

AN ANALYSIS OF LOW-INCOME HOUSING BUSINESS CHAIN IN THE LIGHT OF TARGET COSTING CONCEPT: A CASE STUDY IN BRAZIL

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ABSTRACT

Several studies on the transference of the target costing concept from manufacturing to the construction industry have been developed (Ballard and Reiser, 2004; Granja *et. al.*, 2005). However, the application of this concept in the public sector is still seldom explored.

This paper presents preliminary results of an ongoing research project aimed to analyze the applicability of target costing concepts and principles to the development of low income housing projects sponsored by a public agency in Brazil. This study has been conducted based on an exploratory case study developed in a council housing office, whose mission is to provide housing for low-income people. This office develops the building designs and promotes the construction of the projects. In order to analyse this supply chain as a business, the researchers have adapted the tool Value Stream Mapping (VSM) for information flow. The objective of the VSM is to provide a comprehensive view of a product development process as a flow of information, and, therefore, identify improvement and failures of the process. The efforts made in the exploratory case study were concentrated on a literature review and elaboration of the map.

KEY WORDS

low income housing, target costing, value stream mapping

INTRODUCTION

Target costing is a strategy developed at the Toyota Production System, which is used for developing a new product aiming at a target cost, concurrently to providing clients with requirements and quality to products, without profit margins loss (Cooper and Slagmulder, 1997). The transfer of this strategy to the building context has been addressed by some researchers,

but its application in the public sector is considered to be rarely explored.

This paper shows the preliminary results from a research which is being carried out in Brazil, whose objective, amongst others, is to explore the possibility of Target Costing application in the development and conception processes of the Low-income Housing Projects (LIHP).

The objective is to have a clear vision of the development of the LIHP

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and the existing information flow through the use of the Administrative Value Stream Map (AVSM), to identify opportunities or barriers to the application of the target costing concept, considering the results expected by every agent in the productive chain.

TARGET COSTING AS A STRATEGY FOR THE DEVELOPMENT OF NEW PRODUCTS

The Target Costing concept was created in 1959 to be applied to Toyota's Production System, but it was put into practice only in the Mid 60's, aiming at the production of a vehicle at a cost of US\$1,000.00 (Cooper and Slagmulder, 1997).

According to Everaert *et.al.* (2006), the application of Target Costing involves two processes: the first aims to establish the Target Cost, and the second aims to achieve the Target Cost. This achievement is supported by management of the costs, carried out by the entire team involved in the new products development processes through motivation, in order to guarantee the desired profitability.

Cooper and Slagmulder (1997) see target costing as a structured approach to determine a product's life-cycle costs, in order to develop it with its functionality and quality required by the market demand, as well as guarantee the desired profitability. This is also Kato's vision (1993), who defines target costing as a management strategy for reducing an active product cost throughout its entire life cycle, in all the company's departments and its supply chain.

Cooper and Slagmulder (1997) define three steps in the application of Target Costing, so that it is ensured

that new products are profitable when launched: the first step is to determine the Target Selling Price and the Target Profit Margin. The second one is to establish the level for possible target cost of the product, and the third step is to decompose the target cost of the product up to the level of its components so as to determine the purchasing price of each and every one of its components. The Target Selling Price is especially defined by the market analysis, whereas the Target Profit Margin is based on the company's expectations towards profits, historical results and competitiveness analysis. The Target Cost of the product is reached by subtracting the Target Profit Margin from the Target Selling Price, and adjusting it to the company's price reduction capacities and its suppliers. Once the Target Cost is defined, it must never be exceeded, which leads to the product's management strategy in all its supply chain, planning process, and product development control, from its conception to its placement in the market.

Monden (1999) emphasizes the accomplishment process of the target cost described by Everaert *et.al.* (2006), and defines Target Costing as a cost reduction system which guarantees the profit of a product in a competitive market, in which those responsible for the planning identify and plan the characteristics of the qualities required by the clients.

Most of the costs are defined in the first stages of product development (Tani, 1995; Cooper and Slagmulder 1997). This fact has motivated the adoption, in the present work, of Target Costing as a strategy for the development of new products. The authors aim to apply it in early stages

of the product's life cycle to determine the Target Cost and establish supporting measures so that it can be achieved and, in the following stages, to manage the product cost together with all agents involved in the product's life cycle so as to guarantee the desired target cost.

TARGET COSTING IN CONSTRUCTION

The target costing was created for the manufacturing industry environment, but recent studies have pointed out the possibility for the application of this strategy in the construction context, even considering the peculiarities of the building product development (Ballard, 2006).

In the discussion of the Target Costing applicability in the Construction, the need to estimate the variables present in the product's development processes with a high level of precision is outlined, for uncertainties can considerably reduce target costing benefits, (Fisher¹ 1995, apud Granja et al., 2005; Cooper and Slagmulder, 1997). This is a challenge for the applicability of Target Costing in construction, since the level of uncertainties is high, due to the low level of definitions from the design, the change of specifications in the execution, the variability of the workforce and materials, the activities exposed to weather conditions, amongst other factors (Melles and Wamelink², 1993, apud, Alves and Formoso, 2000).

¹ FISHER, J. (1995) "Implementing target costing." *Journal of Cost Management*, 9 (2)50-59.

² MELLES, B.; WAMELINK, J. (1993) *Production control in construction*. Netherlands: Delft University Press.

In manufacturing, it is possible to determine the expected result for the investment from the estimate product selling price with pre-defined characteristics. This feature allows the product development process to be focused only in the profitability of the new product. In construction, each product is designed and built for a client strongly involved in the product process development (Ballard, 2006). Therefore, efforts are made by construction companies to add value to the product in the design conception through the identification of clients' requirements, besides guaranteeing its profitability (Ballard, Reiser, 2004).

In the manufacturing, the complexity is regarded as a factor which can influence the target costing process. According to Cooper and Slagmulder (1997), the product complexity defines the level of difficulty in managing its design process. This is clearly observed in construction: with the increase in the level of complexities of the buildings comprising the design process, because of the new choices of materials and technologies, characteristics and technical specifications are altered and, in production, there is an increase in the number of interferences along the process (Formoso et.al.,2001).In comparing the manufacturing and construction contexts, it is believed that the complexity can be considered difficult to both contexts.

BUSINESS PROCESS FOR THE DEVELOPMENT OF LIHP

A comprehensive analysis of LIHP development, including the supply and value chains, leads to a process management approach in order to identify the possibilities for improvements as well as the

inefficiencies of the process in the information and material flows (Gonçalves, 2000).

The objective of organizing and analyzing the development of LIHP in the light of a business process was to focus the external client, since this business process aims to add value for this client:

“The processes see a sequence of activities that start with a clear understanding of what the external client wants, and ends with this client buying what s/he needs and wishes from a business. The client is in the core of organizations based on processes, and the objective of those companies is to offer more value to the client, as quickly as possible and at a low cost.” (GONÇALVES, 2000, p10).

The tools used to analyze a LIHP development was the Administrative Value Stream Map (AVSM), which is a representation of all stages involved in the development of a product or a certain business process, defining the flow of present materials and information. It is also supposed to illustrate a company's productive process, at a given moment, revealing the opportunities for improvement in the processes, creating, therefore, a map of a future state (Reis, 2004). This tool was created from the fundamentals of the Value Stream Map (VSM), developed for the Toyota Production System. While VSM is used in the manufacture environment, where information and materials are processed, the AVSM is used in administrative environments to track information flow.

With the AVSM it was possible to represent and analyze all the

administrative processes involved in the conception and development of a LIHP, and to identify opportunities and barriers for the use of target costing concepts in the productive chain. The described processes at the AVSM start at the establishment of the program guidelines, and it ends in the use and maintenance of the LIHP.

However, there are some difficulties on the use of this kind of instrument, the AVSM. One of them is concerned with the client's concept of value: the perception of advantages or benefits received by the client in each negotiation with a company depends on emotional and irrational aspects. The price the client has to pay is only a parcel of her/his sacrifice or effort to get the product or service. The client assesses the product, the delivery time and comfort in getting what s/he wishes (Gonçalves, 2000).

The client's notion of value is seldom identified in an objective and irrefutable way, mostly because this assessment is very complex. Therefore, in this paper, the value flow analysis is limited to the conditions for adding value, attending the client's main requirements.

METHOD

THE ENTERPRISING OBJECT OF A CASE STUDY

The object of study of this work is one of the several existing LIHP development programmes, the Social Interest Housing Subsidizing Programme (SIHSP), in which the Housing Company of Londrina (COHAB-LD) acts as the sponsor and manager of the programme. The SIHSP goes to the population with an income up to 3 minimum wages

(US\$711,43³), usually assisting those living in forbidden areas, placing them into habitable ones, located preferably in the same region, aiming at the preservation of social relationships. SIHSP's residences built by the COHAB-LD are 29,00m² and their maximum value is pre-defined by the condition of the programme at US\$ 16,000.00.

THE STAGES OF THE RESEARCH

Initially, a literature review on target costing was carried out, for the understanding of the concept and applicability in the construction; on the AVSM, for the understanding of the use of the tool and on the SIHSP, in order to understand the business proposal of the programme.

Then the work was aimed at the identification of all processes present in the development of a LIHP in the SIHSP programme. Three interviews were carried out with the technical director of the COHAB-LD: the objective of the first interview was to understand the supply chain present in the project development in the SIHSP's scope and to initiate the elaboration of the AVSM. The second interview detailed the processes involved in the map and gathered information on the inputs and outputs of each process. After the necessary

changes to the structure of the map were made, a third interview was carried out in order to validate the map and finalize the information gathering stage.

The data obtained during the interviews are specified in each process represented in figures 1 and 2 are: description, agent, professional in charge, and resulting information which will be used in the next process(es).

The AVSM showed in figures 1 and 2 was based upon the model presented by Fontanini and Picchi (2005). In this map the arrows identify the information flow and each box represents an information treatment process.

AVSM ANALYSIS

The AVSM analysis, according to the SIHSP's flow of processes represented in figures 1 and 2, focused on:

- The extension potentiality of activities in the processes, in order to allow extra value to the chain agents, according to the expected results;
- Cost reduction for the accomplishment of activities in the processes.

³ The currency-conversions were based on the dollar rate of US\$1.00 = R\$1.75 (reals)

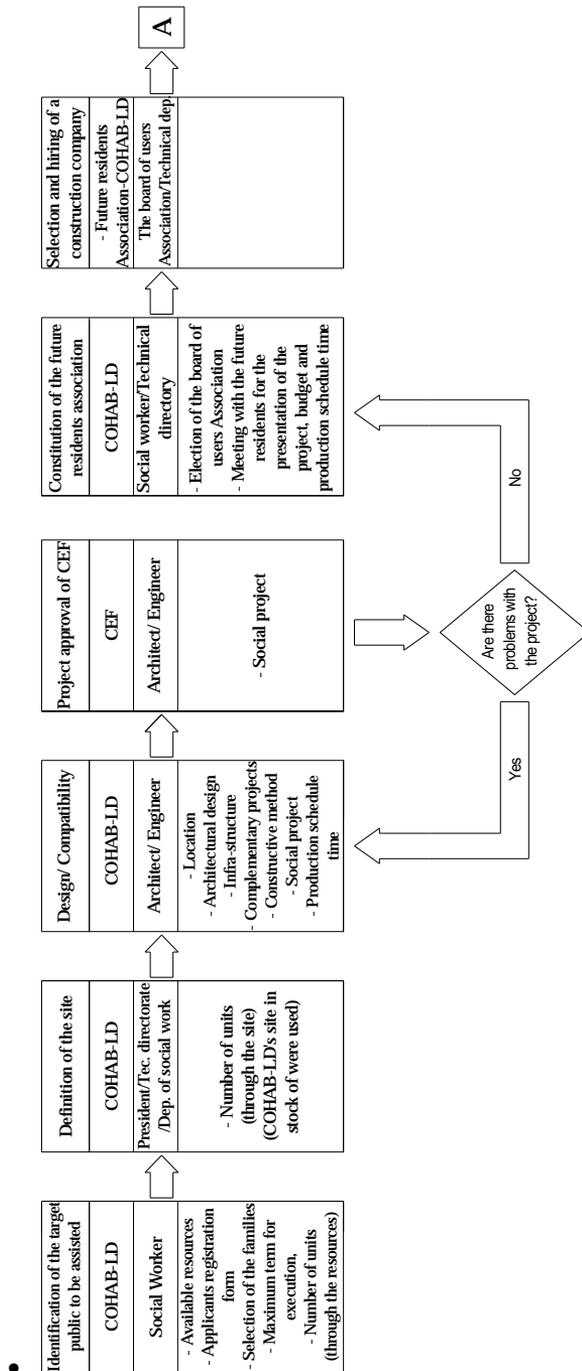


Figure 1: First part of the AVSM of a SIHSP enterprising.

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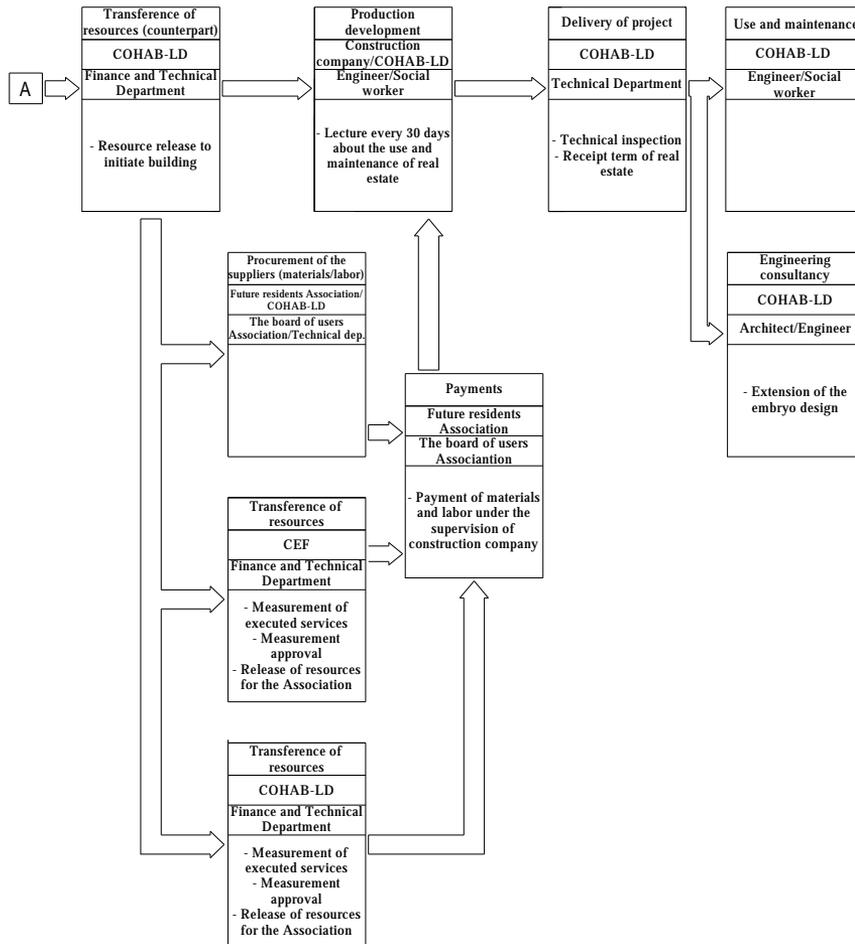


Figure 2: Second part of the AVSM of a SIHSP enterprising

In the first process, whose objective is to *identify the target public to be assisted*, opportunities for improvements were identified, especially regarding the identification of requisites of the end-client, aiming at adding value to the final product. The fact that the SIHSP establishes the target public to be assisted enables the registry of applicants to a residence, which is carried out by COHAB-LD's social work team, by means of the fulfillment of a personal data

collecting form about the applicant's current housing situation, amongst other information.

As the programme has the priority to assist people occupying illegal areas, reallocating them preferably in the same region, *site definition* is an important issue, because in keeping the already established relationships, the client's satisfaction increases. However, this activity must be wisely developed so that there are no extra costs to the process, therefore

guaranteeing profit for the chain agents.

The *design/compatibility* process, in which all projects are elaborated, is of high complexity. At this stage, one can identify a great opportunity for improvement applying target costing, once the target cost is already established by the programme, and there are various possibilities to add value to the housing unit design and project, based on a survey about the client's requirements.

The process whose objective is *to approve the project at the financial agent, Caixa Econômica Federal (CEF)*, may be a bottle neck in the process, once the CEF has not a clearly defined project approval criteria, which is likely to lead to a series of reworks at this stage. Should there be good interface relationship between COHAB-LD and CEF, time and costs would not be wasted, improving the results for the chain agents and the client, once the SIHSP could be developed and delivered faster. COHAB-LD has adopted the strategy of using a standard design called embryo project (with extension alternatives) in order to reduce approval time. Although it is not an ideal solution, it demonstrates this agent's interest in reducing the waiting time for approval and eliminating the rework stage.

To *constitute the future residents association* the board of directors election is held, then the designs, schedule and bill of quantities are presented. Each family can suggest minor changes in the design (e.g. changing in the placement of doors and windows) aiming at the client's satisfaction. However, the spatial configuration cannot be altered, once

the project was already approved by the CEF.

COHAB-LD can interfere in the *procurement of the construction company*, being able to appoint companies which have already produced SIHSP or not authorizing options from the future residents Association. Amongst the criteria adopted by COHAB-LD for the appointment of the company, one can highlight the commitment to the delivery term and product quality, as well as the ability to manage construction works, due to SIHSP's small profit margin: a way to guarantee profitability would be elaborating the construction work planning, establishing the company's production strategy, reducing, therefore, uncertainties.

The *transfer of resources by COHAB-LD and CEF* is an important issue for the chain, because delays in this transfer affect profitability for both the construction company and the suppliers, delaying the SIHSP to the end-client.

Besides, it does not motivate construction companies and the suppliers to improve their performance in order to continue in the SIHSP programme field.

The *procurement of the supplier* is influenced by COHAB-LD, similar to the construction company selection process. A barrier for the target costing application is the lack of partnerships between the association and suppliers, because the criterion adopted is usually the lowest price. The lack of this partnership hinders participation from COHAB-LD's design team along with the suppliers. This partnership would allow the development of the design with constructive materials and systems which could lead to higher

quality, lower cost and greater profits for the chain agents.

Throughout the *production development*, COHAB-LD and CEF define the quality and time criteria for the release of monetary resources forecast for the construction company. It is of great importance that the company has the management capability, as well as the guarantee of product delivery with quality and specified time for completion, adding value to the SIHSP.

The *engineering consultancy* process is an additional stage of the project, providing end-clients with possible extension designs for each project unit as well as consultancy whenever they wish to carry out the extension of their unit. Even though there are alternatives for the extension of the embryo design, COHAB-LD's design team is available to consult at this stage, adding value to the product as the clients can obtain a design which meets their needs and requirements.

DISCUSSION

In the literature review it was pointed out that the product must be planned and designed according to the client's needs and requirements, in other words, the market demand (Everaert *et. al.*, 2006; Cooper and Slagmulder, 1997; Ibuzuki and Kaminski, 2007; Ballard, 2006). Actions such as the adoption of tools for the identification of clients' requisites could contribute to improving clients' satisfaction, which is connected to the technical and aesthetical characteristics of the housing unit and the project, as well as to the location and delivery time. These tools can be used, both in the applicants' registry process for their dwelling and in the SIHSP of the LIHP

already dwelled. Their results would be used in the development process of the project, so that they can be elaborated with higher added value to the client.

In the design development process, besides considering the client's requisites, another target costing basis could be applied: the integration of COHAB-LD's design team and the suppliers. However, as the selection of the suppliers is carried out by the future residents Association, and because there is no commitment from them as to acquire materials for all the production process from the same suppliers, it can be considered a failure of the process. According to Ballard (2006), in a case study, there was great success while integrating the design teams, as it resulted in a systematic design besides ensuring the target costs for the chain. Still on the relationship with suppliers, Granja, Picchi and Robert (2005); Cooper, Slagmulder (1997) claim that when it is established so that the supplier has the guarantee of a mass volume purchasing, it brings profits to the entire chain.

Another identified failure of the process is the existence of problems in the communication between COHAB-LD and CEF, which incorporates additional costs and time to the development and delivery of the product. These communication failures result in greater efforts for the accomplishment of their actions.

The failures identified are mostly caused by cultural and [bureaucratic](#) difficulties present in the accomplishment of the LIHP, yet they are not impossible to overcome, and the opportunities highlighted in this paper are not difficult to be adopted by the agents.

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