

IMPROVING TECHNIQUE FOR CAPTURING VALUE IN LOW-INCOME HOUSING

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ABSTRACT

Due to the current housing provision policy for low-income houses in Brazil, a large amount of new houses are being built. These constructions comply with a list of requirements provided by the government and follow the typological patterns arising in the market, but adapted to smaller dimensions and funding. The families benefited receive aid from the government and constitute a new social class, of which little is known about their needs and perspectives of value. Thus, it is necessary to grasp the information about their needs in order to define what adds value for them and therefore improve the projects, which could be better suited to the needs of its end users.

In that manner, this paper aims to improve a quantitative technique for capturing the needs of the end users of low-income housing by setting the value perceived by them. First, an existing questionnaire based on the middle class was adapted to the public of low-income housing. Subsequently, the questionnaire was tested, and the tests showed that respondents had difficulty in giving an answer in the appropriate format. Thus, a visual device was created to facilitate the process and then a new test was made. Changes in the data collection technique showed a better understanding of the questions by the respondents, an increase in the speed of application and, consequently, reduced the total amount of time spent in the application of the questionnaire. Thus, the quantitative technique for capturing value from residents of low-income housing has been improved, allowing its application in a large scale and thereby identifying the points that generate value for the research's target audience.

KEYWORDS

Value capture, Low-income housing, Satisfaction.

INTRODUCTION

The last century in Brazil was marked by a demographic explosion, followed by celerity in the process of urbanization in the country. Some urban problems emerged, which drove scientific research towards the search for solutions, concerning primarily the housing issue. The housing issue stands out amongst the most relevant urban issues, bringing other issues such as: public housing policy, land regularization, urban

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infrastructure, mobility, the quality of housing and construction technologies (Abiko; Ornstein, 2002).

According to the João Pinheiro Foundation (2008), the Brazilian housing deficit reached a peak of 7.9 million housing units in 2006. The majority of this deficit is concentrated in urban areas (6.6 million) and in families with total income of up to R\$1,200.00 (approximately US\$535.71) who live in the North and Northeast regions. In 2008, said deficit was reduced to 5.8 million households.

Several factors influence the housing problem in the country, amongst them is the mismatch between the cost of housing and the household income. Habitation is the most expensive of all basic necessities, which makes its purchase difficult for low-income families. Thus, the means of access to housing for low-income families were restricted to rent, long-term financing and cohabitation. However, due to the low purchasing power of low-income families, high interest rates and scarcity of long-term financing available in the market, access to housing for low-income families has become even more difficult, increasing the need for state intervention in the housing market, the regularization process, the raising of capital, the financing and the production of housing units (Ministério das Cidades; Secretaria Nacional de Habitação, 2009)

Policies for housing provision in the country had different characteristics over the years, becoming increasingly stronger the presence of the state in the process. In 2008, due to an economic crisis in the country, the Federal Government created the Program “Minha Casa, Minha Vida” (My House, My Life Program - MHMLP), bringing with itself incentives to housing production, aimed at generating jobs and economic growth. Launched in 2009, the MHMLP predicted the construction of 1 million homes throughout the country, for families who had a monthly income of up to 10 minimum wages.

Meanwhile, the policies for housing provision has been designed in such a way as to win numerical questions, seeking to solve only so much as the basic need for shelter. However, the human being's demands for other needs related to housing implies that listening to the users prior to designing the space is mandatory.

Customer requirements (needs) are translated into solutions during the design phase, when the key attributes of value perceived by the customer, especially those related to functionality and adequacy of space, are determined (Koskela, 2000).

In a simplistic way, the customer describes their needs to designers, which in turn consolidates them into a preliminary requirements program, so it can then turn it into solutions of technical and spatial matters (Leinonem; Huovila, 2000).

However, this process is not always straightforward. In the cases where construction companies are the contractors of the projects, they figure as intermediaries agents. Thus, designers are developing products aimed towards the requirements given by the construction companies (intermediate customers), hence moving the solution further away from the real needs of the end customers, questioning the extent to which these end customers' needs are satisfied (Costa; Sampaio; Barros Neto, 2009).

This scenario is no different from the current process of housing provision in Brazil, where the preliminary requirements program comes from a list provided for builders by the federal government itself, without the end customer been involved in this process.

In this context, searching for improvements in the Social Interest Housing (SIH) projects, the inclusion of low-income residents in the decision-making processes of housing is mandatory. Thus, it is necessary to develop appropriated techniques of discovering the aggregated values for end costumers and to send this information to the designers. They need to receive inputs for the design of new projects, ensuring, thus, that they meet the needs of the end user in the process of SIH production.

The survey, analysis and recommendations for design improvements (instrumental sequence of quality control to the design phase) can be put into practice through the post-occupancy evaluation (POE) methodology. These relate to a number of methods that identify strengths and weaknesses in a built area, after a certain time of use, considering various aspects – whether they're socioeconomic, construction-related, comfort and efficiency, aesthetic, functional, and behavioural – from the perspective of designers, clients, users and also the evaluators themselves.

The POE assumes even greater importance in SIH, in view of the adoption of repeated construction-related, urban and architectural solutions on a large scale, to meet a heterogeneous population with very different cultural repertoires (Romero; Ornstein, 2003).

Within this context, this paper aims to define value for end customers in low-income housing in Brazil through improvements in a quantitative technique for capturing data and applying the technique of data collection on a large scale.

CAPTURING VALUE PERCEIVED BY POST-OCCUPANCY EVALUATION

POST-OCCUPANCY EVALUATION AND CLIENT SATISFACTION

POE can be defined as a set of performance evaluation methodologies applied in an environment built up over its usage. It aims to establish diagnoses, which consider both the expert advice, as the needs of the end users of said evaluated environments. From these assessments, rights and wrongs are pointed out, which allows setting guidelines for the improvement of future designs. Thus, this practice works as a tool of quality control for the process of product development (Abiko; Ornstein, 2002).

The POE also behaves as a feedback enabled database of the design processes, in which unmet needs are transformed into design parameters, which shows its relevance for decisions in the short, medium and long term (Sampaio et al, 2011).

Within this context, satisfaction consists of a customer's natural response to the experience of using a particular product, which relates strongly to the value perceived by him (Woodruff, 1997).

Measuring the customer satisfaction is an important means of obtaining competitive advantage in the market place (Cronin; Taylor, 1992) and it's commonly described as being a comparison between the customer's pre-purchase expectations and their post-purchase perceptions (Oliver, 1993).

However, due to its complexity, satisfaction is characterized as an unobservable variable, which can hardly be measured only by means of a question (Cunha; Borges; Fachel, 1998).

Satisfaction surveys as tools for feedback in the design process bring technical, social and economic contributions. Contributions on a technical level occur through constructive evaluation of quality and functionality of the units in use, seeking the identification of design flaws and executives mistakes. Since these observations are

made by the users, the satisfaction rating finds social justification, since it helps the identification of the end customer with his house. With this information, you can develop new projects considering all flaws pointed out, allowing minimization of problems and reduced production costs, which confirms the economic justification of the satisfaction survey (Lima, 2011).

SEARCH FOR THE PERCEIVED VALUE REGARDING LOW-INCOME HOUSING IN BRAZIL

In the housing provision in Brazil, one senses a growing consideration of the user needs towards generating value to the final product and this is used as part of the competitive strategy of construction companies. Thereby, it is necessary to encourage research that aimed to assess these needs, as well as the satisfaction of the residents, in order to feedback the process of project development in the pursuit of improved quality housing (Lima, 2011).

Based on the principles of Lean thinking and taking advantage of the theory as presented by Koskela (2000) on production, TFV (Transformation-Flow-Value) theory, it is essential that this process incorporates the customer as a source of feedback. In essence, the production value can only be set in regards to the customer, being the satisfaction of their needs the main purpose of production.

When it comes to value, Woodruff (1997) states that the common definitions on the matter have three similar points: value is inherent to the use of the product; value is something perceived by the customer, and; this perception of value involves a trade off between what the customer gets and what he gives in order to acquire the product.

Bringing this reality to the current Brazilian scenario of low-income housing, it becomes complicated to capture the values because the customer pays an insignificant amount for housing and, at the same time, receives a superior product than its former dwelling, assigning, thus, a high value on the property acquired.

In other words, the achievement of having your own house, by itself, generates a high degree of satisfaction of SIH ventures residents, which leads them to overlook some construction problems and also to overlook some incompatibilities of the facilities with their needs. Especially in SIH ventures in Brazil, applied POE generally shows high levels of satisfaction amongst end users, which indicates the need for parsimony in the use of this information.

This *unconditional satisfaction* makes it difficult to define perceived value by means of capturing customer value requirements, since it generates noise in the end customer's real level of satisfaction. This compromises the effective participation of the end user in the processes of decision making involved in the design phase.

However, as stated previously, the inclusion of the end-user in the decision-making process is extremely important in defining value. Thus, it is necessary to continue to improve the techniques for capturing value in low-income housing, to ensure the participation of the end user and, therefore, seek to add value to the product in SIH.

METHODOLOGY

In this research we chose to work with the housing units arising from MLMHP, due to its relevance in the current context of social housing in Brazil. The target audience are the beneficiaries of the first track of the program, characterized as low-income

housing. All housing units are located in Ceará state, which is the 3rd poorest state in Brazil.

The Group of Research and Consultancy in Construction Management (Gercon), already has plenty of experience in POE. So they already have their own methods, which have been improved upon over the years. Although the group has also performed some researches involving low-income housing, most of its studies involved dwellings of residents in middle or upper class.

Considering this, we made some adjustments to the data collection method usually used by Gercon group, in order to bring it closer to the reality of low-income residents. The adjustments were primarily in relation to the content of the questions, so it's closer to the reality of the residents of low-income housing.

After that, we went to the field to make an application testing of the method in 6 housing units. During the application, we found many difficulties, such as: low understanding of questions, difficulty in giving the answer in the appropriate format, large size of the questionnaire and elevated application time. Therefore, we decided we needed to change more drastically the method of data collection.

The changes made that were related to the length of the questionnaire and understanding of questions were easy, being necessary only to merge some similar questions (to avoid sense of repetition), while simplifying the language used. However, the biggest challenge was to help people understand the response format requested and make them respond more objectively.

After reviewing and discussing a lot about the experience gained in the field during the application test, we created a tool to assist the traditional survey. This tool consists of a visual device playfulness, where the various response options would be represented.

So, we returned to the field to conduct a second test application, which involved the same number of housing units from the first test. The results of the second application showed major improvements over the previous one, giving us more certainty as to the accuracy of the answers.

After the completion of the second test, we were able to apply the method officially in 364 housing units. Thereby, we confirmed huge benefits due to the improvements proposed to the survey, as well as identifying the satisfaction and dissatisfaction points in the products that were delivered, which will be discussed in a later chapter.

DISCUSSION ABOUT THE TECHNIQUE OF CAPTURING VALUE USED

The method of data collection used in this study consists of a survey of satisfaction, in terms of a POE. This method involves the application of the questionnaire, whose answers ought to be given in the form of grades (from 1 to 5), based on the Likert scale. Each grade is related to a degree of satisfaction in ascending order: 1 corresponds to "very dissatisfied", 2 corresponds to "dissatisfied", 3 corresponds to "neither satisfied nor dissatisfied", 4 is "satisfied" and 5 represents "very satisfied".

The questionnaire divides the questions into three groups: those related to the location of the venture; those related to the common area of the venture; and those related to the housing unit itself. The first block and the second block features 10 and 9 questions respectively, while the last, more extensive, block contains 24 questions.

The first block (location) has 5 questions related to public services (water supply, lighting, sewage and garbage collection and local policing) and 5 other related to the neighborhood (proximity to recreation, commerce, services, education, health, etc.). The second block (common area) has 5 questions regarding the functionality, quality and maintenance and 5 other related to aesthetics, privacy and security. Lastly, the third block (housing unit) has 6 questions related to functionality, 6 questions related to quality issues, 7 questions related to building's installations and 5 questions related to comfort (natural ventilation, natural lighting, acoustics).

At the end of the 3 blocks, each correspondent was asked to deliver a general grade, also ranging from 1 to 5, for each of the major items: location, common area and housing unit (appendix A).

The POE method was chosen because it is considered to be effective when it comes to considerations arising from the users themselves, so that future housing units are improved through the opinions of residents of those housing units that are already delivered. In this sense, the POE is effective to capture the needs of the end customer.

We used a survey to capture the data because it gives the research a wider range, since it is possible to apply this technique in a larger number of units, compared to other methods of capturing value. Thus, the survey shows good efficacy in POE, as we have a larger amount of data collected in the field.

TRADITIONAL SURVEY X SURVEY WITH VISUAL DEVICE

During the application test of the traditional survey, we noticed some difficulties that could lead to a negative meddling during the official application. First of all, we noticed that the inhabitants had, in general, a poor understanding of the Likert scale. When we made them some question, they usually answered with a long report about the subject and had a hard time translating their thoughts to a 1 to 5 scale grade.

It was necessary to explain the Likert scale many times to the same person and give many examples, so they could understand how they should answer the questions, which were difficult to get, since the examples couldn't involve elements from the original question, to avoid biasing and compromising the whole research.

All that was mentioned increased, substantially, the application time of each questionnaire. Thus, the applications took, on average, 40 minutes per dwelling. At the end of the second half of the questionnaire, the residents were already quite tired and impatient. They were tired of trying to understand the questions and to give us the answers in the requested format.

So it was clear to us that the result was completely compromised. We realized that we couldn't ask people with that level of schooling to understand the abstraction of giving grades for so many items, when what they wanted to do was to speak freely on the subject.

All this just generated frustration. The inhabitants became frustrated because, for them, the note didn't express their true feelings about the topics. Likewise, we, researchers were also frustrated because we weren't getting answers in accordance with the reality.

Maybe the output to maintain the accuracy of the information and motivate the inhabitants would change to the qualitative format. However, this perspective, although deeper, could not be applied in 364 residences in a timely manner. So, we

could only consider the qualitative point of view to investigate the results already achieved with the quantitative research.

Therefore, to maintain the quantitative perspective, we realized we needed a ludic (playful) tool. This tool needed to entertain people and, at the same time, clarify the use of the Likert scale. The aim was to make the people recognize their ideas expressed into the scale. That way, they would understand how their feelings would be considered in the answer format required.

So, we developed a visual device that relates each note from 1 to 5 in a facial expression. The inspiration for this came from observation of the expressions the inhabitants made while they were trying to express themselves in a long speech.



Figure 1: Survey's visual device

After that, we went back to the field to make a new test, this time using the visual device. This second application has shown advantages over the other in several aspects. First of all, we noticed a much clearer understanding of the Likert scale. The visual device helped the inhabitants to remember the answer's format and the meaning of each grade. Therefore, they were more objective. Moreover, we didn't need to explain more than once how the 1 to 5 scale works. Thus, the average time of application – which in the first test was 40 minutes – was 25 minutes using the visual device. Moreover, the participants were more aware, receptive and humorous during the entire application. Furthermore, and surprisingly for us, other members of the family showed interest at the research and tried to participate to the application, including children and teenagers.

In this manner, we were sure that we were approaching the results to the reality of those people, and getting closer to the definition of value for users of low-income housing.

Thus, the questionnaire with the aid of visual device was implemented on a large scale. We applied the method in 364 housing units, located in 23 different condominiums. All of them, located in Ceará state, in Brazil, spread in 6 cities: Fortaleza, Aquiraz, Caucaia, Horizonte, Maracanaú and Maranguape.

Over 80% of residents interviewed were women, and 40% were between 30 and 39 years (average age of 38 years). In relation to the occupation of respondents, over 40% were housewives and just over 25% were private sector employees, such as: janitor, housemaid, mason, and doorman. Over 60% claimed that their family income

was up to 1 minimum salary¹ in total. In relation to educational level, nearly 60% reported that they dropped out of school before high school. Between 5% and 6% of residents stated that they were illiterate.

The implementation took four days (from 7 to 10 February 2014) and was performed by 8 applicators. On occasion, the applicators reported that data collection was fast and hassle free, confirming the average application time of 25 minute.

RESULTS

According to the survey conducted in the ventures, it was found that the visual devices brought not only practicality in applying the study but also allowed more reliable results. From figure 2, it can be seen that there is little difference between the overall grades given to the ventures with the average of their specific grades.

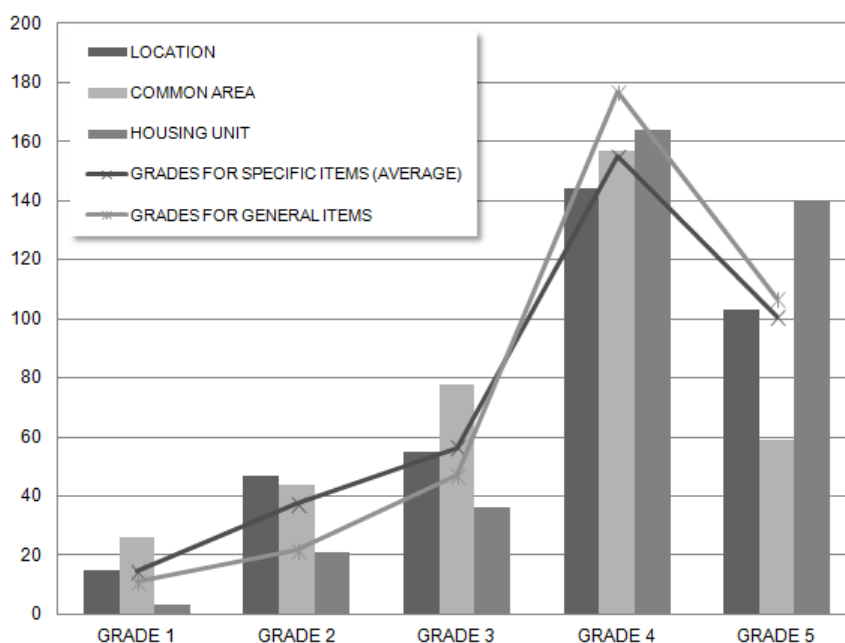


Figure 2: Distribution of general and specific grades.

As was observed in the first testing of the questionnaires, respondents tended to give a grade of satisfaction unrealistically high for their homes, which possibly is the result of the *unconditional satisfaction*, as the locals are happy to have achieved the dream of home ownership, in which payment is possible within their financial reality. However, when the questions were directed to specific items of the venture, residents were able to identify areas to improve, i.e., the degree of satisfaction experienced a reduction.

This, on the other hand, should be reflected in the overall grade of each major item, which was not always the case. In some cases, residents attributed to major items (location, common area and housing unit) maximum overall grades (ie, note 5),

¹ In Brazil, the current minimum salary is R\$722,00, which is equivalent to US\$309 or 222€.

while for specific items within each of the items above, residents were already able to assign lower grades. In other words, residents appeared to be more critical in the specific items than they were in the general grades, which led to a gap between the average of the specific grades and the general grades – which, in turn, made us unsure about the accuracy of the answers of the full-scale questionnaire replication, to be made at a later time.

In the second test, with the adoption of a visual device, respondents were able to have a constant view of the Likert scale with grades on the format in which it should be provided. This meant that they always had in mind the hierarchy and the significance of grading the grades, which lowered the difference between the average of all specific grades and the general grades.

Thus, while the general grades provided us with a generic overview of the satisfaction of residents with respect to major items, the specific grades had the role of identifying exactly which points most influenced negatively and positively in each of the major items.

In table 1, it can be seen, from the topics related to location, common area and housing unit that, indeed, the locals gave answers consistent with those presented in figure 2, which displays the grades for the general items. The balances shown in the table 1 were calculated using the following system: all grades higher than 3 were subtracted from all the grades lower than 3. Grade 3, which represents the answer "neither satisfied nor dissatisfied", was disregarded, as represented the respondent's neutrality with respect to the item.

Table 1: Balances of grades for specific items

LOCATION			
PUBLIC SERVICE		NEIGHBORHOOD	
Street lighting	20,9%	Access to commerce	-16,5%
Water supply	36,5%	Access to services	-4,9%
Sewage collection	42,3%	Access to recreation	-69,3%
Garbage collection	61,5%	Access to the condominium	4,4%
Local policing	-33,8%	Access to public transportation	-9,4%
COMMON AREA			
FUNCTIONALITY, QUALITY AND MAINTENANCE		ESTHETIC, PRIVACY AND SECURITY	
Gates and guardhouse	5,9%	Appearance of buildings	73,6%
Parking	32,6%	Appearance of open spaces	19,8%
Recreation areas	-28,7%	External closures	31,4%
Common areas	31,9%	Electric fences and security devices	-47,2%
Trashcans	3,3%		
HOUSING UNIT			
FUNCTIONALITY		QUALITY	
Living / Dining	65,1%	Floor of the rooms	-44,1%
Kitchen / Service Area	24,7%	Coverings walls of the bathroom	54,1%

Bedrooms	70,9%	Coverings walls of the kitchen	17,9%
Bathrooms	69,1%	Coverings walls in general	25,7%
Balcony or backyard	39,8%	Doors and windows	50,0%
Suitability of the furniture	52,2%	Building structure	61,3%
BUILDING SERVICES		COMFORT	
Quality of electrical points	72,3%	Natural lighting	86,0%
Amount and distribution of electrical points	83,0%	Natural ventilation	6,3%
Gas facilities	61,0%	Internal noise level	9,4%
Telephone facilities	48,7%	External noise level	8,8%
Interphone	-52,7%	Privacy	32,8%
Plumbing	66,8%		
Plumbing fittings	51,1%		

In the block of questions concerning "location", items related to the "neighborhood" (access to recreation, commerce, transportation and access to the condominium) and the item "local policing" were the ones that most influenced the grades. The latter may reflect the high level of crime in the area and the heightened sense of insecurity of each region, since often the ventures are located in more remote land on the outskirts of cities.

In the block of questions concerning "common area", the items listed "recreation areas" and "security devices" were the ones that most influenced the grades, and the latter is not delivered by contractors.

Finally, in the block of questions concerning "housing unit", the items "floor of the rooms" and "interphone" were the ones that influenced heavily and negatively. It's important to note that the housing units were delivered without flooring, (subfloor only) and without intercoms themselves (only providing facilities for future placement of intercoms). Other topics related to the housing unit had a high degree of satisfaction.

In general, the residents had a higher degree of satisfaction with respect to the housing unit itself and a greater degree of dissatisfaction with the common area and location of the ventures. This result may be consequence of the location of the ventures, since they're found next to cheaper land and may also be consequence of the conflicts that occur in collective spaces among residents, since many came from illegal housing (slums) and have no previous experience in sharing a common area with other residents.

CONCLUSIONS AND FURTHER WORK

POE methods have been used over the years as a way of capturing values perceived by the clients (end users). However, it was realized that a lot of caution in using this method is necessary if researchers are actually committed to reality and interested in the determining the true value perceived by the customer.

In the particular case of this research, it was noted that a traditional survey applied to residents of low-income housing (and who had lower education) would not be the

best way to get accurate responses. However, we understand that, since it was desired an application on a large scale, it would be very difficult to abandon a quantitative (survey) method and replace it with a qualitative method, which is deeper, but less comprehensive. So, the solution would be to adapt the traditional quantitative method for each particular case, improving the technique of data collection.

However, we never refuted the possibility of working with a qualitative methodology to deepen the results acquired using quantitative methodology. Thus, while the technique presents bulky quantitative data, fruits of a large-scale application, indicating the points of greatest dissatisfaction and satisfaction, qualitative research would allow us to understand the reasons that led to this result. Thus, we would be closer to understanding the needs of the research's target audience, approaching increasingly more to the precise definition of the target audience's perceived value.

Therefore, it was decided that we would make a second part of that research, seeking, through the adoption of qualitative techniques, to deepen the results already obtained. This second phase of qualitative research is ongoing and results will be presented in future papers.

Finally, we believe that researchers need to be increasingly sensitized regarding the definition of value perceived by residents of low-income housing with little to no education, since the limitations of respondents require creativity on the researcher's part and requires them to think beyond the traditional methods, improving them constantly.

ACKNOWLEDGMENTS

To the National Council for Scientific and Technological Development (CNPq), that provides the funding for our research. To students and researchers from the Group for Research and Consulting in Management in Construction (Gercon).

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