Factors Influencing the Target Costing Process: Lessons From Japanese Practice

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Abstract

The target costing process at most firms can be broken into three major steps. The first consists of market-driven costing, the second of product-level target costing, and the third of component-level target costing. To identify the factors that influence the target costing process at firms, an exploratory comparative analysis of the target costing processes at six Japanese manufacturing firms is undertaken. From this analysis, five factors are identified that play a role in influencing the target costing process by altering the levels of the benefits that the firms can derive from target costing.

The factors that help shape market-driven costing include the ***intensity of competition*** *and the* ***nature of the customer****. The factors that help define the benefits associated with product-level target costing include the firm's* ***product strategy*** *and the* ***characteristics of the product****. Finally, the firm's* ***supplier-base strategy*** *influences the benefits associated with component-level target costing.*

It is argued that it is these five factors that primarily determine the magnitude of the benefits that the firm will generate from the application of target costing. As the benefits increase, the amount of energy the firm is willing to expend on the target costing process is expected to increase concomitantly. Therefore, firms that gain significant benefits from target costing are likely to have more extensive target costing processes than those that gain only minor benefits.

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Introduction

Target costing is primarily a technique for profit management. Its objective is to ensure that future products generate sufficient profits to enable the firm to achieve its long-term profit plans. This objective can only be achieved if products are designed to satisfy the demands of the firm's customers and to be manufactured at a sufficiently low cost. Target costing systems first identify the cost at which the product must be manufactured if it is to achieve its profit objective and then create a disciplined environment to help ensure that the target cost is achieved.

Most target costing processes contain three distinct steps, market-driven costing, product-level target costing, and component-level target costing. Market-driven costing is used to transmit the competitive pressure that the firm faces in the marketplace to its product designers and suppliers. This pressure is transmitted by subtracting the target profit margin (i.e., the margin required of the product if it is to enable the firm to achieve its long-term profit objectives) from the target selling price (i.e., the price customers are willing to pay for the product) to determine the product's allowable cost (i.e., the cost at which the product must be manufactured if it is to generate the target profit margin at its target selling price).

The allowable cost is set by the market, it does not incorporate the capabilities of the firm or its suppliers. Setting the target cost equal to the allowable cost risks setting unachievable targets and thus reducing the effectiveness of target costing. Therefore, in the product-level target costing step, product-level target costs are set that are often higher than allowable costs. These product-level target costs are determined so that they can be achieved, but only if the product designers expend considerable effort on designing costs out of the future products. The objective is to create intense but realistic pressure on the product designers to reduce costs.

To create an equivalent pressure on the firm's suppliers, component-level target costing is used to focus supplier creativity on reducing the costs of the components they supply. At the heart of component-level target costing is establishing the price that the firm is willing to pay for each of the externally acquired components in the new product. Thus, component-level target costing enables the buyer to establish the selling prices of its suppliers. These prices must be realistic and allow the suppliers to make adequate returns if they too expend considerable efforts on designing costs out of their products.

The majority of documented target costing systems contain these three major steps. However, the way these steps are undertaken appears to vary by firm. The purpose of this research is to begin the process of identifying the factors that influence the target costing process. To achieve this objective, an exploratory comparative analysis of the practice of

target costing at six Japanese manufacturing firms is undertaken. From such an analysis, conditions that appear to favor target costing can be identified. They can be used in subsequent research that adopts a more deductive design to further clarify the factors and how they shape the target costing process.

Literature Review

In recent years, target costing has begun to attract attention as a powerful method to manage product costs during the product design stage of a product's life. As such, it is a feedforward cost management technique as opposed to the more traditional feedback techniques used to manage costs during the manufacturing stage. Target costing is not a new development, its use has been documented since at least the mid-sixties (Newbrough, 1967 and Carsberg, 1975). In addition, there is anecdotal evidence of its use by Henry Ford, when developing the Model T (Shank, 1995). The Japanese approach to target costing appears to have been developed at Toyota in the early 1960s (Monden, 1995; Cooper and Tanaka, 1996).

Over the last several years, an extensive western literature on the way Japanese firms practice target costing has developed. The first descriptions of the technique, in English, were Hiromoto (1988) followed by Sakurai (1989). Hiromoto identified target costing as one of a number of "hidden" cost management techniques that Japanese firms use to ensure alignment between their strategies and their cost reduction programs. Sakurai, on the other hand, described the major steps in the target costing process at a single firm, but did not place it in the context of strategy. Subsequently, a number of articles have appeared describing Japanese practice in more depth, including Hiromoto (1991), Kato (1993), Monden and Hamada (1991), Monden (1992), Tanaka (1993), and Kato et al. (1995). These articles primarily describe the target costing practices at one or more Japanese firms, however, they do not try to explain the differences in the observed practices.

Other publications focus more on the underlying process of target costing and the advantages that can be derived from its application. For example, Yoshikawa et. al. (1993) discuss the technique by using simple examples to illustrate the general mechanics of the process, but do not provide in-depth descriptions of either the process or the practice. In contrast, Monden (1995) describes the generic process of target costing in considerable depth. In addition, he uses vignettes about actual practice to illustrate the application of target costing. Cooper (1995) describes the cost management practices at twenty Japanese manufacturing firms, including detailed descriptions of the target costing practices at six firms (Komatsu LTD (Cooper, 1994a); Nissan Motor Company LTD (Cooper, 1994b); Olympus Optical Company LTD (Cooper, 1994c); Sony Corporation (Cooper, 1994d); Toyota Motor Corporation (Cooper and Tanaka, 1996); and Topcon Corporation (Cooper, 1994e)). Finally, Cooper and Chew (1996) describe the benefits anticipated from the adoption of target costing.

Taken together, the literature provides a rich description of the complex process that helps Japanese firms manage future profits by carefully identifying new products and the cost at which they must be manufactured. However, existing research has not moved beyond

description to provide a thorough analysis of the factors that influence the target costing process. The purpose of this research is to begin to fill that gap.

Research Method

The data for this paper were collected over a five year period from late 1990 to early 1996. The firms were visited by at least one of the authors and a total of 13 days was spent on-site. Visits were made to Corporate or Divisional head offices and, where appropriate, to manufacturing facilities.

Managers, design and manufacturing engineers, and blue collar workers at the six firms, who were activity involved in the application of target costing, were interviewed. It is difficult to estimate the number of individuals interviewed at each firm because often several people were in the room with the authors and would answer questions as appropriate. In-depth interviews in English, with translator support as appropriate, were typically held with between three-to-five individuals in each firm. These individuals were responsible for one or more target costing projects. Job titles included General Manager of Product Planning, Manager of Corporate Planning, Chief Engineer, and Senior Manager of Group Accounting.

Copious notes and tape recordings of the interviews were used to prepare research cases of approximately 5,000 words each. These cases were sent to the contact manager in each firm for review. The first draft of the cases contained numerous questions that the authors could not answer from their tape recordings and notes. The cases typically went through two-to-three revision stages before being cleared. It took between 12 - 18 months to clear each case. Where necessary, the questions and appropriate textual portions of the case were translated into Japanese so that managers with inadequate English skills could answer the questions and review the text for accuracy. In a typical clearance procedure approximately 60 questions were answered and about one third of the case was rewritten or amended in some way. While the majority of these changes related to the author-initiated questions, others were corrections to the drafts identified by the reviewing managers.

If necessary, competitive or sensitive information was disguised at the request of the participating company. Once the reviewing managers at the firms were satisfied that the cases were factually correct, the cases were used as a basis for writing this paper. Ultimately, each company signed a representation letter authorizing release of the final version for publication.

The factors influencing the target costing process were identified by carefully reading the cases and analyzing the similarities and differences in the way the firms performed target costing and the environments in which they competed. This analysis was augmented by the knowledge of the firms and their practices gained through visiting them, but not captured in the cases. When a difference in practice was detected, the cases were analyzed to determine what conditions caused that difference to occur. For example, Komatsu expended considerably less energy on customer analysis than Nissan and Toyota. The condition that appeared to lead to this difference was the ease of identifying the future requirements of their customers.

Each condition was analyzed to identify the factors that lead to its occurrence. For example, for Komatsu the factor identified was the relatively slower rate of change of functionality expectations on the part of its customers compared to Nissan and Toyota. As each factor was identified, the role that it played in all of the firms in the sample was studied. A factor was only included in the theory if a causal model of how changes in its relative value would affect the target costing process could be identified. For example, the magnitude of the up-front investment influenced the target costing process because the greater the investment, the more that was at stake, therefore, the more energy the firm was expected to spend to ensure success.

It should be noted that in some cases, the relationship was obfuscated by the difference between the ease of accessing the information required by a particular section of the target costing process and the value of applying the technique. For example, if customers had similar future requirements and could explain them clearly, then little customer analysis was required even though the information was valuable. In contrast, if customers had very disperse future requirements and had little understanding of them, then the customer analysis was expected to be time consuming and of little value. Therefore, it was not considered worth the effort. Consequently, there were really two interactive determinants of how much energy a firm expended on target costing.

To capture how the factors influenced the target costing process a +/- relative weighting scheme was developed. This scheme assigns a "+" to the factor if its relative value is considered favorable, that is increasing the potential benefits of target costing, and "-" if it is considered unfavorable, that is decreasing the potential benefits. For example, if the up-front investment for a product is high compared to the up-front investment of the products made by the other firms, then it is assigned a "+" for that firm because high up-front investments favor target costing. In contrast, if the relative up-front investment is low, then the factor will be assigned a "-" for that firm. An ordinal +/- scale was used instead of a numerical weighting scheme because there was no way to assign realistic weights to the factors.

The resulting +/- profiles (i.e., the vector of pluses and minuses for each firm) provided insights into how all of the factors acted together at the sample firms to shape their target costing processes. If the factors were indeed influencing the target costing process, then firms with profiles dominated by pluses were expected to have richer and more extensive target costing processes than firms whose profiles were dominated by minuses.

The Research Sample

The six firms in the sample are all large manufacturing entities with international reputations for being leaders in their industries. They are all known to have excellent cost management systems. While there is no guarantee that these firms represent the best of Japanese practice, it appears reasonable to assume that the systems in these firms are well designed and reflect the underlying economics of target costing.

The firms are drawn from a number of different industries.

- Komatsu, Ltd. is one of the largest heavy industrial manufacturers in Japan.
- Nissan Motor Company, Ltd. is Japan's second largest automobile company.
- Olympus Optical Company, Ltd. is the world's fourth-largest camera manufacturer.
- Sony Corporation is one of the world's largest electronics companies.
- Topcon Corporation is the world's largest producer of ophthalmic instruments.
- Toyota Motor Corporation is Japan's largest automobile company.

The firms were identified in a number of different ways. Some were identified as having excellent target costing and value engineering systems by Japanese academics. Nissan and Komatsu were identified by Michiharu Sakurai of Senshu University and Toyota was identified by Takao Tanaka of Tokyo Keizai University. Sony was identified by a Japanese executive of that firm who was attending an executive program taught by the lead author. Finally, Olympus and Topcon were contacted directly based upon their reputation for innovative and competitive products. In both cases, a letter was sent to the firm's President requesting involvement in the research project. Both agreed to participate and selected their target costing system as the most noteworthy part of their cost management systems.

All of the firms in the sample were selected based on the criterion that they have mature target costing systems that appear to be well adapted to the specific requirements of the firm. The primary purpose of the comparative analysis undertaken in this research is to identify the factors that influence the practice of target costing, not necessarily the decision to adopt target costing. To identify the factors that help determine whether a firm can benefit from adopting target costing and the critical values of those factors would require including firms in the sample that have consciously chosen not to adopt target costing. Such firms were not included in this sample because the research focuses on firms that do practice target costing and the factors that affect the degree of effort expended on the target costing process. Even though these factors presumably also play a role in determining if adopting target costing is justified in the first place, this analysis was not considered to be part of the research.

The Factors Influencing the Target Costing Process

All of the target costing processes documented contain three major steps, market-driven costing, product-level target costing, and component-level target costing (Figure 1). Each step has a defined output: allowable cost, product-level target cost, and component-level target costs respectively. While these outputs are essentially identical across firms, the process of target costing is more difficult to observe and varies by firm. There are at least five major factors that apparently influence the target costing process. Two of these primarily influence the market-driven costing portion of the target costing process. These are the intensity of competition and the nature of the customer. The next two factors influence the product-level target costing process. These are the firm's product strategy and the characteristics of the product. Finally, the last factor, the firm's supplier-base strategy shapes the component-level target costing process.

Factors Influencing Market-driven Costing

The factors that apparently help shape the market-driven costing portion of the target costing process include the **intensity of competition** and the **nature of the customer** (Figure 2). These two factors help determine how difficult it will be to ensure that products are successful when launched and hence, the magnitude of the benefits derived from target costing. They also help determine the nature and extent of the information collected about customers and competitors in the market analysis portion of the target costing process. It is reasonable to suspect that the intensity of competition is a factor to consider since it has been shown in other environments to influence the energy expended on cost management (Khandwalla, 1972).

Intensity of Competition

The intensity of competition apparently influences how much attention the firm is paying to competitive offerings in the target costing process. All of the firms studied could identify four to six direct competitors who were fairly evenly technologically matched. These firms had adopted a confrontational strategy because they lacked the ability to develop sustainable competitive advantages over each other (Cooper, 1995).

Three product-related characteristics, referred to as the survival triplet, play a critical role in determining the success of firms. The survival triplet comprises the product price, quality and functionality. Quality is defined as conformance with product specification. Functionality, which includes service, refers to the degree of success in designing the product to meet the specifications that customers require.

A product's survival zone (Figure 3) is bounded by the minima and maxima of these three elements. For example, there will be a level of functionality above which it will be too costly for the firm to operate if it wishes to retain customers by charging prices that they are prepared to pay. Similarly, there will be minimum levels of quality and functionality required by customers. In markets with perfect information and only strictly economic rational customers, the specific customer trade-offs between price, quality and functionality would be clearly visible and a well specified functional relationship between values for the three triplet elements could be set down as the basis for determining strategy. In reality, firms can usually only identify the approximate position of the maxima and minima of the three triplet elements. There is in other words, a three-dimensional space within which a product can succeed that is bounded by the maxima and minima of price, quality and functionality.

Where the minima and maxima are set widely apart, it may not be possible to detect trade-offs in a precise functional form and it will be more likely that there will be more than one survival zone with customers forming rivalry groupings, such as those competing on cost for a minimum quality and functionality in contrast to those attempting to operate a differentiated product strategy (Figure 4). But, increasingly, and especially in markets faced by the Japanese companies described in this study, competition is very different. Customers

have become more informed, rivals more aggressive and survival zones have been squeezed. In such a situation, the traditional approach of selecting whether to use a cost-leadership or differentiated product strategy is no longer available. If a firm wants to survive, there is no alternative but to compete head on in terms of cost, quality and functionality.

When these conditions exist, certain realities are present (Cooper, 1995):

- Profit margins are low,
- Customer loyalty is low,
- First mover advantages are small,
- Product that are launched outside their survival zones fail dramatically.

Under such conditions, the benefits of target costing are potentially high. The low profit margins and customer loyalty mean that the firm can not afford to make too many mistakes when launching new products. By transmitting the competitive pressure faced by the firm to its product designers and suppliers, target costing increases the probability that new products are inside their survival zones when launched. In contrast, in environments where the intensity of competition is lower, non-confrontational strategies, such as cost leadership and differentiation, can be successful. Such strategies allow for higher profits and increased customer loyalty. Therefore, the benefits of target costing will be potentially lower in such environments.

The ability of competitors to rapidly bring out me-too products makes it difficult for firms to recoup their investments in product development. First, the rapid copying leads to shorter life cycles and second, the inability to reap first mover advantages leads to lower profits. Thus, the firm is forced to amortize its development costs over fewer units that are generating lower profits. Therefore, the ability of the successful products to offset failures is reduced. This inability creates significant pressure on the firm to minimize product failures.

Consequently, it is postulated that target costing is particularly valuable for firms that have adopted confrontational strategies because failure to launch products that are in their survival zones typically leads to rapid and significant loss of market share. These losses are driven by the narrow survival zones that result from equivalent competitors chasing the same customers. In general, it is conjectured that as the intensity of competition increases, so does the value of target costing to the firm. For example, Sony has managed to differentiate its products based upon their superior functionality over those of the firm's competitors. This lowered intensity of competition is thought to be one of the main reasons that Sony has a less well developed target costing process compared to the other firms in the sample. In contrast, all of the other firms are in confrontation and, with the exception of Topcon, have well developed and elaborate target costing systems.

Nature of the Customer

There are many characteristics of customers that can influence the intensity of consumer analysis that is undertaken by firms, but evidence suggests that three are particularly important in helping determine the benefits derived from target costing. The first

is the **degree of customer sophistication**, the second is the **rate at which future customer requirements are changing**, and the final characteristic is the **degree to which customers understand their future product requirements**. These three characteristics appear to help determine the benefits that a firm can potentially derive from target costing because they deal with the width, rate of change of location, and ease of predicting the location of survival zones. Analysis of the practices observed in the six companies suggests that target costing is particularly valuable for firms that have to compete in environments that have narrow survival zones, whose locations are changing rapidly, but are relatively predictable.

Degree of Customer Sophistication

The degree of customer sophistication determines how good customers are at detecting differences between the price, quality, and functionality of competitive products. Sophisticated customers are highly educated about the product offerings that are available, can detect minor differences, and will freely switch between manufacturers to buy the products that best satisfy their needs. Consequently, as customers become more sophisticated, the survival zones of products become narrower. When survival zones are narrow, it is easier to launch products that fall outside them and hence fail. To increase the probability that products are launched inside these narrow survival zones, firms expend considerable energy on consumer analysis trying to determine the location of survival zones when the product is launched.

For example, in the automobile industry, the primary characteristic of the survival triplet used to differentiate products is functionality. Firms compete by continuously increasing the functionality of their products while keeping the price and quality essentially unchanged. Customers therefore, have come to expect a steady increase in product functionality and have quite clear expectations for their future purchases. For example, to ensure that their products are successful, Toyota and Nissan both expend considerable energy on consumer analysis to help them identify the future automobiles that will both satisfy their customers and sell sufficient volumes to be profitable.

The same holds true in the camera industry where most consumers are highly sophisticated and capable of identifying the exact features they expect in a new camera. Survival zones are narrow in that industry and there is no price freedom. For example, Olympus expends considerable energy on collecting qualitative information about consumer preferences. The firm collects information about consumer trends from seven sources including recent purchases, professional photographers, and focus groups. In addition, the firm monitors its competitors' actions closely.

The evidence suggests that target costing becomes especially valuable in environments with highly sophisticated customers because survival zones are narrow and therefore, products must be designed that satisfy customer requirements as closely as possible. For example, without the discipline of target costing engineers sometimes add extra functionality to the products in the belief that they are attractive to customers. Unfortunately, these extra features often cost more than the value that the customer places on them. The outcome of such design "improvements" is products that cost too much and therefore have

profits that are below expectations. However, in confrontational environments profits are already low and there is little room for error, rendering the discipline on the product designers imposed by target costing critical to firm survival. Therefore, it is postulated that target costing systems will be especially valuable in environments with sophisticated customers. In addition, the target costing process will have a strong external orientation in such environments because understanding the customer's requirements is critical. In contrast, it is postulated that in environments where consumers are less sophisticated, target costing will not be as beneficial and will be more internally focused.

The Rate at which Customer Requirements Change

The rate at which customer requirements change defines how rapidly the location of survival zones moves over time. When survival zones are moving rapidly, it becomes more difficult for the firm to predict where a product's survival zone will be when it is launched. This inability makes it more difficult to ensure that new products are inside their zones when launched than when zones move more slowly.

In the automobile industry, the rate of change of customer expectations is relatively high and therefore, Nissan samples consumer preferences on a regular basis during the product design process. For example, the market is sampled when the product is first conceptualized, just before it enters the product design stage, and just before it enters the production stage. The primary purpose of these market revisits is to capture how the position of survival zones has changed since the last survey. The product's design is then modified where possible to increase its probability of success. In contrast, Komatsu's customers are commercial buyers not consumers. They are highly sophisticated and well aware of their preferences which given the nature of the firm's products (bulldozers and excavators), do not change rapidly. Therefore, it is easier for Komatsu to keep track of changing customer expectations than it is for an automotive company. Consequently, Komatsu expends considerably less energy than Nissan's or Toyota's on customer analysis.

Consequently, it is postulated that target costing is more beneficial in environments where consumer preferences are changing rapidly. Under such conditions it is easier to launch products that are outside their survival zones. Firms with such customers are forced to expend considerable effort on predicting future customer requirements. In contrast, it is postulated that when customer requirements are stable, less effort is required to locate the position of a product's survival mode and target costing provides smaller benefits. Reflecting the diminished benefits, the target costing systems at these firms are more internally focused.

The Degree to which Customers Understand their Future Product Requirements

The degree to which customers understand their future requirements, in part, determines the amount of energy expended on customer analysis in the target costing process. As the degree of understanding increases, it becomes more beneficial to rely upon espoused customer preferences to determine the future location of survival zones. In contrast, when

customers have little understanding of their future requirements, firms that pay too much attention to customers risk launching products that fail because they are outside their survival zones.

In the earth moving business, customers have a high degree of awareness of their future requirements. For example, Komatsu's customers can be relied upon to tell the firm what needs to be improved in their designs and to a certain extent by how much. In such an environment, target costing will offer considerable benefits because the customer is able to specify quite accurately the location of future survival zones. In contrast, in the consumer electronics industry consumers have a lower degree of understanding of their future requirements. Consequently, product failures are more common because the critical attribute often only becomes apparent after the firm has launched a new product. Consequently, it is postulated that target costing is less beneficial in environments where the future locations of survival zones are hard to predict. In contrast, it is postulated that target costing will be more beneficial when the future locations are predictable.

Factors Influencing Product-Level Target Costing

Based upon the analysis of the target costing practices at the sample firms, it is conjectured that the factors that help shape the product-level target costing portion of the target costing process are the firm's **product strategy** and the **characteristics of the product** (Figure 5). These two factors help determine the nature and extent of the information collected about historical cost trends and customer requirements. The product strategy establishes the number of products in the line, the frequency of redesign, and the degree of innovation in each generation of products. The characteristics of the product include the complexity of the product, the magnitude of the up-front investments, and the duration of the product design process.

Product Strategy

The evidence suggests that the firm's product strategy is a primary determinant of the degree of effort expended on target costing and where and how that effort is expended. Therefore, it is postulated that firms with product strategies that create a lot of uncertainty about how the customer will react to new products will typically spend considerable efforts on target costing, while those whose product strategy creates only a small amount of uncertainty will typically expend less energy. There are three characteristics of a firm's product strategy that analysis indicates help determine the benefits to be derived from target costing, these are the **number of products in the line**, the **frequency of redesign**, and the **degree of innovation.**

Number of Products in the Line

Customers have different requirements and these can be satisfied by developing products that are either vertically or horizontally differentiated. Vertically differentiated products differ by the degree of functionality they provide and their selling price. The higher

the price, the higher the functionality (and perhaps quality) of the product. Horizontally differentiated products sell at the same price, but deliver a different bundle of quality and functionality. Relatively small variations in functionality and price are often achieved by developing optional features; for example, a Corolla with or without a passenger airbag. In contrast, major variations in functionality are achieved via the introduction of different product models; for example, a Corolla versus a Camry.

The greater the number of different products[1] that the firm supports, the higher the overall level of customer satisfaction. The evidence suggest that as the number of products in the line increases, so does the effort expended on target costing because new product launches occur more frequently. This observation is intuitively reasonable because target costing operates predominantly at the individual product level, hence the benefits must derive at that level. For example, Olympus had a relatively ineffective target costing system prior to the reconstruction of its camera business. As part of their strategy to reconstruct their camera business they significantly increased the number of horizontally differentiated products in its line. The enhanced benefits from target costing that was the outcome of the increased number of products might have helped motivate the decision to upgrade the firm's target costing system.

An exception to the above observation occurs when customers demand a greater variety of products than the firm can afford to support. When this condition exists, the market analysis the firm undertakes must include procedures to identify the products that are going to be launched. Such procedures are necessary if the firm's overall profit objective is to be met. As the number of products has to be rationed, the role of the target costing system shifts away from helping ensure individual product profitability towards helping identify the most profitable mix of products. For example, at Nissan, computer simulations are used to ensure that the right mix of products is developed. Thus, it is postulated that target costing is especially beneficial for firms that have to ration the number of products they produce. In contrast, it is postulated that firms that can launch as many new products as they choose will derive lower benefits from target costing.

Frequency of Redesign

At the heart of the product strategies of the sample firms is the objective to increase product functionality as rapidly as possible. This objective is achieved via the rapid introduction of new products with each new generation incorporating the latest technology and hence providing increased functionality. In all of the firms, product development times have been reduced to enable more frequent product introduction to occur. Thus, intense competition has forced the firm to become expert at developing and launching products at a rapid rate.

However, this ability has a downside. First, the duration of the manufacturing phase is short, therefore the time available to generate an adequate return on the up-front investment is limited and it leads to lower sales volumes of each product. To remain profitable, the firm

[1] Number of products excludes minor variations such as color.

must launch a high percentage of profitable as opposed to unprofitable products. Second, due to the short product life cycles, there is inadequate time to correct any errors. If an unprofitable product is launched, it will often remain unprofitable until it is withdrawn. Therefore, it becomes critical to design new products so that they are profitable.

Consequently, it is postulated that the higher the rate of new product introduction, the greater the benefits derived from target costing. Therefore, such firms are expected to have well developed target costing systems that subject the product design process of all new products to systematic cost reduction pressures. In contrast, it is hypothesized that firms that rarely introduce new products will not require formal target costing systems, but will probably apply target costing principles on an ad hoc basis as required.

Degree of Innovation

The degree of innovation in each new product generation helps determine how much historical cost information can be used to estimate future costs. As the degree of innovation increases, information about past products becomes less valuable. Especially, for revolutionary products that rely upon completely new technologies, historical cost information about earlier products will have little value. Similarly, customer, competition, and supplier information can be invalidated by significant innovations in product design. In contrast, for products that are similar to the ones that they are replacing, the past is often highly predictive of the future and value engineering techniques such as functional analysis, which depend upon the use of the same technology, can be applied.

Target costing is most difficult to apply to revolutionary products. First, target selling prices are often difficult to establish because the value to the customer of the new product is difficult to estimate. Second, because the firm has never applied the technology in its products, historical cost information is not available and third, a higher percentage of new suppliers are typically involved. When the new model does not rely upon existing designs, the target costing system is of less value as more intuition as opposed to hard facts is required. For example, when Toyota introduced the Lexus, they were able to derive less benefits from target costing because of the high degree of innovation in the new vehicle.

When the degree of innovation is low, then the target costing process becomes relatively straightforward. First, the selling price of the new product is primarily determined by the selling price of the product it replaces and second, historical cost information is highly predictive of the costs of the new products. Third, the suppliers are typically unchanged. For example, most new Walkmans are essentially technologically equivalent to the ones they replace. Therefore, Sony derives less advantage from target costing than Nissan or Toyota where the level of innovation in each new product generation is higher.

It is postulated that target costing has increased benefits in environments where the degree of innovation is relatively low and decreased benefits when high. Furthermore, in environments where the degree of innovation is low, the target costing system will rely more heavily upon historical information than in environments were the rate of innovation is higher.

Characteristics of the Product

There are three characteristics of the product that apparently have a particularly strong influence on the benefits derived from target costing and the way it is practiced. These characteristics are the **product complexity**, the **magnitude of up-front investments,** and the **duration of the product development** process. The complexity of the product captures how difficult it is to manage the product design process. The magnitude of up-front investments captures the amount of capital consumed in the research and development process, getting ready for production, and actually launching the product. The duration of the product development process captures the time it takes to go from product conception to release to production.

Product Complexity

Product complexity captures the number of components in the product, the number of distinct production steps required to manufacture it, the difficulty of manufacturing the components it contains, and the range of technologies required to produce them. As the complexity of the product grows, there are two major reasons that the benefits of target costing increase. First, the degree to which costs can be influenced in the product design stage versus the manufacturing stage increases. Second, it becomes more difficult to manage the product design process and ensure that component-level target costs sum to the product-level target cost. Therefore, the benefits of target costing are expected to increase with the complexity of the product. However, as the complexity increases, so does the cost of applying target costing at the component level. Fortunately, there are ways to simplify the target costing process to reduce the effect of product complexity by only performing detailed target costing on two or three representative variations, as opposed to all of them.

Consequently, as product complexity increases, it is postulated that target costing becomes more beneficial and ways to reduce the costs of performing target costing emerge. Toyota, Nissan, and Komatsu manufacture products that are considerably more complex than the other firms. Their target costing processes reflect this increased complexity by being more formalized. This formalization helps the firms cope with the large number of components that have to be subjected to target costing.

Magnitude of Up-Front Investments

As the magnitude of the up-front investment increases, the number of products that a firm is willing to launch typically will decrease because the firm will be less willing to take risks. Consequently, firms that produce products that have high up-front investments typically develop a fairly small range of products, each carefully designed to satisfy a specific market segment.

For firms that have products with high up-front investments target costing will have increased benefits, because every product has to have the maximum probability of being successful. In contrast, when up-front investments are small, the benefits of target costing are lower. Furthermore, for firms with product with high up-front investments that have short

manufacturing lives, target costing is even more important because it is critical that the products launched have both adequate profit levels and sales volumes. Under such conditions, careful product selection is critical and target costing can play an important role in helping ensure that product profitability is adequate.

Finally, for high up-front investment products, life cycle analyses are especially important. Therefore, it is postulated that life cycle target costing is more commonly practiced in such firms than those producing products with low up-front costs. For example, Nissan uses life-cycle analysis to justify the launching of new automobiles, whereas Sony does not.

Duration of Product Development

The length of time it takes to develop a new product also helps determine the benefits derived from a target costing system. As the duration of design gets longer, the probability that the market conditions that were used to validate the design of the new product might change increases. Therefore, for products with long development cycles, such as automobiles and bulldozers, the target costing system needs to contain several stages at which market conditions are reviewed. In contrast, for products with short development cycles, such as cameras and consumer electronics, fewer reviews are required. Thus, as the product design cycle increases in length, the target costing system typically becomes more complex with greater interaction with the marketing function.

The product development cycle for automobiles is relatively long at six years. This extensive period required multiple reviews of market conditions and decision points about continuing the project. For example, at Nissan and Toyota reviews occur at the beginning and end of the conceptual design stage and during the product design stage. In addition, just prior to entering production, a final adjustment to the new model specifications is undertaken to make sure that it achieves its target cost. Consequently, just prior to product launch, the firm decides exactly which features will be treated as optional versus standard. This fine tuning ensures that, where possible, the target cost will be achieved and that the new model satisfies the customer.

It is postulated that longer product development cycles make target costing more beneficial because the long time between design and launch increases the risk that unsuccessful products will be launched. In addition, it is postulated that longer product development cycles typically lead to more formal target costing systems with multiple decision points reflecting a disciplined product development process. Even when the duration of product development is short, as is the case with Olympus cameras, there does not appear to be any significant delays introduced into the process by target costing. The target costing process is so integrated into the market analysis and product development processes that most if not all of the extra time required by the target costing process can be undertaken in parallel.

Factors Influencing Component-Level Target Costing

The analysis indicates that the component-level target costing portion of the process is most influenced by the **supplier-base strategy** of the firm. This strategy helps determine the benefits that can be derived from component-level target costing because it shapes the amount of information that the firm has about the costs and design capabilities of its suppliers.

Supplier-Base Strategy

There are three aspects of the supplier-base strategy that have a particularly strong influence on the benefits derived from component-level target costing (Figure 6). These characteristics are the **degree of horizontal integration**, the **power over suppliers**, and the **nature of supplier relations**. The degree of horizontal integration captures the percentage of the total cost of the firm's products that are sourced externally. The power over suppliers helps establish the ability of the firm to legislate selling prices to its suppliers. Finally, the nature of supplier relations deals with the degree of cooperation that the firm can expect from its suppliers and in particular the amount of design and cost information sharing.

Degree of Horizontal Integration

Lean enterprises are typically horizontally not vertically integrated. Therefore, they buy a large percentage of the inputs required to produce their products from external sources. The higher reliance that lean enterprises place upon external suppliers increases the importance of supplier management and hence, component-level target costing. Evidence suggests that the potential benefits that can be derived from component-level target costing are increased for two primary reasons. First, since a greater percentage of the product is externally sourced, there are greater potential savings because target costs can be developed for each of the externally acquired components and used to help create pressure on suppliers to reduce their prices. In contrast, in vertically integrated firms, it is often difficult to put effective pressure on the other divisions to reduce their costs. Second, the returns from focusing supplier creativity are greater. Suppliers not only provide a higher percentage of the firm's products, they are also responsible for a greater portion of the design. For example, Komatsu's suppliers are now asked to design and produce complete engine cooling systems instead of producing individual components such as radiators, electric motors, and fans.

Power over Major Suppliers

The relative power of buyer-supplier relations determines how much energy is expended on determining purchase prices for components. When buyer power is high, it is hypothesized that buyers will expend considerable energy developing component-level target costs (i.e., purchase prices) for purchased components. In contrast, in industries where production volumes are low and buyer power is low, the firms will expend less energy on developing target costs for purchased components because suppliers will not accept them as the selling prices for their products (unless they provide adequate returns). Therefore, it is

postulated that the more power the firm has over its suppliers, the more benefits it can derive from target costing by using it to create cost pressures on its suppliers. In contrast, it is postulated that when a firm has little power over its suppliers, the benefits of target costing will be reduced. For example, Topcon due to the low volume of specialty ophthalmic equipment it sells has little power over its suppliers and therefore expends little energy on developing component-level target costs. In contrast, the other firms have considerable power over their suppliers and have sophisticated component-level target costing systems.

Nature of Supplier Relations

The evidence suggests that as supplier relations become more cooperative, the target costing process in general and, in particular, the component-level step become richer and more beneficial. At the heart of the increased benefits lies the ability of the two firms to combine their design creativity to find superior ways to reduce costs. For example, Komatsu's design engineers frequently visit their suppliers and help them with design problems. In addition, in cooperative relations it can be supplemented by a number of inter-organizational cost management techniques. These other mechanisms primarily enable product designers and suppliers to pool their expertise to find creative solutions to increase functionality and quality or reduce costs through joint meetings and frequent interactions. When used in this cooperative setting, component-level target costing still places suppliers under considerable cost pressure. However, this pressure is offset, to some extent, by the product designers helping suppliers to find ways to achieve their cost reduction objectives. In contrast, in adversarial supplier relations, while component-level target costing can be used to force selling prices on the firm's suppliers, there is no mechanism to take advantage of any synergy between the designers.

How the Factors Influence the Target Costing Process

The factors identified influence the target costing process in four ways (Figure 7). Some of them, such as the intensity of competition and the sophistication of customers, alter the width of survival zones. As survival zones narrow, it becomes more difficult for the firm to launch successful products. Other factors, such as the rate of change of customer requirements and customers' understanding of their future requirements, alter the rate of change and ease of prediction of the location of survival zones. As survival zones move more quickly and their future location becomes more difficult to predict, the greater the difficulty that the firm will have in launching successful products. The evidence suggest that the benefits of target costing increase in such environments because the greater coordination between marketing and product design increases the likelihood that the product will satisfy the customers.

Other factors, such as the number of products, the rate of redesign, and the magnitude of up-front investments, help determine the product development budget. The budget can be increased by adding additional products to the line, accelerating the frequency of redesign, and developing products with a greater up-front investment. As this budget increases, so, evidence suggests, does the value of target costing, because more capital is at risk.

Finally, some of the factors influence the ease of predicting future costs. As the degree of innovation increases, the firm's level of experience with the technologies, components, and suppliers associated with new products falls and so does its ability to use past experience to predict the future. Second, as the complexity of the product increases, predicting future costs becomes more difficult because a higher number of components are involved that are more difficult to manufacture and rely upon multiple technologies. Third, as the degree of horizontal integration increases, the importance of component-level target costing increases because a higher percentage of the product is externally sourced. Next, the power over suppliers is important because it controls the degree to which the firm can legislate purchase prices to its suppliers. The higher the power, the greater the firm's ability to dictate purchase prices using the target costing system. Finally, the more cooperative the supplier relations, the greater the opportunity to take advantage of any synergy between the firm's design engineers and those of the suppliers.

Comparing The Target Costing Processes

As the processes at the six companies demonstrate, target costing is not a monolithic technique but an adaptive one. In addition to creating pressures to reduce costs, the target costing process creates a vital communications link between the marketing, engineering, purchasing, and manufacturing functions. Thus, target costing is more than simply a profit or cost management technique. It is a highly sophisticated way to both increase intra-organizational integration across a number of functions and transmit the competitive pressure faced by the firm to its product designers and suppliers.

While all of the target costing systems studied contained the three major steps of market-driven costing, product-level target costing, and component-level target costing, the process of target costing at the six firms is quite different. In particular, different levels of energy are expended on the three major steps. To compare the target costing processes at the six firms, each influencing factor was assigned to an ordinal scale of plus or minus. If the relative effect of a factor was perceived as being favorable to target costing, the factor was assigned a plus value. If it was considered unfavorable, it was assigned a minus value. The results of this analysis was a plus and minus profile for each firm. These profiles are shown in Table 1.

Each profile provides a way to observe the cumulative effect of the factors on each of the three major steps in the target costing process. If all of the factors relating to a given step are favorable, then the firm is expected to have a well developed process for that portion of the target costing process. For Toyota and Nissan, all of the factors favor target costing. The firms are in a confrontational industry with sophisticated consumers whose requirements are changing rapidly and who know what they want. In addition, the firm's product strategy and the characteristics of the product all suggest that the benefits of target costing will be high. Nissan and Toyota source a considerable portion of their products from outside suppliers and subcontractors. Both firms clearly dominate their suppliers. Suppliers are much smaller firms and typically rely heavily upon Nissan and Toyota for their survival.

Both firms therefore expend considerable energy on all three steps of the target costing process. They both have highly sophisticated procedures for monitoring the changing requirements of their customers throughout the product development process. These procedures are integrated into the market-driven costing process. In addition, the product-level target costing process is quite elaborate with the product design being continuously modified to ensure that the target cost is achieved. This modification is continued up until one month before launch when the final specifications of the standard version are established. Finally, the component-level target costing process is highly sophisticated. The decomposition of the product into its major functions and the major functions into components reflects the ability of Nissan and Toyota to legislate purchase prices to their suppliers. In most cases, the target costs set for purchased parts becomes the suppliers' selling prices. Only under very specific circumstances is the target cost for a purchased part violated. However, both firms maintain highly cooperative relations with their suppliers and share considerable design expertise with them. While their component-level target costing systems apply intense cost pressure upon their suppliers, the firms dedicate considerable resources to help their suppliers find ways to achieve their targets.

Therefore, it is not surprising that these two firms have mature well developed target costing procedures that are highly formal and extensive. The identified factors, however, do not capture all of the forces that influence the process of target costing at the firms. Despite the fact that Toyota and Nissan are in the same industry and are direct competitors, their target costing processes are not identical. Therefore, other factors, at the firm level, must also play a role in determining the exact nature of the target costing process.

For Komatsu, all but two of the factors favor target costing. The commercial nature of the product and the relatively slow changes in the requirements of customers means that the degree of innovation in products is typically low. Komatsu often undertakes minor modifications to its products to keep them up to date as opposed to major redesigns. The low rate of change of customer requirements coupled to the extent to which customers understand their requirements means that sophisticated customer analysis is not required. The firm does not have to continuously monitor customer requirements or keep fine-tuning the design of their products. Consequently, Komatsu spends considerably less energy on the market-driven costing process than Toyota or Nissan. Thus, the effect of this single factor on the market-driven costing process is significant.

The lower degree of innovation allows the firm to more heavily rely upon the past than Nissan or Toyota. For example, the functional and productivity analyses that lie at the heart of the firm's target costing processes assume that history is predictive. Functional analysis assumes that the new model will be utilizing the same technology as the old model and productivity analysis assumes the same general production process will be used. Despite the low degree of innovation, the frequency of redesign is high requiring a formal system that is well documented and communicated to the users. In addition, the high up-front investments and the complexity of the products cause target costing to have high benefits to Komatsu. Consequently, the product-level target costing process at Komatsu is as sophisticated as that at Toyota and Nissan but more internally focused.

The firm relies heavily upon historical cost information to set the purchase prices of externally acquired components. Its relations with its suppliers are not as cooperative as those of Nissan and Toyota, therefore it relies more heavily upon component-level target costing and less upon other inter-organizational cost management techniques.

Olympus faces a confrontational environment with highly sophisticated customers whose requirements are changing rapidly. Reflecting the values of the factors that influence the market-driven costing process, that process is well developed and monitors customer preferences throughout the product development process. For Olympus, the nature of the product reduced the benefits of target costing: cameras are much simpler than automobiles. In addition, they require lower up-front investments and have a shorter product development cycle. These differences cause the Olympus product-level target costing process to be simpler and less formal than those at either Toyota or Nissan. Instead of multiple decision points, the decision process at Olympus is predominantly centered around the launch decision. The high degree of horizontal integration means that Olympus relies heavily upon its suppliers over which it exerts considerable power. Consequently, the component-level target costing process is well developed and as sophisticated as Toyota's or Nissan's.

For Sony most of the factors are non-favorable. The firm has developed a competitive advantage in the technology required to create ever smaller and long-playing Walkmans. This advantage has been sustained ever since the Walkman had been introduced. The firm is thus not fully in confrontation. In addition, the rate of change of customer expectations is low, the degree of innovation between each generation is typically small. Thus, only one of the factors that influences the market-driven target costing process is favorable. Therefore, the firm expends little effort on market-driven costing. Typically, the selling price of the Walkman that is being replaced is used as the starting point for estimating the target selling price and the target profit margin is assumed to be the same for both the old and new models.

The firm's product strategy results in relatively few models in the line, frequent redesigns, but with low innovation. Thus, only one of the product strategy related factors favors product-level target costing. In addition, Walkmans are not particularly complex products, require low up-front investments, and have product development cycles that are measured in months not years. Consequently, the product-level target costing process is simple and unsophisticated compared to the other firms in the sample.

Little information about the firm's supplier-base strategy was provided by the firm. However, it appears that the strategy is not particularly favorable towards component-level target costing. With all of these factors not favoring target costing, it is not surprising that Sony has the least well developed target costing process of all of the firms. It is important to realize that it is not the relative value of a single factor that leads Sony to adopt a simple approach to target costing, rather it is the cumulative effect of many of them being relatively unfavorable.

For Topcon, several factors are considered relatively unfavorable to target costing. The factors that influence the market-driven costing process are all favorable and the firm does expend considerable energy on developing allowable costs. Of the six factors that

influence the product-level target costing process, four are relatively unfavorable. Consequently, the product-level target costing process is relatively unsophisticated.

Topcon produces only a small number of ophthalmic instruments a year compared to the number of units that the other firms sell. This small volume is insufficient for Topcon to wield any significant power over its suppliers. Therefore, developing target costs for components is not particularly valuable for Topcon. Since it cannot control supplier costs via setting target costs for purchased parts, it has to live with the prices set by its suppliers. The focus of the value analysis (VA) program is to find ways to reduce costs via changing the design of the products and, where possible, through supplier negotiations not through legislating their prices.

The remaining aspects of the target costing process at Topcon are less well developed reflecting the lower value that target costing has for that firm. For example, the discipline of target costing is not as intensely applied at Topcon as it is at the firms already discussed. In addition, the target costing process is part of the firm's turn-out-value (TOV) system and not a stand-alone system like at the other firms. The TOV is also responsible for product costing and other cost management techniques.

The plus/minus profiles help explain why the target costing processes at the six firms vary. Whenever one or more of the factors are considered relatively unfavorable, the amount of energy expended and the sophistication of the process decreases. It is the cumulative effect of all of the factors that shapes the target costing process at the firms not just a single factor. Each of the factors identified influence one of the three major steps in the target costing process. These three processes can be influenced independently of each other. Therefore, it is possible for some of the steps to be sophisticated while others are relatively simple.

Summary

In this paper, an exploratory comparative analysis of the target costing processes at six Japanese manufacturing firms was described. The objective in undertaking this analysis was to identify factors that influenced the target costing process. While the outputs of target costing are virtually identical for all firms: the cost at which a new product must be manufactured in order to make an adequate return and the purchase price of externally acquired components, the process of target costing is a rich and complex undertaking that varies by firm.

By comparing the intensity of competition, the nature of the customer, the firm's product strategy, the characteristics of the product, and finally, the supplier-base strategy it is possible to explain the nature of the target costing process. The target costing process is influenced by these factors because they help determine the benefits that the firm will derive from the application of target costing and hence, the energy the firm is willing to expend on each of the three major parts of the process. Presumably, if the benefits fall below a certain level, then the firm will either not implement a target costing system or discontinue its use.

The target costing process is influenced by the intensity of competition, especially when the basis of competition is enhanced product functionality. All of the firms studied are in intensely competitive industries and most have adopted confrontational strategies. The only possible exception is Sony which is on the edge of being a differentiator due to its sustainable technological lead over its competitors.

The nature of the customer was identified as an influencing factor because it determines the degree of sophistication of the customer, the rate at which customer requirements change and the degree to which customers understand their future requirements. Customer sophistication plays a role because it determines the width of the survival zones of new products. The narrower the zones, the more beneficial target costing. The rate of change of customer requirements captures how fast survival zones are moving over time. The faster the zones are moving, the more beneficial target costing becomes as it increases the probability that new product designs will reflect customer preferences when launched. The customers' degree of understanding of their future requirements also influences the benefits derived from target costing. As the customer's ability to estimate their future requirements drops, it becomes more difficult to provide the product designers with adequate information on the type of products they should be designing.

The firm's product strategy was identified as an influencing factor because it determines among other things the number of products in the line, the frequency of redesign, the degree of innovation. Again, these factors are important because they help determine the benefits of target costing. The number of products affects the benefits because target costing operates at the product level. Therefore, the more numerous the products, the greater the benefits are likely to be. In addition, target costing is especially beneficial for firms that have to ration the number of products they produce. Similarly, the frequency of redesign is important because it determines how often new products are introduced. The more frequently products are introduced, the greater the benefits from target costing. The degree of innovation has to be considered because, to a certain extent, target costing relies upon historical cost information. As the degree of innovation increases, the value of historical information drops. Therefore, there is evidence to suggest that the benefits of target costing fall with increases in the degree of innovation.

The characteristics of the product relate to the complexity of the product, the magnitude of up-front investments, and the duration of the product development process. These factors play an important role in determining the benefits of target costing because they shape the product design process. The complexity of products helps determine how formal the target costing process should be. With simple products an informal process is probably adequate. However, with products such as automobiles and bulldozers, their complexity requires more formal target costing processes. The magnitude of the up-front investments is critical because it determines whether the firm can afford to launch numerous products with a high probability of failure or a limited number of products that must have as high a probability of success as possible. Therefore, the higher the up-front investment, the greater

the benefits of target costing. Finally, the duration of the product development process plays a role because it helps determine the risk that the product will be outside its survival zones when launched. The longer the product development process, the greater the risk, and therefore, the greater the benefits of a more formal the target costing process.

One of the major outputs of target costing is component level target costs. These are the prices that the firm is willing to pay for externally acquired components. Such target costs appear to have maximum value when the firm sources a high proportion of the total cost of its products externally, when it has sufficient power over its major suppliers to dictate selling prices, and finally, when supplier relations are cooperative as opposed to adversarial.

The factors identified apparently help determine the magnitude of the benefits that the firm can derive from target costing. When the benefits are low, the target costing process is usually less sophisticated and less energy is expended on the process. At Toyota and Nissan the target costing systems are formal and complete because virtually every factor supports target costing. In the other firms at least some of the factors do not favor target costing. The existence of factors that do not favor target costing helps explain the concentrated decision process at Olympus, the internal focus of the target costing system at Komatsu, and the limited systems at Topcon and Sony.

Table 1
The Relative Values of the Influencing Factors

Factors	Nissan	Toyota	Komatsu	Olympus	Sony	Topcon
Intensity of Competition	+	+	+	+	-	+
Nature of Customer						
Customer Sophistication	+	+	+	+	+	+
Rate of Change of Requirements	+	+	-	+	-	+
Understanding of Requirements	+	+	+	+	-	+
Product Strategy						
Number of Products	+	+	+	+	-	-
Frequency of Redesign	+	+	+	+	+	+
Degree of Innovation	+	+	-	+	-	+
Characteristics of the product						
Complexity	+	+	+	-	-	-
Up-front Investments	+	+	+	-	-	-
Duration of Product Development	+	+	+	-	-	-
Supplier-Base Strategy						
Degree of Horizontal Integration	+	+	+	+	+	+
Power Over Suppliers	+	+	+	+	-	-
Nature of Supplier Relations	+	+	+	+	-	+

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Figure 1
The Target Costing Process

Figure 2
Factors Influencing Market-Driven Costing

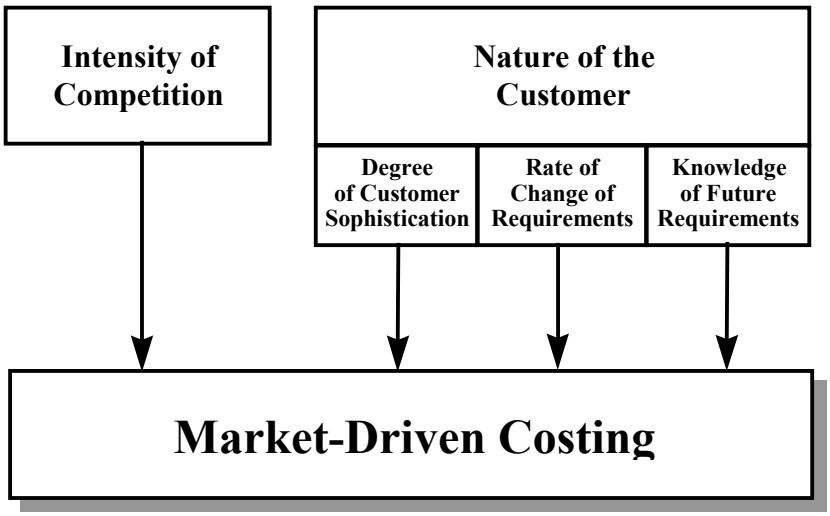

Figure 3
The Survival Zone for a Product

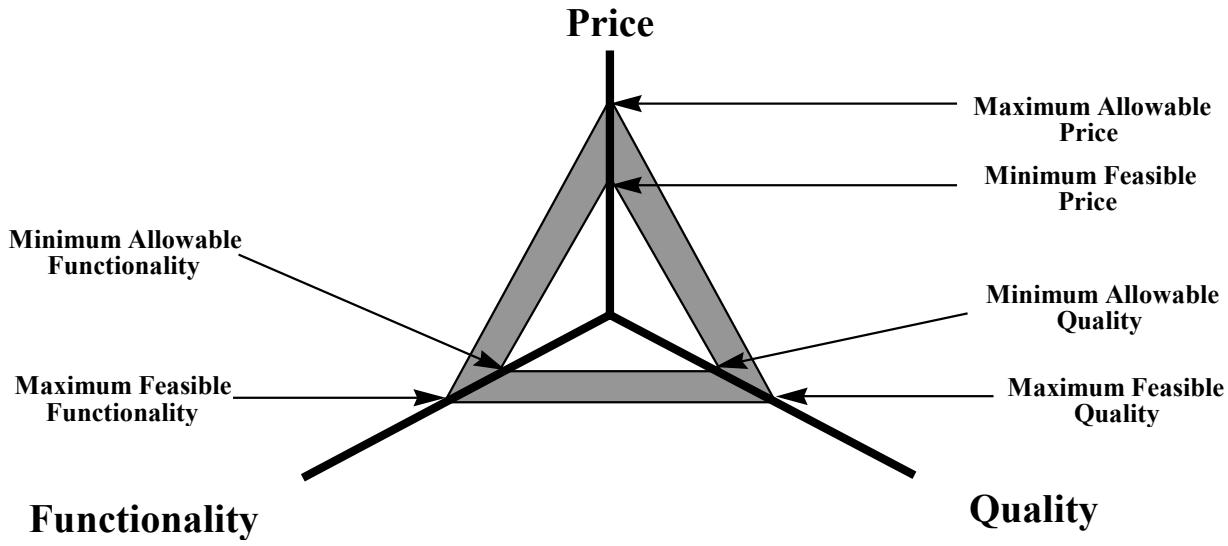

Figure 4
The Survival Zone of the Cost Leader and Differentiators

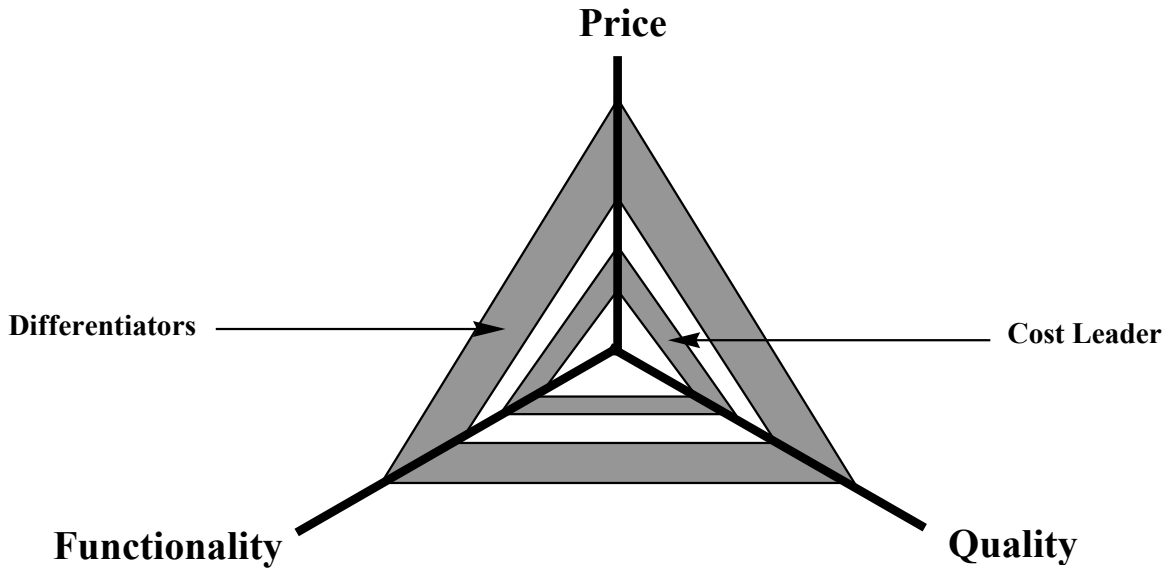

Figure 5
Factors Influencing Product-Level Target Costing

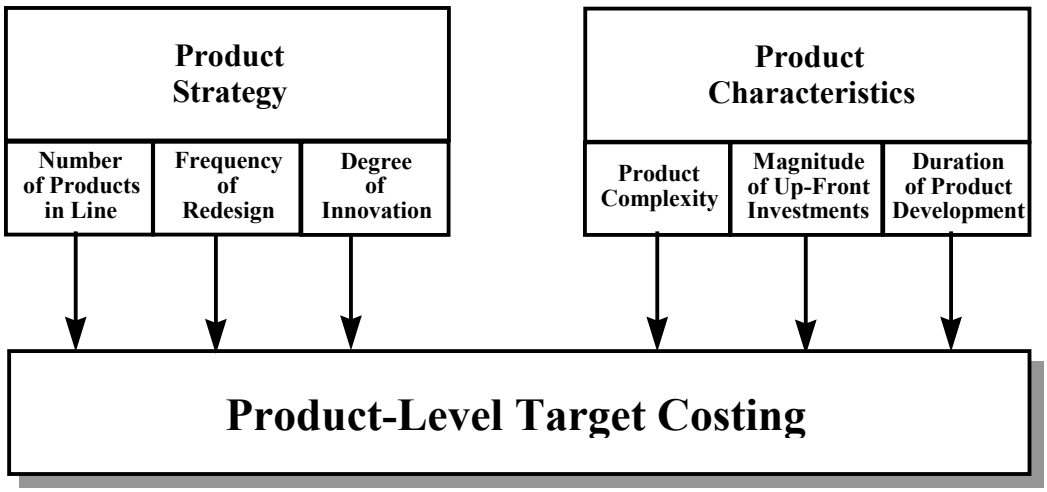

Figure 6
Factors Influencing Component-Level Target Costing