CHAPTER 7

EFFECTS OF TARGET COST DETERMINATION AND BEHAVIORAL FACTORS IN ITS ALLOCATION ON TARGET COST ACHIEVEMENT: A SURVEY RESEARCH

In this chapter, we intend to see the combination effects of behavioral factors in target cost determination and allocation on the target cost achievement.

Target costing system has two major steps to bring the competitive challenge of the market place through the organization to the product designers to ensure that only profitable products are launched. The first phase of target costing is the establishment phase where a product concept is defined and the target cost is set for the product. The second phase is the attainment phase where the product target cost is transformed into achievable target cost. To achieve the target cost of a product, product-level target cost is discomposed down to the discrete elements such as, functions, components and parts. In most of the organizations, departments are responsible for function level costs, teams are responsible for component level costs and designers are responsible for individual parts' cost (Ansari, Bell and CAM-I, 1997). The overall accounting process in a target costing system consists of these two steps and the competence of a target costing system depends on how precisely the product's target cost is determined and apportioned among its constituting parts, because once target cost is determined all the activities are directed to achieve it.

In confrontational environment, highly efficient firms will have lower target cost than their less efficient competitor. Since a company has no control over setting target-selling price, to survive in the intense market competition and hence to ensure the earning of the target profit demanded by the competitive pressure, it must have to determine the lowest possible target cost. The greater the degree of tightness inherent in the target cost method, the lower will be the amount of target cost to be attained. This process often creates intense pressures on the product designers. The decision to use different types of target cost methods will create severity and/ or motivation of different magnitudes. The adoption of a particular method of setting target cost of a product differs from company to company.

In target cost allocation process, to attain the per-unit target cost of a product, the designers initially break down this target cost into functional elements assigned to corresponding design departments which are again broken into parts elements. If the target cost cannot be achieved, i.e. if the estimated cost is greater than the target cost, the cost-reduction activities will be repeated by investigating alternative designs, until the estimated cost becomes, at most, equal to the target cost. The cost-reduction activities in the real world are essentially based on ideas created by designers. The idea generation capability or cost-reduction performance of product designers may vary since different levels of participation and performance-evaluation methods will motivate them in different ways.

This chapter will also investigate whether adopting strict or loose policy in determining and allocating target cost will improve target cost achievement level. To fulfil the objective the combined effect of target cost determination method along with the behavioral factors relating to participation and performance-evaluation measures on target cost achievement will be verified.

A series of studies on target costing has addressed some general aspects describing the adoption, objectives and organization of target costing, implementation of its different subsystems (such as VE, QFD, cost tables, simultaneous engineering, etc.), influential power of managers in the process of target costing, interactive control directed at information and value sharing among managers and so on.[1] However, no study has so far been conducted regarding the combined effects of target cost determination methods, participation and performance-evaluation measures on target cost achievement level.

The next section reviews the relevant literature and develops the theoretical expectations of the study. This is followed by sections describing the research method and results, respectively. A final section concludes the paper with some brief directions for further research.

7.1. Behavioral Factors in Target Cost Determination and Allocation Processes

Choosing a particular method for determining target cost is a behavioral issue. The behavioral factors in allocating a target cost of a product into its parts are designers' participation and their performance evaluation measures. The effects of these factors on target cost achievement level are theorized in the following subsections.

7.1.1. Effects of Target Cost Determination Methods on Cost-reduction Performance

Most of the target costing literature states that there are three methods for determining target cost: (1) 'subtractive' or 'sales price-based' method, (2) 'adding-up' or 'estimated cost-based' method and (3) 'combination' method. An early estimate of target cost is known as allowable cost, the 'maximum permissible cost' that can be committed to a product in the product planning stage. Allowable cost is considered as the final target cost only when it is achievable. Target cost determined in this way is called subtractive method that calculates target cost by deducting target profit from target selling price. It acts as a signal to all involved in the target costing process as the magnitude of the cost-reduction objective that eventually must be achieved. The target cost requirement via the subtractive method is likely to be demanding because management desires to realize the largest possible profit. Here, target cost is determined by market forces that does not take into account the internal design and production capabilities of the firm or its suppliers.

When the designers are unable to achieve the allowable cost, the target cost of the product is set higher than the allowable cost. To compute target cost in this situation, first, estimated cost is calculated for each part based on existing work structures, technology and processes. Then to reduce the gap between the estimated and allowable cost, VE and continuous improvement activities are performed until these two merges. If it is not possible to achieve allowable cost, target cost is set higher than this. Target cost determined in this way is called adding-up method, where target cost is determined by deducting possible profit improvement target value from the estimated cost. The inability to achieve the allowable cost indicates that the firm is not efficient as demanded by the competitive conditions. Therefore, the firms using adding-up method are not as efficient as demanded by the market demand.

There is another variation to compute target cost, called combination method that is a hybrid of subtractive and adding-up methods. This method is used when the amount of allowable cost or target cost by subtractive method is too small and target cost by adding-up method contains slack that requires further reduction. Therefore, combination method sets target cost somewhere in the middle of subtractive and adding-up methods. It computes target cost by revising the target amount of cost reduction or profit improvement.

Cost target should be established in a way that the profitability of the product is ensured which can be achieved through the designers' extra efforts. All these three methods possess these criteria; however, management's profit expectation is ensured more by the subtractive method than by combination and adding-up. The subtractive method is clear to have a strong linkage with firm's middle-range profit plan and a profit plan provides projected profit figures to target costing (Tani and Kato, 1994). Usually, a firm adopts subtractive method only when it is capable of earning the profit needed for maintaining its competitive position. Adding-up method, on the other hand, emphasize mainly on the ability of the firm and its suppliers. Therefore, it ensures that the earning of profit is possible by technology, process, and work structure. Focusing mainly on profit demanded by market condition will make the target cost figure lower. Conversely, emphasizing mainly on profit possible by firm's ability will provide a larger target cost. However, combination method consolidates the operating focus on profitability and the technological focus on feasibility (Sakurai and Scarbrough, 1997). It identifies how much cost improvement is possible over the achievable figure as determined by adding-up method towards the desired one as determined by subtractive method.

The degree of tightness associated with the target formulations in the product development stage will affect target cost achievement level. In practice, among these three methods, subtractive method appears to lead to the lowest target cost, combination method provides the target cost higher than subtractive but lower than adding-up, while adding-up method provides comparatively larger amount of target cost. The tighter the method of target cost determination, the lower (or more challenging) will be the amount of target cost determined by that method. From the viewpoint of tightness of target cost, subtractive method is 'tight', combination method is 'medium-tight' and adding-up method is 'loose'. Therefore, the cost targets by subtractive and combination methods are more challenging than that by adding-up.

According to goal setting theory (Locke, 1968), hard goals result in a higher level of performance than do easy goals and as long as goals are accepted, the more difficult the goals the higher the level of performance. Latham and Yukl (1975), Locke and White (1981) also support this finding. Moreover, 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. In keeping with this reasoning, we can postulate that target cost achievement level will be improved more by subtractive and combination methods than by adding-up method. Therefore, the greater the degrees of tightness of target cost method the better will be the cost-reduction performance.

7.1.2. Effects of Target Cost Allocation on Cost-reduction Performance

Although some contradictory results are also found where participation is negatively associated with performance (Bryan and Locke, 1967; Stedry, 1960), there is sufficient evidence in the previous literature to conclude that participation is positively and significantly associated with performance (Bass and Leavitt, 1963; Kenis, 1979). From the analyses in chapters 5 and 6, we found that target cost achievement level improves as the degrees of product designer's participation in allocating target cost into parts increases.

Budgeting and psychology literature shows that high employee performance creates when their performance is evaluated by controllable information, and the inclusion of uncontrollable items in the performance evaluation measures will cause their performance to decline (Ansari, 1976; Argyris, 1952; Stedry, 1960; Hofstede, 1967; Becker and Green, 1962; Cook, 1967; Ronen, 1974). In a laboratory experiment, as discussed in chapter 5, we also found that performance improves when controllable information is used for evaluation performance. However, while working with survey data we could not establish any significant relationship between performance evaluation measures and performance.

The moderating effects of participation in laboratory experiment as well as in survey data supports previous researches and shows that target costing performance improves when (1) the product designers' participation in target formulation is low and their performance is evaluated by uncontrollable rather than controllable information; (2) the product designers' participation in target formulation is high and their performance is evaluated by controllable rather than uncontrollable information.

Therefore, use of top-down approach in target cost determination and use of either top-down or bottom-up approach in target cost allocation would improve target cost achievement level. To see the effects of the behavioral factors in target cost determination and allocation process on target cost achievement level, for the moment it is rather difficult to predict whether the strict or the loose policies followed by the management will render higher performance. Hence, two different combinations are expected to produce better achievement of target cost,

Hypothesis 7-1:

If a comparatively strict policy is followed,

The target cost achievement level will be improved, when subtractive method is employed for determining products target cost, the designers cannot participate in allocating target cost and designers' performance is evaluated by the uncontrollable information.

If a comparatively lenient policy is followed,

The target cost achievement level will be improved, when adding-up method is employed for determining product's target cost, only the designers participate in target cost allocation and their performance is evaluated by the controllable item information.

The hypotheses are tested using a variation of logistic regression of ordinal categorical variable called proportional-odds model (McCullagh and Nelder, 1989). In accordance with hypothesis 7-1, the expected model for explaining the cost-reduction performance by the accounting factors may take the following form:

Logit of frequency of TCAL = f (Effects of Categories and /or combinations

of categories of TCAL, TC, PAR, PE)

Where, *TCAL* : Target cost achievement level

TC : Target cost determination methods

PAR : Participation in the target cost allocation process

PE : Performance evaluation measures

For developing parallel regression on the logistic scale,

let the log odds of a positive response of *TCAL*

$$= \log\{\gamma_k / 1 - \gamma_k\} = \sum_{k=1}^{2} \theta_k^{TCAL} - \sum_h \sum_i \sum_j \beta_{hij}^{TC \times PAR \times PE}$$

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

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

β_{hij} = expected effect of combinations of categories *h, i,* and *j* of *TC, PAR* and *PE*

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

h (category of TC) = SUB, COM, ADD (SUB =Subtractive; COM =

Combination; ADD =Adding-up)

i (category of PAR) = P, JP, NP (P =Participation; JP = Joint participation;

NP = Nonparticipation)

j (category of PE) = C, UC (C = Controllable, UC = Uncontrollable)

Thus the expected model would be,

(1) When a comparatively strict policy is followed

$$\log\{\gamma_k/1-\gamma_k\} = \sum_{k=1}^{2}\theta_k^{TCAL} - \beta_{(SUB\times NP\times UC)}^{TC\times PAR\times PE}$$

(2) When a comparatively lenient policy is followed

$$\log\{\gamma_k/1-\gamma_k\} = \sum_{k=1}^{2}\theta_k^{TCAL} - \beta_{(ADD\times P\times C)}^{TC\times PAR\times PE}$$

7.2. Results and Discussion

7.2.1. Combination Effects of the Factors in Target Cost Determination and Allocation Processes

To find the combined effects of the behavioral factors in target determination and allocation on target cost achievement level, the related variables are combined. Altogether 18 combinations are available. Considering inherent characteristic of the factors, we postulate that among all the combinations, *TCAL* will be declined highly by *ADD*×*NP*×*C* and *ADD*×*P*×*UC*. Taking *ADD*×*NP*×*C* as the baseline, we obtain the following saturated model.

$$\begin{aligned}\Rightarrow \log\{\gamma_k/1-\gamma_k\} = &\underset{(-2.19)}{-1.44}\,\theta_1^{TCAL} + \underset{(1.08)}{0.69}\,\theta_2^{TCAL} - \underset{(-0.72)}{0.71}\,\beta_{(SUB\times NP\times UC)}^{TC\times PAR\times PE} - \underset{(-0.13)}{0.10}\,\beta_{(COM\times NP\times UC)}^{TC\times PAR\times PE} - \\ &\underset{(-1.75)}{1.60}\,\beta_{(ADD\times NP\times UC)}^{TC\times PAR\times PE} - \underset{(-1.28)}{1.34}\,\beta_{(COM\times NP\times C)}^{TC\times PAR\times PE} - \underset{(-0.56)}{0.52}\,\beta_{(SUB\times JP\times UC)}^{TC\times PAR\times PE} - \underset{(-0.08)}{0.06}\,\beta_{(COM\times JP\times UC)}^{TC\times PAR\times PE} - \underset{(-0.93)}{1.01}\,\beta_{(ADD\times JP\times UC)}^{TC\times PAR\times PE} + \\ &\underset{(1.78)}{2.35}\,\beta_{(COM\times JP\times C)}^{TC\times PAR\times PE} + \underset{(0.34)}{0.38}\,\beta_{(ADD\times JP\times C)}^{TC\times PAR\times PE} + \underset{(0.34)}{0.38}\,\beta_{(SUB\times P\times UC)}^{TC\times PAR\times PE} - \underset{(-0.28)}{0.29}\,\beta_{(COM\times P\times UC)}^{TC\times PAR\times PE} - \underset{(0.00)}{0.00}\,\beta_{(ADD\times P\times UC)}^{TC\times PAR\times PE} - \\ &\underset{(-0.72)}{1.01}\,\beta_{(SUB\times P\times C)}^{TC\times PAR\times PE} - \underset{(-1.06)}{1.01}\,\beta_{(COM\times P\times C)}^{TC\times PAR\times PE}\end{aligned} \quad \text{(M-1)}$$

Degrees of Freedom: 30 Total; 14 Residual
Residual Deviance: 9.047653

Considering only the combinations having t-value more than one, we get following three nested models. Comparing the number of terms, LR^2/df ratio, *AIC* and interpretability, we accept model 4 (M-4).

$$\Rightarrow \log\{\gamma_k/1-\gamma_k\} = -\underset{(-1.78)}{1.32}\theta_1^{TCAL} + \underset{(0.89)}{0.61}\theta_2^{TCAL} - \underset{(-1.70)}{1.55}\beta_{(ADD\times NP\times UC)}^{TC\times PAR\times PE} - \underset{(-1.25)}{1.30}\beta_{(COM\times NP\times C)}^{TC\times PAR\times PE} + \underset{(1.71)}{2.27}\beta_{(COM\times JP\times C)}^{TC\times PAR\times PE} - \underset{(-1.03)}{0.98}\beta_{(COM\times P\times C)}^{TC\times PAR\times PE} \quad \text{(M-2)}$$

Degrees of Freedom: 10 Total; 4 Residual
Residual Deviance: 3.526795

$$\Rightarrow \log\{\gamma_k/1-\gamma_k\} = -\underset{(-1.53)}{1.12}\theta_1^{TCAL} + \underset{(0.66)}{0.45}\theta_2^{TCAL} - \underset{(-1.66)}{1.48}\beta_{(ADD\times NP\times UC)}^{TC\times PAR\times PE} - \underset{(-1.22)}{1.24}\beta_{(COM\times NP\times C)}^{TC\times PAR\times PE} + \underset{(1.65)}{2.14}\beta_{(COM\times JP\times C)}^{TC\times PAR\times PE} \quad \text{(M-3)}$$

Degrees of Freedom: 8 Total; 3 Residual
Residual Deviance: 1.969825

$$\Rightarrow \log\{\gamma_k/1-\gamma_k\} = -\underset{(-1.63)}{1.20}\theta_1^{TCAL} + \underset{(0.75)}{0.52}\theta_2^{TCAL} - \underset{(-1.68)}{1.51}\beta_{(ADD\times NP\times UC)}^{TC\times PAR\times PE} + \underset{(1.67)}{2.19}\beta_{(COM\times JP\times C)}^{TC\times PAR\times PE} - \underset{(-1.01)}{0.94}\beta_{(COM\times P\times C)}^{TC\times PAR\times PE} \quad \text{(M-4)}$$

Degrees of Freedom: 8 Total; 3 Residual
Residual Deviance: 2.655127

Table 7-1 Fit information of the models showing the effects of *TC*, *PAR* & *PE* on *TCAL*

Model	LR^2	Residual df	Parameter	LR^2/df	AIC
M1	9.05	14	16	0.65	13.90
M2	3.53	4	6	0.88	4.94
M3	1.97	3	5	0.66	6.06
M4	**2.66**	**3**	**5**	**0.89**	**4.68**

From the results it is apparent that, when adding-up method is used in determining the target cost of a product, in that situation the target cost achievement level will be the highest if the designers cannot participate in the allocation of target cost and their performance is evaluated by group performance (*ADD*×*NP*×*UC*). Again, when combination method is employed in calculating target cost of a product, in that case also target cost achievement level improves if only the designers participate in target cost allocation process and their performance is evaluated by individual performance (*COM*×*P*×*C*). However, the result is marginally significant. On the other hand, target cost achievement level declines the most when the use of combination method is accompanied by the joint participation of product designers and managers and performance is evaluated by controllable information (*COM*×*JP*×*C*). Probably, in joint participation, the dominance of product manager is high which makes the state of joint participation equivalent to the nonparticipation. The interaction of nonparticipation and performance evaluation by controllable information creates cognitive dissonance that may contribute to the lowest performance of *COM*×*JP*×*C*.

It is clear that while considering determination and allocation of target cost together, neither a strictly top-down approach nor a strictly bottom-up approach will provide higher cost-reduction performance. If a lenient method is employed in setting target cost, then adopting a top-down approach in target cost allocation process will provide better target costing performance. On the other hand, the use of a tighter method for setting target cost followed by a bottom-up approach in the allocation of target cost will provide higher target cost achievement. Thus, hypothesis 7-1 cannot be accepted. Therefore, it may be proposed that in target costing adopting top-down approach in each phase of accounting process will not provide better performance. In certain stage, a stricter policy followed by the management is indispensable, while in other situation, a comparatively loose policy should be followed by the management for getting higher cost-reduction performance.

The effects behavioral factors in target cost determination and allocation on target cost achievement can be presented in Figure 7-1.

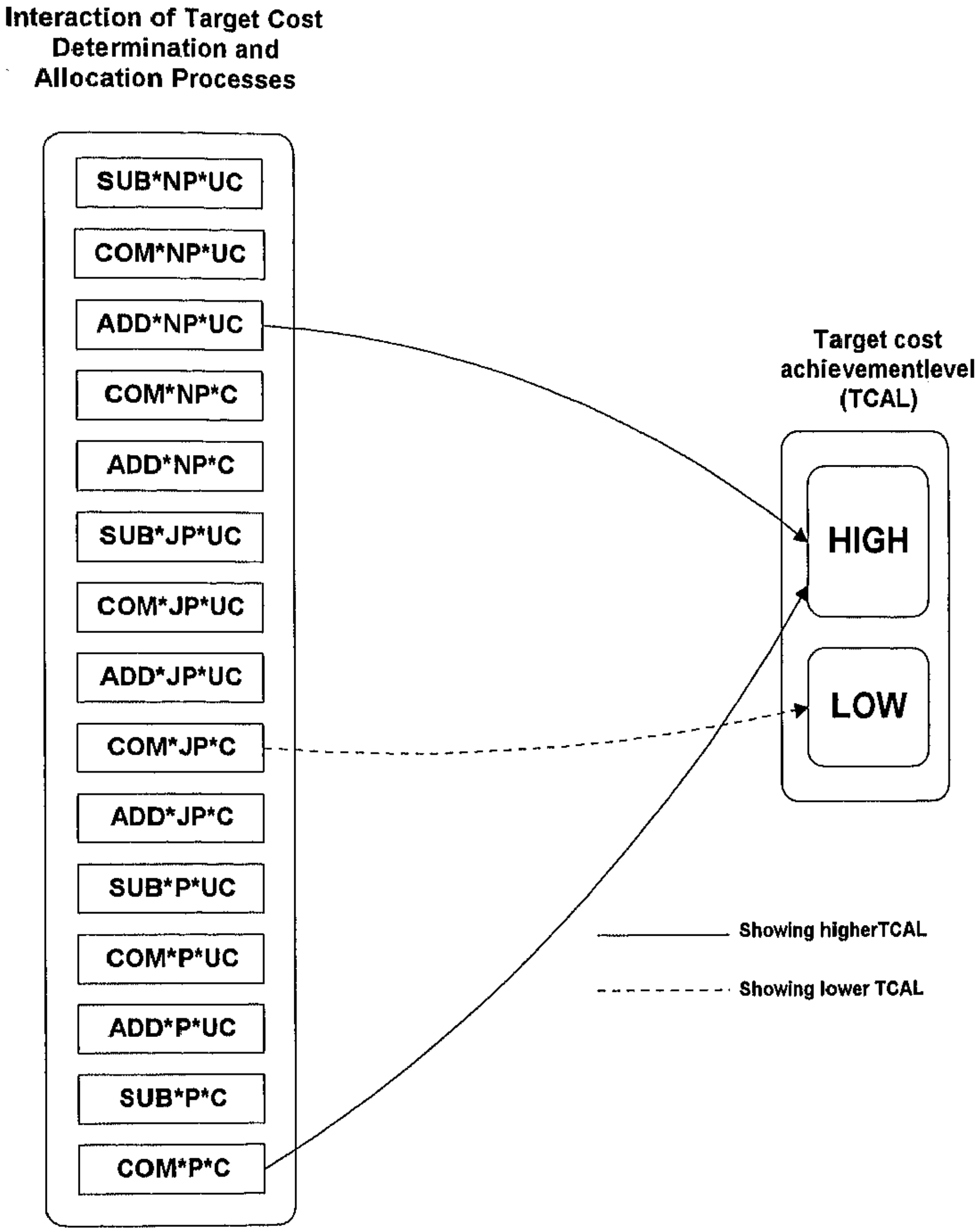

Figure 7-1. Effects behavioral factors in target cost determination and allocation on target cost achievement

7.3. Conclusion

The results of this study suggest that the policy that is suitable for getting higher cost-reduction performance in the target cost determination process may not be desirable for the same in target cost allocation process. Measuring the effects of overall behavioral factors depict that, the cost-reduction performance would better be improved when the use of a lenient method in computing target cost is mingled with the adoption of top-down approach in its allocation than when a stricter method of target cost calculation is used along with bottom-up approach in the allocation process. Thus, neither a pure top-down (or tight) nor a pure bottom-up (loose) approach in the accounting process will render the achievement of target cost at a higher level.

End Notes

1. See also Noboru and Monden (1983), Monden (1986, 1995), Monden and Hamada (1991), Tanaka (1992, 1993, 1994), Kato, Boer and Chow (1995), Cooper (1995, 1996), Fisher (1995), Lee and Monden (1996), Yoshikawa, Innes and Mitchell (1990), Carr and Julia (1995), Dutton and Ferguson (1996), Sakurai (1991), Tanaka (1990), Tani and Kato (1994), Yoshikawa (1990), Tani et al. (1994), Tani (1995).