

# OPPORTUNITIES FOR CLIENT REQUIREMENTS MANAGEMENT IN LOW-INCOME HOUSE BUILDING PROJECTS IN BRAZIL

Fernanda Lustosa Leite<sup>1</sup>, Luciana Inês Gomes Miron<sup>2</sup> and Carlos Torres Formoso<sup>3</sup>

## ABSTRACT

This paper describes the main results of multiple-case studies concerned with client requirements management in the product development process (PDP) of eight low-income house-building projects, carried out in the South of Brazil. These projects were developed in two different existing forms of housing provision in Brazil: the Residential Leasing Program (*Programa de Arrendamento Residencial—PAR*) and the City Entrance Integrated Program (*Programa Integrado Entrada da Cidade—PIEC*). Both are new forms of housing provision as far as they have created new types of client-supplier relationships that have never been experienced in Brazil before. The aim of this paper is to describe the PDP of both forms of housing provision as well as to discuss opportunities for client requirements management, emphasizing the role of the state in value generation. This investigation was based on the analysis of design, production control and legal documents, semi-structured interviews carried out with design and production professionals, as well as the evaluation of users' degree of satisfaction. This study is part of a broader research project, which aims to propose guidelines for client requirements management in low-income house-building projects.

## KEY WORDS

Client requirements management, Value generation, Product development process, Low-Income house-building projects.

## INTRODUCTION

The debate over the replacement of the mass production paradigm by the Lean Production model has created an opportunity to extend the theoretical basis to operations management research; this is the purpose of the TFV (transformation, flow and value) theory proposed by Koskela (2000). According to this author, the value generation view is the least understood among the views. Thus, at the outset, the development of researches to investigate methods, approaches and practices are needed. In this paper, the client requirements

management is treated as a practice to improve value generation.

In the construction industry, the term most traditionally used for requirements capture is briefing. The CIB (1997) defines briefing as the process through which a client informs others of his or her needs, aspirations and desires for a project (CIB 1997). Barrett and Stanley (1999) use a broader definition for the briefing process, assuming that this process should ensure that the client's requirements are initiated, developed, adapted, maintained and communicated throughout the project.

1 M.Sc., Research Assistant at the Building Innovation Research Unit (NORIE), Federal University of Rio Grande do Sul (UFRGS), Av. Osvaldo Aranha, 99, 3o andar, Porto Alegre, RS, CEP: 90.035-190 Brazil. FAX:+ 55 51 3316 4054, e-mail: fleite@cpgec.ufrgs.br

2 M.Sc., Ph.D. Candidate, Building Innovation Research Unit (NORIE), Federal University of Rio Grande do Sul (UFRGS), Av. Osvaldo Aranha, 99, 3o andar, Porto Alegre, RS, CEP: 90.035-190 Brazil. FAX:+ 55 51 3316 4054, e-mail: lumiron@cpgec.ufrgs.br

3 Ph.D., Associate Professor at the Federal University of Rio Grande do Sul, Av. Osvaldo Aranha, 99, 3o andar, Porto Alegre, RS, CEP: 90.035-190 Brazil. FAX:+ 55 51 3316 4054, e-mail: formoso@ufrgs.br

Several research studies have criticized the briefing process in practice. Although several briefing guides have been published, they are rarely used as a key source in the briefing process, because they are considered to be too prescriptive or vague (Barrett and Stanley 1999; Smith and Jackson 2000). Most brief-makers rely on their own experience (Barrett and Stanley 1999), and do not usually base their work on any type of formal procedures (Kamara et al. 2002). The absence of any objective or structured framework for supporting the briefing process in complex projects may lead to problems in the product development:

- a) (Clients' needs are not sufficiently studied and considered (Huovila and Serén 1998);
- b) (The brief is biased by the perspective of the brief-taker (Barrett et al. 1999);
- c) (It may not be possible to properly balance the perspectives from different interest groups as well as to establish the relative importance of requirements (Kamara et al. 2002); and
- d) (The conformity of selected technical solutions is not managed systematically (Huovila and Serén 1998).

For this reason, from the conception of a project, the key objective should be to capture the clients' needs (either explicit or implicit), to interpret them into requirements and to manage the conformity of technical solutions in different phases of the design and construction processes (Huovila & Séren 1998). The expression "client requirements management" used in this paper consists of the identification, analysis, prioritization and availability of information about the client's necessities and preferences. Such tasks can potentially result in a better definition of possible design solutions, consequently increasing the perceived value by the client. Concurrently, a great challenge for a designer is to define the best solution to meet the client's needs (considering all parts represented by the client, specially the final client) (Kamara 1999).

The systematic management of information on client requirements consists of finding the knowledge applicable to a problem situation and formulating it in project objectives and constraints. This process goes through several stages of refinement and iteration throughout the product development process. Moreover, it is closely related to the company strategy in the market, since it starts by the definition of a target customer and a type of product. Such tasks may have a positive impact on the design solutions, avoiding what is named by Koskela (2000) as value loss, and consequently increasing the perceived value by the client.

This study is focused on the identification of barriers and opportunities for improving value generation in the product development process through the client requirements management, emphasizing the role of the state in two forms of housing provision.

## LOW-INCOME HOUSING IN BRAZIL

According to the Brazilian Federal Government's Cities Ministry (Ministério das Cidades 2004), the Brazilian social debt related to the housing deficit is very large. More than 7 million families need new homes and over 10 million homes have basic infrastructure problems.

The social differences and the concentration of wealth that exist in the Brazilian society, are physically manifested in the segregated spaces in urban areas. In most large cities, the shortage of dwellings is a major social problem, since 91.6% of the total Brazilian urban housing deficit is concerned the population that earns less than five minimum salaries a month (see Table 1).

According to Fundação João Pinheiro (2004), the housing needs include both the housing deficit and the inadequacy of existing dwellings. It means that the deficit must be understood as the need for the construction of new homes, because of both the replacement and increment of the housing demand. The deficit also considers that some homes do not have adequate conditions for

Table 1: Brazilian Urban Housing Deficit  
(Fundação João Pinheiro 2004)

Region	Urban Housing Deficit	0-3 Min. wages (%)	3-5 Min. wages (%)	5-10 Min. wages (%)	Over 10 Min. wages (%)
North	411,600	84.0	7.2	6.9	1.6
Northeast	1,729,100	91.3	5.1	2.1	0.7
Southeast	2,257,500	77.6	11.0	7.1	3.0
South	589,100	80.9	9.4	6.7	2.5
Center-west	427,600	82.9	7.8	6.5	2.0
<b>Brasil</b>	<b>5,414,900</b>	<b>83.2</b>	<b>8.4</b>	<b>5.4</b>	<b>2.0</b>

inhabiting because of the poor quality of construction or due to the deterioration of its physical structure, and also for the co-inhabitation of families or inhabitation in places that are meant for non-residential activities.

The inadequacy of the housing stock affects not only the quality of life of its inhabitants, but also their self-esteem (Fundação João Pinheiro 2004). Inadequate homes are those that do not give its inhabitants the desirable conditions of living, but it does not necessarily imply the construction of new dwelling units. Homes with lack of infrastructure needs (sewage system, rubbish collection, etc.), with too many inhabitants, legal problems, high degree of degradation, are classified as inadequate.

Due to these complex housing needs and the lack of resources for public investment have led to some important changes on the Brazilian Government's role in the provision of low-income housing in the last few decades. Instead of being the sole promoter (and client) of the construction of large housing estates, the Government has created a wide range of housing provision schemes, in which there is much involvement of both the public and private sectors, including local authorities. This has led to a growing financial, regulatory, environmental, social and technical complexity, which has made the construction process of low-income house buildings highly decentralized in Brazil. A larger number of organisations are involved, resulting in requirement conflicts and in the need to manage many trade-offs.

This situation is made even more complex due to the fact that the government has to deal with complete housing provision instead of simply providing housing. In this sense, the term housing provision must be understood as the group of specific actions developed by various governmental and non-governmental agents, that result in one or many types of dwelling units, while complete housing provision is concerned with supplying of a dwelling unit in an area with urban infrastructure, giving complete inhabitation conditions (Werna et al. 2001). The provision of a complete dwelling unit demands the involvement of a much larger number of organisations and creates different forms of relationships among them.

Consequently, managing the product development process in such context has become a much more difficult task, especially considering constraints in terms of resources and the need to deliver products that provide more value from the user's perspective.

The importance of low-income housing in Brazil has made the Federal Government to restructure its housing policy in recent years in

order to create adequate institutional conditions to face this problem. The main existing programs have been designed to bring together the Federal Government, and Local Authorities as partners in action. The Brazilian Government is trying to avoid specific, isolated and disperse interventions, acting in an integrated form focusing investments in conjoint actions that involve all three levels of the government, the private sector, and the community.

The Residential Leasing Program (*Programa de Arrendamento Residencial—PAR*) and the City Entrance Integrated Program (*Programa Integrado Entrada da Cidade—PIEC*) illustrate two representative forms of housing provision in Brazil. They were selected for this research project because they focus on the population that represents the largest part of the Brazilian housing deficit—lower than five minimum salaries of monthly income. The PIEC is a specific program carried out in Porto Alegre, led by the City Council, and is focused on a population with a family monthly income between zero and three minimum wages. The PAR program is being developed in the entire country and is focused on a population with a family monthly income between three and five minimum wages.

## RESEARCH METHOD

### OVERVIEW

This paper describes the main results of a multiple case study concerned with client requirements management in the PDP of eight low-income house-building projects, carried out in the South of Brazil. This investigation was based on the analysis of design, production control and legal documents, semi-structured interviews carried out with professionals involved in the conception, design, production and financing of the PAR and PIEC programs.

It is important to point out that, in both forms of housing provision, process maps were devised in order to better understand the PAR and the PIEC as well as to identify the main opportunities for client requirements management. The process maps consisted of: the main phases (conception, design, production and use), milestones between each phase (contracts and delivery), main clients (funding agencies, construction companies, City Council, final clients), main activities carried out in each phase by each client and the critical activities identified in the process (those that may slow the process down or even paralyze it, demanding special attention). These process maps were developed in previous studies in project



Figure 1: PAR in downtown Porto Alegre



Figure 2: PAR in Pelotas  
—countryside of Rio Grande do Sul

REQUALI and will not be presented in the present article.

Regarding the PAR program, seven case studies were carried out. In these studies, seven house-building projects were analyzed in the cities of Pelotas, Rio Grande and Santa Maria, all in the State of Rio Grande do Sul. Besides the analysis of the development of the seven projects, 8 interviews were carried out with professionals from design and construction companies, as well as from public institutions, such as the Brazilian Public Savings Bank (*Caixa Econômica Federal*). Based on these evidences, a process map for PAR projects was proposed. This made the identification of opportunities for improving client requirements management in this program possible. Moreover, evaluations of user's satisfaction in four PAR projects that have already been delivered to the final users were carried out. In this evaluation, 20% of the families were interviewed. Multiple sources of evidence were used in this investigation: the critical incident technique, a questionnaire with closed questions for measuring the degree of satisfaction, direct observation of the dwelling units, documentation on the way the apartments were used (layout), and changes introduced by users.

For the comprehension of the PIEC, a case study was carried out, analyzing it as a whole. In this case study, the three housing allotments that were concluded in the first phase of the program were analyzed. A process map was also outlined, based on 16 interviews carried out with professionals from various disciplines and organisations, such as the Brazilian Public Savings Bank, Fonplata (Fund for the Financial Development of

the River Plate Basin), all the eight secretariats that form the Municipal Executive Unit, part of Porto Alegre's City Council. Other sources of evidence included designs and reports supplied by the City Council for the Brazilian Public Savings Bank, participation in seminars and workshops, and direct observation of the informal settlements and new allotments.

#### **BRIEF DESCRIPTION OF THE RESIDENTIAL LEASING PROGRAM**

The Residential Leasing Program (*Programa de Arrendamento Residencial—PAR*) started in 2001 and is targeted to families with a total monthly income of two to six minimum wages. The program provides resources for the development of construction or refurbishment housing projects in metropolitan areas, state capitals and urban centers, with a population of, at least, 100,000 inhabitants. This program is managed by the Cities Ministry of the Federal Government of Brazil and is operated by the Brazilian Public Savings Bank. Construction companies' role is to develop and construct these projects.

The Residential Leasing Program (*PAR*) is currently one of the most important programs for low-cost housing provision in Brazil, having delivered over 170,000 dwelling units from 2001 to 2005 in the whole country. It is a new form of housing provision and requires innovative roles for both public and private organizations in product development, and a new form of relationship with the final user, which has never been experienced in Brazil before.

Table 2: The main clients involved the Residential Leasing Program

Clients	Responsibilities
Cities Ministry	Establishes directives and manages the program
Brazilian Public Savings Bank ( <i>Caixa Econômica Federal—CEF</i> )	Operates the program
Public partners (City Councils, community)	Help CEF Identify land plots and help in the process of selecting families
Construction Companies	Design and build PAR projects
Estate agents	Facilities management
Users—families that fulfill the minimum requirements, capable of living in a PAR building	Pay the leasing and maintenance taxes, as well as maintain the dwelling unit

Table 2 presents the main clients involved in the Residential Leasing Program along with their responsibilities. It is important to point out that the main client is the Bank, since it plays a major role in the conception of projects and owns the buildings for a minimum period of 15 years. Its technical staff is responsible for establishing the main parameters for the product (cost yardstick, design parameters, criteria for choosing technologies, etc.), design evaluation, and final user selection.

The users have a fairly late participation in the process, being selected only during the production phase, when the design has already been concluded. This is a potential source of value loss and may cause future conflicts during the 15-year leasing period, since the Bank does not allow any irreversible change to be made in the dwelling unit. In this sense, it would be very important to

identify the users' requirements in order to minimize these conflicts and increase the product's value, since they can become the owners after the leasing period.

In the state of Rio Grande do Sul, 58 PAR projects are either already in the use phase or in the production phase. Only in 2004, 3.4 thousand dwellings were built in 11 different urban areas: Bagé, Cachoeirinha, Novo Hamburgo, Parobé, Passo Fundo, Pelotas, Portão, Porto Alegre, Rio Grande, Santa Maria e Sapiranga.

Of these 11 towns, two of them stand out: Pelotas (with 12 projects) and Porto Alegre (with 9 projects, including 4 refurbishments). Due to the importance of these two cities for the PAR Program, they were chosen as a focus for the development of this research. The four projects selected for the evaluation of users' degree of satisfaction were located in those towns, three in Pelotas and one in Porto Alegre.

#### BRIEF DESCRIPTION OF THE CITY ENTRANCE INTEGRATED PROGRAM

The City Entrance Integrated Program (*Programa Integrado Entrada da Cidade—PIEC*), started in 2002 in Porto Alegre. The PIEC will benefit 3,775 families, who live precariously in 22 informal settlements. In the first phase of PIEC, that has already been concluded, 413 families received new dwellings. The first phase of PIEC was financed by Habitar Brasil IDB<sup>4</sup> (HBB). One of the most important requirements of HBB is the creation of a Municipal Executive Unit, which was composed by eight City Council secretariats: planning cabinet, department of housing, mayor's cabinet, regional administrative center, road system, industry and commerce, environmental and urban planning. The PIEC is can be described as an integrated approach to housing provision



Figure 3: Informal settlement in Porto Alegre



Figure 4: New dwellings, part of PIEC

4 This is a housing program that is partially financed by the Inter-american Development Bank (IDB)

because it merges five projects for the same neighborhood: road infrastructure, environmental recovery, housing (including special houses for the handicapped), social work (including community participation) and planning.

The program's conception was a very complex process that lasted around 6 years. The intervention area involved three neighborhoods in the city of Porto Alegre (Humaitá, Farrapos and Navegantes). The selection of this area was made according to indicators concerned with the quality of life in that area, that were among the lowest in the country.

Moreover, the evolution of the PIEC Program is also a consequence of the Participatory Budget (*Orçamento Participativo—OP*), which was initiated in the beginning of the 1990s in Porto Alegre. According to Fruet (2003), the need to solve urban problems (lack of urban services, secure tenure, transportation, education and health services) has motivated people to organize and adhere to this new space of participation: "The OP facilitates the participation of citizens and organizations in the discussion and on the elaboration of the city's annual Plan of Investments. The aim of the OP is to better redistribute public revenue towards the more under-privileged regions of the city and also to democratize the relationship between state and civil society. The transparency embedded in the process helps to combat clientelism and patronage. Its three basic principles are: (1) universal participation rules in regular and institutional bodies; (2) objective methodology for the definition of resources for investment; and (3) decentralized decision-making process based on the division of the city into 16 budgetary regions (Fruet 2003)".

The OP established among several priorities the development of integrated housing provision projects in Special Social Interest Areas. This allied to the demands of international financing institutions, and to the previous experience of the City Council in housing provision, created the conditions for conceiving this fairly innovative low-income housing Program in Porto Alegre. This is the largest housing provision scheme in Brazil at the moment.

The size of the project demanded much effort for integrating the work of the professionals from the various City Council secretariats involved, and also from the funding agencies and from the Federal Government. Moreover, a supporting social work project is being developed, focused

Table 3: The main clients involved in the first phase of PIEC and their responsibilities

Clients	Responsibilities
Cities Ministry	Establishes directives according to HBB (Habitar Brasil IDB)
Brazilian Public Savings Bank (Caixa Econômica Federal – CEF)	Manages the first and second phases of the program – HBB financing
City Council	Develops the PIEC (conception, design, planning, budget, building inspection, post occupancy supervision, maintenance)
Private partners, community associations, public institutions, universities and NGOs (non-governmental organizations)	Help City Council in the social work project
Construction companies	Build allotment projects, infrastructure, equipment, squares, road system
Users - families from informal settlements who earn between 0 and 3 minimum wages	Participate of PIEC development, sign the adhesion term, pay the occupancy expense

on the implementation of new mechanisms for enabling the future community's participation possible, such as community organization and mobilization, environmental and sanitary education, as well as job creation and income generation.

PIEC is different than PAR because there is a clear definition of the community to be served. The aim is to improve the living conditions of those families living in the existing irregular settlements. The social work project included, among other actions, the collection of fairly detailed data on the families that will benefit from the project. Another important client in the PIEC Program is the City Hall itself, because of its involvement in the conception and development of the entire program and in the future management of the settlements.

## PRELIMINARY RESULTS

These studies are part of the Requirements Management and Quality Improvement in Social Housing (REQUALI)<sup>5</sup> Project, which is still in its early stages. The main results so far are concerning the description of the PDP in both types of projects, including the identification of opportuni-

<sup>5</sup> The REQUALI Project started in 2003 and its conclusion is previewed for 2006. It is being carried out by a network of six Brazilian universities in the states of Rio Grande do Sul (Federal University of Rio Grande do Sul, Federal University of Pelotas), Ceará (Federal University of Ceará, Ceará State University), Paraná (Londrina State University) and Bahia (Feira de Santana State University). The main objective of the REQUALI

ties for improving client requirements management.

#### **THE RESIDENTIAL LEASING PROGRAM'S PRODUCT DEVELOPMENT PROCESS**

Three main phases were identified in the PDP of PAR projects. In the conception and design phase, the construction company developed the design, look for a land plot and proposes a design that is submitted to the National Savings Bank, and sometimes also to the municipal housing department or secretariat. It is also in this first phase where the registration of the prospective dwellers is carried out. Once the project is approved, the Bank signs a contract with the construction company, buying out the project. In the production phase, the construction company builds the project and the Bank inspects the production. In this second phase, the social work project and the selection of the users are done. The last phase is the use and operation phase, which starts when the project is delivered to the Bank and, finally, to the final users.

Four main opportunities for client requirements capture were identified: during the registration of the prospective users, the selection process, the social work project, and the evaluation of user's satisfaction. Even though no substantial change is made in the PDP, these four activities can potentially be changed in order to create conditions for increasing the value of the product for the final user and also for the Bank, since it will be the owner of the dwellings for at least 15 years. Of these four opportunities, the evaluation of users' satisfaction was initially chosen to be developed. For that reason, four post-occupancy evaluations were carried out in four PAR projects, three in Pelotas and one in Porto Alegre. From the evaluations, several important sources of dissatisfaction were identified, such as the integration of the kitchen and the living room, and the reduced size of the laundry room. Such critical points should be given special attention during the conception of new projects. Also, a k-means cluster analysis was done using seven variables collected in the evaluations: age, educational level, number of inhabitants in the dwelling unit, number of children in the dwelling unit, previous home (house or apartment), degree of satisfaction with the common areas and degree of satisfaction with the dwelling unit. Four different clusters were identified, each one with different characteristics,

which indicates a fairly broad diversity of people living in PAR projects.

#### **THE CITY ENTRANCE INTEGRATED PROGRAM'S PRODUCT DEVELOPMENT PROCESS**

Compared to the PAR Program, the PDP in the PIEC Program is much broader, since it involves five different types of projects. Besides being concerned with housing provision, that program also involves restructuring a very large urban area, especially due to changes in the road system and environmental recovery. In order to make this thorough intervention feasible, there is a need to integrate the work of several departments of the City Council, and different design disciplines that take part in the PDP. In search of integration, a multidisciplinary approach was used among secretariats and, especially, inside the Municipal Department of Housing (DEMHAB). In fact, this program demands a new form of working that breaks the traditional organizational structure of the City Council that results in the fragmentation of the process view by professionals involved.

Another difference from that program to PAR is the stronger emphasis on the social work project, which aims to promote the inclusion of those people in the formal city by means of job creation and income generation, besides community participation in some phases of the development of house building projects. The social work project has deserved a special emphasis in this study because it represents an important opportunity for client requirements management. Besides, it is an initiative that tries to promote the effective social inclusion of the communities involved. PIEC was the first program with specific resources for the social work project in the city of Porto Alegre. This has resulted in the first application of a thorough client requirements capture effort through a social and economic survey, which allowed much data from the community to be collected, such as income, educational level, jobs, relationship with animals, existing handicapped people). Among others, through the register, it was possible to define the replacement of communities in near areas in order to guarantee that similar conditions were given related to income generation activities as well as social relations (leisure, support, safety).

Besides, the interface with the participatory budget demands (OP) and the creation of three initiatives (community organization and mobili-

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project consists of establishing criteria and directives for client requirements management in low-income house building projects, aiming at the improvement of these projects' quality. The studies are focuses on existing programs in Brazil, such as PAR and PIEC.

zation, environmental and sanitary education, and job creation and income generation) has incremented the community participation mechanisms in the process. It is important to point out that the involvement of the City Council professionals with the community through the regional committee of project follow-up, which is part of the community organization and mobilization initiative, made the design and production of the project feasible. Nevertheless, the integration between the community participation mechanisms and the City Council teams has not been fully developed yet.

Since PIEC is more advanced in client requirements capture, when compare to PAR, the analysis of the PIEC Program pointed out three main opportunities for improving client requirements management: qualify the professionals involved to perceive the whole program development process; improve the multidisciplinary approaches to work; and improve the integration among the mechanisms of community participation. All opportunities are related to improve the value generation through the understanding the program as a whole and the integration among its parts, allowing the interests of the main clients to drive the improvement of citizenship.

## CONCLUSIONS

The study for both forms of housing provision indicated that there is much potential for improving client requirements management from the initial phases of building projects. In the PIEC Program there is much effort to capture client requirements early in the project but it seems that these requirements are not well processed during the PDP. By contrast, in the PAR projects, there is no client requirements capture in the beginning of the process, leading to a design that follows, to a large extent, the logic of mass production, since it does not consider specific requirements of the final clients. The developers of PAR projects believe that, by following the logic of mass production, they can reduce overall costs. But there are other effective means of cost reduction that are not currently used in the PAR, such as continuous flow of construction, reduction of production deadlines and reduction of the design approval period, which varies from nine to twelve months. In this sense, there is a potential for the introduction of the logic of mass customization in PAR projects. The register of the families, carried out during the social project in the PIEC, is an example of client requirements capture that could be adapted to for the PAR projects, identifying the client's needs before the design phase. Neverthe-

less, the requirement processing must be improved in both programs.

Also, a need for a more thorough view of the PDP as well as collaboration between the organizations and professionals that develop the products and those that inspect them for both forms of housing provision is needed. For the PIEC projects, there should be a more intense collaboration between the Bank and the City Council. Moreover, for the PAR projects, there should be a more intense information flow between the Bank and the construction companies that develop the products, avoiding re-work.

Among the agents that conceive the programs (the Bank for the PAR projects and the City Council for the PIEC projects), an improvement opportunity was identified when it comes to the integration among the various sectors in these institutions. In both institutions, because of the traditional fragmented structure, the technicians have difficulty in viewing the entire PDP because they only work in parts of it. The development of an organizational structure that permits and enables conjoint actions can be reached through the use of training and approaches that can help these professionals to view the process as a whole. This integrated view of the processes is a pre-requisite for client requirements management. Besides this, the use of approaches to manage trade-offs and establish communication interfaces, as well as specific training for collaborative work, is needed for client requirements management and, consequently, value generation for the main clients involved in the processes. Moreover, the PIEC indicate a new trend in Brazilian housing interventions, being more complete and thorough when compared to the more traditional punctual and fragmented interventions, such as PAR.

Finally, another important point in value generation is the participation of the final client in the development process. For the PIEC, there is an intense participation of the final client in the process, from the conception phase, through the identification of their demands by the participatory budget. This participation goes through the development of the design, production, until the use and operation of these projects. By contrast, in the PAR Program, the final clients have no effective participation in the process and the families are only selected at the end of the production phase, when the design has already been completed. Therefore, their requirements are not properly captured at the beginning of the process. The assessment of both forms housing provision from the point of view of value generation could be used in order to improve them both, especially related to client requirements management.

The studies carried out were mainly focused on client requirements capture, which is the first phase of client requirements management. Future studies, also in project REQUALI, will be carried out in order to consider the information on users in the PDP, which has already been developed in previous studies, using tools for analyzing, establishing priorities and controlling the flow of client requirements, such as: tree of objectives, design brief, multidisciplinary-team meetings, the PDP log, web site and project extranet as well as indicators of design and production planning (Miron, 2003).

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### REFERENCES

- Barrett, P.S.; Hudson, J.; and Stanley, C. (1999). Good practice in briefing: the limits of rationality. *Automation in Construction*, **8**, 633–642.
- Barrett, P.S. and Stanley, C. (1999). *Better Construction Briefing*. Blackwell Science, Oxford.
- CIB (1997). *Building the Team, Working Group I*. Thomas Telford, UK.
- Fruet, G. (2003). “The low-income housing cooperatives in Porto Alegre, Brazil: a state/community partnership”. *Habitat International*, Elsevier, Oxford, UK, **2**(29), 303–324.
- Fundação João Pinheiro (2004). *Déficit Habitacional no Brasil: Municípios Selecionados em Microrregiões Geográficas (Brazilian Housing Deficit: Selected cities in geographical micro-regions)*. Fundação João Pinheiro, Belo Horizonte, Brazil. 99 pp. (in Portuguese).
- Huovila, Pekka; Serén, K.J. (1998). “Customer-oriented design for construction projects”. *Journal of Engineering Design*, **9**(3).
- Kamara, J.M. et al. (2002). *Capturing client requirements in construction projects*. Thomas Telford, London.
- Kamara, J.M. et al. (1999). “Client requirements processing in construction: a new approach using QFD”. *Journal of architectural engineering*, ASCE, New York, **5**(1) 8–15.
- Koskela, L. (2000). “An exploration towards a production theory and its application to construction. 296 f. Thesis. (Doctor of Technology). Technical Research Centre of Finland—VTT. Helsinki.
- Ministério das Cidades (2004). *Política Nacional de Habitação (National Housing Policy)*. Ministério das Cidades, Brasília, Brazil. 103 pp. (in Portuguese)
- Miron, L.I.G.; Formoso, C.T. (2003). “Client Requirement Management in Building Projects”. International Group For Lean Construction Conference, 11, Blacksburg: Virginia.
- Smith, J. and Jackson, N. (2000). “Strategic needs analysis: its role in brief development”. *Facilities*, **18**(13/14). 502–512.
- Werna et al. (2001). *Pluralismo na Habitação (Housing Pluralism)*. Annablume, São Paulo, Brazil. 299 pp. (in Portuguese)