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RESIDENTIAL SATISFACTION INDICATOR: LATIN AMERICAN EVIDENCE

Michelle-Ángela ZEA-DE LA TORRE[1], Juan-Antonio JIMBER-DEL RÍO[2*], Julia NUÑEZ-TABALES[3], Francisco-José REY-CARMONA[3], Arnaldo VERGARA-ROMERO[2]

[1] *Department of Research, Universidad Ecotec, Samborondon, Ecuador*
[2] *Department Agricultural Economics, Sociology, and Policy, Faculty of Economics and Business Sciences, Universidad de Córdoba, Cordoba, Spain*
[3] *Organización de Empresas, Faculty of Economics and Business Sciences, Universidad de Córdoba, Cordoba, Spain*

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Abstract. Latin American construction companies, particularly in Ecuador, operate in a highly competitive environment. In this context, achieving customer satisfaction is a primary objective for the success of real estate projects. This research aims to develop a comprehensive residential satisfaction index that includes sustainability dimensions, based on global satisfaction indices and structural equation modeling. This study will enable residential builders to assess their performance from the customer's perspective and make strategic decisions aimed at improving quality, which, in turn, will lead to greater customer satisfaction in future projects. The findings of this research will provide valuable input for decision-making in the real estate sector, with a focus on the Latin American context.

Keywords: satisfaction, index, housing, Guayas, Structural Equation Model.

*Corresponding author. E-mail: *jjimber@uco.es*

1. Introduction

Customer satisfaction is a fundamental aspect of the financial and marketing performance of organizations (Golovkova et al., 2019; Sun & Kim, 2013). In the specific context of residential construction companies in Latin America, which operate in a highly competitive environment, understanding customer expectations and preferences becomes essential for achieving optimal levels of satisfaction. This understanding not only enables organizations to tailor their products and services to market demands but also serves as a determining factor for establishing a sustainable competitive advantage. Furthermore, customer satisfaction acts as a critical indicator of business performance, as it directly influences consumer loyalty, brand reputation, and ultimately, the financial outcomes of the company (Kärnä et al., 2004; Othman, 2015).

As the Industry 4.0 revolution progresses, sustainability has become an essential component for companies to effectively address customer demands. This approach not only facilitates a substantial improvement in the quality of the products and services offered but also contributes to the well-being of consumers in the medium and long term. Thus, the ability of developers to create sustainable housing solutions generates significant social, economic, and environmental benefits for residents, which, in turn, supports the continuity and relevance of the company in an evolving market (Othman, 2015; Warren-Myers & Heywood, 2018). Furthermore, homeowners are reevaluating their purchasing decisions based on criteria of innovation and sustainability, indicating that these factors are transforming the residential housing industry. The demand for solutions that integrate functionality, efficiency, and sustainability is driving a paradigm shift in homeowners' expectations, requiring construction and development companies to proactively adapt to these new realities. However, the relationship between customer satisfaction and sustainability in housing has been little explored, although understanding it could enhance organizational performance (Dananjoyo et al., 2022).

In the realm of residential construction in Ecuador, the availability of large-scale housing projects can have a considerable impact on the characteristics of the buildings, limiting customers' ability to customize their homes according to their needs and conditions (Milion et al., 2017). This traditional approach, which prioritizes efficiency and cost over individual customer needs, may be one of the reasons why the properties offered do not fully meet homeowners' expectations. Although some companies allow for certain changes in the properties, these are often restricted to final construction details and a limited

selection of architectural designs. This implies that adaptations are only partially considered during the pre-sale phase, overlooking the possibility of customization during the project design phase (Mendoza-Vélez & Ortega-Bravo, 2022). Furthermore, most Ecuadorian real estate companies have shown little interest in understanding the actual needs and preferences of their customers, despite the existence of methods and concepts such as attribute management, business strategy, consistency evaluation, and utility and feature assessment, which could facilitate the implementation of customer satisfaction-oriented functions (Al-Betawi et al., 2022; Egemen, 2021).

A limited number of builders in Ecuador implement approaches to assess customer satisfaction, which, if not addressed, can lead to widespread dissatisfaction and a loss of trust in the brand, damaging its reputation and decreasing demand for its properties. Although some companies recognize the importance of comprehensively evaluating customer satisfaction, they often do so post-sale, which limits their effectiveness (Martínez & Ibarra, 2017; Nguyen & Do, 2020; Othman, 2015). To meet customer needs, it is essential for residential developers to incorporate sustainability aspects into their offerings, thereby contributing to Sustainable Development Goal (SDG) 11. The creation of a comprehensive customer satisfaction index is crucial for motivating builders to evaluate their performance relative to the industry, allowing for a better understanding of customer needs and facilitating the development of residential projects that are more aligned with future demand (Egemen, 2021).

Considering that some studies measure customer satisfaction through indices in several countries, to date, there has been no equivalent study in Ecuador. Therefore, the study aims to develop a comprehensive residential satisfaction index for the sector, which includes determining the level of residential satisfaction of the residential real estate sector to understand its performance. This index has been based on a methodology that uses key customer satisfaction indices, such as the Swedish Customer Satisfaction Barometer (SCSB), the American Customer Satisfaction Index (ACSI), the German Customer Satisfaction Barometer (GCSB), the European Customer Satisfaction Index (ECSI), and the Norwegian Customer Satisfaction Barometer (NCSB) (Othman, 2015).

This index will be developed using the Structural Equation Model (SEM), where the purchasing, product and sustainability experience is evaluated. The latter is the novelty of this research since the models developed so far do not discriminate this aspect and therefore the index development proposal of this study incorporates it into the analysis, which will allow obtaining the ratings of each construct and averaging them with the individual rating of each client, obtaining the satisfaction indices of each construct (Ibarra & Salazar, 2017; Nguyen & Do, 2020; Ren & Folmer, 2017; Riazi & Emami, 2018).

The scope of the research focuses on the creation of a comprehensive satisfaction index for the residential construction industry in the province of Guayas, Ecuador, with the aim of measuring the satisfaction of property owners while incorporating sustainability aspects. This will promote a comparable customer satisfaction standard among developers, driving improvements in the real estate offering and fostering consumer loyalty and satisfaction, which will ultimately lead to increased profitability and competitiveness in the sector (Othman, 2015).

The relevance of this research lies in the scarcity of studies on the Ecuadorian coast that comprehensively analyze customer satisfaction while incorporating sustainability aspects in the context of residential housing. This represents an underexplored area that requires attention in the academic field. This article will be structured as follows: the second section will present the theoretical framework for analyzing previous research; the third will describe the applied methodology; and the fourth will showcase the results obtained through the index developed in this study. Finally, the findings will be discussed, reflections proposed, and future research directions outlined.

2. Theoretical framework

A Consumer Satisfaction Index allows organizations to measure their performance based on the evaluation of the quality of goods and services experienced by consumers. From a market-oriented perspective, this indicator reflects how well consumers' expectations are aligned with the reality of their experience with the products or services offered (Al-Betawi et al., 2022).

Other ratios can complement it, for example, investment profit, profitability, market shares or the balanced scorecard, to evaluate the quality of products and services for both consumers and product managers. In addition, they help companies, sectors and countries (Fornell et al., 1996) to make comparisons of their operations and formulate policies that contribute to decision-making on aspects related to quality (Egemen, 2021).

Customer satisfaction indices have been developed and used in several countries, among the five most critical below: Swedish Customer Satisfaction Barometer (SCSB), American Customer Satisfaction Index (ACSI), German Customer Satisfaction Barometer (GCSB), European Customer Satisfaction Index (ECSI) and the Norwegian Customer Satisfaction Barometer (NCSB). Generally speaking, these satisfaction indices are based on estimates from causal models. It means that satisfaction is related to the results of the researchers (Othman, 2015).

2.1. Swedish Customer Satisfaction Barometer (SCSB)

The Swedish Customer Satisfaction Barometer, created in 1989, was the first system developed and the first national satisfaction index. As presented in Figure 1, the entities in charge of the elaboration are The Quality Research Center of the National University of Michigan and the Swedish Post Office. The information is compiled over a survey of about 24,000 consumers. The evaluation was proposed to

Figure 1. SCSB structural model (source: Fornell, 1992)

obtain a nationwide typical tester of Sweden's 32 most prominent industries (Grigoroudis et al., 2008). The model posits that customer satisfaction is a function of expectations before the purchase and perception of product or service performance after purchase. The level of satisfaction will consequently determine the complaints and customer fidelity (Fornell, 1992; Johnson & Fornell, 1991).

2.2. American Customer Satisfaction Index (ACSI)

The American Customer Satisfaction Index was developed in 1994 as a system that evaluates the characteristic of merchandises and assistances purchased by consumers. It was created through the University of Michigan Business School Association, the American Society for Quality, and Arthur Andersen (Fornell et al., 1996). Currently, the American Society for Quality, the University of Michigan Business School, and Claes Fornell International oversee investigating and generating the ACSI (American Society for Quality [ASQ] et al., 2022).

As represented in Figure 2, this model includes antecedents: the observed quality, the observed value, and the expectancies of the client, which affect the satisfaction, fidelity, and behavior of consumer complaints. The determinants of overall customer satisfaction are supposed quality or performance, supposed value, and target market expectations (Fornell et al., 1996).

This model has undergone improvements regarding the type of information it generates. Today, in addition to offering the index's information, it also generates a set of tools with predictive capabilities of the American Customer Satisfaction Index that provide detailed and actionable information to improve the customer experience. Additionally, it provides advice and generates the association between nations that use the index to compare with other indexes (ASQ et al., 2022).

2.3. German Customer Satisfaction Barometer (GCSB)

The German Customer Satisfaction Barometer was developed by the German Marketing Association eV. Moreover, it was launched by ServiceBarometer AG in 1992 and is published every year. It is established as a scientific research project that provides informative and methodically reliable performance indices regarding customer orientation of different industries (Meyer & Dornach, 1994; ServiceBarometer AG, 2022). Being an independent comparative study that is more extensive regarding customer orientation, it has a large database collected over more than 20 years, allowing comparison between countries. The study has also been conducted in Austria since 2008 and Switzerland since 2006, applying to the retail, financial, and infrastructure sectors (ServiceBarometer AG, 2022).

The GCSB does not support a fundamental standard for consumer fulfillment, like ACSI and SCSB, whose focus is based on surveys and provides information for companies to instrument inside, industrial, or global standards. It complements the analysis of customer satisfaction and fidelity; it is necessary to consider conventional quantifiable presentation guides such as market share or effectiveness. Finally, the GCSB evaluates employee satisfaction through a survey (Meyer & Dornach, 1994, 1996).

2.4. European Customer Satisfaction Index (ECSI)

The effective presentation of the ACSI and SCSB indexes has driven this indicator. It was initiated by the European Organization for Quality (EOQ), the European Foundation for Quality Management (EFQM), and the European Academic Network for Customer-oriented Quality Analysis, and it was also reinforced by the European Commission (DG III). In 1999, a survey was used as a data collection

Figure 2. Model structural ACSI (source: National Quality Research Center, 1998)

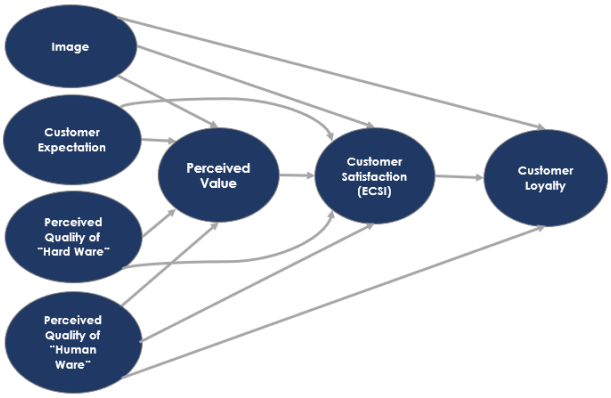

Figure 3. Model structural ECSI (source: Fornell, 1992)

instrument in which 11 nations and a limited quantity of segments (selling, communications, networks, supermarkets, and banking) participated (Grigoroudis & Siskos, 2004; Grønholdt et al., 2000; Kristensen et al., 2000).

It has a structural approach elaborated at the expense of a descriptive (or non-structural) approach. This second approach prepares a "standard" market study with a company's customers, from which the satisfaction indices are derived directly, this being the most used approach (Associação Portuguesa para a Qualidade [APQ] et al., 2022).

Like the ACSI, the ESCI concerning consumer expectancies, supposed quality, supposed value, consumer satisfaction, and consumer fidelity are modeled in the same way, as shown in Figure 3, it presents seven latent variables that measure and explain consumer satisfaction and fidelity (Cassel & Eklöf, 2001) which are: expectations, supposed quality, supposed value, consumer satisfaction, image, complaints, and consumer fidelity. The ECSI argues that business image has a straight consequence on consumer fidelity as well as supposed value. At the same time, it includes the constructive influence of criticisms on fulfillment and fidelity. Consumer fidelity is described as a purpose of consumer fulfillment and criticisms, which means that if the correlation among these two is affirmative, the company's complaints management is practical and focused, transforming the petitioners into reliable consumers (APQ et al., 2022).

2.5. Norwegian Customer Satisfaction Barometer (NCSB)

The initial Norwegian Customer Satisfaction Barometer was designed much like the singular ACSI, with the difference that it incorporated business image and associations with consumer fulfillment and fidelity (Othman et al., 2004) and has been developing since 1996 (BI Norwegian Business School & Barcode Intelligence, 2022).

In general, the NCSB focuses on the relationships between customers and suppliers. Based on an annual data collection conducted among Norwegian households, the NCSB aims to be the benchmark that Norwegian companies use:

- Basis for comparison with other companies;
- Basis for comparison with other industries;
- Basis for comparison over time;
- Starting point for own and more complete surveys (BI Norwegian Business School & Barcode Intelligence, 2022).

Today and since 2013, Barcode Intelligence, with origins coming from the BI Norwegian Business School, is the company that performs the analysis and consulting of the NCSB model, whose analysis lies not only in knowledge based on research and customer analysis but also of employees and competitors and together with the development of NCSB also constitute the Norwegian Sustainability Barometer (BI Norwegian Business School & Barcode Intelligence, 2022).

The current model replaces the value construct with pure price and changes consumer opportunities with business image because of fulfillment. Likewise, it includes correlation guarantee and business image as promoters of fidelity includes the probable direct consequences of value on fidelity, and adds criticism management as a driver of both fulfillment and fidelity (Van Haaften, 2022), as seen in Figure 4.

Figure 4. NCB structural model (source: Johnson & Ettlie, 2001)

As already seen, the NCSB model has expanded over time, influenced by the evolution of marketing, which has gone from having a transactional orientation to a relational alignment between amenity contributors, which, in turn, incorporates the development of relationship commitment. This construct has developed to emphasize both emotional components and obligation calculators. Its components are how the calculation factor is based on the less expressive aspects of the connection, such as transaction costs, to the extent that the emotional factor is more expressive. Obligation constructs are modeled as mediators of the consequences of fulfillment on fidelity (Behavioral intentions) (Van Haaften, 2022).

2.6. Comparison of customer satisfaction models

The models presented in this study have an academic and scientific causal construction. They are similar concerning the causal model except for the GCSB, which, as mentioned, does not have a causal model. In the same way, these models have some differences in structure and the variables' choice. However, the results are not comparable.

In practical terms, Tables 1 and 2 have been prepared to compare each satisfaction model concerning the intervening latent variables and the general properties of each one.

The variables in 2015 were developed by Ezzat Othman and Ahmed Ayman, an international customer satisfaction index for the construction industry, which has contemplated some models. This study is based on the drivers of residential satisfaction found in the literature, 30 case studies, and a survey that identifies 77 drivers necessary to build the construction. In the first phase, they calculate the measures of central tendency, such as mean, median, and mode. In the second phase, because not all the drivers used show the same relevance in obtaining customer satisfaction, they used a Relative Importance Index (RII) to distinguish the drivers with the greatest representativeness in satisfaction (Othman, 2015).

Generally, most analysed models result from a structural equation model for measuring and evaluating customer satisfaction, supported by latent variables specific to the sets of manifest constructs. Therefore, the level of each latent variable is measured and estimated, the relevant relationships of the latent variable are defined, and the magnitude of these relationships is estimated (Henseler & Chin, 2010).

This research demonstrates that customer satisfaction exposes the general behaviour of the customer regarding the product or service of their offeror (Fida et al., 2020), which includes the emotional reactions when they question or compare what they have been promised in the sale

Table 1. Comparison of the analysed models (source: Van Haaften, 2022)

Latent variable	GCSB	SCSB	ACSI	NCSB	ECSI
Consumer expectations	Does not support a causal model for customer satisfaction	✓	✓	X	✓
Overall supposed quality		X	✓	X	X
Supposed performance			X	X	X
Supposed service quality		X	X	X	
Supposed quality of the product		X	X	X	✓
Quality drivers		X	X	✓	X
Affective commitment		X	X	✓	X
Calculation commitment		X	X	✓	X
Corporate image		X	X	✓	✓
Supposed value		X		✓	✓
Price index		X	X	✓	X
Complaints processing		X	X	✓	X
Consumer complaints		✓	✓	X	X
Consumer satisfaction		✓	✓	✓	✓
Customer fidelity		✓	✓	✓	✓

Table 2. General properties comparison (source: Van Haaften, 2022)

General properties	GCSB	SCSB	ACSI	NCSB	ECSI
Linked to quality organizations	✓	X	✓	X	✓
Causal equation model	X	✓	✓	✓	✓
Publish national results	✓	X	✓	X	✓
Publish sectoral results	✓	X	✓	X	✓
Survey/interviews	✓	✓	✓	✓	✓

offer and what they receive after it, in the way to satisfy some need, desire, or purpose.

Thus, customer satisfaction is a strategic instrument that drives business sales, which in turn generates a positive effect on the profitability of companies since by keeping customers in a state of satisfaction, the success of companies is guaranteed. In other words, every satisfied customer is on track to buy again, be loyal to the brand, and promote a recommendation (Yang & Zhu, 2006).

Very often, the analysis of the degree of customer satisfaction is carried out based on the general analysis of the complaints or claims of the customers or the individual perception by the employees in interaction with them, which, as a result, generates diagnoses that lack accuracy, representativeness, and reliability (Othman, 2015). That is why a systematic process verified through a formal model of customer satisfaction is a resource to be used by companies to ensure adequate measurement of customer satisfaction, tending to have loyal customers and profitable companies.

3. Methodology

3.1. Development of satisfaction indices

After analysing customer satisfaction models such as the Swedish Customer Satisfaction Barometer (SCSB), the American Customer Satisfaction Index (ACSI), the German Customer Satisfaction Barometer (GCSB), the European Customer Satisfaction Index (ECSI), and the Norwegian Customer Satisfaction Barometer (NCSB), a convergence is observed in modeling determinants such as the purchasing experience and product performance. These aspects are analyzed through variables that evaluate expected quality, perceived quality, and perceived value (Rahadi et al., 2015).

The ACSI and SCSB models measure customer satisfaction at a national level, based on pre-purchase expectations and perceptions of product or service performance after acquisition (Othman, 2015). From the analysis of these five indices, a model has been designed that emphasizes customer evaluation in relation to the expected and perceived quality of goods and services, its linkage to price, and residential satisfaction. Although none of these models explicitly include sustainability, understanding their structure and foundations is essential for developing a new model that integrates this element (Hadi et al., 2019).

In this regard, the research suggests adapting components from existing models to formulate an index that responds to the growing demand for sustainable business practices. The creation of the overall satisfaction index and the various sub-indices that comprise the proposed causal model is based on the expectations and experiences of property owners during the pre-sale, sale, and post-sale phases. A survey was used as the primary tool for data collection and index formulation. Based on the most relevant customer satisfaction models analyzed in this study, a model is proposed that considers what the customer experiences during the pre-sale, sale, and post-sale processes; circumstances encountered during purchase; experiences with the product; attributes of the property; or external factors related to sustainability; and how these experiences reflect on satisfaction (Figure 5).

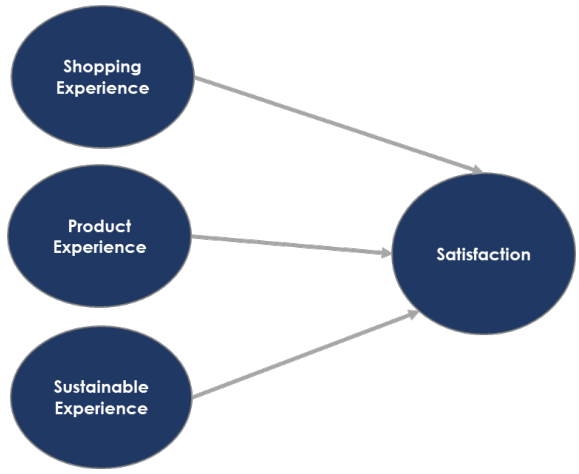

Figure 5. Theoretical causal model (source: compiled by the authors)

The proposed model has incorporated the observed and latent variables, which were analysed by identifying the factors that potentially influenced satisfaction. Then, a group was constructed, and it included a set of relevant aspects such as purchase experience, product experience, and sustainable experience, which in turn were structured taking into account the customer satisfaction models referred to in the theoretical framework to debug the repetitive aspects of the customer experience, modifying in that way the level of generality, while at the same time, appropriate latent variables were attributed or new ones were added (Gogni et al., 2019; Wang et al., 2020).

The structural equation model is used to estimate the multiple dependency relationships, represented using unobserved or latent variables, and the measurement errors that are part of the estimation process (Hidalgo-Fernández et al., 2019).

Following all the above, the customer satisfaction indexes were calculated, and now they are detailed below:

1. Shopping experience index;
2. Product experience index;
3. Sustainability experience index;
4. General satisfaction index.

3.1.1. Shopping Experience Index

The design of this index has taken into account the customer experience during the pre-emptive phase of the property (before signing the purchase contract), in it a number of variables related to the advertising and the quality of the service offered are evaluated.

Table 3 shows the different variables that are part of this index.

Table 3. Latent and observed variables EXC (source: compiled by the authors)

Dimension	Factors	Expected quality	Perceived quality	Perceived value	Reference
Shopping experience	Information and commercial graphic documentation	✓	✓		(Kaklauskas et al., 2020; Selvi et al., 2021)
Shopping experience	Political attitude of staff	✓	✓		(Ahmed & Kangari, 1995; Tang et al., 2003)
Shopping experience	Ability to know and solve problems with buyers	✓	✓		(Chittenden et al., 1998; Roy & Cochrane, 1999)
Shopping experience	Provision of services as a commitment	✓	✓		(Goetsch & Davis, 2000; Tang et al., 2003)

3.1.2. Product Experience Index

The development of this index contemplates all client's experience with the property in all phases of the sale (pre-sale, sale, and post-sale). Variables that involve aspects such as property characteristics, external attributes of the property, and the quality of the service provided are considered.

The variables that participate in elaborating this index are observed in Table 4.

Table 4. Latent and observed variables EXP (source: compiled by the authors)

Dimension	Factors	Expected quality	Perceived quality	Perceived value	Reference
Product experience	Quality/price relationship			✓	(Coulson et al., 2021; Rahadi et al., 2015)
Product experience	Security outside and inside	✓	✓	✓	(Tan, 2016)
Product experience	Finishes and materials	✓	✓	✓	(Atterhög, 2005)
Product experience	Bedrooms	✓	✓	✓	(Aigbavboa, 2016; Aigbavboa & Thwala, 2014)
Product experience	Bathrooms	✓	✓	✓	
Product experience	Number of square meters of land	✓	✓		
Product experience	Number of square meters of construction	✓	✓		
Product experience	Deadline for payment of entry	✓	✓		(Cook et al., 1999; Maloney, 2002)
Product experience	Advice for obtaining credit	✓	✓	✓	(Goetsch & Davis, 2000; Tang et al., 2003)
Product experience	Management to obtain credit	✓	✓		
Product experience	Location in the city	✓	✓		(Choi et al., 2014; Monteiro et al., 2021)
Product experience	Location within the urbanization or complex	✓	✓		(Choi et al., 2014; Monteiro et al., 2021)
Product experience	Architectural design of urbanization or complex	✓	✓	✓	(Buys & Miller, 2012; Oluwatayo et al., 2014)
Product experience	Common facilities if any (gym, swimming pool, soccer fields, ...)	✓	✓	✓	(Hidalgo et al., 2021; Mao et al., 2015)
Product experience	Compliance with technical specifications (level of finishes)	✓	✓		(Goetsch & Davis, 2000; Othman et al., 2004)
Product experience	Access to shopping centers, doctors, gas station, religious centers, education and recreation center		✓	✓	(Ibarra & Salazar, 2017)
Product experience	Architectural design of the property	✓	✓	✓	(Buys & Miller, 2012; Oluwatayo et al., 2014)

Table 5. Latent and observed variables EXS (source: compiled by the authors authors)

Construction	Name	Expected quality	Perceived quality	Perceived value	Reference
Sustainable experience	Water efficiency	✓	✓	✓	(Stavenhagen et al., 2018)
Sustainable experience	Indoor environment quality	✓	✓	✓	(Baeza_Romero et al., 2022; Laskari et al., 2017)
Sustainable experience	Knowledge, education and regulation: Waste management, CO2 reduction, planting trees in green areas and water reuse (treatment plants)	✓	✓		(Gamtessa & Guliani, 2019; Karytsas & Theodoropoulou, 2023; Olivero-Lora et al., 2019; Solís-Guzmán et al., 2018)
Sustainable experience	Possibility of alternative trips to the car	✓	✓		(Diaz-Serrano & Stoyanova, 2010)
Sustainable experience	Energy efficiency and atmosphere		✓	✓	(Best & de Valence, 2013; Coulson et al., 2021)

3.1.3. Sustainable Experience Index

This index has been prepared considering aspects related to sustainability, reflected in the development of the construction of the property, and the degree of involvement of real estate developers in social awareness about sustainability.

The variables considered in this index are shown in Table 5.

3.1.4. General Customer Satisfaction Index

For the elaboration of this index, all the aspects analyzed in this study were collected, such as Shopping experience, product experience, and sustainable experience, assimilating all the variables contained in these groups, which were evaluated through the relevance that each aspect or construct represents. This index has been prepared considering aspects related to sustainability, reflected in the development of the construction of the property, and the degree of involvement of real estate developers in social awareness about sustainability.

In general, the data processing of the study was carried out using the statistical software WarpPLS 7.0 to estimate the models and calculate the relevance of the variables of each construct. PLS-SEM is a recognized and appropriate analytical technique for this type of study, both in theory development and testing (Hair et al., 2011).

3.2. Questionnaire and data collection

This study was conducted in the province of Guayas, Ecuador, which is the most populated in the country, with a population of 3,645,483 inhabitants (Instituto Nacional de Estadística y Censos, 2020). A survey was administered to homeowners who had resided in their homes for at least 12 months. The survey was designed by analyzing questions used in previous research on residential aspects (Mao et al., 2015; Torbica & Stroh, 2001). Before administering the survey, prior studies were reviewed to determine the questions (Ibarra & Salazar, 2017; Nguyen & Do, 2020; Othman, 2015). A preliminary test was then conducted with 50 surveys to verify the understanding and validity of each item, as well as its internal consistency, which were reviewed based on similar prior studies to reinforce the validity of the selected items (Ren & Folmer, 2017; Yang & Zhu, 2006).

In the final stage of the process, a group of experts was consulted, consisting of two researchers specialized in the real estate construction sector and customer satisfaction, as well as a professional with 18 years of experience in the field. This group reviewed and evaluated the selected items to ensure the quality and relevance of the survey.

3.3. Measurements and methodology

The questionnaire was distributed to the following six groups, defined in Table 6.

Most of the groups in the survey are made up of 55 items for which a Likert scale graduated in seven points was used, which fluctuate between 1 (totally disagree with the statement) and 7 (totally agree with the statement) except for the sociodemographic profile and the details of the property, where closed questions were used. The participation of the owners in the survey was deliberate since the survey team had previously informed them about the research objectives. The sample comprised the owners who had been residing in their properties for at least 12 months and whose construction had been carried out by a residential builder.

Data was collected in August 2022 to March 2023 and obtained from primary sources. The population consists of 50,000 people from three cantons of the province of Guayas: Guayaquil, Samborondón, and Daule. The survey was extended to 250 owners chosen with the intentional sampling method with a confidence level of 95%.

Respondents were informed about the academic purposes of the completed questionnaire. In the same way, the object of study was informed, verbal consent was

Table 6. Latent and observed variables (source: compiled by the authors authors)

Cluster	Aspects addressed
Shopping experience	Customer service
	Confidence
Product experience	Characteristics of the product
	Characteristics of the environment
Shopping experience as a sustainable commitment	Energy efficiency and atmosphere
	Water efficiency
	Indoor environment quality
	Knowledge and sustainable education
Resident demographic profile	Gender
	Age
	Educational level
	Professional category
	City and country of origin
	Professional category
	Financing
	Property type
	Income level
	Habituality of the property
	Property type
	Income level
	Habituality of the property

requested for their participation, and anonymity was guaranteed. The survey was carried out among residents of the Guayaquil, Daule, and Samborondón cantons (urban area), where 250 valid surveys were obtained, with a margin of error of 5% and a confidence level of 95%.

4. Results

The following section describes the results of the research in an orderly manner.

4.1. Socio-demographic profile of the respondents

Table 7 presents the results of the sociodemographic profile of the property owners participating in this study. As expected, 97.20% of owners are Ecuadorian. The respondents are between 40 and 59 years old, which make up 68.8%. 47.60% of those surveyed are salaried people. Regarding the level of family income, 60.8% receive income between $401 and $2000.

4.2. Generation of Satisfaction Index

The generation of the indices is carried out by calculating the ponderance indices of each construct of the proposed SEM model.

Table 7. Sociodemographic profile of residents (source: compiled by the authors authors)

Variable (n = 250)	Category	Absolute frequency	%
Gender	Men	130	52.00
	Woman	119	47.60
	I prefer not to say	1	0.40
Age	[Under 30]	11	4.40
	[30–39]	57	22.80
	[40–49]	86	34.40
	[50–59]	86	34.40
	60 or more	10	4.00
Level of studies	No studies	0	0.00
	Primary education	3	1.20
	Secondary education	29	11.60
	University teaching	172	68.80
	Postgraduate	46	18.40
Professional category	Salaried	119	47.60
	Official	0	0.00
	Entrepreneur	56	22.40
	Retired	6	2.40
	Liberal professional	58	23.20
	Student	5	2.00
	Housework	6	2.40
Origin	National	243	97.20
	Foreign	7	2.80
Family income	Less than 400 dollars	8	3.20
	Between 401 and 2000 dollars	152	60.80
	Between 2001 and 5000 dollars	81	32.40
	Between 5001 and 10000 dollars	7	2.80
	More than 10001 dollars	2	0.80

With the calculation of these values, the ponderance of each variable of each construct is weighted. Considering the ponderance of the weights of each variable, the following equation was applied to calculate the satisfaction index:

$$SI = \sum = \left(\frac{Y_{ab}}{n}\right)\cdot(Z), \quad (1)$$

where: *SI* – Satisfaction Index (Experience Index and General Satisfaction Index); *b* – represents the analysed question; *a* – unit of analysis to the owner of the property surveyed; *n* – it is the total number of property owners surveyed; Y_{ab} – it is the answer of the owner of the property surveyed *a* in question *b*; *Z* – ponderated weight per construct.

Table 8 shows the results of a general satisfaction index. The results were calculated from Equation (1), including the satisfaction construct and the three experiences of customer interest.

Table 8. Indices of the model (source: compiled by the authors authors)

General indices	Index
Satisfaction	5.84
EXP shopping	5.87
EXP product	5.83
EXP sustainability	5.43

Along with obtaining the general indexes, the percentage of satisfaction of property owners was calculated, which was obtained after dividing the value of each index calculated by the maximum scale (7 agree) of the established level of customer satisfaction. On the Likert scale, as presented in the Table 9.

Table 9. Hypotheses analysis (source: compiled by the authors authors)

General indices	Index	% of satisfaction
Satisfaction	5.84	83.39%
EXP shopping	5.87	83.86%
EXP product	5.83	83.25%
EXP sustainability	5.43	77.64%

From the results, we can say that, in general, and according to the owners' experiences, the satisfaction level is above 70%. The case of the purchase experience, which has 83.86% satisfaction and the highest level of all the experiences analyzed, indicates that customers are satisfied with the service received during the pre-sale and sale phase of the property. The experience with the product shows that the owners are satisfied by 83.25%, which is slightly lower than the purchase experience. Regarding the sustainability experience, the owners are satisfied by 77.64%. Even though the figure could be acceptable, the clients gave their assessment. Most properties were handed over to their owners, and sustainability was not a variable to consider in the business model of the construction companies in this geographical area. For this reason, customers issued intermediate ratings because it was not a point to consider or evaluate when purchasing.

4.3. Calculation of the Impact of Individual Satisfaction Indices on the General Customer Satisfaction Index

After obtaining the purchase experience, product, and sustainability indices and as previously presented by Equation (1), this section proposes to measure the impact of the satisfaction indices by user experience calculated on the general satisfaction index to explain its causality.

The impact measurement will be carried out using a multiple linear regression model using the Ordinary Least Squares (OLS) method, whose equation is used for calculating the general satisfaction index, presented below.

$$y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + u, \quad (2)$$

where: *y* – general satisfaction index; α – independent term; β_1 – parameter that estimates the impact of the shopping experience index; x_1 – hopping experience index; β_2 – parameter that estimates the impact of the product experience index; x_2 – product experience index; β_3 – parameter that estimates the impact of the sustainable experience index; x_3 – sustainable experience index; *u* – residual.

Once the multiple linear regression equation has been defined by the OLS method, the impact of the individual satisfaction indexes on the general satisfaction index is calculated, for which the standardized coefficients of the regression model are used. Table 10 estimates the coefficients of the satisfaction indices concerning the general satisfaction index.

With the coefficients, the regression equation that we present below is generated:

$$y = 3.390 + 0.365x_1 - 0.252x_2 + 0.326x_3. \quad (3)$$

With these results, it can be inferred that, when unit increases in the shopping experience index, the general

Table 10. Estimating the coefficients presented by the individual satisfaction indexes concerning the general satisfaction index (source: compiled by the authors authors)

General indices	Coefficients	Standard errors	*t*	Next
Constant	3.390	0.236	14.380	0.000
EXP shopping	0.365	0.096	3.973	0.000
EXP product	–0.252	0.117	–2.154	0.032
EXP sustainability	0.326	0.049	6.632	0.000

satisfaction index increases by 0.365, indicating that if the customer qualifies with one more point in the shopping experience, the satisfaction will increase by 0.365. Concerning the product experience, the opposite occurs, that, with unit increases in the index of experience with the product, satisfaction decreases by –0.252. Finally, regarding the sustainable experience, to the extent that the index increases by one point, satisfaction increases by 0.326.

5. Discussion

In this study, a residential satisfaction index was developed for properties in the province of Guayas, drawing on globally recognized satisfaction indices as references. The statistical technique of Structural Equation Modeling (SEM) was employed to estimate the weights of each construct and to evaluate complex relationships between latent variables, based on survey responses from the clients, as contrasted by (Sarstedt et al., 2019). The results indicate that 83.39% of residents were satisfied, according to the general satisfaction index (5.84), which aligns with the findings of (Kumari et al., 2023), who analysed variables influencing residential satisfaction. Furthermore, these findings are consistent with the studies of (Wegener & Schmidt, 2024), which highlight satisfaction with the acquired property.

A controversial issue in this study is sustainability. Satisfaction with the sustainability experience was the lowest, at 77.64% (sustainability experience index: 5.43), reflecting a disconnect between customer expectations and the reality of the purchased product, as corroborated by (Han & Jun, 2021) and (Yuan et al., 2023). This decline in satisfaction may be attributed to the fact that many properties were constructed several years ago, when sustainable attributes were not a priority in architectural design. Moreover, many real estate developers implement sustainability initiatives only superficially, further widening the gap between buyers' expectations and the actual delivered property, as discussed by (Dipeolu & Ibem, 2020). While sustainability is increasingly becoming a key factor in consumers' purchasing decisions, it remains an area for improvement for developers, as reaffirmed by (Lee, 2021). Although overall satisfaction levels exceed 80%, the findings suggest there is room for enhancement, particularly in terms of sustainability and post-occupancy features of the property.

6. Conclusions

This research allows us to observe essential indications for researchers and real estate developers, focusing on the cantons with the most significant and accelerated real estate development on the Ecuadorian coast. The model developed in this research can be prolonged to increasing states, especially those with a high population density, to analyse whether customers are satisfied with the properties acquired. This study clarifies the interrelationship between the shopping experience, product, and sustainability and how these significantly impact residential customer satisfaction. This evidence must help real estate developers incorporate into their internal processes the assessment of customer satisfaction individually and then be compared with the sector. Thus, they can make decisions that improve customer satisfaction and achieve their profitability objectives. In addition, for the creators and promoters of policies accountable for executing and encouraging sustainable and functional expansion, as well as for investigators, their interests focus on the interrelationship between shopping experience, product, and sustainability and its impact on residential satisfaction.

The constraint of this research is the sample. The socioeconomic profile of the respondents was mostly medium-low and low, who resided in 3 (Guayaquil, Daule, and Samborondón) of the 25 cantons that are part of the province of Guayas. The data collected corresponds to a socioeconomic profile of level "b" between medium low and medium high. A more diverse sample could improve the sample by surveying owners of medium-high and high economic classes.

The contributions of this research will lead real estate development companies to take measures to improve the real estate offer. This decision making considers an internal evaluation of the satisfaction of their clients and the degree of loyalty they have with them to understand what factors are present in the residential satisfaction of their clients. Likewise, having a broader vision of resident citizens who feel satisfied with their properties.

The originality and importance of this study lie in creating a residential satisfaction index for decision-making in the real estate sector since the current indices do not address the particularities of Latin American territories. For future lines of research, it is recommended to incorporate variables that cover the sustainability and innovation of the real estate sector, among the main ones being design, functionality, and comfort. Finally, applying this index at the regional, national, or continental level would be of great interest.

Statements and declarations

The authors have no relevant financial or non-financial interests to disclose. The authors have no competing interests to declare relevant to this article's content. All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript. The authors have no financial or proprietary interests in any material discussed in this article.

Compliance with ethical standards

Disclosure of potential conflicts of interest

The authors declare that they have no conflict of interest concerning the manuscript sent for publication.

Research with human and animal participants

For the research carried out, citizens of rural and urban areas were surveyed. Citizens were informed about the academic purpose and anonymity of the study before completing the questionnaire.

Informed consent

Verbal consent was requested before the citizen completed the questionnaire. The anonymity of the interviewee was guaranteed at all times.

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