CHAPTER 4

EFFECTS OF THE TIGHTNESS OF TARGET PROFIT & COST ON TARGET COST ACHIEVEMENT: AN EMPIRICAL RESEARCH

Survival strategies in today's intensely competitive environments differ from those that were effective in the past. Japanese lean enterprises have learned that adopting the generic strategy of confrontation is often the only viable way to ensure corporate survival. The core of the confrontation strategy is an integrated approach toward managing the quality, functionality and cost/price of the product. Inherent to this approach is aggressive cost management that begins when the product is designed and that continues until it is discontinued (Cooper and Slagmulder, 1997). With the advent of lean manufacturing methods, target costing emerged as a system of not only profit planning but also cost management that is price led, customer focused, design centered, and cross functional (Ansari, Bell and CAM-I, 1997).

Since the late 1980s, target costing has become ever more closely connected with business strategy and considered as a strategic cost management tool for attaining target profit as well as for cost reduction (Sakurai and Scarbrough, 1997). To achieve this objective, it identifies the cost at which the product must be manufactured if it is to achieve its target profit margin when sold at its target-selling price. In the contemporary industrial environment that changes rapidly and plays by its own set of rules, prices are largely market driven and not controlled by management.[1] Target profit, on the other hand, is based on corporate profit expectations, historical results and competitive analysis, and therefore is a decision variable.

If the target profit margin is very demanding, the resulting target cost will be difficult to achieve. However, the difficulty of implementing target cost methods depend not only on the tightness exercised in setting target profit, but also on the degree of tightness inherent in the target cost methods.

Competitive environment, company's efficiency and development stage of management accounting system mainly persuade the selection of a particular method for determining target profit. The attainability of target profit influences the decision of using a target cost method. When a company decides to use a particular target profit method, it does not finalize the target profit figure immediately. Rather, a provisional target profit is determined first based on which allowable cost, the cost at which the product must be manufactured if it is to generate the desired profit margin, is determined. Subsequently, the attainability of allowable cost is checked. If this allowable cost is attainable, the management accepts provisional figure as the final profit and here target cost is determined by subtractive method. On the other hand, if management feels that the allowable cost objective is not possible to achieve, target cost is determined by adding-up or combination method. When either one of these two methods is used, the provisional target profit could not be attained because the target cost will be higher than the allowable cost. Thus, the target profit will be changed downward to derive the target costs. Therefore, the selection of a particular target cost method depends on the attainability of the allowable cost. Moreover, setting target profit margins in this manner makes the allowable cost reflect the relative competitive position of the firm. A highly efficient firm will set target profit margins higher and will have lower allowable cost (Cooper and Slagmulder, 1997, 102). Figures 4-1(a) and 4-1(b) depict this process.

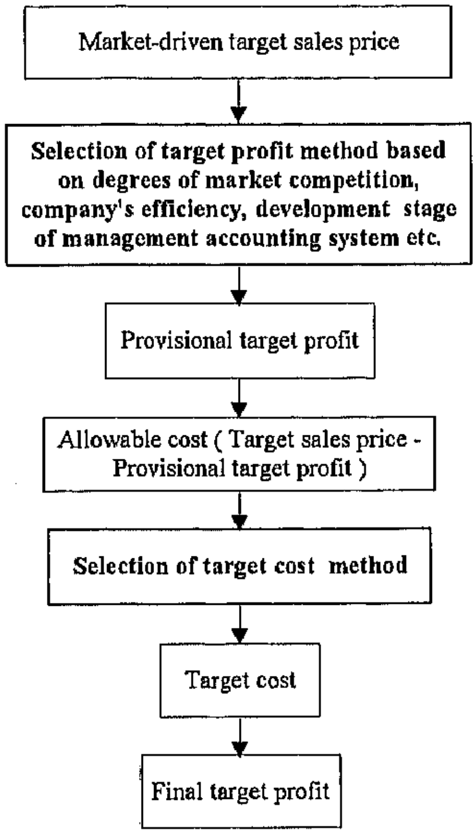


Figure 4-1(a). Relationship between target profit and target cost

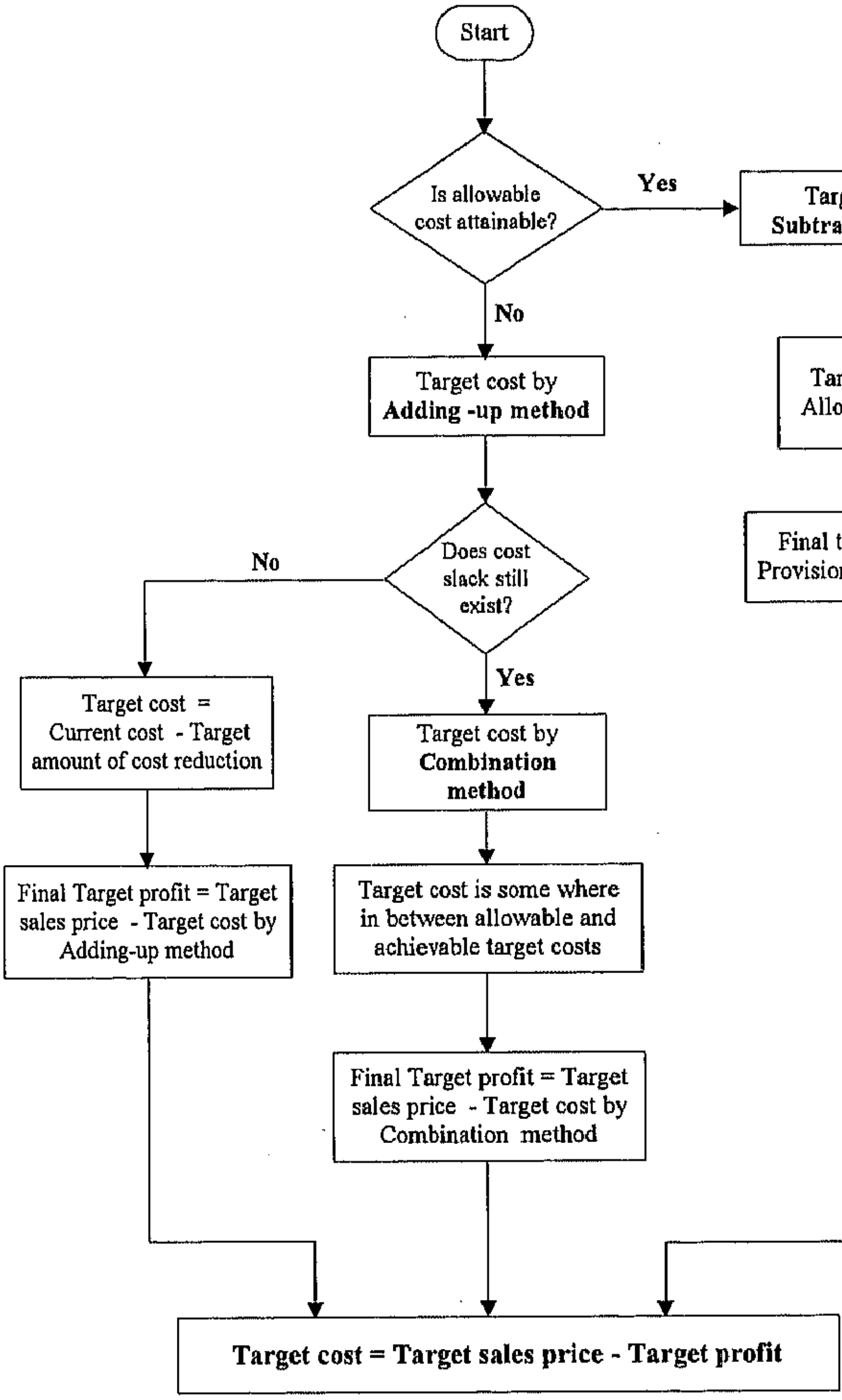


Figure 4-1(b). Selection process of target cost

The process of achieving the target profit and target cost often creates intense pressures on the product designers. The constant pressure to meet the target cost and target profit can cause management burnout and sometimes problems with the supplier, when the cost-reduction or profit-improvement demands are passed down to them (Kato, Boer and Chow, 1995). The decision to use different combinations of target profit and cost methods will create severity and/ or motivation of different magnitudes. The target cost achievement of the product designers may vary according to the levels of tightness of different target profit and target cost methods since they will motivate them in different ways. However, there are hardly any previous studies to this effect. Therefore, the main objective of this study is to examine how the differences in the methods of target profit and target cost determination will influence the target cost achievement. More precisely, the paper aims to study how the tightness inherent in the target cost and target profit methods influences the target cost achievement level.

This paper is organized into six sections. The first section describes the different methods of determining target profit and target cost. The second presents the sample and statistical framework. The third states the focus of this research. The forth formulates the hypotheses to be verified. The fifth presents the statistical analyses and the interpretations of the empirical evidence. Sixth section concludes the paper.

4.1. Different Methods of Target Profit and Target Cost

In developing technology Japanese-manufacturing companies has reached that level of sophistication where they are constantly innovating new production technologies that helps them to undertake cost improvement as a continuous effort. The levels of efficiency in the improvement activities leads the different companies to select different methods for calculating target profit and cost. A description of different methods of target profit and cost is included in the following two subsections.

4.1.1. Target Profit Methods

Target profit is the expected profit from total sales of the product over its life. It is determined by corporate profit expectations, historical results, competitive analysis, and sometimes, computer simulations (Cooper, 1995). The objective in setting target profit margins is to ensure the achievement of the firms long-term profit plan. Setting target profit is a function of bringing together business level plans with product level plans (Ansari, Bell and CAM-I, 1997). The two considerations in setting target profit margins are to ensure that they are realistic and that the margin is sufficient to offset the life-cycle cost of the product (Cooper and Slagmulder, 1997, 100).

Usually, there are three methods of calculating target profit by targeting: (i) *return on sales ratio determined in the middle-range profit plan (TP1)*, (ii) *reduction rate in the cost of the existing or similar product (TP2)*, and (iii) *return on sales ratio based on past actual performance of the related product (TP3)*. Among these, the first one is used for formulating macro plan and the would-be profit is termed as required profit, the third one is used at micro level and the profit to be materialized under the method is called planned profits, while the second one adjusts the gap between the first and third.

At the business level, target profit is determined by considering the profit requirements for the business as a whole. This is done by considering the firm's intended product portfolio and by establishing a required profit from this portfolio. The product portfolio comes from a firm's multiyear product plan and the profit comes from the middle-range profit plan applying a target return on sales (ROS) ratio to the sales revenue from the product portfolio. Product level plans, on the other hand, represent a product manager's expectations for his or her product. To develop a projected sales volume, the product manager considers the projected market size, targeted market share, and the competitive market price. Applying the ROS targets from the profit plans to this projected sales levels yield the planned profit at the product level. Here, the ROS ratio is determined based on the past actual performance of the related product. The two profits, required and planned, are compared to set a final target profit for the product.

Target profit, if it is to be determined in the middle-range profit plan, reflects management's expectations that allow them at best to run the company smoothly or at worst to survive. This is somewhat unrealistic in that its attainability is presumed to be assured. On the other hand, when target profit is based on the past actual performance of the related product, the actual return-on-sales ratio for the current product is more achievable since the company has experiences in attaining this profit (Monden, 1995). Usually, there is a gap between management's profit expectations and actual profit.

Target profit determined at middle-range planning often begins at executive levels and follows top-down approach. It reflects the strategic profit needs of the organization for ensuring the survival and growth of the firm and its affiliates. By contrast, target profit based on past actual performance of the related products is usually determined at the product department level using a bottom-up approach. If there is gap between the profit decided at executive and departmental levels, the reconciliation process continues until there is no gap or both sides agree that it is not possible to close the gap. A company's prosperity depends on playing this kind of "catch" between top management and managers at the operational level (Sakurai and Scarbrough, 1997).

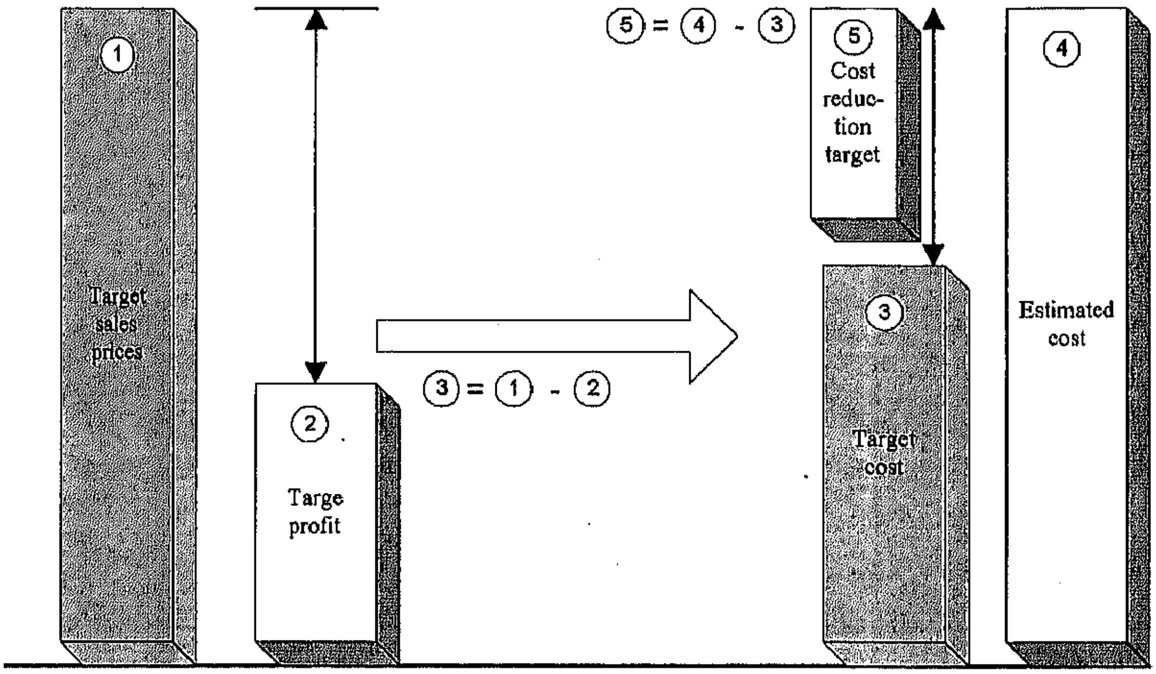
Simply by adhering to the target profit based on past actual performance of the related products the company is unlikely to reduce cost below the current level, which has already been achieved. When the profit expected in the middle-range profit plan exceed the actual one, the reconciliation process or "catch" can proceed by calculating the target profit based on targeting reduction rate of cost of the existing or similar product. This method helps to identify the unachievable or unrealistic portion of target profit determined in the middle-range profit plan. In terms of earnings, this method stands in the middle of the desired and achievable earnings level.

4.1.2. Target Cost Methods

Target costing occurs in two phases that corresponds, roughly, to the first and second halves of the product development cycle, that is, the establishment phase and the attainment phase (Ansari, Bell and CAM-I, 1997, 26). While establishment phase focuses on the allowable cost, the attainment phase focuses on how to make the allowable target cost achievable.

The allowable cost is calculated by subtracting the target profit from the target sales price. It is known as the 'maximum permissible cost' that can be committed to a product in the product planning stage. It is the desired cost based only on market conditions, and is called 'market-driven' cost. In competitive environment firms that are highly efficient will have higher target profit margins and hence lower allowable costs than their less efficient competitor. Since the allowable cost is determined by market forces and does not take into account the internal design and production capabilities of the firm, there is a possibility that the allowable cost will not be achieved. In practice, however, it is not always possible for the designers to find ways to achieve the allowable cost and still satisfy the customers. (Cooper and Slagmulder, 1997).

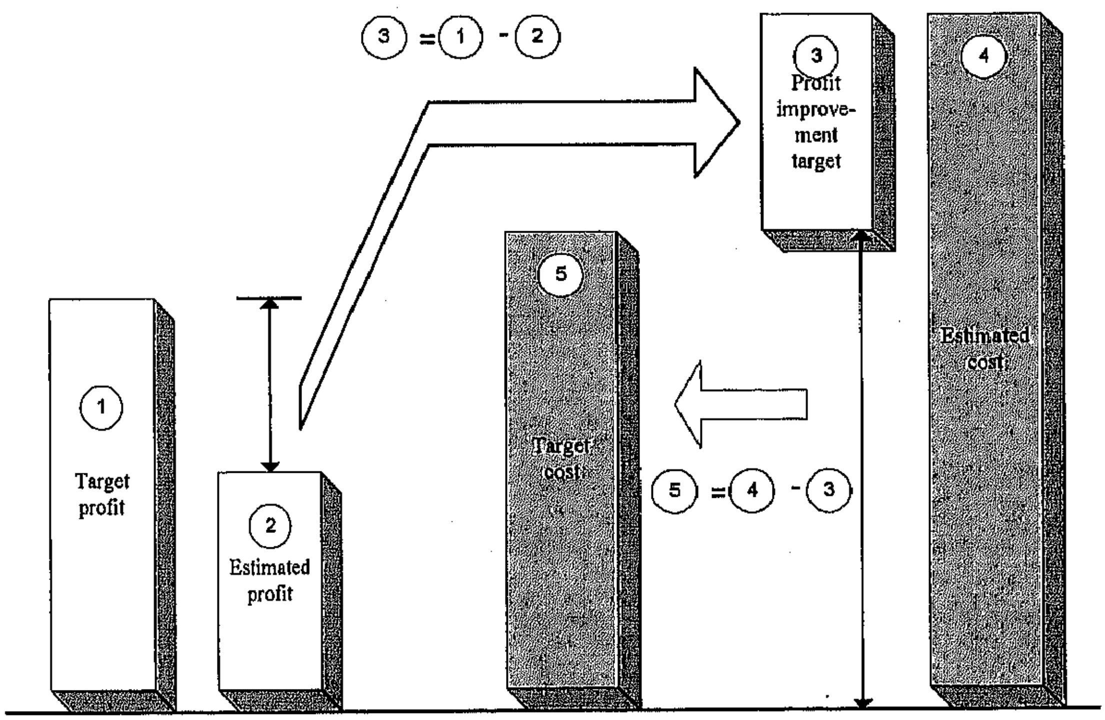
Usually, allowable cost is the early estimate of the target cost. It is considered as the final target cost only when the product can be made for this amount. If this cost is adopted as the target of efforts, the requirement is very severe and not immediately attainable (Monden and Hamada, 1991). Target cost determined in this way is called '*Subtractive method*' (*SUB*) or '*Sales price-based method*'.[2] Subtractive method acts as a signal to all involved in the target costing process as to the magnitude of the cost-reduction objective that inevitably must be achieved. From the management viewpoint, it is desirable to realize the largest possible profit and for this the target cost requirement by the subtractive method is likely to be demanding (Monden, 1986). The subtractive method will clearly have a strong linkage with firm's middle-range profit plan that incorporates projected profit figures to target costing. Graphically, we can present the process of target cost determination by subtractive method as in Figure 4-2.



Source: Monden, 1995, p. 103

Figure 4-2. Determination of target cost using sales price-based method

When allowable cost is not achievable, to check its attainability the 'drifting cost', which is the current estimated cost with no targets in mind, is calculated for each part. It is the preliminary estimate of a product, assuming the existing work structures, technology and processes. The primary task in target costing is to perform the VE and continuous improvement activities to reduce the gap between drifting and allowable costs. The cost reduction target is continually refined until the 'allowable' and 'achievable' cost merge. If the allowable cost cannot be achieved, the process of attaining the target cost increases the allowable cost of the product to a level that can reasonably be expected to be achievable, given the capabilities of the firms and its extended enterprises, i.e. suppliers. Target cost determined in this way is called '*Adding-up method*' (*ADD*) or '*Estimated cost-based method*'.[3] Graphically, we can present the process of target cost determination by adding-up method as in Figure 4-3.



Source: Monden, 1995, p. 106

Figure 4-3. Determination of target cost using estimated cost-based method

Under this method target cost is determined by examining every possible cost reduction opportunities, taking likely VE proposals, work structures, technology, and processes into considerations. In adding-up method, the target amount of cost reduction is deducted from the estimated or current cost of the product, where the target cost is set to an achievable level by considering the firm's and its suppliers' capabilities. This method is used when the designers are unable to achieve the allowable cost and signals that the firm is not as efficient as demanded by the competitive conditions. Usually, target cost requirement via the subtractive method is much harder to meet than that through the adding-up method because non-value-added cost slack still exist when adding-up method is applied (Tani and Kato, 1994).

When determining target cost by adding-up method, however, if there is any cost slack, the target cost figure is made lower and set somewhere in the middle of allowable and achievable costs. A hybrid of subtractive and adding-up methods, called the '*Combination method*'[4] (*COM*) is used when target cost cannot be finalized either by subtractive or by adding-up method (Kato, 1993; Tanaka, 1992). It consolidates the operating focus on profitability and the technological focus on feasibility (Sakurai and Scarbrough, 1997). From the viewpoint of the tightness of target cost methods, combination method stands in the middle of the two extremes of subtractive and adding-up methods.

An organization establishes the targets for production efforts only when it is convinced that these are attainable. Therefore, determining the appropriate difficulty in attaining the targets is of particular interest. The targets would most likely be attainable when these are set quite low relative to the possible levels of attainment. On the other hand, the targets would be regarded as 'impossible' if they were set quite high. Our definition of attainability excludes these two extremes. Moreover, irrespective of the methods of target cost and profit, the established targets get the product designers' acceptance in the process of checking their attainability by investigating alternative designs. Consequently, there would be no difference among these methods in terms of target acceptance.

4.2. Data and Statistical Framework

4.2.1. Survey Administration

We chose for the study the companies that listed their stocks at the Tokyo stock exchange, Part I from four major manufacturing industries whose products require regular model changes. Companies manufacturing machinery, electrical and electronics, transportation equipment and precision machinery were selected. The structured questions used for the purpose of this study are included as appendix 4-A. Industry-wise effective response rate is presented in Table 2-1 of chapter 2 (page 26).

4.2.2. Variable

The list of the variables and their categories used in this study is shown in Table 4-1.

Table 4-1. List of the variables and their categories

Name	Variable	Categories
Target profit determined in the middle-range profit plan	*TP1*	$TP1_L$ = Lower utilization of *TP1* $TP1_M$ = Medium utilization of *TP1* $TP1_H$ = Higher utilization of *TP1*
Target profit by target reduction rate of cost of the existing or similar products	*TP2*	$TP2_L$ = Lower utilization of *TP2* $TP2_M$ = Medium utilization of *TP2* $TP2_H$ = Higher utilization of *TP2*
Target profit based on past actual performance of the concerned product	*TP3*	$TP3_L$ = Lower utilization of *TP3* $TP3_M$ = Medium utilization of *TP3* $TP3_H$ = Higher utilization of *TP3*
Target cost methods	*TC*	*SUB* = Subtractive *COM* = Combination *ADD* = Adding-up
Target cost achievement level	*TCAL*	*TCAL-1* = *TCAL* 70% *TCAL-2* = *TCAL* 80% *TCAL-3* = *TCAL* 90% *TCAL-4* = *TCAL* 100%

Target cost achievement level, the *TCAL*, a surrogate variable for the cost- reduction performance, is the response variable of the model and we measure how the target cost and profit methods influence the *TCAL*. Target profit methods (*TP1*, *TP2*, and *TP3*), and target cost methods (*SUB*, *COM*, and *ADD*) will be used as explanatory variables. In this research we assigned three levels of difficulty for three methods of target costs and profits, that is, tight, medium-tight and loose. Among target cost methods, *SUB* provides tight target; *COM* provides the medium-tight target, while *ADD* provides loose target.[5] Among target profit methods, *TP1* provides tight target, *TP2* gives medium-tight target while *TP3* gives loose target.

Three kinds of target profit methods have been considered as three independent variables and each of them along with the target cost method variable form the sets of explanatory variables. The reason why we consider three profit methods independently is that we intend to verify the effects of using a target cost method in a particular profit situation on the company's target cost achievement. The level of utilization of each profit method is further categorized into three groups, higher utilization, medium utilization and lower utilization. Here, 'higher or wider utilization' means *the use of a particular profit method only for the company's entire product.* For example, the wider utilization of *TP1* means the use of only *TP1* for all the products of the company. 'Lower utilization' means *the use of any other profit method, but not that particular one.* For example, the lower utilization of *TP1* means instead of *TP1* using *TP2* and/ or *TP3* for entire products. 'Medium utilization' means *the use of a particular profit along with any other profit method.* For example, medium utilization of *TP1* means using *TP1* for some products along with using *TP2* and/ or *TP3* for other products.

Usually, the amount of profit by a tight or a medium-tight method (*TP1* or *TP2*) is bigger than that by loose method (*TP3*). The wider utilization of *TP1* and *TP2* ($TP1_H$ and $TP2_H$) results in earning bigger amount of profit at a greater extent (i.e. by using them for entire products) than their medium ($TP1_M$ and $TP2_M$) or lower utilization ($TP1_L$ and $TP2_L$). Therefore, for a tight or a medium-tight target profit, the higher utilization implies a more demanding environment than medium or lower utilization. Conversely, since the profit by a loose method (*TP3*) is smaller than that by a tight or medium-tight, its wider utilization ($TP3_H$) means earning that smaller amount at a greater extent than its medium ($TP3_M$) or lower utilization ($TP3_L$). Therefore, for a loose target profit, the higher utilization refers to a more lenient atmosphere than its medium or lower utilization level.

$TP1_L$ implies that instead of *TP1* using one or both *TP2* and *TP3* for entire products, and both render less profit than *TP1*. Therefore, $TP1_L$ represents a less demanding environment. On the other hand, the lower utilization of *TP3* means using one or both *TP1* and *TP2*, which provide more profit than *TP3*. Therefore, $TP3_L$ represents a more demanding environment. In profit situation 2, $TP2_L$ implies that instead of *TP2* using *TP1* and/ or *TP3*. However, between *TP1* and *TP3*, the former provides more profit and the later provides less profit than *TP2*. Therefore, $TP2_L$ may represent either a more or a less demanding environment depending on whether the company is using *TP1* or *TP3* instead of *TP2*.

Data used for statistical analyses are presented in appendix 3-B. We assign the degrees of tightness of different combinations of target profit and cost methods in the following way as shown in Table 4-2.

Table 4-2. Degrees of tightness of different combinations of target profit and cost methods

Profit situation-1

Target Profit / Target Cost	$TP1_L$	$TP1_M$	$TP1_H$
ADD	Very loose	Loose	In between Loose & Medium-tight
COM	Loose	Medium-tight	Tight
SUB	Somewhat loose	Fairly tight	Very tight

Profit situation-2

Target Profit / Target Cost	$TP2_L$	$TP2_M$	$TP2_H$
ADD	Very loose	Somewhat loose	In between Loose & Medium-tight
COM	Loose	Medium-tight	Tight
SUB	Somewhat loose	Fairly tight	Very tight

Profit situation-3

Target Profit / Target Cost	$TP3_H$	$TP3_M$	$TP3_L$
ADD	Very loose	In between Loose & Medium-tight	In between Loose & Medium-tight
COM	Loose	Somewhat tight	Tight
SUB	Somewhat loose	Medium-tight	Very tight

4.2.3. Statistical Model

The impact of the tightness of the different methods of target cost and profit on the cost-reduction performance is evaluated in the present empirical study through a variation of logistic regression of ordinal categorical variables called proportional-odds model for cumulative probabilities. The reason we choose this particular model is explained in detail in the estimation approach in appendix 3-C. We also include the estimation methodology under the model there. We develop three models for three profit situations. The expected model for explaining the *TCAL* by *TP1* & *TC*, by *TP2* & *TC* and by *TP3* & *TC* may take the following forms,

Logit of cumulative frequency of TCAL = f (Effects of categories and /or combinations of categories of TCAL,TP1,TC)

Logit of cumulative frequency of TCAL = f (Effects of categories and /or combinations of categories of TCAL,TP2,TC)

Logit of cumulative frequency of TCAL = f (Effects of categories and /or combinations of categories of TCAL,TP3,TC)

Where, *TCAL* : Target cost achievement level

TP1 : Target profit determined in the middle-range profit plan

TP2 : Target profit based on reduction rate in the cost of the existing or similar Products

TP3 : Target profit based on past actual performance of the related product

TC : Target cost determination methods

For developing parallel regression on the logistic scale, let the log odds of a positive response of *TCAL*

$$\Rightarrow \log\{\gamma_k/1-\gamma_k\} = \sum_{k=1}^{3}\theta_{TCAL_k} - \sum_{i=1}^{2}\beta_i^{TC} - \sum_{j=1}^{2}\beta_j^{TP1} - \sum_{ij=1}^{4}\beta_{ij}^{TC\times TP1}$$, when *TP1* is used

$$\Rightarrow \log\{\gamma_k/1-\gamma_k\} = \sum_{k=1}^{3}\theta_{TCAL_k} - \sum_{i=1}^{2}\beta_i^{TC} - \sum_{n=1}^{2}\beta_n^{TP2} - \sum_{in=1}^{4}\beta_{in}^{TC\times TP2}$$, when *TP2* is used

$$\Rightarrow \log\{\gamma_k/1-\gamma_k\} = \sum_{k=1}^{3}\theta_{TCAL_k} - \sum_{i=1}^{2}\beta_i^{TC} - \sum_{m=1}^{2}\beta_m^{TP3} - \sum_{im=1}^{4}\beta_{im}^{TC\times TP3}$$, when *TP3* is used

where, γ_k = the cumulative probability of a positive response of *TCAL*

θ_{TCAL_k} = expected effect of category k of *TCAL*

β_i = expected effects of category i of *TC*

β_j = expected effects of category j of *TP1*

β_n = expected effects of category n of *TP2*

β_m = expected effects of category m of *TP3*

β_{ij} = expected effect of combinations of categories i and j of *TC* and *TP1*

β_{in} = expected effect of combinations of categories *i* and *n* of *TC* and *TP2*

β_{im} = expected effect of combinations of categories *i* and *m* of *TC* and *TP3*

k (category of *TCAL*) = $TCAL_1$, $TCAL_2$, $TCAL_3$, $TCAL_4$

i (category of *TC*) = *SUB*, *COM*, *ADD*

j (category of *TP1*) = $TP1_H$, $TP1_M$, $TP1_L$

n (category of *TP2*) = $TP2_H$, $TP2_M$, $TP2_L$

m (category *of TP3*) = $TP3_H$, $TP3_M$, $TP3_L$

4.3. Research Focus

The entire target costing process is ineffective if the methods of determining cost and profit targets are unrealistic. Deciding the appropriate level of attainability of target is of greatest importance for a meaningful target costing system. An effective way to determine the target cost rationally is to link cost reduction activity to profit planning, and to approach the target cost based on long-range profit planning (Makido, 1989).

Japanese companies follows that the cost-reduction or profit-improvement objectives must be challenging but achievable most of the time that can be achieved with considerable but not impossible effort (Coopers and Slagmulder, 1997). If the targets are continuously set too high, the design teams might give up trying to achieve these. Again, if the targets are set quite low relative to possible levels of attainment, the firms will lose competitiveness because the new products will have excessively high target cost and the employees will be discouraged to strive for easy targets. To avoid these motivational problems, rational targets should be set where optimism is restrained in favor of realistic targets. It is important that the target assignments are not overly affected by the organizational power structure. Each target should be determined through consultation between manager and employees and each employee must tackle cost reduction positively. A company needs to devise methods that motivate employees to achieve their targets positively (Monden and Hamada, 1991). We test whether the differences in the levels of tightness in target profit and cost will have any impact on target cost achievement.

4.4. Hypotheses Development

For developing the theoretical framework and hypothesis of this study, we applied the concepts of goal difficulty and goal acceptance of goal-setting theory (Locke, 1968) due to their resemblance with the tightness exercised in target setting and internalizing the target.

The most heavily researched area in the goal-setting literature centers around the impact of goal difficulty on task performance. The basic theoretical concept here is the contention that at least up to some point, increasing goal difficulty increases the perceived challenge of a goal, which in turn increases the amount of effort that is expended for goal attainment (Atkinson, 1964; March and Simon, 1958). However, these studies do not explain clearly, why goal difficulty is so important in performance. Aimed at answering this central question, Locke and his associates carried out a series of experiments (Locke, 1966; Locke and Bryan, 1966, 1967,1969; Locke, Bryan and Kendall, 1968). In all these studies, strong and consistent evidence found that hard goals lead to greater performance than do easy goals, as long as the goals are accepted. No such relation is found where goal acceptance is not present. Charnes and Stedry (1964) find that difficult goals produce better performance unless they are raised to the point at which, in the proper circumstances, they are rejected as being too high relative to performance expectations.

Zander and Newcomb (1967) find that prior success on previous goals promotes the effects of setting difficult goals that leads to increased subsequent performance. However, past failure on previous goals negates the effects of setting difficult goals. In a comparison between consistent success and failure in goal attainment, Zander, Forward and Albert (1969) find that success-group sets higher absolute goal and attains a higher absolute level of performance, attributes more importance to the attainment of the goal, and their goals are more reasonable than those of failure-group. The unreasonableness of the goal and the lack of importance attributed to it by the failure-group suggest that there is little goal acceptance and commitment. Analyzing the effects of goal difficulty, Latham and Yukl (1975a) find that participation affects performance to the degree that it leads to the establishment of and commitment to specific hard goals.

The variable found to moderate the effects of goal difficulty probably also influence goal acceptance. These variables include the employee's perception that goal is reasonable, and the perceived contingency between goal attainment and desirable outcomes. Hard goals are more likely to be perceived as challenging rather than impossible if the employees have a high degree of self-assurance and has previously had more successes in goal attainment than failures (Latham and Yukl, 1975b). Stedry and Kay (1966) find that difficult goals perceived as challenging resulted in significantly greater performance than difficult goals perceived as impossible, and for the impossible goals, performance actually decrease. Moreover, perceived impossibility of goal attainment may stifle employee effort and resultant performance (Steers and Porter, 1974). These findings are equivalent to Locke's theory if it can be assumed that impossible goals are not accepted (Latham and Yukl, 1975b).

Stedry (1960) has set forth an original contribution to the relationship between goal difficulty and performance, where he finds that hard assigned goals lead to a higher performance than easy goals only if the goals are assigned before the subjects set their personal goals. If they set personal goals first, they tend to reject the assigned hard goals and perform quite poorly on the task. Experimenting with various goal difficulty levels, Stedry (1960) finds that "high" and "medium" goals to produce significantly better performance, on the average, than "low" goals resembling the "attainable-but-not-too-loose" goals recommended in the budgeting literature.

Therefore, according to goal difficulty proposition, the greater the degrees of tightness of the target cost and profit methods employed, the better will be the target cost achievement for the companies. Now, we formulate the hypothesis of this study,

Hypothesis 4-1: The tighter the target profit and cost methods employed the better the target cost achievement.

The expected hypothetical relationships in three profit situations are presented in Figure 4-4.

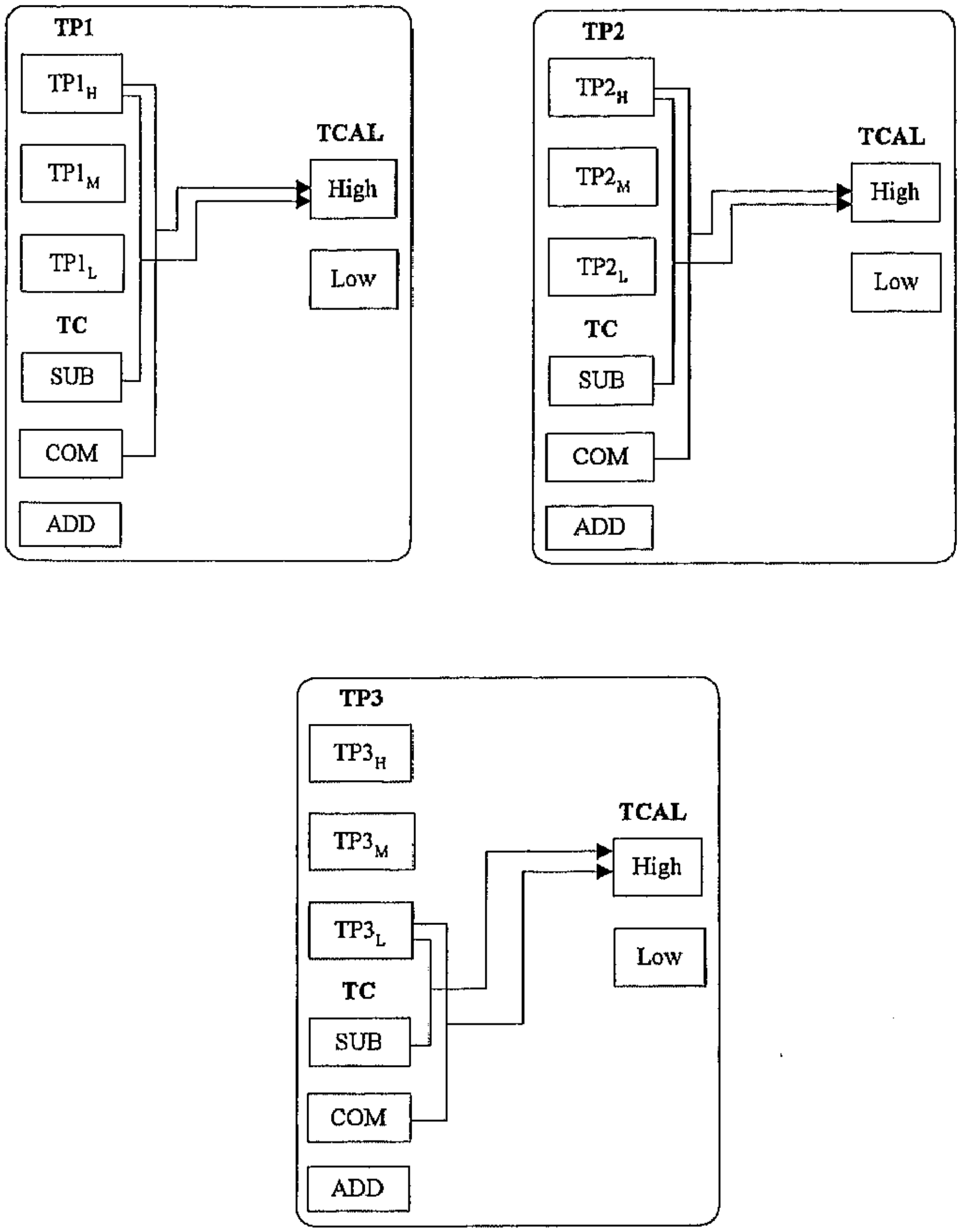


Figure 4-4. Hypothetical relationships in three profit situations

4.5. Analysis and Interpretation

4.5.1. Criteria for Selecting the Model

We employed multiple criteria to guard against under-and over-fitting, and to choose a parsimonious final model. First, among the models that yield large chi-square value (LR^2) in light of the degrees of freedom (*df*) are to be discarded on the basis of the ratio of LR^2 and *df* and the ordinary significance level, *p*. Finally, in case more than one model should satisfy the above criteria, they would be compared with each other in terms of *AIC*.[6] Hence, a model is said to be better than others are if its *AIC* is smallest (Matsuda, 1988; Matsuda, Ihara and Kusumi, 1994; Sakamoto, 1991, 15). The *df* value here is called the residual *df* for the model. The *p*-value is the right-tail probability; large test statistics and small *p*-values suggest a poor model fit.

4.5.2. Results

The effect of the explanatory variables on the *TCAL* needs to be measured in terms of change from a baseline combination. The results of the effects of *TC & TP1*, *TC & TP2*, and *TC & TP3* on *TCAL* and the fit of the models are presented in Tables 4-3 to 4-8.

Table 4-3. Estimates for the parameters in showing the effects of *TC & TP1* on *TCAL*

Model		SUB	COM	$TP1_M$	$TP1_H$	$SUB \times TP1_M$	$COM \times TP1_M$	$SUB \times TP1_H$	$COM \times TP1_H$
M1	$logit(\gamma_{ijk}) = \theta_k$	+0.70 (1.16)	+0.70 (1.60)	+0.55 (1.15)	+0.15 (0.27)	-1.16 (-1.31)	-1.14 (-1.61)	-2.09 (-2.40)	-2.01 (-2.83)
M2	$logit(\gamma_{ijk}) = \theta_k$	+0.65 (1.14)	+0.65 (1.65)	+0.50 (1.10)		-1.11 (-1.28)	-1.09 (-1.60)	-1.95 (-2.89)	-1.87 (-4.16)
M3	$logit(\gamma_{ijk}) = \theta_k$	+0.48 (0.87)	+0.48 (1.33)			-0.61 (-0.83)	-0.59 (-1.17)	-1.94 (-2.89)	-1.86 (-4.15)
M4	$logit(\gamma_{ijk}) = \theta_k$		+0.41 (1.15)			-0.20 (-0.36)	-0.59 (-1.17)	-1.53 (-3.20)	-1.86 (-4.15)
M5	$logit(\gamma_{ijk}) = \theta_k$		+0.43 (1.24)				-0.59 (-1.17)	-1.51 (-3.18)	-1.86 (-4.15)
M6	$logit(\gamma_{ijk}) = \theta_k$						-0.28 (-0.64)	-1.63 (-3.50)	-1.55 (-4.21)
M7	$logit(\gamma_{ijk}) = \theta_k$							-1.59 (-3.46)	-1.51 (-4.17)

Figure in parenthesis represents t value.
Non-bracketed figure represents regression coefficient.

Table 4-4. Fit information of the models showing the effects of *TC & TP1* on *TCAL*

Model	LR^2	*df*	*p-value*	LR^2/df	*AIC*
M1	15.08	16	0.7	0.94	-8.16
M2	15.15	17	0.7	0.89	-10.3
M3	16.37	18	0.7	0.91	-14.74
M4	17.14	19	0.7	0.90	-18.28
M5	17.27	20	0.7	0.86	-20.54
M6	18.83	21	0.7	0.90	-25.66
M7	**19.24**	**22**	**0.7**	**0.87**	**-28.48**

For verifying the effects of *TP1 & TC* on *TCAL* (Table 4-3), we considered *ADD* and $TP1_L$ as the baseline. The fits of the models 1 through 7 are all reasonable

($p \geq .70$) as summarized in Table 4-4. Among them, M7 is most parsimonious as judged by LR^2/df, AIC and number of terms (LR^2=19.24, df= 22, $p \geq .70$, AIC= –28.48). The LR^2/df ratio of M7 is higher than that of M5 by 0.01 (0.87–0.86), however its AIC is the lowest. From M7, it is evident that ($SUB \times TP1_H$) and ($COM \times TP1_H$) are significantly improving the *TCAL* than any other available combinations and between these two, the former is contributing more. The results indicates that when *TP1* is widely utilized, the use of a tight (i.e. *SUB*) or medium-tight (i.e. *COM*) target cost method renders higher *TCAL*. This implies that performance improves more in a demanding situation than in an easy atmosphere, which reinforces our hypothesis.

Table 4-5. Estimates for the parameters in showing the effects of *TC* & *TP2* on *TCAL*

Model		SUB	ADD	$TP2_L$	$TP2_H$	$SUB \times TP2_L$	$ADD \times TP2_L$	$SUB \times TP2_H$	$ADD \times TP2_H$
M8	$\text{logit}(\gamma_{ijk}) = \theta_k$	+0.51 (0.99)	+0.12 (0.28)	-0.31 (-0.55)	-0.20 (-0.51)	-0.75 (-0.75)	+0.75 (0.98)	-1.19 (-1.66)	+0.01 (0.02)
M9	$\text{logit}(\gamma_{ijk}) = \theta_k$	+0.51 (1.01)	+0.13 (0.41)	-0.30 (-0.56)	-0.20 (-0.64)	-0.75 (-0.76)	+0.75 (1.05)	-1.19 (-1.78)	
M10	$\text{logit}(\gamma_{ijk}) = \theta_k$	+0.46 (0.95)		-0.35 (-0.65)	-0.19 (-0.61)	-0.72 (-0.72)	+0.88 (1.38)	-1.20 (-1.80)	
M11	$\text{logit}(\gamma_{ijk}) = \theta_k$	0.54 (1.17)		-0.26 (-0.51)		-0.79 (-0.81)	+0.88 (1.38)	-1.39 (-2.33)	
M12	$\text{logit}(\gamma_{ijk}) = \theta_k$	0.57 (1.23)				-1.05 (-1.27)	+0.64 (1.48)	-1.39 (-2.33)	
M13	$\text{logit}(\gamma_{ijk}) = \theta_k$					-0.53 (-0.75)	+0.58 (1.35)	-0.87 (-2.08)	
M14	$\text{logit}(\gamma_{ijk}) = \theta_k$						+0.60 (1.40)	-0.85 (-2.04)	
M15	$\text{logit}(\gamma_{ijk}) = \theta_k$							-0.91 (-2.19)	

Figure in parenthesis represents t value.
Non-bracketed figure represents regression coefficient.

Table 4-6. Fit information of the models showing the effects of *TC* & *TP2* on *TCAL*

Model	LR^2	*df*	*p-value*	LR^2/df	*AIC*
M8	11.75	16	0.75	0.73	-1.50
M9	11.75	17	0.8	0.69	-3.50
M10	11.91	18	0.8	0.66	-5.82
M11	12.28	19	0.9	0.65	-8.56
M12	12.54	20	0.9	0.63	-11.08
M13	14.08	21	0.8	0.67	-16.16
M14	14.64	22	0.9	0.67	-19.28
M15	**16.65**	**23**	**0.85**	**0.72**	**-25.30**

In case of *TP2*, we considered *COM* and $TP2_M$ as the baseline to see the effects of the two extremes of tightness, i.e. tight and loose. The stepwise model selection and the fits of the models 8 through 15 are depicted in Tables 4-5 and 4-6 respectively. The fits of all models are reasonable ($p \geq .75$) as summarized in Table 4-6. Among them, M15 is most parsimonious as estimated by LR^2/df, *AIC* and number of terms (LR^2=16.65, df= 23, $p \geq .85$, AIC= −25.3). The LR^2/df ratio of M15 is slightly smaller than that of the saturated model M8 (0.72 vs. 0.73), however its *AIC* is much smaller (−25.3 vs. −1.5). Therefore, we accepted M15. The selected model contains only one interaction term, ($SUB \times TP2_H$), that significantly improves the *TCAL*. This signifies that when a company widely use *TP2*, it would be able to achieve target cost at the highest level if it sets the target cost by *SUB* method. This also implies the superiority of fixing tight targets of over loose targets and supports our theoretical proposition.

Table 4-7. Estimates for the parameters in showing the effects of *TC & TP3* on *TCAL*

Model		SUB	COM	$TP3_L$	$TP3_H$	$SUB \times TP3_L$	$COM \times TP3_L$	$SUB \times TP3_H$	$COM \times TP3_H$
M16	$\text{log}it(\gamma_{ijk}) = \theta_k$	+0.34 (0.63)	+0.30 (0.71)	+1.27 (2.01)	−0.76 (−1.57)	−1.90 (−1.83)	−2.68 (−3.23)	−1.06 (−1.37)	−0.26 (-0.41)
M17	$\text{log}it(\gamma_{ijk}) = \theta_k$	+0.17 (0.36)		+1.10 (1.88)	−0.92 (−2.17)	−1.73 (−1.71)	−2.38 (−3.36)	−0.89 (−1.21)	+0.04 (0.08)
M18	$\text{log}it(\gamma_{ijk}) = \theta_k$	+0.17 (0.36)		+1.10 (1.88)	−0.90 (−2.81)	−1.73 (−1.71)	−2.38 (−3.36)	−0.92 (−1.34)	
M19	$\text{log}it(\gamma_{ijk}) = \theta_k$			+1.07 (1.85)	−0.93 (−3.04)	−1.56 (−1.75)	−2.38 (−3.36)	−0.74 (−1.53)	
M20	$\text{log}it(\gamma_{ijk}) = \theta_k$			+1.06 (1.84)	−1.11 (−3.87)	−1.56 (−1.75)	−2.37 (−3.36)		

Figure in parenthesis represents t value.
Non-bracketed figure represents regression coefficient.

Table 4-8. Fit information of the models showing the effects of *TC & TP3* on *TCAL*

Model	LR^2	df	*p-value*	LR^2/df	*AIC*
M16	6.45	16	0.98	0.40	9.10
M17	6.95	17	0.98	0.41	6.10
M18	6.96	18	0.99	0.39	4.08
M19	7.09	19	0.99	0.37	1.82
M20	**9.48**	**20**	**0.97**	**0.47**	**-4.96**

The regression results showing the effects *TC & TP3* on *TCAL* and the fits of the models 16 through 20 are presented in Tables 4-7 and 4-8 respectively. Here we considered *ADD* and $TP3_M$ as the baseline. Of the fitted model, M19 is more acceptable in terms of LR^2/df ratio and p-value (LR^2=7.09, df=19, LR^2/df=0.37, p≥.99). Although fit of M19 is slightly better than that of M20 (.99 vs. .97), bias in the fit information, i.e. *AIC* of M20 is much smaller than that of M19 (–4.96 vs. 1.82). Moreover, M20 is plausible from the viewpoint of the number of terms. Thus, we accept M20 at the 0.97 significance level. Since there is no compelling reason to test more models by reducing the terms, M20 is finally accepted. This model includes two main and interaction effects. We find that individual effects are different from the interaction effects. The single effects show that *TCAL* improves by $TP3_H$ but deteriorates by $TP3_L$. However, the combination effects show that *TCAL* can be improved by not using *TP3* with *SUB* and *COM*. Since low emphasis on a loose target profit necessarily represents a tight environment, the use of tight or medium-tight target cost method in that setting leads to higher *TCAL*. Thus, this evidence is congruent with our theoretical propositions.

4.5.3. Analysis of the Results

Evaluating the regression results in three profits situations, we observe that when *TP1* is widely utilized, the use of both *SUB* and *COM* improve the *TCAL*. Similarly, when *TP2* is highly utilized, the use of *COM* improves *TCAL*. The effects of using *SUB* and *COM* along with *TP1* and *TP2* in improving the *TCAL* are supported by the findings in *TP3* profit situation. We observe that lower utilization of *TP3* along with *SUB* and *COM* improves the *TCAL*. In fact, $TP3_L$ implies the use of *TP1* and/ or *TP2* instead of *TP3*. Therefore, the increase in *TCAL* by $SUB{\times}TP3_L$ and $COM{\times}TP3_L$ is equivalent to the increase in *TCAL* by $SUB{\times}TP1_H$, $COM{\times}TP1_H$ and $COM{\times}TP2_H$. The lower utilization of 'loose' target profit is equivalent to the higher utilization of 'tight' and/ or 'medium-tight' target profit and represent a demanding environment. Therefore, when a company decides to use 'tight' or 'medium-tight' profit method (*TP1* or *TP2*) but not the 'loose' method (*TP3*), its *TCAL* will be improved if it adopts stricter methods (*SUB* and/ or *COM*) for calculating target cost.

Comparing the combinatorial effects in three profit situations (Tables 4, 6 and 8), we find that the effects of $COM \times TP3_L$ and $SUB \times TP3_L$ in improving *TCAL* is more than that by $SUB \times TP1_H$, $COM \times TP1_H$ and $SUB \times TP2_H$. Therefore, for improving *TCAL* the company should avoid using *TP3* with *SUB* and *COM*. Instead, it should use *TP1* and/ or *TP2*. When a company decides to use *TP1*, it should employ both *SUB* and *COM* for better *TCAL*. Further, when a company decides to use *TP2* it should choose *SUB*. Irrespective of the profit methods, the company should avoid using adding-up method for calculating target cost.

Target profit set in the middle-range profit plan (*TP1*) is more suitable from managerial point of view, as they can set it according to their desire, they can make target cost determined by subtractive method tighter by making the target profit figure bigger. The entire target costing process is futile if the long-term profit objectives underlying it are unrealistic (Cooper and Slagmulder, 1997). Since $TP1_H$ improves *TCAL*, we can confirm that *TP1* is tight but realistic. $TP2_H$ also resembles the effect of tight and realistic target in improving *TCAL*. We observe that between $TP1_H$ and $TP2_H$, the former has more effect on *TCAL* than the later. Actually, *TP2* is based on target reduction rate of cost of the existing or similar product and gives a benchmark to which the present performance ought to be elevated. Probably the inherent characteristic of *TP2*, i.e. detecting how much cost improvement is possible by *TP2* over the actual realized figure (*TP3*) towards the desired one (*TP1*), would create continuous pressure on designers that would lead to its lower effect on *TCAL*.

TCAL in general improves with the tightness of target cost and profit. However, tightness in target cost and profit beyond a certain threshold cannot improve the performance as supported by the findings of Stedry's (1960) research on budget tightness. From the present findings, we observe that *TCAL* improves with the level of tightness in target profit and cost. Therefore, we can authenticate that the determined targets are tight, realistic and attainable.

Finally, the ubiquitous presence of *SUB* with 'tight' and 'medium-tight' profit methods improves the *TCAL*. This is because the imposition of the fundamental rule of target costing, that is, 'target cost must never be exceeded' is mainly possible by *SUB*, which facilitates the attainment of determined profit.

4.6. Conclusion

In this paper, we studied the effects of tightness of target cost and profit methods on target cost achievement. The theoretically formulated relationships among different methods of target profit and cost are mostly observed in the real-world situation in the Japanese manufacturing industries. We find that greater the tightness of the target profit and cost methods employed the better the target cost achievement. This is interesting in that in target costing, the adoption of a particular method of target cost and profit depends on company's ability in the periodical revision or continuous improvement of the target profit and cost. Therefore, the tighter the target profit and cost methods adopted, more efficient the firm is in improvement activities and hence better the target cost achievement. The superiority of subtractive method with 'tight' and 'medium-tight' profit and combination method with 'tight' profit is prevalent which recommends their use in these situations. The company should avoid using adding-up method for calculating target cost in any profit situations. The judicious mixture of a tight target cost along with a tight and realistic target profit method is better choice for the companies to improve their target cost achievement level.

In a target-costing environment, identifying the appropriate degree of tightness of the targets for profit and cost is very crucial factor to take into account. In certain situations performance improves with the level of tightness while in the other circumstances, it deteriorates. The tight but attainable target should be established for high and persistent cost-reduction performance. In target costing, the overall accounting process consists of target cost determination and allocation processes. The effects of both of these processes on target cost achievement level may be interesting aspects to study in future.

End Notes

1. Our research assumes the environment where target sales price is established by market-based method. Usually, there are two methods of target sales price, cost-based and market-based. Although cost-based pricing is a very popular method of pricing used by many companies, it is unsuited for target costing environments. Because of the competitive nature of markets, prices lead costing in target costing situations. Use of cost-based pricing in competitive environments negates the entire rational for the use of target costing. In fact, being wedded to cost for product pricing is an impediment to the successful adoption of target costing (Ansari, Bell and CAM-I, 1997).

2. Subtractive method calculates target cost as:

Target cost per unit = Target sales price per unit – Target profit per unit

3. According to adding-up method, target cost is computed as:

Target cost per unit = Estimated cost per unit × (1 – Target reduction rate of cost)

= Estimated cost per unit – Achievable target amount of cost reduction per unit

4. Combination method computes target cost as:

(a) Target sales price per unit – Target profit per unit = Allowable cost per unit

(b) Target sales price per unit – Target cost per unit (as per adding-up method) = Revised target profit per unit

(c) Target cost per unit = Somewhere between the allowable cost and the target cost determined by adding-up method,

5. The tightness of a target cost method is different from that of a target profit method. The smaller the amount of target cost to be achieved, the tighter the target cost method, while the bigger the amount of target profit to be earned, the tighter the target profit method.

6. Akaike's Information Criterion (*AIC*) is a criterion for model selection for comparing the goodness of fit of models in the case where there are several models (Sakamoto, 1991, 15). It is calculated by the following formula,

$$AIC = -2(\text{maximum log likelihood}) + 2(\text{number of parameters}).$$