Studies on Behavioral Issues in Target Cost Determination and Allocation Processes

Submitted in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

in

Management Science and Engineering

by

Mahmuda Akter

Doctoral Program in Policy and Planning Sciences

University of Tsukuba, Japan

January, 2000
Dedicated to my parents
Acknowledgments

I would like to express my sincere gratitude to my academic adviser, Professor Yasuhiro Monden, for his untiring efforts without which my study in Japan would not have been possible up to now. He is guiding, supporting and encouraging me in my study for which I would like to thank him from the core of my heart.

I am indebted to Professor Yuichiro Kanazawa, for never failing to attend to my statistical problems and for his enthusiastic and untiring guidance and support throughout the process of research. I am very thankful to Professor Homare Endo, Dr. Mohammad Hobibullah, Professor Mahbub Ahmed, and Professor A. B. M. Khalid for their support in number of ways. I gratefully acknowledge with thanks Professor Anjan Mukherji and Mrs. Shormila Mukherji for their tenderness, encouragement and useful help. I am grateful to Dr. Henry Osadolor Aigbedo for his insight in improving the earlier draft of one of my papers and for his help on number of occasions. I am very thankful to the following professors for taking out time from their busy schedules to attend my Ph. D seminar and for their useful suggestions and comments that helped greatly in the improvement of its presentation: Professor Kenjiro Omura, Professor Yasuo Hoshino, Professor Seizo Ikuta, Professor Yuichiro Kanazawa, Professor Kazuhisa Takemura, Professor Hitoshi Takehara and Professor Hideo Suzuki. I gratefully acknowledge the two anonymous reviewers of the thesis for their comments.

I am particularly indebted to Dr. Malik Ashiq Rabbani, Mr. Anit Nath Mukherjee, Ms. Paula Bastos, Ms. Ana Barreto, Mr. Bernard Dupraz, Mrs. Akiko Dupraz, Mr. and Mrs. Kojima, Mr. Susumu Yamaguchi, Mrs. Noriko Yamaguchi, Ms. A. R. Indra Fernando, Mr. Md. Akbar Hossain, Mr. Aminul Karim Chowdhury, and Mr. A. B. M. Rahmatullah, for their friendship and enormous supports. I also wish to
acknowledge Ms. Nobuko Miyamoto, Mr. Walid Zeramdini, Ms. Hoshi Noriko, Mr. Chao Hsiung Lee, and other students under Professor Monden's supervision for their support and friendship.

Financial support by the Japanese Ministry of Education made it possible for me to devote my time fully to my studies. Thanks also go to all members of my family for their untiring moral support, especially to my Father, late Mohammad Faiz Bakhsha Patwary who passed away on September 16, 1997.

Finally, but not least important, I express my heart-felt thanks to my husband, Mahfuz, for providing me unfailing support which was invaluable to complete this study.
Abstract

Target costing is widely known as the system to support the cost-reduction process for reducing the price of the product at the new product development, which has been adopted not only in the automobile and other assembly manufacturing industries but also in the process-type industries. For its successful implementation, the target cost must be determined in a rational manner. If it is not determined rationally, the designing activities cannot be controlled, and targets will be ineffective and the discipline of the whole target costing system would be lost. An effective way to determine the target cost rationally is to link cost reduction activity to the behavioral base of target costing that deals with the behaviors needed to succeed at target costing, including issues of employee motivation, morale, and performance measurement and evaluation. These issues are addressed in this thesis. We conducted two laboratory experiments to assume a real-world situation of a target cost-setting process where to determine the target cost in an environment of product design and development a department was created. The research questions dealt in the laboratory experiment were also investigated by data collected through questionnaire survey to see whether the impact of independent variable upon the dependent variable also exist in the uncontrolled real-world situation.

Chapter 3 deals with the motivational impacts of target-information type and target attainability on the cost-reduction performance of product designers. Alternative target-information types are ideal, total and incremental targets. The attainability of target has two levels, tight and loose. The goal-setting theory in psychology is used for hypotheses formulation. To test the hypotheses we conducted a laboratory experiment on ninety-six subjects. ANOVA results show that no significant effect of target information type and tightness is found when the goal-
acceptance proposition is not considered. The cost-reduction performance of the high-
acceptance group improves with the level of tightness. Further, when incremental
targets are assigned to the low-acceptance group, setting loose-targets improves their
actual performance ratio more than tight targets. When ideal targets are provided
along with total targets to the low-acceptance group, setting tight total-targets produce
better performance.

Chapter 4 empirically examines how the tightness of target profit and target
cost methods influences the target cost achievement. The findings are based on a
mail-out survey of 146 machinery, electrical and electronics, transportation
equipment, and precision machinery companies listed on the Tokyo stock exchange
Part I. The effects of these variables on target cost achievement are evaluated through
a variation of logistic regression of ordinal categorical variables called proportional-
odds model. The findings of the study confirm our hypothesis that tighter the target
profit and cost methods employed better the target cost achievement. The uses of
‘tight’ (subtractive) and ‘medium-tight’ (combination) method for calculating target
cost, render higher target cost achievement level in case of wider utilization of tight
target profit ($TP1_t$). Similarly, the higher use of ‘medium-tight’ target profit method
($TP2_t$) along with ‘tight’ target cost method improves the target cost achievement.
Irrespective of the target profit method employed, adding-up method, the loose
method for determining target cost does not improve the target cost achievement
level.

Chapter 5 deals with the motivational impacts of alternative participation and
performance evaluation methods on the cost-reduction performance of the product
designers in product development process. Alternative participation methods for
establishing the target cost consist of the participative and the nonparticipative
approaches. In addition, the alternative performance evaluation methods include the evaluation based on only the controllable item measure and on both controllable and uncontrollable item measures. To test the hypotheses that are proposed with respect to the above impacts, we conducted a laboratory experiment on 120 subjects. When participation and performance evaluation factors are considered separately, the cost-reduction performance of product designers improves if they can participate in target-setting process and are evaluated by their controllable information. In investigating their joint influence, it is found that the combinations of participative method and controllable item and nonparticipative and uncontrollable item information have improved cost-reduction performance. Among all the independent variables, controllable item information is the most dominant variable as it has the strongest effect on cost reduction.

Chapter 6 reports the results of an empirical study designed to assess the effects of behavioral factors in target cost allocation on target cost achievement level. The findings are based on data collected through questionnaire survey. Pair-wise relationships between the variables as well as their combinatorial effects on target cost achievement are estimated through a variation of logistic regression of ordinal categorical variables called proportional-odds model. The single effects of the variables show that target cost can be achieved at higher level when product designers participate in the target cost allocation process. However, the effect of performance evaluation measures was not found statistically significant. When participation variable is categorized into two levels, we observed that the results of this field study are generally consistent with those from a previous laboratory experiment, which showed that the product designers evaluated by controllable information perform better under the conditions of high participation. Moreover, the designers evaluated
by uncontrollable information perform better under the conditions of low participation. We observed the similar trend when participation was categorized into three levels, in addition, the effect of joint participation was found much closer to the nonparticipation.

In chapter 7, we intend to see the combination effects of behavioral factors in target cost determination and allocation on the target cost achievement by using the survey data. The expected model portrays that, when adding-up method is used in determining the target cost of a product, 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 uncontrollable information \((ADD\times NP\times UC)\). Again, when combination method is used in calculating target cost of a product, in that case also target cost achievement level improves when only the designers participate in target cost allocation process and their performance is evaluated by controllable information \((COM\times P\times C)\). 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 manager and performance is evaluated by controllable information \((COM\times JP\times C)\). 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 \(COM\times JP\times C\).

There are hardly any previous studies in the target costing literature dealing with the research questions that are being investigated by this research. The research problems are of immense importance as these facilitate the determination of a rational target cost on which the success of a target costing system depends.