TARGET AND KAIZEN COSTING IN CONSTRUCTION

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ABSTRACT

Target costing has been pointed out as a powerful strategy of lean manufacturing companies' interaction with suppliers. In fact, recent academic and corporate literature show that target costing has a wider role in the lean business system, driving product development and production activities, when combined with kaizen costing. This research aims to develop a framework taking together these two matching approaches, providing a basis of a total cost-management system during the project's life cycle. The main idea is to first design the project to an allowable cost consisting of the difference among target price meeting customer's expectations and the desired profit. Cost-reduction interventions should be not restricted to the design phase; they proceed to the construction phase where a continuing series of kaizen activities are needed to achieve great product performance and, at the same time, assuring value for the customer at a lower cost. Combining target and kaizen costing is a powerful approach for construction firms performing in a competitive market, by assuring value for the customer at a low but still profitable price.

KEY WORDS

Target costing, Kaizen costing, Cost reduction.

INTRODUCTION

Conflict generation and resistance to chance are very frequently features of construction environments. The rule of surviving in this rather competitive situation is that clients on one hand and main contractors on the other try to maximize their own benefits, to the loss of synergy required of any successful construction endeavour. Therefore, the idea that the sector has a culture that is speculative is well-known in construction.

Excluding rare exceptions, construction's agents seem to maintain its old practice of pricing its products on the basis of the mass production paradigm. Value engineering or designing according to an allowable cost are empty concepts in this circumstances, and the mechanism of pricing construction products assumes the following approach:

Price = Costs + Benefits (including profit)

Subsequent to this logic, in a typical design-bid-build contract clients will be seeking to protect their benefits by entering in a vicious circle of a minimum-price negotiation policy. Contractor by their turn will try to protect their own interests, accepting temporarily these conditions on the hope of recovering the setbacks later to the detriment of the client. It is very predictable that in a such hostile environment trade-offs among cost, price and quality will be the rule, not the exception as it would be preferable.

Claims by contractors for recovering payments are a major source of difficulties and concern in the sector, and there are reasonable evidences that these practices are not managed by accident (Rooke, Seymour and Fellows, 2004). As a rule, this situation challenges the contractor to main-

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tain the budget costs at best. When expected results are not achieved, urgency for claims during the course of the project logically emerges, contributing for the use of reactive techniques more and more. It is plausibly to suppose that in such conditions the contractor has no interest at all in developing his own competitive advantages.

Although these business rules of mass production are still practiced in manufacturing, companies facing severe competition must offer more value for an even declinable price of a product the market is ready to pay (Williamson, 1997). The construction sector has great opportunities to build up more collaborative practices among clients and contractors, seeking jointly methods of increasing value, as a way of maintaining profitability and if possible, increasing it in markets with escalating requirements

Our main research question is not to move toward the sector's claims culture *per se* (Rooke, Seymour and Fellows, 2003), but to advance on how construction companies facing a competitive market are allowable to offer a competitive but still profitable price, giving final customers what they want. We sought to answer this question employing an exploratory study, aiming at the development of a total cost management conceptual framework. Thus, our main contribution is to offer a theoretical primer for the development of a broader cost management system aiming not merely at controlling, but adding a cost reduction and improvement function that focuses on the construction stage of the product.

We first review the principles and concepts behind target and kaizen costing systems as they are envisioned in manufacturing environments, and infer opportunities to the construction sector through an abstracted approach (Lillrank, 1995). In addition we seek a similar context in construction as a means to conceive a conceptual introduction for the sector, taking together these two balancing ideas.

CONTROLLING COSTS IS NOT ENOUGH

Two paths are available to increase company's profits. One of them consists in increasing revenue (higher volume of sales and/or higher prices) and the other in reducing costs. In most construction markets, it is not generally feasible to keep, or even to improve company's results, by increasing sales' volume, or by practicing higher prices, which, in turn, can cause sales decrease, if not resulting of higher value delivered to clients. Thus, companies facing the greatest difficulty with growth due to the cited conditions need cost's reduction implementations to increase outcomes. The measures to achieve that include waste elimination and producing high quality products at a lowest possible price. A suitable inference for construction is to conceive a total cost management system where costs of products are targeted to sell well, by assuring value for the client at a still profitable price. Hence, the concept of product's allowable cost assumes the following request (Maskell, 1996):

Target price – Target profit = Allowable cost

The target selling price regards an acceptable and reasonable price in consumer's view, while target profit is based on company's necessities. Once the difference among target price to the target profit is obtained, the allowable cost for producing can be determined and becomes the goal for managing cost activities at a broad company's perspective. In pragmatic terms, the allowable cost is often far less than the current estimated cost. This difference between the allowable and the estimated cost is the cost gap, or target cost (Maskell 1996). It is worth to note that almost none of this information's requirements stems from the accounting system itself, nor is it a relevant source of data used to periodically update target costs (Johnson and Bröms, 2000). In this regard, financial accounting and management accounting represent different objectives. The reason that cost control, or the cost improvement function, is conducted outside the standard financial accounting system is not because of it's lack of relevance, but rather an extra degree of importance warranting an independent system (Makido, 1989). We restrict ourselves to the management's accounting domain as the main focus of this research.

In a broader sense a target costing approach has two aims: first to decrease costs of new products so that the required profit level can be ensured, while at the same time assuring quality, delivering time and price required by customers, and second to motivate all company employees for the achievement of the target profit along new product conception, by means of making target costing a company wide profit management activity (Monden, 1995). Controlling costs isn't enough for companies facing growth difficulties and tough competition. Besides, product's price can be under constant reduction pressures by customers, and the competitive price today may not be competitive tomorrow. In this research cost management is regarded as a process consisting of the following three components: (i) cost planning, (ii) cost maintenance and (iii) cost improvement (Toyota Motor Corporation, 2002).

COST PLANNING

Cost planning is particularly relevant because a great part of product's cost is determined during the development stages of the product (Monden, 1993). Implementing changes before production actually begins are very cost-effective as changes after production's start could involve additional costs to be implemented.

Engineering, accounting and finance, product engineering, sales and purchasing staff, among others, work intensively to achieve the target (allowable) cost by establishing planned cost reduction efforts such as value engineering (VE), simultaneous engineering (SE), and cost estimation (CE) activities. Typical evolutionary steps of action for cost planning activity are given in Figure 1 (Toyota Motor Corporation, 2002).

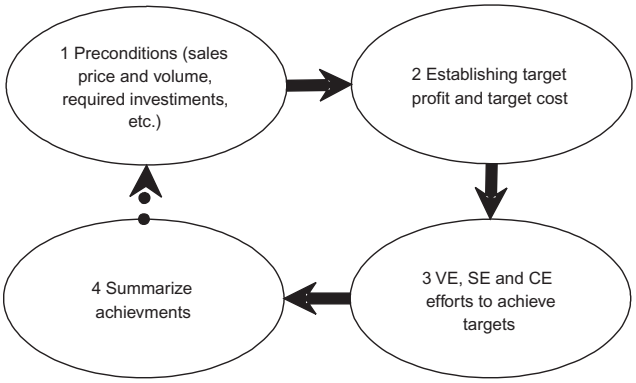

Figure 1: Evolutionary steps of action for cost planning activity (VE = value engineering, SE = simultaneous engineering, CE = cost estimation)

Once the target cost for the product is determined, additional efforts for identifying cost and functional elements are required. Identifying cost and functional elements involve separating the target cost into material costs, direct labor, special equipment and tools, overheads, sales costs, administration and so forth (Monden 1989). A possible inference for a construction endeavour would be dividing the project into functions using the Work Breakdown Structure (WBS) technique. Comparing their itemized costs should determine the relative relevance for each considered item.

Continuing the increasing detailing efforts, functions are divided into major units, and then further subdivided, since a project's target cost normally includes a number of on site produced and also outsourced elements. It is important to note that in construction part of the design flow process evolves during the job site flow, which in turn offer good opportunities of VE interventions for lowering costs provided function's performance is not sacrificed.

COST MAINTENANCE

Ensuring company's profit after production starts demands the necessity of maintaining costs. It is necessary to grasp planned cost and to manage irregular fluctuations and to take further actions trough cost preserving activities. Daily management practices need to include maintaining planned costs because costs tend to increase if not managed properly (Toyota Motor Corporation 2002).

It is obvious that cost maintenance implementations demand a very precise system to capture actual results according to each unit of cost control. This requires setting up a daily management system to capture actual cost data, in order to identify deviations. Quick counteractions are then necessary to correct abnormalities by means of PDCA cycle activities[5]. Project condition's changes are also prone to cause cost fluctuations particularly production initial planning, low productivity of labor at start of production, etc., and they need to be managed properly. Figure 2 shows a outline for a cost maintenance management.

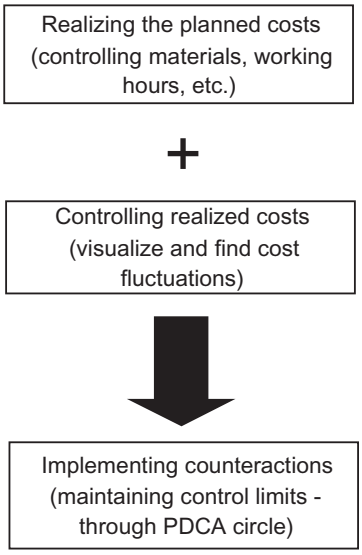

Figure 2: Arrangement for cost maintenance management

COST IMPROVEMENT (KAIZEN COSTING)

A total cost management system involves the conception of a cost reduction function for target profit management rather than just reacting after cost overruns occur on the manufacturing stage of a product's life. Thus, kaizen costing is essentially

5 At the very beginning of each construction stage, First Run Studies can help to improve initial conditions of the first unit being built, achieving the planned cost (Salem et al. 2004)

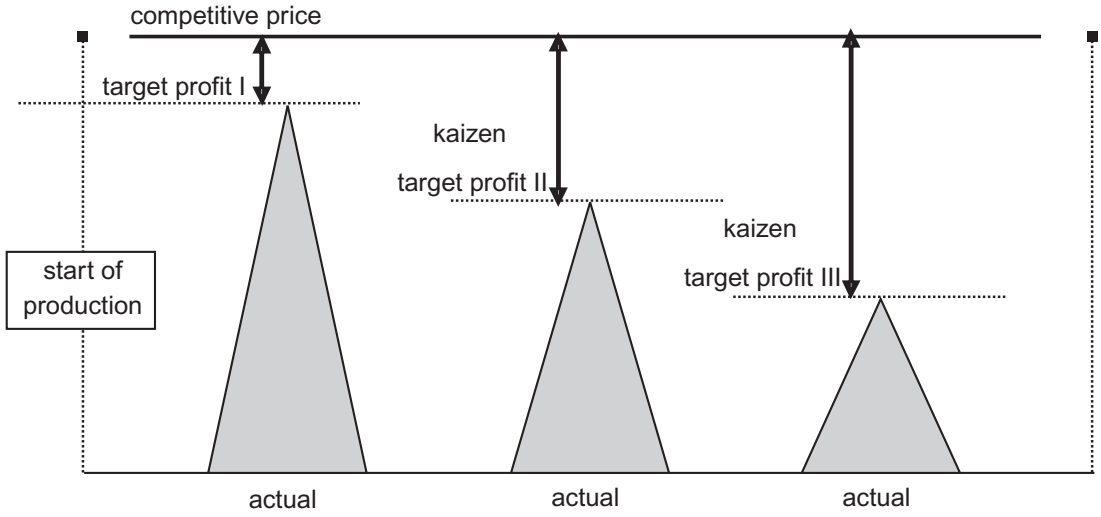

Figure 3: Cost improvement (kaizen) management as a means of progressive profit increasing

a method for profit management. Kaizen costing is also required to discipline company's interactions with suppliers by establishing the supplier's selling prices on the basis of the buyer's kaizen costing system. This fact is very important for effective implementation in the construction sector (Nicolini et al. 2000). Normally this process is controlled by the buyer establishing an ordinary kaizen cost reduction proportion for all outsourced items (Cooper and Slagmulder, 1999).

Locating and eradicating every possible types of Muda[6] is a precondition for the implementation of a cost improvement function. Figure 3 shows the connections among cost maintenance and cost improvement management. There are two directions for improving costs: first a vertical one based on cost items, and a second horizontal one founded on projects units. Improvements are required in a whole company basis through managing a harmony among these two directions.

VALUE ENGINEERING (VE) AND VALUE ANALYSIS (VA)

VE and VA implementations serve the purpose of maintaining the function of a product or service at the lowest possible cost. Value management is an ordered function-oriented team approach directed at analyzing the functions of a product, system or supply, for the purpose of enhancing its value by identifying and eliminating unnecessary costs and achieving the required performance at the lowest life-cycle project cost (Fong and Shen 2000) A mathematical abstraction of value can be represented as the following relation:

$$Value = \frac{Function}{Cost}$$

VE is typically exercised before the start of production, contributing in the planning phase. VA normally occurs after the production begins, contributing in the maintenance and improvement phases. VE/VA is an approach for decreasing costs and at the same time maintaining the quality and function that is required of the part being analyzed. It is recommended to implement VE at development and planning stage because if it occurs after the start of production, additional investments and design efforts should be necessary. Furthermore the production stage will also be shorter what means that the net potentials of cost reduction will decrease (Toyota Motor Corporation, 2002).

A TARGET AND KAIZEN COSTING ABSTRACTION TO CONSTRUCTION

We try next to establish a conceptual framework of target and kaizen costing to construction projects, having in mind the differences to manufacturing environments (Koskella 2000; Kern and Formoso 2004). Certain types of standardized buildings like brand retail units (BRU) and hotel chains, among others, emulate nearly make-to-order strategies of standardized products in manufacturing and their required functionality does not differ significantly between locations (Winch 2003). Thus, a BRU was select to serve as a basis for the conceptual primer tentative as a close approximation to emulate repetitive work cycles.

6 Muda is the japanese word for waste, recognized as any thing or operation that not create any value added for the product. There are 7 types of *Muda* in Toyota Production System (TPS): overproduction, inventory, conveyance, correction, motion, waiting and processing (Monden, 1998). Identification of the seven types of *Muda* in the construction's context can be found in Ott (2005).

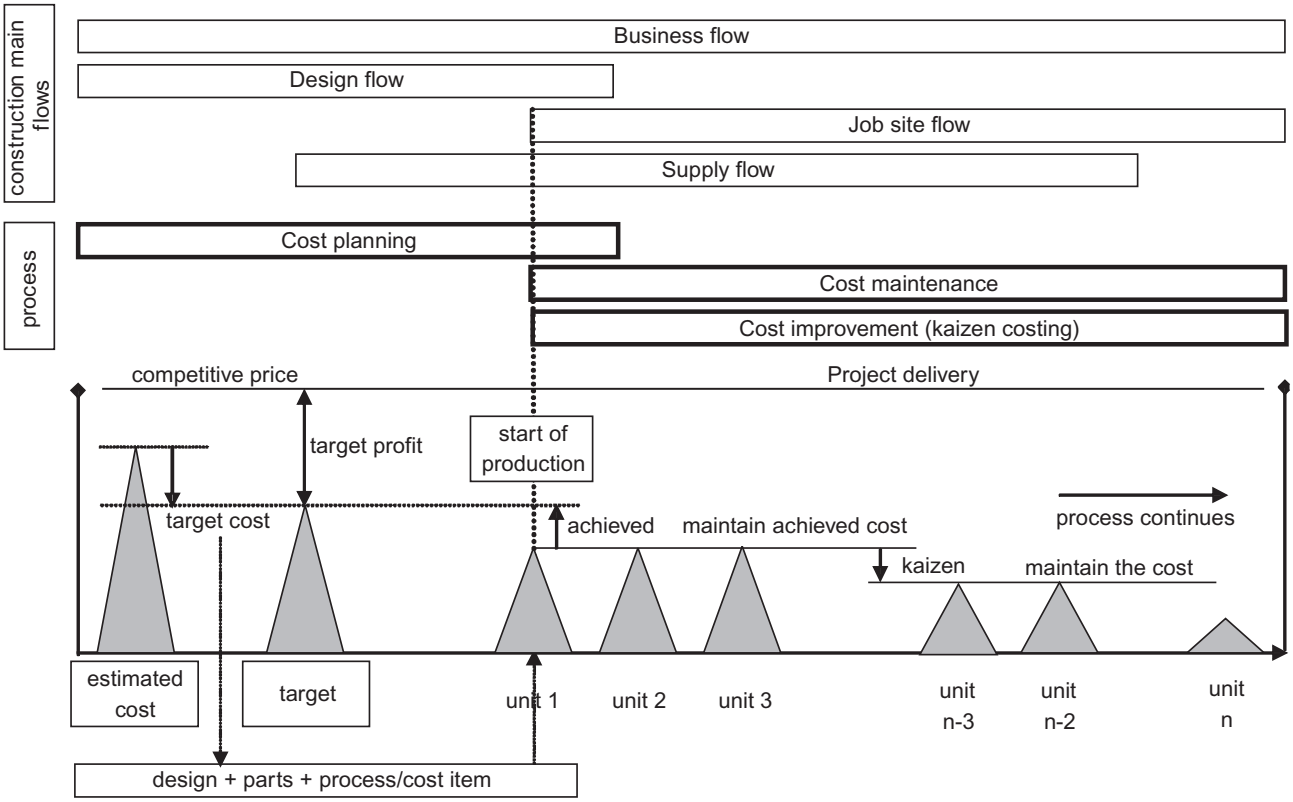

Figure 4: A proposed total cost management system for the construction stage of Brand Retail Units (BRU)

One may note that the proposed analysis focuses on the main contractor side perspective, in a design-bid-build basis. VE studies during the project design stage should join together BRU, the main contractor and the architecture office in charge, as requisite for implementing target and kaizen costing strategies. Under the BRU perspective, the competitive price for the facility should be determined according to its core business policy, considering fixed and indirect costs necessary for the operation. By this means, the allowable allocation of capital for the facility can be obtained.

Figure 4 shows a model for a total cost management system for the construction of a BRU, based on the author's experience with this kind of construction in Brazil. Details of the number of repetitive operations are not important in this exploratory stage of the research. What is important is that the repetitive feature of this kind of project can close replicate a systematic learning environment required to implement kaizen initiatives.

The four construction main flows from concept to delivery are represented (Picchi 2001). Our tentative total cost management system consists of three major processes: first the cost planning, second, the cost maintenance, and third, the cost improvement (kaizen costing) function. First attempts are made at the cost planning stage to reduce the estimated cost of the BRU at the target cost level, required to fit the target profit. Target costs are divided in parts and cost items, and a business wide commitment to achieve target cost is essential. A suggestive and inspiring sample of these practices of designing for target cost can be found in the work of Ballard and Reiser (2004).

The process of following-up the required target cost reaches the start of production stage, where the first unit starts to be built. Subsequently, a continuous process of cost maintenance and cost improvements (kaizen costing) evolves from Unit 2 to Unit n, and it is predictable that costs will continue to decrease by means of kaizen implementations and repetitive cycles of work. Additionally, designing processes to immediate detection of problems, establishing methodical procedures for continuous learning on the functional hierarchy, whenever standardized work processes deviate, are necessary measures for successful implementations of a learning environment (Picchi and Granja, 2004).

It is important to note that costs will always oscillate due to different reasons such as money inflation, labor wage and materials increases, increase and decrease in performance on site, etc. The probable consequence of managing costs weakly is that they will tend to increase. The following measures after the start of production stage are very important to manage costs properly (Toyota Motor Corporation, 2002):

i. Endless seeking improvements in productivity.
ii. Improvements in standard usage (e.g. yield ratio increase of materials)

iii. Reduction of overhead costs (sales and general administration expenses).
iv. To implement kaizen actions of outsourced trades led by procurement's department.

To accomplish those requirements, a learning environment, and the participation and commitment from people are pre-requisites for implementing an integrative cost management system focusing on the processes involved (Kern and Formoso, 2004). We regard the pointed out recommendations as a minimal support for first tentative implementations of a total cost management system in the construction sector.

CONCLUSION AND FURTHER WORK

We have presented a conceptual primer for a total cost management system to the construction sector, and limited the approach to brand retail units as a means to emulate a similar repetitive work context of manufacturing environments. Our main contribution consisted in tentative abstractions and adaptations to construction projects of insights, tools and techniques that exist and are practiced in manufacturing environments yet, regarding cost management as a process. It is reasonable to infer that this model should be valid in other similar contexts where characteristics of repetitive construction activities are present, not only linear infra-structure construction projects like road construction or pipelines, but also repetitive building endeavours such as housing projects, open building and its form of infill construction on demand, etc.

The proposed abstraction to construction regards cost management as an integrative process, by adding to the conventional cost controlling and maintenance function a cost improvement dimension by means of kaizen implementations during the production stage. To achieve the promised results, it is implicit that developing a lasting learning culture and obtaining commitment and attachment of the people involved need to be consummate. Besides, a more proactive business milieu among clients, providers, contractors and suppliers is to be established to smooth the progress of developing a lean environment in the construction sector, consequently assisting proper implementations of target and kaizen costing concepts.

The presented exploratory primer needs to be further developed. We point out bellow some recommended research guidelines to further develop this research:

i. Case studies seeking replications and implementations of the proposed model, establishing to what extent generalizations are possible in different construction projects,
ii. Explanatory researches seeking further development of the presented theoretical framework.
iii. Detailed studies in search of proper use of tools and techniques for achieving a total cost management perspective: VE/VA, SE, CE, among others.

We were very stimulated to develop this research because proper cost management is an essential step for any company to be competitive. Construction's old paradigms can be changed by means of such simple measures as having standard work procedures, and easy ways of finding and fixing deviations to continuously remove waste. A successful total cost management implementation depends on that, and it is certainly a substantial guiding principle for company's success also in the construction sector.

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