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Target costing operationalization during product development: Model and application

Tiago Pascoal Filomena [a,*], Francisco José Kliemann Neto [b], Michael Robert Duffey [a]

[a] Department of Engineering Management and Systems Engineering, The George Washington University, 1776 G Street, NW, Washington, DC 20052, USA
[b] Department of Industrial and Transportation Engineering, Federal University of Rio Grande do Sul, Av. Osvaldo Aranha, 99, 90035-190, Porto Alegre, RS, Brazil

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ABSTRACT

Target costing is a widely used technique for cost management during product development (PD). Despite target costing's strategic intuitiveness, its operationalization during PD requires careful decomposition of a product's constituent cost elements. The main objective of this paper is to describe an experience developing early-stage cost parameters for a specific product development process effort at a mid-sized Brazilian manufacturing company by proposing and applying a target costing model. One secondary objective is to provide a model to operationalize "target costing" by breaking down cost targets into product parts, features and common elements, focusing on creating parameters for cost control during PD. Using a detailed case study, target costing is explicitly decomposed in four different stages in a PD environment. All these are intended as a complement to the strategic use of target costing.

1. Introduction

Product development (PD) is a core factor in competitive advantage and effective early-stage cost management techniques, during the product development process (PDP), are increasingly sought after by many industries. Horngren et al. (1997) and Tornberg et al. (2002) have established that most of the product costs are determined in the early stages of product's life-cycle. There is also an evolving literature to identify and manage the specific economic factors that are important during the PDP (Andreasen and Hein, 1987; Cooper, 1990; Crawford and Benedetto, 2006; Dickson, 1997; Kotler, 2003; Pahl and Beitz, 1995; Prasad, 1996).

Target costing is a technique for economic management, particularly cost management, during PD (Filomena et al., 2005). The use of the target costing during PD is supported by the surveys of Dekker and Smidt (2003) and Tani et al. (1994) which show that the PD and design departments are major users of target costing. Furthermore, Afonso et al. (2008) present a survey in which target costing has a positive impact in new PD.

Cooper and Slagmulder (1999) define target costing as a technique to manage future profits in the organization. The target costing begins with the target price, which is in general determined by market research or observation. A desired per unit profit is then simply subtracted from the target price to obtain the target cost (Cooper and Chew, 1996; Monden, 1995), as it is presented in Eq. (1).

$$\text{Target cost} = \text{Target price} - \text{Profit} \quad (1)$$

The concept of target costing seems to be closely related to studies conducted in Japanese companies and/or by Japanese researchers (Cooper and Yoshikawa, 1994; Kato, 1993; Tani et al., 1994; Tani, 1995). Target costing apparently emerged as a cost management technique used by Japanese management accountants to enable better decision-making during the PDP and to stimulate employees to follow long-term strategic policies (Gagne and Discenza, 1995). Its evolution as a strategic concept has been described by Everaert and Bruggeman (2002).

* Corresponding author. Tel.: +1 202 994 4920; fax: +1 202 994 0245.
E-mail addresses: tiagopf@gwu.edu, tiagofilomena@gmail.com (T.P. Filomena), kliemann@producao.ufrgs.br (F.J.K. Neto), duffey@gwu.edu (M.R. Duffey).

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However, practical applications of cost and profitability control during the PDP require detailed and available product cost information. Furthermore, despite the target costing strategic intuitiveness, its operationalization during early-stage product life-cycle decision making requires careful decomposition of a product's cost constituent elements. Terms such as "features," "characteristics," "parts," "functions," and "elements" can become inherently context-specific and overlapping depending on the type of product, the product family genealogy, geometric and functional complexity and other factors. These issues are discussed in this study.

The main objective of this paper is to describe an experience developing early-stage cost parameters for a specific PDP effort at a mid-sized Brazilian manufacturing company by proposing and applying a target costing model. One secondary objective is to provide a model to operationalize target costing by breaking down cost targets into product parts, features and common elements, focusing on creating parameters for cost control during PD. Using a detailed case study, the target costing is explicitly decomposed in four different stages in a PD environment. All these are intended as a complement to the strategic use of "target costing".

This model is limited to the creation of product cost parameters. As a complement to this model, the development team must estimate product costs during the evolution of PDP and then the estimated product cost can be compared with the beforehand generated cost parameters (proposed in this model). As an example, at the end of the case study some estimated costs for the proposed features are presented. When the estimated costs exceed the cost parameters, the development team knows that some action must be taken to decrease product's cost. Cooper and Slagmulder (1997), Ansari et al. (1997) and Yoshikawa et al. (1994) point out value engineering as one technique to reduce costs.

This paper is structured in three main sections. In the first one, concepts of product parts, features and common elements are standardized. In the second, a model that can be used to break down product target cost during PD is presented. Then the model is applied to the development of a new family of seats products in a Brazilian bus body automotive manufacturing company. Some other justifications for this study are presented on Sections 2 and 3.

2. Product parts, features and common elements conceptualization

To provide some background and context, concepts of *product parts*, *features* and *common elements*, used during the target costing or PD, are examined, including the sometimes disparate terminologies deployed by various authors and practitioners. First, a brief review of how other authors have decomposed product costs during target costing and PD is presented. Then three important concepts for this study are defined: *products parts*, *features* and *common elements*.

Cooper and Slagmulder (1997, 2002a, b) divide the target costing process into product-level target cost and component-level target cost. Between the product-level and the component-level, they define "functions", for which they provide the following definition: *"Major functions are the subassemblies that perform a critical function that supports the product in its ability to perform its primary function. For example, an engine cooling system is a major function of an automobile."* Ansari et al. (1997) and Monden (1995) use taxonomies that are similar to Cooper and Slagmulder (1997, 2002a, b). In a somewhat similar fashion, Ibusuki and Kaminski (2007), in a study of the automotive industry, decompose vehicles parts into their "functions" and "components".

Brimson (1998) does a different conceptualization. This author separates the product into "features" and "characteristics". For example, a pair of blue jeans has a watch pocket and a zipper fly as its "features" and fabric thickness and size as its "characteristics." In another study, Ou-Yang and Lin (1997) define "parts" as physically separable components of the product and "feature" as the geometry of possible components.

Leibl et al. (1999) writes that a *"feature may consist of semantic facts of the case, of geometrical description, or of both. Semantics should be looked upon not simply as an accessory, but rather as a central component. For concrete application each feature obviously possesses a geometry."* Ben-Arieh and Qian (2003) use activity-based costing (ABC) to evaluate a rotational part development's cost, using during their paper the expression "part." Dixon et al. (1988) developed a taxonomical classification system for decomposing mechanical systems that relates geometric "features" and other descriptors to the evolving stages of design. Dixon and Duffey (1990) also present operational definitions of "features" for a variety of computer-aided mechanical design methodologies.

Weighting the relative merit and extensibility of theses definitions is not a goal for this paper. However, the semantics of *product parts*, *features* and *common elements* will be standardized because they are used to break down the product target cost during the PD. As an explanatory purpose, consider a bicycle.

Product parts are the main physically separable parts of the product. For example, without exhausting all the possibilities, consider five separable parts in a bicycle: frame, wheels, break, seat and suspension. The *features* are the characteristics that economically differentiate each part, not only for material but also for production. For instance, the material, the size and the design could be considered as *features* of the frame *part*. Fig. 1 presents the deployment of the product in *parts* and *features*.

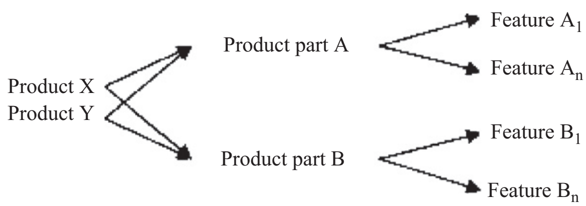

Fig. 1. Deployment of the product in parts and features.