      |                 |                 |               |
| F10        | 0.893       | F12                    |                      |                 |                 |               |
| F11        | 0.797       |                        |                     |                 |                 |               |
| F12        | 0.755       | F14                    |                      |                 |                 |               |
| F13        | 0.797       | F15                    |                      |                 |                 |               |
| F14        | 0.702       | F16                    |                      |                 |                 |               |
| IM4: Economic | 0.782 \(a\) | F18                   |                      |                 |                 |               |
| F17        | 0.780       | F19                    |                      |                 |                 |               |
| F18        | 0.786       | PE5: Economic 2        |                      |                 |                 |               |
| F19        | 0.767       | F20                    |                      |                 |                 |               |
| F20        | 0.667       | F21                    |                      |                 |                 |               |
| F22        | 0.588       | F22                    |                      |                 |                 |               |
| IM5: Cultural | 0.758 \(a\) |                     |                     |                 |                 |               |
| F23        | 0.759       | F25                    |                      |                 |                 |               |
| F24        | 0.522       | F26                    |                      |                 |                 |               |
| F25        | 0.846       |                        |                      |                 |                 |               |
| F26        | 0.786       |                        |                      |                 |                 |               |

\(a\) Factor loadings from a second-round EFA of the identified dimensions under importance and performance; \(b\) Factors originally established under social dimension; IM = Importance; PE = Performance.

The measurement model was set with importance, performance, satisfaction, and loyalty as main variables. Fit indices from the CFA, such as chi-square/degrees of freedom (\(\chi^2/df\) = 2.365, goodness-of-fit index (GFI) = 0.93, comparative fit index (CFI) = 0.95, normed fit index (NFI) = 0.92, Tucker Lewis index (TLI) = 0.94, root mean squared error of approximation (RMSEA) = 0.06, and standardized root-mean-square residual (SRMR) = 0.05, all denoted good fit of the model to the data set. Table 3 exhibits the average variance extracted (AVE) and composite reliability (CR) of each of the variables that were above the respective levels of 0.50 and 0.70, suggesting that the convergent validity of the model was fulfilled with sufficient internal consistencies within the variables [50]. The square root of AVE of each variable that was larger than the inter-construct correlations signified good discriminant validity.

Table 3. Correlation analysis outcomes.

| Importance | CR | 1   | 2   | 3   | 4   |
|------------|----|-----|-----|-----|-----|
| 0.618      | 0.890 | 0.786 |     |     |     |
| Performance| 0.560 | 0.884 | 0.252 ** | 0.749 |     |
| Satisfaction| 0.843 | 0.915 | 0.105 * | 0.532 ** | 0.918 |
| Loyalty    | 0.696 | 0.902 | 0.133 ** | 0.460 ** | 0.748 ** | 0.834 |

Values in bold are square roots of AVE; * \(p < 0.05\); ** \(p < 0.01\).

As for the structural model, the overall fit statistics, \(\chi^2/df = 2.344\), GFI = 0.93, CFI = 0.95, NFI = 0.92, TLI = 0.94, RMSEA = 0.06, and SRMR = 0.05, indicated that the model fitted the data well. Altogether the model explained 89% of the variation in
resident loyalty. Figure 2 shows that performance had a significant positive influence on satisfaction, so H1 was supported. Performance mediated the relationship between importance and satisfaction, thus supporting H2. Satisfaction had a positive effect on loyalty, and it mediated the relationship between performance and loyalty, so H3a and H3b were supported. The direct mediation effect of satisfaction between importance and loyalty was not tested because importance did not have an influence on satisfaction in the first place. However, together with performance, satisfaction mediated the relationship between importance and loyalty, thus partially supporting H3c. All paths between the latent variables and their respective factors were significant at $p < 0.001$.

![Diagram of the structural model](image)

**Figure 2.** Structural model. ***$p < 0.001$; **$p < 0.01$.**

5. Discussion and Conclusions

Congruent with the statistics of Shanghai as reported by the Shanghai Municipal Statistical Bureau [46], there were more female than male residents in this study, and a majority of the residents were in their middle adulthood of between approximately 30–35 and 59 years old. Pertaining to the structural model outcomes, the residents’ overall perceived importance of sustainable city attributes had a direct effect on overall perceived performance of Shanghai as well as an indirect effect on satisfaction mediated by perceived performance, which was positively related to satisfaction. These are in accordance with the expectation confirmation model which posits that expectations, signified by perceived importance in this study, influences perceived performance, which in turn influences satisfaction [34,35].

Resident satisfaction, which had a positive effect on resident loyalty, mediated the relationship between perceived performance and loyalty. Unrelated to the hypotheses of the study, perceived performance had no direct effect on loyalty. These indicate that the residents would be loyal to the city only if they were satisfied. Therefore, it is important for Shanghai to perform well in all aspects of development in order to ensure resident satisfaction, which would lead to resident loyalty. The authorities should survey the residents every now and then to gauge their perceptions about the city’s development status and should work toward fulfilling the residents’ demands and expectations. After all, the residents’ insights are useful for helping the authorities to plan and implement
development measures for resolving urban issues and monitoring their progress toward sustainability [26,27].

Together with perceived performance, satisfaction also partially mediated the relationship between perceived importance and loyalty. This further adds to the impact of the overall sustainability performance of Shanghai on the satisfaction and loyalty of the city’s residents. The better the city performed in development areas that are important to the residents, the more satisfied and subsequently more loyal the residents would be with the city. With the guide of the IPA grid, the authorities could identify the factors that are comparatively more important to the residents in the high importance quadrants, Q1 and Q2, and strive to perform well in those factors to ensure that they reach or fall within the high performance, Q2 quadrant, which symbolizes “keep up the good work”. The findings from the SEM are in line with the IPA’s concept in that, to ensure resident satisfaction and loyalty, Q1 (concentrate here) is the quadrant that requires the most attention, whereas Q2 is the target quadrant where the factors’ scores should belong for favorable outcomes.

Regarding the residents’ importance and performance scores, the environmental dimension was rated as being most important compared with the other dimensions, which was the same as what was rated by the residents of three counties in Virginia, U.S. [51] and tourists in Savannah, Georgia [10]. On the contrary, corresponding with the findings from Lee and Xue’s [21] recent study among tourists in Shanghai, the worst performance of Shanghai as perceived by the residents was in the environmental dimension. Environmental factors such as pollution controls and natural areas preservation were identified within Q1 in the IPA grid. Although there have been increasing investments in environmental protections in the city over the years, including pollution controls and urban green space expansions and conservation [46], the government needs to continue to allocate more resources to tackle persistent environmental issues in the city.

The best perceived performance of Shanghai was the social dimension, the factors of which fell within the high-performance quadrants, Q2 and Q4, except for traffic congestion and crowdedness—two lowest rated performance factors of all dimensions, similar to Lee and Xue’s [21] findings. Such congestion problems could be inevitable in the world’s third most populated city. The authorities have recently implemented a smart technology by Alibaba to reduce traffic congestion and waiting times in the city [52]. The solutions should be monitored to ensure that they can effectively minimize congestion in the city over time. On the other hand, the highest rated social performance factors were safety and security in the city, and public transportation and accessibility to places in the city, factors that were also high in importance to the residents. As reported by the U.S. Overseas Security Advisory Council [53], Shanghai is generally a safe city compared with other similar metropolitan cities in the world owing to stringent enforcement of law by the government. The city’s public transportation system is among the most extensive in the world, with 18 metro lines that run a total of 743 kilometers [54] and more than 1500 bus lines covering over 24.5 thousand kilometers [46].

In terms of the economic dimension, the residents generally perceived strong economic performance of the city with a diverse economy and an abundance of employment opportunities, but on the flip side, half of the economic factors fell within the low performance quadrants, with two of them—monthly income and cost of living—being in the high priority bracket, Q1. Cost of living and housing affordability were the worst rated economic factors. Although Shanghai is one of the most developed cities in China with a strong economic image [21,48], the city’s economic conditions, particularly with regard to cost of living, may not necessarily facilitate the sustainable living of its inhabitants. The government has to enhance measures to ease the financial burden of residents in the city, such as through affordable housing schemes and subsidies on goods and services for the lower income residents.

Shanghai performed fairly well in the cultural dimension as rated by the residents, who generally agreed that there were ample cultural facilities and entertainments in the city, the same as what was projected in the city’s statistics on culture [46]. However, the
dimension was the least important to the residents, with all factors falling within the low
importance quadrants, Q3 and Q4. It is, nonetheless, important to promote and maintain
the cultural heritage of a local place or community in order to conserve it for generations
to come, especially in a megacity like Shanghai where rapid development takes place. The
current generation should be made aware of the importance of preserving local culture for
the sustainability of the city.

5.1. Contributions and Implications

Theoretically, this study contributes to the literature by integrating IPA and SEM
to measure urban residents’ satisfaction and loyalty as a result of their importance and
performance perceptions in the context of sustainable urban development. The findings
show that satisfaction mediates the relationship between the perceived performance of the
city and loyalty, while perceived performance and satisfaction mediate the relationship
between perceived importance of sustainable city attributes and loyalty. The outcomes
on satisfaction are in line with the expectation confirmation model in that expectations,
signified by perceived importance in this study, affect perceived performance, which in
turn influences satisfaction [34,35]. The positive effects of the residents’ perceptions and
satisfaction on loyalty also correspond with the destination loyalty model established
in tourism studies [21,43]. Most importantly, to fulfill the concept of a sustainable city
consistent with previous studies [8,20,21,51], a city should perform well in all aspects
of development, whether economic, social, environmental, or cultural, so that resident
satisfaction and loyalty can be promoted and ensured.

Furthermore, the SEM’s findings are consistent with the IPA’s concept as they call for
the factors in Quadrant 1 (Q1), which signifies high importance but low performance, to
be given the most attention, while Q2, which denotes high importance and high performance,
to be the target quadrant where the factors should belong in order for resident satisfaction
and loyalty to be achieved. This study has shown that the SEM and IPA methods could
provide powerful, synergistic insights when integrated. Particularly in sustainable city
research, the integrated method can be applied in urban development measurement and
planning, along with the sustainable city indicators established in this study, to facilitate a
city’s progress toward becoming a sustainable city.

Practically, the integrated approach can be implemented by urban authorities to assess
residents’ perceptions, which could provide important insights for decision making and
policy planning in urban development with the aim of creating a sustainable city that
promotes resident satisfaction and loyalty. The survey of residents should be conducted
from time to time to identify the changing needs or expectations of the residents as well as
to monitor the sustainability progress of the city from the residents’ perspectives. For the
purpose of welfare maximization, the authorities could utilize the approach to optimize
the use of resources for urban development by allocating them based on the city’s weak
and strong performance areas to achieve sustainable, optimum results. Specifically, the
outcomes of this study apply to the authorities of Shanghai, who need to pay particular
attention to two environmental aspects of the city, i.e., pollution controls and natural areas
preservation, which fall within Q1. The two economic factors in Q1, cost of living and
monthly income, should also be prioritized. Since the overall performance of the city has
effects on resident satisfaction and loyalty, persistent efforts to ensure the city’s sustainable
growth in each aspect of development would ultimately help to promote the satisfaction
and loyalty of the residents.

5.2. Limitations and Future Research Recommendations

The sustainable city attributes used for the survey in this study were adopted from
previous literature in accordance with the sustainable development dimensions. Future
research could conduct focus groups with experts in the subject matter to discuss and
generate other relevant sustainable city attributes and dimensions. The questionnaire
of this study was rather long due to duplicates of the sustainable city indicators for both the
importance and performance parts of the IPA, on top of the necessary questions on resident satisfaction and loyalty for the SEM. Future research using this integrated approach should be mindful of the respondents’ willingness and time to answer the survey while striving to achieve an effective questionnaire design. Furthermore, the survey was distributed online due to the occurrence of the COVID-19 pandemic. If the situation allows in the future, it is recommended that researchers administer questionnaires using the face-to-face method for better quality control. This research investigated the urban residents’ perspectives cross-sectionally. Future research may use a longitudinal approach to study the changes in residents’ perspectives over time as a city progresses. Future research could also examine the residents of more than one city or country in order to compare the findings between cities or countries.

In conclusion, the integrated, IPA-SEM approach established in this study can facilitate urban authorities’ decision making and policy implementation in developing a sustainable city that could lead to resident satisfaction and loyalty. Using the approach, this research has shown the relationships between residents’ perceived importance, perceived performance, satisfaction, and loyalty in the context of a sustainable city. The authorities of Shanghai could utilize the findings of this study in their sustainable urban development and resident fulfillment initiatives. All in all, in accordance with the UN’s Sustainable Development Goals and in view of today’s rapid urbanization, the pursuit of sustainability should be the focus not only of Shanghai but of cities worldwide.

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