Post-Occupancy Evaluation to Assess Value Generation in Social Housing Projects: Application in the Brazilian Context

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Abstract: Social housing projects (SHPs) have major social and economic importance in many developing countries, including Brazil. For this reason, it is important to assess the benefits of housing projects in terms of achieving housing programme goals. However, most post-occupancy evaluations (POE) have focused on product attributes without consideration of value generation from the perspective of the users. Indeed, previous studies in Brazil have highlighted numerous cases of SHPs failing to meet the population's needs. The aim of this research was to develop a POE method for assessing the effectiveness of housing programmes in generating value, examining both the quality of the built environment and the achievement of project goals. This method was based on the means-end value chain conceptual model, which has been widely applied in the field of marketing. Design science research, the methodological approach adopted in this investigation, divided this study approach into five phases: (1) understanding the context of SHPs in Brazil, (2) development of data collection instruments, (3) evaluation of three SHPs, (4) comparison of the results and discussion and (5) assessment of the proposed method and reflection. The main contribution of this research is the development of a POE method that provides a comprehensive assessment that is not limited to product attributes. The method also introduces several innovations compared to traditional POE processes, namely: (1) adaptation of the means-end value chain to the context of social housing, (2) involvement of different stakeholders in the evaluation process (e.g., social workers and technical staff from funding bodies), in addition to end users, (3) flexibility for assessing projects from different housing programmes and (4) the definition of a set of constructs that are relevant for evaluating SHPs in the Brazilian context.

Keywords: Social housing, Perceived value, Value hierarchy, Post-occupancy evaluation, Housing programmes in Brazil

INTRODUCTION

Social housing projects (SHPs) play a significant social and economic role in developing countries. In Brazil, SHPs have been inconsistent due to a variety of housing programmes with differing rules and implementation strategies

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(Ministério das Cidades, 2009; Marguti, 2018). This inconsistency is partly the result of the discontinuation of certain programmes, often due to shifts in housing policy. In addition, Brazil faces a significant housing shortage, with the deficit estimated at 6.215 million dwellings in 2022 (Fundação João Pinheiro, 2024) and the anticipated demand for housing by 2027 standing at approximately 12 million dwellings (Associação Brasileira de Incorporadoras Imobiliárias, 2018).

It is essential to evaluate SHPs both in terms of the benefits they provide to the population (Villarosa, 2011) and building performance from the perspective of the users (Mughairi, Beach and Rezgui, 2023). Post-occupancy evaluations (POE) serve this purpose and are often carried out by academic institutions. Way and Bordass (2005) suggest that feedback from users can be used to measure outcomes against project goals and to understand how to enhance user satisfaction in future projects. POE studies in Brazil have identified numerous issues with SHPs failing to meet the needs of the population, such as (1) inadequate space (Ornstein, Villa and Ono, 2011; Villa et al., 2022), (2) lack of housing diversity (Formoso, Leite and Miron, 2011; Garrefa et al., 2021), (3) poor aesthetics (Reis and Lay, 2009; Kowaltowski et al., 2019), (4) lack of privacy (Reis and Lay, 2004), (5) inadequate building performance (Lima et al., 2008), (6) ineffective facilities management (Lima et al., 2008), (7) building defects (Villa et al., 2022) and (8) difficulties in urban mobility and social segregation due to the location of housing projects in urban outskirts (Kowaltowski et al., 2019; Villa et al., 2022).

Several issues have been highlighted in the literature regarding the application of POEs, including (1) insufficient stakeholder involvement (Way and Bordass, 2005), (2) inadequate resources in terms of cost, time and skills required to carry out POEs (Sanni-Anibire, Hassanain and Al-Hammad, 2016; Vischer, 2002), (3) challenges in understanding impacts from the users' perspective (Sanni-Anibire, Hassanain and Al-Hammad, 2016; Vischer, 2002) and (4) a lack of clarity about who is in charge of addressing issues identified in POEs (Roberts et al., 2019). Additionally, most POEs are limited to evaluating product attributes rather than the expected benefits or perceived value from the perspective of users (Kowaltowski and Granja, 2011). As previous studies do not adequately consider users' desired values and needs, many fail to provide a comprehensive assessment of SHPs in terms of achieving project goals (Kowaltowski and Granja, 2011). The objectives of SHPs are often framed in terms of enhancing the quality of living for communities, considering factors such as health, education, safety, employment and income generation (Tillmann and Miron, 2020). Therefore, POE methods must assess SHPs not only by examining product attributes but also by evaluating value generation.

Value generation includes delivering a built environment that is fit for a purpose, that is, one that meets the intended goals and considers the needs of the various stakeholders involved, within the constraints of available resources, such as time and money (Tillmann and Miron, 2020). In this study, the means-end value chain conceptual model proposed by Woodruff and Gardial (1996) was used to represent a hierarchy of constructs, connecting product attributes, consequences of use and project objectives. This model was chosen because it describes how value is generated, linking tangible product and service attributes to abstract values. Furthermore, it has been successfully applied in evaluating consumer goods (Gutman, 1982; Zeithaml, 1988), food quality (Vranesevic, Vignali and Vignali, 2004), tourism management (Gallarza and Saura, 2006; Naoi et al., 2006) and business management (Rekom, Riel and Wierenga, 2006).

The aim of this research study was to develop a POE that assesses the effectiveness of SHPs in terms of value generation, considering both the quality of the built environment and the achievement of project goals. Additionally, the proposed method accounted for the need to adapt evaluation constructs to the frequent changes in Brazilian SHP policies and highlighted the importance of involving housing providers, especially funding organisations, in POE. This investigation was conducted in collaboration with the Federal Savings Bank (Caixa Econômica Federal – CAIXA) and POEs were performed in three SHPs funded by different Brazilian SHP programmes.

This article begins with a discussion of the hierarchy of user-perceived value, followed by an explanation of the research method and the presentation of the proposed model. The results of the evaluation of three SHPs are then discussed. The conclusion summarises the main contributions and limitations of the proposed POE method.

User-Perceived Value Hierarchy

The concept of value has been explored across different disciplines, including marketing (Cook and Wu, 2001), psychology (Schmenner and Swink, 1998), operations management and economics (Koskela, 2000). Existing theories provide a framework for understanding how value is generated, focusing on stakeholders' perceptions of value (Formoso and Miron, 2017; Tillmann, 2012). Meanwhile, the concept of perceived value is a key business issue that has emerged in the field of marketing (Sanchez-Fernandez and Iniesta-Bonillo, 2007). Extensive research has been undertaken to examine the relationship between product attributes and the value perceived by customers. From users' perspective, products and services are a means to an end. Therefore, the delivery of value should be based on a precise understanding of users' desires, from which project goals can be defined (Woodruff and Gardial, 1996).

Perceived value is inherently complex and multi-dimensional (Sánchez-Fernández and Iniesta-Bonillo, 2007; Huang et al., 2019; Caber, Albayrak and Crawford, 2020). It results from the interaction between consumers and products (Sánchez-Fernández and Iniesta-Bonillo, 2007). It is also relative and influenced by comparative, personal, and situational factors. Additionally, perceived value is preferential, perceptual and has cognitive-affective dimensions (Sánchez-Fernández and Iniesta-Bonillo, 2007). Consequently, the same product may be perceived differently by different customers (Holbrook, 2006; Mustak, 2019), depending on their personal needs, preferences and willingness to make sacrifices (Ravald and Grönroos, 1996; Zhang, Xiao and Zhou, 2020).

The means-end value chain model has been widely used as a theoretical framework for developing customer value hierarchical maps (Woodruff, Schumann and Gardial, 1993; Woodruff and Gardial, 1996). These maps represent the relationships between product attributes and customer values. This conceptual model is based on the premise that customers acquire and use products or services to accomplish favourable ends (Khalifa, 2004) and that customer values can be grouped into sets or classes (Gutman, 1982). The "means" are related to product attributes, while the "ends" represent the customers' ultimate goals or purposes (Gutman, 1982). On the other hand, customer value hierarchical maps include constructs ranging from tangible, objective aspects (e.g., desired product attributes) to more subtle, intangible goals and purposes. Woodruff and Gardial (1996), building on Gutman's (1982) model, developed a hierarchical model that links the delivery of products and services to their impacts on users, including values, goals and objectives.

Woodruff, Schumann and Gardial's (1993) model consists of three levels (as shown in Figure 1): (1) Attributes – the most concrete level, referring to the physical characteristics, resources or components of a product, (2) Consequences of use – the positive or negative experiences that result from using the product, often described in terms of user experiences and (3) Objectives (or goals) – the most abstract and intangible level, representing the values sought by a group of customers. When customers describe their experiences with a product, they often mention attributes, but these attributes must be linked to the use situations, the benefits sought and the purposes behind using the product (Woodruff, Schumann and Gardial, 1993). The levels in Woodruff, Schumann and Gardial's (1993) model can be associated with customer satisfaction (as shown in Figure 1, right side), which is based on evaluative judgments of product use (Woodruff, 1997; Woodruff and Gardial, 1996). Woodruff (1997) explains that a means-end value hierarchy can clarify both the desired value (prior to acquisition) and the received value (after use). Satisfaction, as the behavioural response to comparing expected and perceived value (Gallarza and Saura, 2006), reflects how much value was

derived from using a product in specific situations (Woodruff, Schumann and Gardial, 1993). Consequently, measuring satisfaction provides insights into customers' perceived value, including that of users or residents (Gallarza and Saura, 2006; Caber, Albayrak and Crawford, 2020).

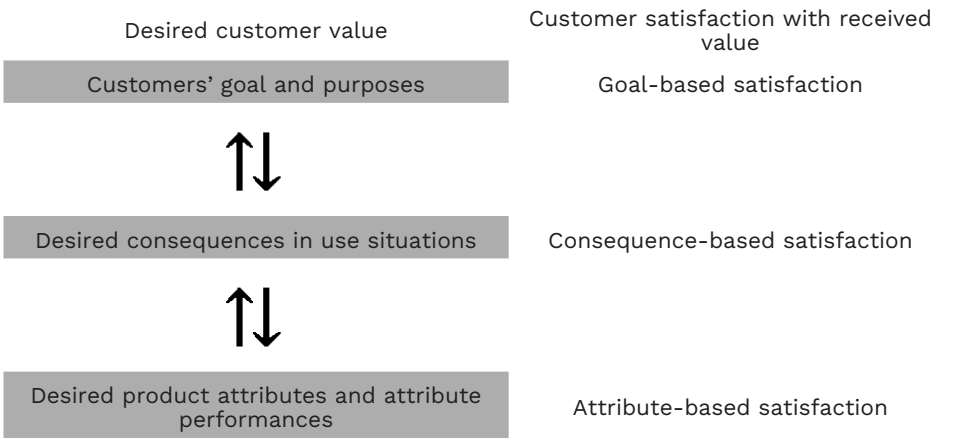

Figure 1. Customer value hierarchy model

Source: Woodruff (1997)

Users can experience varying levels of satisfaction at each stage of the value hierarchy (i.e., attributes, consequences and objectives), which helps to capture the complexity of perceived value after product use (Woodruff, Schumann and Gardial, 1993). Thus, POEs should extend beyond product attributes to the measurement of users' satisfaction by considering the more abstract, upper levels of the value hierarchy.

Overview

Existing literature highlights the limitations of current POEs in the social housing context, particularly regarding the assessment of social housing benefits (Villarosa, 2011). Therefore, improvements to POE methods are needed to better account for the consequences of product use and desired abstract values. By understanding how value is generated, it becomes possible to identify the attributes of the built environment that contribute most effectively to achieving benefits. Previous studies on the assessment of the built environment in SHPs have explored users perceived and desired value. However, some gaps in knowledge still exist, including the need for more flexible methods that accommodate frequent changes in social housing policies, a deeper understanding of the relationship between housing attributes and project goals, the integration of housing providers in the evaluation process

and the development of a feedback system to improve new housing projects. Adapting hierarchical value maps (Woodruff, 1997; Woodruff and Gardial, 1996), based on the means-end value chain model (Gutman, 1982), offers a potential improvement for POE methods (Zinas and Jusan, 2012; Hentschke et al., 2014; Aule et al., 2022). Such maps can support the assessment of user satisfaction by showing the relationships between product attributes, consequences and abstract values.

RESEARCH METHOD

Design science research (DSR) was adopted as the methodological approach for this study. DSR aims to develop artefacts that solve specific classes of problems while contributing to the development of prescriptive theories (Lukka, 2003). DSR outcomes can include models, methods, constructs and instantiations (March and Smith, 1995). The artefact proposed in this study is a POE method that produces a model of value generation, which can be used to assess housing projects in terms of achieving project goals and user satisfaction with the built environment.

The research process was divided into five steps, similar to those proposed by Lukka (2003): (1) Step A (Understanding the problem): Exploring the context of SHPs and Brazilian housing programmes, (2) Step B (Developing data collection instruments): Creating a generic questionnaire to capture different levels of users' perceived value, (3) Step C: Applying the questionnaire in three SHPs, (4) Step D: Comparing results and discussing findings and (5) Step E: Reflecting on the POE process to identify opportunities for improving value generation within the context of SHPs in Brazil. Each step is detailed as follows.

Step A (Understanding the Context of SHP)

The main sources of evidence in the first step were document analysis and six interviews with technical staff from the National Savings Bank, who had been involved in social work, design assessment and providing technical assistance to users (as shown in Table 1). The design development process in each housing programme was analysed and key attributes of housing projects were identified. A total of three housing projects funded by different housing programmes were selected in collaboration with social workers from the bank. These projects were chosen because of their distinct characteristics in terms of programme development processes, user participation, project location and typology, as further described in Step C.

The SHP attributes were grouped into the following categories:

1. Housing unit: A building or part of a building for single-family occupancy, such as one- or two-story houses and apartments.
2. Communal areas: Open or closed spaces or whole buildings for shared use, such as lounges, parking spaces, playgrounds and sports facilities.
3. Surroundings: Related to urban infrastructure and access to services, depending on project location.
4. Support by social workers: Encompass community development activities like environmental education, facility use and maintenance training and income generation projects.
5. Facilities management: Operation and maintenance of the housing estate. A facilities management company is hired for some projects, while others are self-managed by users.

Table 1. The interviews conducted in Step A

Interviewee's Role	Type of Interview
Architect (in charge of project assessment)	Individual
Social workers (including the supervisor and staff in charge of project assessment)	Group
Architect (manager of engineering, architecture and social work teams)	Individual
Architect (supervisor of Solidarity Credit and Collective Operations)	Individual
Architect (supervisor of Technical Assistance and Sustainable Development)	Individual
Architect (responsible for Project Development Unit)	Individual

Step B (Questionnaire Development)

Drawing on previous studies on Brazilian SHPs (Lima, Formosa and Echeveste, 2008; Miron and Formoso, 2010; Formoso, Leite and Miron, 2011; Kowaltowski and Granja, 2011; Hentschke et al., 2014), a set of constructs describing the attributes and consequences of SHPs was identified. These were discussed during two seminars with social workers from the National Savings Bank and two workshops with researchers experienced in POE for SHPs. These discussions helped refine the elements to be included in the questionnaire and shape the data collection process.

The research team anticipated that using the same data collection instrument across different projects would yield poor results, as it would not reflect the specificities of each project. Hence, the data collection tools had to be adapted to the unique characteristics of each project. Figure 2 represents the generic process for preparing a POE.

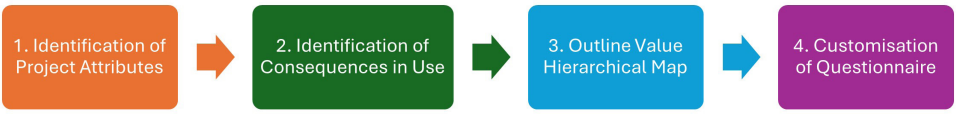

Figure 2. Generic process for preparing a POE

According to Figure 2, the first activity involved identifying the product attributes, including both the physical characteristics and associated services of the specific SHP. This information was obtained through the analysis of project documents and meetings with housing providers (as shown in Table 1). The second activity was the identification of potential consequences of product use within a specific SHP (as shown in Figure 3). The third activity focused on creating the initial version of the value hierarchical map for each project, which included the identification of project goals (the highest level of the value hierarchy). This hierarchical map was essential for understanding the relationships between constructs across different levels of abstraction.

Based on these constructs and their interconnections, evaluation criteria were established for inclusion in each questionnaire. The final activity was the customisation of the questionnaire, along with planning the data collection process, including sample definition. The generic POE questionnaire was divided into four parts: (1) project attributes, (2) users' profiles, (3) users' perception of housing attributes and consequences of use and (4) changes made by users to their housing units. Users' perceptions were captured using several instruments: (1) open-ended questions about product attributes and consequences, aiming to identify the best and worst aspects of the project, (2) satisfaction levels regarding the performance of products and services, (3) comparisons with previous dwellings and (4) intent to remain in the housing unit. Changes in housing units were recorded based on modifications made or planned by the users. In developing the final version of the questionnaire, the specific characteristics of different housing programmes were considered. Consequently, each housing project required an initial preparation phase in which the questionnaire was customised for the specific project. Figure 3 shows the constructs mapped during Steps A and B through a literature review and discussions with social workers (CAIXA).

ATTRIBUTES OF SHP		CONSEQUENCES OF USE	ITEMS FOR EVALUATION OF SATISFACTION
	HOUSING UNIT	ADEQUACY OF SPACE TO USE	1. Living room 2. Kitchen 3. Area for washing tank and clothesline 4. Bedrooms 5. Bathrooms 6. Yard 7. Stairs
		ENVIROMENTAL COMFORT	1. Noise levels from outside of the house/ apartment 2. Noise level between the spaces of the house/apartment 3. Internal temperature of the house/ apartment in winter and summer 4. Natural ventilation of spaces 5. Natural lighting of spaces
		QUALITY OF CONSTRUCTION AND FINISHINGS	1. Walls 2. Floor 3. Ceiling 4. Doors 5. Windows 6. Electrical facilities 7. Hydraulic facilities
		OWNERSHIP FEELING	—
	COMMON USE AREAS	ADEQUACY OF SPACE TO USE	1. Parking lots 2. Stairways and corridors 3. Community halls 4. Playground 5. Sports court 6. Concierge 7. Laundry 8. Theatre 9. Serigraphy 10. Bakery 11. Collective kitchen 12. Refectory 13. Office 14. Terrace 15. Headquarters of users' association (physical spaces)
		QUALITY OF CONSTRUCTION AND FINISHINGS	1. Walls 2. Floor 3. Ceiling 4. Doors 5. Windows 6. Electrical facilities 7. Hydraulic facilities
		APPEARANCE	Appearance (beauty) condominium/ allotment
		SECURITY	Security inside your condominium/allotment

		CONSEQUENCES OF USE	ITEMS FOR EVALUATION OF SATISFACTION
ATTRIBUTES OF SERVICES TO SHP		ACCESS TO INFRASTRUCTURE AND URBAN SERVICES	1. Garbage disposal 2. Water supply (clean tap water) 3. Electricity provider 4. Sewerage 5. Paving of streets
	SURROUNDINGS	SECURITY	Safety in the surroundings of the condominium
		LOCATION	Location in the apartment block/housing estate
		ACCESSIBILITY TO TRANSPORT AND URBAN EQUIPMENT	1. Accessibility to the apartment block/ housing estate by public transport 2. Proximity to shopping areas 3. Proximity to leisure and sport areas 4. Proximity to daycare centres and schools 5. Accessibility to healthcare units and/or hospital
	SUPPORT BY SOCIAL WORKERS	MONITORING BY SOCIAL WORKERS	Monitoring by social workers
		MOBILISATION, USE AND CARE OF CONDOMINIUM	1. Behaviour of users 2. Use and care of condominium 3. Participation of users in the activities of the condominium/allotment 4. Management of users' association
		SOCIAL INTERACTION IN CONDOMINIUM	Relationship with neighbours
		INCOME GENERATION	Professional courses offers/results
	FACILITIES MANAGEMENT	FACILITIES MANAGER	1. Communication 2. Speed in provision of technical assistance services 3. Transparency in accountability 4. Efficiency of the facilities manager
		MAINTENANCE OF CONDOMINIUM	1. Condominium cleaning 2. Actions for the conservation of condominium (repairs, painting, etc.)
		MAINTENANCE OF ALLOTMENT	1. Cleaning of streets and sidewalks (public area) 2. Conservation of yards and facades of houses
		SELF MANAGEMENT	1. Type of condominium administration 2. Administration (housing cooperative)
		INCOME GENERATION	Actions and initiatives to generate income for the community (e.g., bakery)
		COSTS	—

Figure 3. Constructs at the attribute and consequence levels

Step C (Questionnaire Application)

The three POEs were conducted sequentially, with increasing levels of participation from housing providers (CAIXA's technical staff and local government staff). Table 2 summarises the teams involved as well as the time spent on data collection and processing for each project.

Table 2. Summary of the data collection and processing in the three studies

Study 1 (SHP1)	Study 2 (SHP2)	Study 3 (SHP3)
Training of two researchers	Training of five researchers	Training of three social workers
Two researchers applying 27 questionnaires (two days)	Five researchers applying 81 questionnaires (one day)	One researcher and three social workers by CAIXA applying 67 questionnaires (two days)
Data processing by two researchers (one month)	Data processing by two researchers (10 days)	Data processing by two researchers (four days)

The three housing projects are presented in Table 3. SHP1 was funded by the Solidary Credit Programme, which was run by the local government and promoted user self-management. Beneficiaries were families with a monthly income of up to USD440. SHP2 was funded by the Residential Leasing Programme, which was managed by the private sector. Beneficiaries had a monthly income of up to USD705. SHP3 was funded by the Urbanisation Programme for Slums and Informal Settlements, which was run by not-for-profit organisations. Beneficiaries had a monthly income of up to USD410.

The POEs involved visits to the SHPs to deliver the questionnaire to a sample of users (Table 3). The sample size was calculated using Bolfarine and Bussab's (2007) equation, with a 50% proportion, 0.05 significance and 10% error. Only occupied houses were included in the population. During the same visit, direct observations were made of the housing units and communal areas. Social workers' input provided additional evidence on good practices and challenges in each project. For the third case study, technical staff from companies hired by CAIXA and the city council also participated in data collection.

Table 3. SHPs evaluated and sample size

SHP	Location	Programme	Beneficiaries	Characteristics	Typology	Population (*N*)	Calculated Sample (*n*)
SHP1	Porto Alegre, RS South of Brazil	Solidary Credit	Families organised through associations, with a monthly income of up to USD440	Participative management of the project in use	Refurbished building with 8 floors 42 apartments	36	27
SHP2	Porto Alegre, RS South of Brazil	Residential Leasing Programme	Families with monthly incomes up to USD705	Large-size housing projects	6 blocks condominium buildings with 5 floors 469 apartments	469	80
SHP3	Novo Hamburg, RS South of Brazil	Urbanisation Programme, Settlement and Integration Slums	Families with monthly incomes up to USD410	Housing resettlement conducted by the city council	Allotment of 156 two-storey houses 9 storey houses	156 7	60 7

Step D (Comparison of the Results and Discussion)

The research team processed and analysed the data from each POE. A second version of the value hierarchy map was created based on the user perceptions and observations during the visits. The open-ended questions, in which the users listed the five best and five worst characteristics of the project, were particularly valuable in assessing users' satisfaction. Qualitative data from the open-ended questions and observations revealed new constructs and relationships between them. Consequently, the second version of the value hierarchy map included new constructs and relationships, frequency analyses of the best and worst characteristics, satisfaction levels with product and service performance and reasons for staying in the housing unit.

The results were then presented to and discussed with CAIXA's technical staff and, representatives of one of the city councils involved in the study and academics who had previous experience in this type of evaluation. The technical staff directly involved in the development and evaluation of the model were engineers and architects in charge of assessing project proposals and monitoring project execution, as well as social workers supporting community development (as shown in Table 4). The graphical representation provided by the value hierarchical maps helped visualise and simplify the relatively large data set for the technical staff involved in discussing the results.

Table 4. Summary of the discussion of results in the three studies

Study 1 – SHP1	Study 2 – SHP2	Study 3 – SHP3
Presentation and discussion of the results with social workers from CAIXA (two hours)		Presentation and discussion of results with CAIXA's staff: Professionals from the Urban Development Unit and social workers (two hours)

Step E (Refinement of the Proposed Post-Occupancy Evaluations Method and Identification of Improvement Opportunities)

Figure 4 presents the final version of the POE method. It consisted of ten steps. The first four steps focused on defining and refining a set of constructs (attributes, consequences and objectives). Step E involved the initial creation of a value hierarchical map before conducting the POE. The stage covered the customisation of a questionnaire and planning data collection, as well as the application of the questionnaire and the analysis of results. The last stage of the step was the development of the final version of the value hierarchical map (after the POE). Due to space limitations, only the value hierarchical maps of SHP3 were presented in the results. This project was chosen because it featured the strongest participation from technical staff hired by CAIXA and the city council, enriching the data collection and analysis.

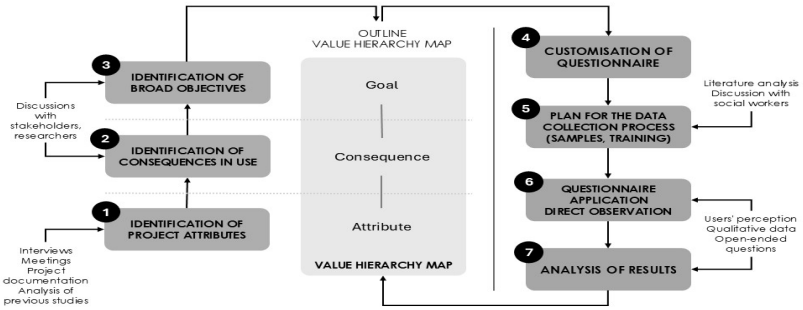

Figure 4. The final version of the POE process

RESULTS

Post-Occupancy Evaluations Results

Table 5 presents the users' profiles for the three SHPs. In SHP1, 39% of units were occupied by individuals living alone, primarily young adults (68%). Despite the lack of parking spaces, 11% of the users owned a car. In SHP2, 31% of units were occupied by three users and 59% of the heads of households were female. Regarding previous housing (as shown in Table 5), 49% of users used to pay rent and nearly half (47%) owned cars. SHP2 provided parking for only 306 vehicles but had 469 housing units. SHP3 units had only one bedroom, but family sizes ranged from one to eight people, with 46% of units housing four or more people. During preparation for the SHP3 evaluation, additional information was requested by the Porto Alegre Council team regarding users' profiles. One request was the inclusion of human-powered vehicles, such as bicycles, as several residents used them. In SHP 3, 23% of the users owned a car. Researchers also monitored the duration of residency, noting that 77% of users in previous homes lived in informal housing settlements.

Table 5. Users' profiles

Information	SHP1 (%)	SHP2 (%)	SHP3 (%)
Household Groups			
Alone	39	6	6
Couple without children	21	17	13
Couple with children	18	37	58
Others	22	40	23

(Continued on next page)

Table 5. *Continued*

Information		SHP1 (%)	SHP2 (%)	SHP3 (%)
Family Provider Profile				
Gender	Male	57	41	39
	Female	43	59	61
Age	10 years old to 19 years old	3	–	–
	20 years old to 39 years old	68	48	51
	40 years old to 59 years old	29	42	39
	60 years old and above	–	10	10
Occupation	Employee	53	57	29
	Self-employed with social security	11	4	1
	Self-employed without social security	18	10	23
	Worker without vinculum	7	3	20
	Retired	3	15	1
	Jobless	4	9	13
	Other	4	2	13
Education	Illiterate	–	–	13
	Junior incomplete	14	7	72
	Junior complete	3	14	4
	Middle incomplete	4	5	4
	Middle complete	29	43	6
	Higher incomplete	29	15	1
	Higher complete	21	16	–
Previous House				
Occupancy condition	Rented	43	49	10
	Cohabitation with relatives	29	31	6
	Borrowed	25	5	7
	Irregular area	–	–	77
	Others	3	15	–

Tables 6, 7 and 8 present the results from the three SHPs, focusing on (1) the best and worst characteristics and reasons to stay or leave the SHP, (2) improvements made or intended in the housing units, (3) comparisons with previous housing and (4) users' satisfaction with product elements and

services. In general, facilities management and social services had a significant influence on users' satisfaction. For instance, in SHP1, users highlighted the positive impact of self-management due to strong community involvement (as shown in Table 8). However, in SHP2, ineffective facility management and poor communal care negatively impacted satisfaction (as shown in Table 8). Thus, in both cases, facilities management seemed to have affected the degree of user satisfaction, either positively or negatively (as shown in Table 6).

Table 6. Users' perceptions and house improvements made or intended by users

Users' Perceptions	**SHP1**		**SHP2**		**SHP3**	
Best and Worst Characteristics	**Best (%)**	**Worst (%)**	**Best (%)**	**Worst (%)**	**Best (%)**	**Worst (%)**
Housing unit	8.4	17.4	5.6	5.6	16.1	11.4
Communal areas	6.5	0.0	10.5	12.8	28.6	8.9
Surroundings	16.8	12.3	12.0	17.4	10.6	5.6
Support by social workers	18.1	0.6	5.4	4.9	6.7	5.6
Facilities management	9.0	7.1	1.5	21.7	1.1	5.3
Others	2.6	1.3	2.0	0.5	0.3	–
Total	61.3	38.7	37.1	62.9	63.3	36.7
Reasons to Stay or Leave SHPs	**Stay (%)**	**Leave (%)**	**Stay (%)**	**Leave (%)**	**Stay (%)**	**Leave (%)**
Housing unit	27.0	5.4	16.8	15.4	29.4	2.9
Common use areas	–	–	1.0	2.9	22.1	1.5
Surroundings	16.2	–	3.1	17.3	11.8	2.9
Support by social workers	18.9	–	6.3	4.8	1.5	2.9
Facilities management	13.5	–	2.1	12.5	4.4	–
Others	18.9	–	5.2	12.5	20.6	–
Total	94.6	5.4	34.6	65.4	89.7	10.3

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Table 6. *Continued*

House Improvements Made or Intended by Users	SHP1		SHP2		SHP3	
Type of Improvement	**Made (%)**	**Intended (%)**	**Made (%)**	**Intended (%)**	**Made (%)**	**Intended (%)**
Horizontal finishings	57.1	17.9	98.8	25.9	76.1	32.4
Vertical finishings	42.9	35.7	96.3	51.9	29.6	19.7
Bathroom accessories	17.9	14.3	1.2	3.7	–	–
Layout	10.7	21.4	–	1.2	9.9	8.5
Door and windows	3.6	10.7	9.9	8.6	5.6	4.2
Expansions	–	–	–	–	64.8	76.1
Safety devices	–	–	25.9%	17.3	36.2	11.3
Others	7.1	35.7	16.0	21.0	7.0	4.2

Table 7. Comparison with previous housing

Results Closed Questions	SHP1			SHP2			SHP3		
Comparison with Previous Housing	**Worst (%)**	**Neutral (%)**	**Best (%)**	**Worst (%)**	**Neutral (%)**	**Best (%)**	**Worst (%)**	**Neutral (%)**	**Best (%)**
Habitability and functionality	4	39	57	33	20	47	10	7	83
Appearance	4	29	68	36	28	36	6	6	89
Safety	7	46	46	37	33	30	4	21	75
Location	–	11	89	43	23	33	1	15	83
Social interaction in the condominium	–	25	75	15	58	27	7	28	65
Costs	46	14	39	–	–	–	–	–	–
Accessibility to transport and urban equipment	–	–	–	–	–	–	3	10	87

Table 8. Users' satisfaction

(a) SHP1

Results of Closed Questions	SHP1				
Items for Evaluation of Satisfaction	**VD (%)**	**D (%)**	**N (%)**	**S (%)**	**VS (%)**
Housing Unit					
1. Adequacy of space to use					
a. Living room	–	3.6	3.6	75.0	17.9
b. Kitchen	–	17.9	7.1	60.7	14.3
c. Laundry	–	20.0	50.0	20.0	10.0
d. Bedrooms	–	7.1	7.1	78.6	7.1
e. Bathrooms	–	10.7	3.6	50.0	35.7
f. Yard	–	–	–	–	–
g. Stairs	–	–	–	–	–
2. Environmental comfort					
a. Noise levels from outside the house/ apartment	39.3	28.6	14.3	10.7	7.1
b. Noise level between the spaces of the house/apartment	–	7.1	21.4	60.7	10.7
c. Internal temperature of the house/ apartment in winter and summer	–	17.9	17.9	53.6	10.7
d. Natural ventilation of spaces	–	25.0	7.1	50.0	17.9
e. Natural lighting of spaces	–	14.3	17.9	60.7	7.1
3. Quality of construction and finishings					
a. Walls	3.6	28.6	7.1	53.6	7.1
b. Floor	10.7	17.9	3.6	50.0	17.9
c. Ceiling	3.6	21.4	25.0	46.4	3.6
d. Doors	–	14.3	17.9	57.1	10.7
e. Windows	–	25.0	21.4	46.4	7.1
f. Electrical facilities	3.6	17.9	3.6	64.3	10.7
g. Hydraulic facilities	3.6	17.9	10.7	64.3	3.6

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Table 8. *Continued*

Results of Closed Questions	SHP1				
Items for Evaluation of Satisfaction	**VD (%)**	**D (%)**	**N (%)**	**S (%)**	**VS (%)**
Common Use Areas					
1. Adequacy of space to use					
a. Parking lots	–	–	–	–	–
b. Stairways and corridors	–	3.6	7.1	71.4	17.9
c. Community hall	–	–	–	–	–
d. Playground	–	–	–	–	–
e. Sports court	–	–	–	–	–
f. Concierge	–	–	–	–	–
g. Laundry	–	3.6	10.7	46.4	39.3
h. Theatre	–	–	10.7	53.6	35.7
i. Serigraphy	–	14.3	60.7	25.0	–
j. Bakery	–	3.6	25.0	53.6	17.9
k. Collective kitchen	3.6	7.1	42.9	39.3	7.1
l. Refectory	–	3.6	42.9	46.4	7.1
m. Office	–	-	32.1	64.3	3.6
n. Terrace	–	7.1	25.0	39.3	28.6
2. Quality of construction and finishings					
a. Walls	3.6	7.1	21.4	57.1	10.7
b. Floor	7.1	35.7	21.4	32.1	3.6
c. Ceiling	3.6	10.7	32.1	50.0	3.6
d. Doors	3.6	7.1	17.9	67.9	3.6
e. Windows	3.6	10.7	10.7	64.3	10.7
f. Electrical facilities	7.1	14.3	14.3	60.7	3.6
g. Hydraulic facilities	7.1	10.7	14.3	64.3	3.6
3. Appearance					
Appearance of condominium or allotment	–	3.6	–	42.9	53.6
4. Security					
Safety inside condominium or allotment	–	3.6	7.1	78.6	10.7

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Table 8. *Continued*

Results of Closed Questions	SHP1				
Items for Evaluation of Satisfaction	**VD (%)**	**D (%)**	**N (%)**	**S (%)**	**VS (%)**
5. Access to infrastructure and urban services					
a. Garbage disposal	–	–	–	–	–
b. Water supply (clean tap water)	–	–	–	–	–
c. Electricity provider	–	–	–	–	–
d. Sewage	–	–	–	–	–
e. Paving of streets	–	–	–	–	–
Surroundings					
1. Security					
Safety in the surrounding areas of the condominium	10.7	71.4	7.1	10.7	–
2. Location					
Location in the apartment block/housing estate	–	7.1	3.6	42.9	46.4
3. Accessibility to transport and urban equipment					
a. Accessibility to the project by public transport	–	–	–	–	–
b. Proximity to shopping areas	–	–	–	–	–
c. Proximity to leisure and sports areas	–	–	–	–	–
d. Proximity to day-care centres and schools	–	–	–	–	–
e. Accessibility to healthcare units and hospital	–	–	–	–	–
Support by Social Workers					
1. Monitoring by social workers					
Monitoring by social workers	–	21.1	42.1	31.6	5.3
2. Mobilisation, use and care of condominium					

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Table 8. *Continued*

Results of Closed Questions	SHP1				
Items for Evaluation of Satisfaction	**VD (%)**	**D (%)**	**N (%)**	**S (%)**	**VS (%)**
a. Behaviour of users	–	–	3.6	71.4	25.0
b. Use and care of condominium	–	17.9	7.1	71.4	3.6
c. Participation of users in the activities of the condominium	7.1	25.0	32.1	35.7	–
3. Social interaction in condominiums					
Relationship with neighbours	–	3.6	14.3	57.1	25.0
Facilities Management					
1. Facilities manager					
a. Communication	–	–	–	–	–
b. Speed in the provision of technical assistance services	–	–	–	–	–
c. Transparency in accountability	–	–	–	–	–
d. Efficiency of the facilities manager	–	–	–	–	–
2. Maintenance of condominium					
a. Condominium cleaning services	3.6	21.4	7.1	64.3	3.6
b. Condominium maintenance services (e.g., repairs, painting)	–	7.1	7.1	78.6	7.1
3. Maintenance of allotment					
a. Cleaning of streets and sidewalks (public areas)	–	–	–	–	–
b. Conservation of yards and facades of buildings	–	–	–	–	–
4. Self-management					
a. Type of condominium administration	3.6	10.7	21.4	53.6	10.7

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Table 8. *Continued*

Results of Closed Questions	SHP1				
Items for Evaluation of Satisfaction	**VD (%)**	**D (%)**	**N (%)**	**S (%)**	**VS (%)**
b. Administration of cooperative	3.6	14.3	17.9	57.1	7.1
5. Income generation					
Actions and initiatives to generate income for the community	3.6	7.1	14.3	57.1	17.9

Notes: VD = Very Dissatisfied; D = Dissatisfied; N = Neutral; S = Satisfied; VS = Very Satisfied.

(b) SHP2

Results of Closed Questions	SHP2				
Items for Evaluation of Satisfaction	**VD (%)**	**D (%)**	**N (%)**	**S (%)**	**VS (%)**
Housing Unit					
1. Adequacy of space to use					
a. Living room	6.2	24.7	19.8	40.7	8.6
b. Kitchen	16.0	45.7	11.1	24.7	2.5
c. Laundry	44.4	37.0	9.9	7.4	1.2
d. Bedrooms	6.2	17.3	16.0	55.6	4.9
e. Bathrooms	2.5	18.5	13.6	60.5	4.9
f. Yard	–	–	–	–	–
g. Stairs	–	–	–	–	–
2. Environmental comfort					
a. Noise levels from outside the house/ apartment	32.1	28.4	17.3	18.5	3.7
b. Noise level between the spaces of the house/apartment	8.6	16.0	22.2	46.9	6.2
c. Internal temperature of the house/ apartment in winter and summer	14.8	23.5	14.8	43.2	3.7
d. Natural ventilation of spaces	3.7	12.3	6.2	69.1	8.6
e. Natural lighting of spaces	2.5	11.1	6.2	67.9	12.3

(Continued on next page)

Table 8. *Continued*

Results of Closed Questions	SHP2				
Items for Evaluation of Satisfaction	**VD (%)**	**D (%)**	**N (%)**	**S (%)**	**VS (%)**
3. Quality of construction and finishings					
a. Walls	29.6	37.0	9.9	19.8	3.7
b. Floor	28.4	29.6	12.3	24.7	4.9
c. Ceiling	27.2	32.1	13.6	21.0	6.2
d. Doors	23.5	32.1	16.0	27.2	1.2
e. Windows	12.3	28.4	13.6	43.2	2.5
f. Electrical facilities	6.2	18.5	9.9	59.3	6.2
g. Hydraulic facilities	8.6	12.3	6.2	67.9	4.9
Common Use Areas					
1. Adequacy of space to use					
a. Parking lots	25.9	22.2	34.6	16.0	1.2
b. Stairways and corridors	34.6	40.7	12.3	11.1	1.2
c. Community hall	14.8	18.5	35.8	27.2	3.7
d. Playground	27.2	35.8	16.0	18.5	2.5
e. Sports court	35.8	23.5	27.2	12.3	1.2
f. Concierge	21.0	34.6	13.6	27.2	3.7
g. Laundry	–	–	–	–	–
h. Theatre	–	–	–	–	–
i. Serigraphy	–	–	–	–	–
j. Bakery	–	–	–	–	–
k. Collective kitchen	–	–	–	–	–
l. Refectory	–	–	–	–	–
m. Office	–	–	–	–	–
n. Terrace	–	–	–	–	–
2. Quality of construction and finishings					
a. Walls	30.9	37.0	17.3	13.6	1.2
b. Floor	38.3	30.9	13.6	16.0	1.2
c. Ceiling	33.3	34.6	13.6	17.3	1.2
d. Doors	27.2	28.4	25.9	17.3	1.2

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Table 8. *Continued*

Results of Closed Questions	SHP2				
Items for Evaluation of Satisfaction	**VD (%)**	**D (%)**	**N (%)**	**S (%)**	**VS (%)**
e. Windows	23.5	25.9	25.9	23.5	1.2
f. Electrical facilities	14.8	23.5	27.2	30.9	3.7
g. Hydraulic facilities	16.0	16.0	32.1	32.1	3.7
3. Appearance					
Appearance of condominium or allotment	34.6	27.2	21.0	16.0	1.2
4. Security					
Safety inside condominium or allotment	27.2	39.5	12.3	17.3	3.7
5. Access to infrastructure and urban services					
a. Garbage disposal	–	–	–	–	–
b. Water supply (clean tap water)	–	–	–	–	–
c. Electricity provider	–	–	–	–	–
d. Sewage	–	–	–	–	–
e. Paving of streets	–	–	–	–	–
Surroundings					
1. Security					
Safety in the surrounding areas of the condominium	24.7	42.0	22.2	11.1	–
2. Location					
Location in the apartment block/housing estate	–	–	–	–	–
3. Accessibility to transport and urban equipment					
a. Accessibility to the project by public transport	8.6	12.3	11.1	55.6	12.3
b. Proximity to shopping areas	9.9	29.6	11.1	44.4	4.9
c. Proximity to leisure and sports areas	13.6	30.9	22.2	29.6	3.7
d. Proximity to day-care centres and schools	14.8	38.3	17.3	24.7	4.9

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Table 8. *Continued*

Results of Closed Questions	SHP2				
Items for Evaluation of Satisfaction	**VD (%)**	**D (%)**	**N (%)**	**S (%)**	**VS (%)**
e. Accessibility to healthcare units and hospital	–	–	–	–	–
Support by Social Workers					
1. Monitoring by social workers					
Monitoring by social workers	43.8	18.8	15.6	21.9	–
2. Mobilisation, use and care of condominium					
a. Behaviour of users	13.6	19.8	32.1	28.4	6.2
b. Use and care of condominium	25.9	45.7	16.0	8.6	3.7
c. Participation of users in the activities of the condominium	19.8	33.3	38.3	8.6	–
3. Social interaction in condominiums					
Relationship with neighbours	–	3.7	22.2	56.8	17.3
Facilities Management					
1. Facilities manager					
a. Communication	34.6	27.2	17.3	19.8	1.2
b. Speed in the provision of technical assistance services	32.1	34.6	21.0	11.1	1.2
c. Transparency in accountability	30.0	23.8	35.0	8.8	2.5
d. Efficiency of the facilities manager	34.6	22.2	25.9	13.6	3.7
2. Maintenance of condominium					
a. Condominium cleaning services	39.5	28.4	9.9	19.8	2.5
b. Condominium maintenance services (e.g., repairs, painting)	40.7	37.0	17.3	4.9	–

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Table 8. *Continued*

Results of Closed Questions	SHP2				
Items for Evaluation of Satisfaction	**VD (%)**	**D (%)**	**N (%)**	**S (%)**	**VS (%)**
3. Maintenance of allotment					
a. Cleaning of streets and sidewalks (public areas)	–	–	–	–	–
b. Conservation of yards and facades of buildings	–	–	–	–	–
4. Self-management					
a. Type of condominium administration	–	–	–	–	–
b. Administration of cooperative	–	–	–	–	–
5. Income generation					
Actions and initiatives to generate income for the community	–	–	–	–	–

Notes: VD = Very Dissatisfied; D = Dissatisfied; N = Neutral; S = Satisfied; VS = Very Satisfied.

(c) SHP3

Results of Closed Questions	SHP3				
Items for Evaluation of Satisfaction	**VD (%)**	**D (%)**	**N (%)**	**S (%)**	**VS (%)**
Housing Unit					
1. Adequacy of space to use					
a. Living room	8.5	26.8	12.7	39.4	12.7
b. Kitchen	11.3	40.8	5.6	33.8	8.5
c. Laundry	8.5	35.2	8.5	40.8	7.0
d. Bedrooms	4.2	32.4	15.5	39.4	8.5
e. Bathrooms	9.9	39.4	12.7	29.6	8.5
f. Yard	8.5	23.9	11.3	47.9	8.5
g. Stairs	1.4	5.6	4.2	69.0	19.7

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Table 8. *Continued*

Results of Closed Questions	SHP3				
Items for Evaluation of Satisfaction	**VD (%)**	**D (%)**	**N (%)**	**S (%)**	**VS (%)**
2. Environmental comfort					
a. Noise levels from outside the house/ apartment	12.7	32.4	15.5	33.8	5.6
b. Noise level between the spaces of the house/apartment	4.2	23.9	11.3	50.7	9.9
c. Internal temperature of the house/ apartment in winter and summer	9.9	39.4	12.7	29.6	8.5
d. Natural ventilation of spaces	8.5	23.9	11.3	47.9	8.5
e. Natural lighting of spaces	1.4	5.6	4.2	69.0	19.7
3. Quality of construction and finishings					
a. Walls	4.2	16.9	8.5	60.6	9.9
b. Floor	8.5	26.8	7.0	52.1	5.6
c. Ceiling	5.6	25.4	4.2	60.6	4.2
d. Doors	9.9	19.7	9.9	52.1	8.5
e. Windows	9.9	21.1	11.3	50.7	7.0
f. Electrical facilities	2.8	21.1	2.8	56.3	16.9
g. Hydraulic facilities	2.8	18.3	2.8	60.6	15.5
Common Use Areas					
1. Adequacy of space to use					
a. Parking lots	–	–	–	–	–
b. Stairways and corridors	–	–	–	–	–
c. Community hall	–	–	–	–	–
d. Playground	–	–	–	–	–
e. Sports court	–	–	–	–	–
f. Concierge	–	–	–	–	–
g. Laundry	–	–	–	–	–
h. Theatre	–	–	–	–	–
i. Serigraphy	–	–	–	–	–

(Continued on next page)

Table 8. *Continued*

Results of Closed Questions	SHP3				
Items for Evaluation of Satisfaction	**VD (%)**	**D (%)**	**N (%)**	**S (%)**	**VS (%)**
j. Bakery	–	–	–	–	–
k. Collective kitchen	–	–	–	–	–
l. Refectory	–	–	–	–	–
m. Office	–	–	–	–	–
n. Terrace	–	–	–	–	–
2. Quality of construction and finishings					
a. Walls	–	–	–	–	–
b. Floor	–	–	–	–	–
c. Ceiling	–	–	–	–	–
d. Doors	–	–	–	–	–
e. Windows	–	–	–	–	–
f. Electrical facilities	–	–	–	–	–
g. Hydraulic facilities	–	–	–	–	–
3. Appearance					
Appearance of condominium or allotment	–	9.9	8.5	57.7	23.9
4. Security					
Safety inside condominium or allotment	15.5	26.8	4.2	46.5	7.0
5. Access to infrastructure and urban services					
a. Garbage disposal	–	2.8	1.4	70.4	25.4
b. Water supply (clean tap water)	1.4	11.3	4.2	64.8	18.3
c. Electricity provider	–	4.2	1.4	71.8	22.5
d. Sewage	1.4	7.0	2.8	76.1	12.7
e. Paving of streets	1.4	1.4	2.8	59.2	35.2
Surroundings					
1. Security					
Safety in the surrounding areas of the condominium	13.0	43.5	11.6	24.6	7.2

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Table 8. *Continued*

Results of Closed Questions	SHP3				
Items for Evaluation of Satisfaction	**VD (%)**	**D (%)**	**N (%)**	**S (%)**	**VS (%)**
2. Location					
Location in the apartment block/housing estate	–	–	–	–	–
3. Accessibility to transport and urban equipment					
a. Accessibility to the project by public transport	–	9.9	5.6	66.2	18.3
b. Proximity to shopping areas	1.4	11.4	4.3	70.0	12.9
c. Proximity to leisure and sports areas	21.4	47.1	14.3	12.9	4.3
d. Proximity to day-care centres and schools	2.9	15.7	18.6	51.4	11.4
e. Accessibility to healthcare units and hospital	7.0	32.4	11.3	42.3	7.0
Support by Social Workers					
1. Monitoring by social workers					
Monitoring by social workers	1.7	6.9	6.9	62.1	22.4
2. Mobilisation, use and care of condominium					
a. Behaviour of users	5.6	25.4	18.3	45.1	5.6
b. Use and care of condominium	4.2	29.6	14.1	46.5	5.6
c. Participation of users in the activities of the condominium	11.6	36.2	17.4	29.0	5.8
3. Social interaction in condominiums					
Relationship with neighbours	3.1	15.4	7.7	58.5	15.4
Facilities Management					

(Continued on next page)

Table 8. *Continued*

Results of Closed Questions	SHP3				
Items for Evaluation of Satisfaction	**VD (%)**	**D (%)**	**N (%)**	**S (%)**	**VS (%)**
1. Facilities manager					
a. Communication	–	–	–	–	–
b. Speed in the provision of technical assistance services	–	–	–	–	–
c. Transparency in accountability	–	–	–	–	–
d. Efficiency of the facilities manager	–	–	–	–	–
2. Maintenance of condominium					
a. Condominium cleaning services	–	–	–	–	–
b. Condominium maintenance services (e.g., repairs, painting)	–	–	–	–	–
3. Maintenance of allotment					
a. Cleaning of streets and sidewalks (public areas)	5.7	35.7	10.0	44.3	4.3
b. Conservation of yards and facades of buildings	1.4	30.0	20.0	42.9	5.7
4. Self-management					
a. Type of condominium administration	–	–	–	–	–
b. Administration of cooperative	–	–	–	–	–
5. Income generation					
Actions and initiatives to generate income for the community	–	–	–	–	–

Notes: VD = Very Dissatisfied; D = Dissatisfied; N = Neutral; S = Satisfied; VS = Very Satisfied.

In all three studies, a sense of ownership emerged as a key reason for staying, while inadequate space was the primary reason for users wanting to leave. Ownership of property appeared to be a major goal for users, differing from

the housing programmes' emphasis on improving living quality. In SHP3, there was an additional benefit derived from the legal ownership of the property, which was the fact that users felt able to make improvements to and changes in the dwellings as needed (as shown in Table 6). Furthermore, the high levels of changes to the housing units in all SHPs suggested a need to adopt mass customisation strategies. This may be related to the Brazilian culture, as pointed out in previous POE studies (Miron and Formoso, 2010; Formoso, Leite and Miron, 2011). Despite the variability of responses regarding the best and worst features in comparison with the previous housing (as shown in Table 7), the main reported consequences of use were location and accessibility to transport and urban equipment, indicating that location and the availability of urban infrastructure strongly influence users' perceived value.

SHP3 (Value Hierarchical Map)

Figure 5 presents the first version of the hierarchical value map (refer Step B) for SHP3, while the final version of that map is presented in Figure 6. The second version of the map combined a model of value generation and the evaluation by the users, considering the reasons to leave or stay and the degree of satisfaction (refer to Step D). Therefore, the map presented in Figure 6 is a synthesis of evaluation results, highlighting key constructs in value generation and their relationships so that it could be used as a visual device to support decision-making. Regarding the evaluation of SHP3, the most and least cited project characteristics are presented in Table 6, as well as satisfaction levels (as shown in Table 8) and reasons to stay or leave (as shown in Table 6). Among the consequences considered, the quality of construction and finishings received 50.7% to 60.6% satisfaction for all items (see green ellipse), respectively. Responses explaining the best characteristics accounted for 16.1% of the responses (intermediate green), while 11.4% highlighted the worst (light red) and 29.4% of users' intention to stay (light green).

New constructs and relationships emerged from the data collected through direct observations and interviews. A comparison was made between the value hierarchical map created before the POE (as shown in Figure 5) and the map created after it (Figure 6). The maps reflected the different perspectives, on one hand, of the housing providers (i.e., city councils, cooperatives, construction companies and funding agencies like CAIXA) and, on the other, of the final users. However, there was a high degree of similarity, which might be related to the strong involvement of housing provider representatives, such as social workers from CAIXA and technical staff from the Novo Hamburgo City Council.

One key relationship identified in the final map was between the appearance and adequacy of space in the housing unit, which was represented in the final value hierarchical map (see Figure 6). Due to the small size of dwellings, only one bedroom, several users had built housing extensions (65%). These were self-funded by users, often using poor-quality materials, affecting aesthetics, especially from the point of view of neighbours. A relationship was also found between health and access to infrastructure and urban services (as shown in Figure 6). The project is in an area prone to floods, raising concerns about insect infestations and the spread of diseases. Health was identified as a construct in the hierarchical value map, but there were clear benefits of having access to infrastructure and urban services. In fact, sewage and access to infrastructure and urban services were the most cited positive characteristics of this project, while facility management costs were seen as a negative characteristic, as users had to pay for some services.

The technical staff from housing providers involved in this investigation agreed that the graphical value hierarchical map effectively summarised the large data set (as shown in Tables 6 and 8), providing a clear overview of the evaluation results.

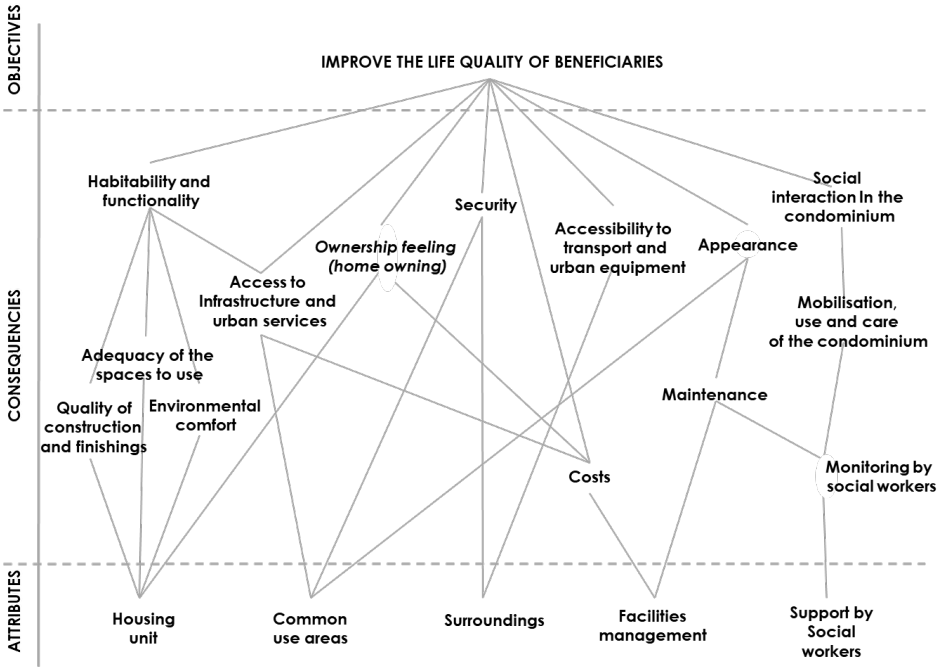

Figure 5. Value hierarchy for SHP3 (Step B)

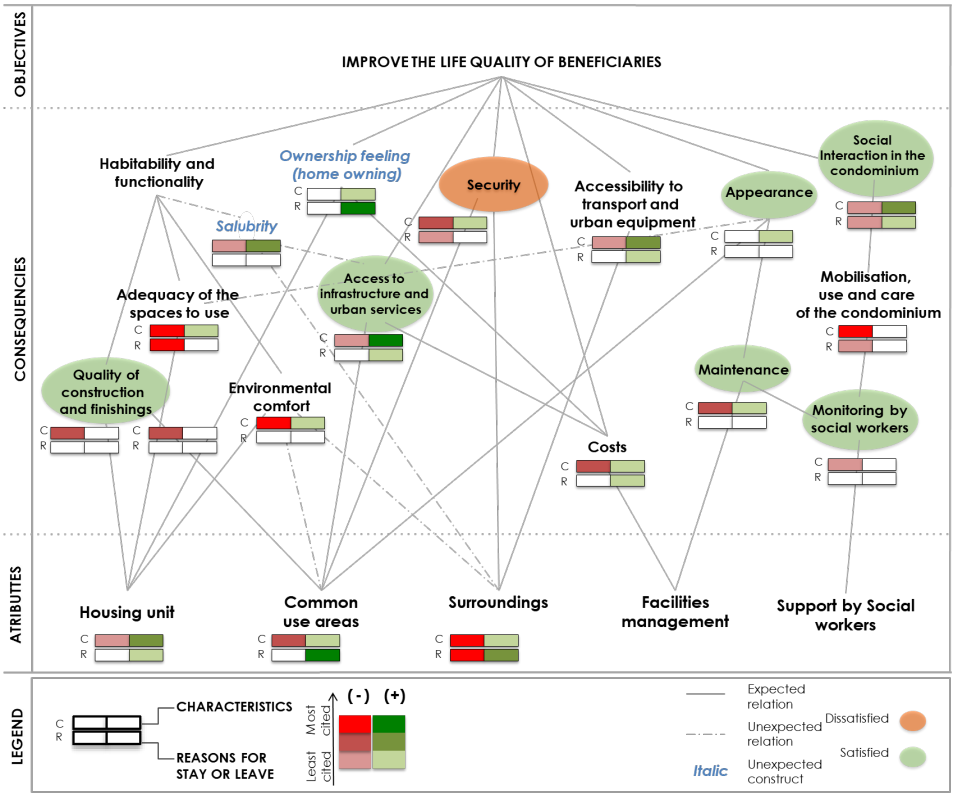

Figure 6. Visual display of the value hierarchy map for SHP3

DISCUSSION

This study proposed a POE method for assessing SHPs and identifying opportunities to improve value generation. In relation to previous POE studies (Kowaltowski and Granja, 2011; Sanni-Anibire, Hassanain and Al-Hammad, 2016; Roberts et al., 2019; Villa et al., 2022), the main innovations include the following: (1) the use of multiple sources of data, including perceptions captured from social workers and other stakeholders, user questionnaires and direct observations of housing units and communal areas and (2) the adoption of a structured process for modelling value generation, including the proposal and refinement of a set of constructs, development of a preliminary value hierarchical map, customisation of the questionnaire according to the characteristics of the project and development of the final version of the value hierarchical map. A customised data collection instrument was developed for each project, although all questionnaires had sections that

produced comparable results. This method established a structure for data collection and analysis, allowing for explicit connections between constructs and evidence, making the evaluation process traceable.

"Product attributes" is the easiest hierarchical level for data collection, as it is based on the descriptions of products and services, which are usually well documented in the programme or project documents (e.g., design drawings, standards, contracts). Some "consequences of use" were identified in project documents, while others required the use of other sources of evidence, such as interviews and reports. During the interviews with users, some additional consequences emerged, which had not been foreseen by other stakeholders. These included a sense of ownership (SHP1), improvements in infrastructure and urban services (SHP2) and enhanced sanitation (SHP3). In contrast, some consequences deemed essential by CAIXA, such as maintenance, were less important to SHP3 users. Defining project goals related to value generation proved to be the most challenging task, as conflicting views among stakeholders led to differing expectations for each project, often expressed as abstract values. Consequently, only one generic goal for SHPs was considered in the empirical studies: improving the quality of life for users.

As previously mentioned, an important step in developing value hierarchical maps is understanding housing providers' perceptions of project expected outcomes. The input from housing providers and funding organisations was instrumental in producing the preliminary maps used in the evaluation (e.g., Figure 5). These preliminary maps broadened and integrated the expected values from various stakeholders. For instance, social workers' perceptions of the three SHPs offered additional insights into good practices and problems related to each project. Moreover, these preliminary maps can be used to compare the value envisioned during project conception with the value received by users (Woodruff and Gardial, 1996). This comparison also allowed the identification of expected benefits that were not realised in practice. From a theoretical perspective, an important contribution of this study is the set of constructs (as shown in Figure 3) used to produce the value hierarchical maps. While some constructs have been used in previous studies, an effort was made in this study to understand the connections between them. The construct definitions were initially based on the literature and then contextualised for SHPs in Brazil. Clearly defining these constructs is essential for developing databases that could be used for comparing results from different projects in the future.

CONCLUSIONS

The main outcome of this research is the development of a POE method for SHPs, grounded in the means-end value chain model devised by Gutman

(1982). By using value hierarchical maps, this evaluation approach extends beyond product attributes to focus on user consequences and benefits. The concepts of perceived value and value hierarchy proved useful in linking project expectations to actual outcomes as experienced by users. Analysing these results enabled the identification of the consequences perceived by users. One advantage of using value hierarchical maps is that they offer a structured framework for meaningfully comparing POE results across different types of projects, emphasising the benefits perceived by both users and other stakeholders (e.g., representatives from housing providers). The utility of this method is evident in the comparative analysis of the three housing projects that were assessed. A set of constructs was developed to support the evaluation process, grounded in the literature and expressed in a way that could be understood by project stakeholders. These constructs were identified and refined through the application of the POE method. Additionally, involving representatives from housing providers and funding organisations in the design, execution and discussion of POE results enhanced the assessment of value generation.

Several limitations should be pointed out. First, the evaluation was based on three empirical studies of housing programmes in Brazil, so the results cannot be generalised to other programmes or locations. Further work is needed to assess the method's utility and applicability in other social housing programmes. Future research should also explore the use of value hierarchical maps to support decision-making in the planning of social housing programmes or in the design of new projects. Finally, another opportunity for future research is to develop and test digital tools to process data and disseminate POE results, making feedback to new projects more effective.

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