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TARGET COSTING BASED ON THEORY OF TECHNICAL SYSTEMS

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Abstract: *An enhanced Target Costing methodology for reducing product costs is introduced in this paper. At first the methodology is analysed and applied on the concrete product, the cover for machine tool, and some insufficencies of the current procedure are pointed out. Proposals how they can be eliminated, or at least minimized, by using Theory of Technical Systems (TTS), especially by using TTS based systematic Product Design Specification and Evaluation are introduced.*
Key words: *Product design specification, evaluation, target costs, constructional unit, judged quality, value*

1. INTRODUCTION

Target Costing is a known means for control of costs in product development process. This metodology, invented in Japan in 1960s, is based on structuring the manufacturing costs to product constructional units according to customer preferences. If it is possible to recognize so called „product functions" that are required and which are customers willing to pay for, then we can recognize potential to make savings. Determination of these factors is a joint task for marketing, product development, etc. The steps of Target Costing metodology according to [Hundal 1997], [Kleinova 2009] applied on a product depicted in Fig. 1 are outlined in the following chapter.

2. USUAL PROCEDURE

The traditional steps of the Target Costing methodology are as follows:

1) Structuring of an analysed technical product/system (TS) into individual constructional units (i.e. groups or components) and allocation to them relevant ratio of manufacturing costs by percentage (Tab. 1) is performed at first.

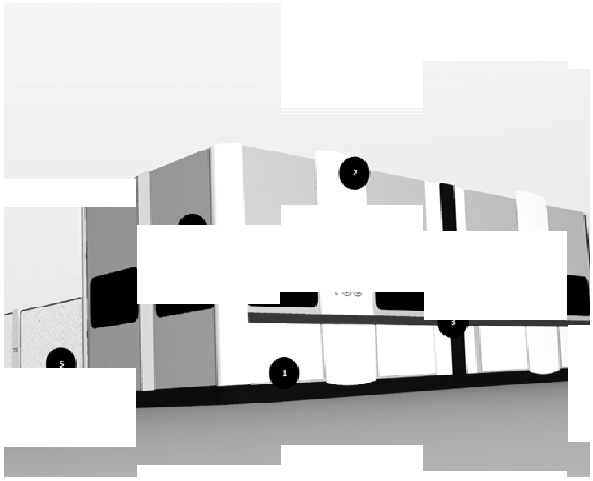

Fig. 1.Cover for machine tools (1-frame, 2-sensors, 3- door, 4 - modular covers, 5 - safety equipment)

2)The most important attributes of the designed product required by customers, called Customer Functions, are then listed, and their respective weighted shares by percentage in the Total Product Usefulness are then established (Tab.2).

3) Determination of the shares by percentage in which the respective Constructional Units contribute to fulfill required „Customer Functions" is performed now (Tab. 3).

4) The weighted shares of the respective Constructional Units in the corresponding share in their fullfillment of the respective Customer Functions (Tab. 4) is now calculated by multiplication of the respective property „weightings" (Tab. 2) and their corresponding „unweighted" shares (Tab 3.).

Constructional Units (CU)	Share in Manuf.Costs (%C)
CU1 frame	10%
CU2 sensors	20%
CU3 door	40%
CU4 modular covers	20%
CU5 safety equipment	10%

Tab. 1.Constructional Units and allocation of ratio of their Manufacturing Costs by percentage respectively

Customer Functions (Fi)	Share in Product Usefulness (%U)
F1 reliability	25%
F2 safety	25%
F3 adjustability	20%
F4 capability	20%
F5 design	10%

Tab. 2. Shares of the required "Customer Functions" in the Total Usefulness of the analysed product by percentage

CU	F1	F2	F3	F4	F5
CU1	20%	15%	15%	30%	40%
CU2	20%	35%	15%	25%	20%
CU3	10%	25%	35%	25%	20%
CU4	15%	10%	20%	20%	-
CU5	35%	15%	15%	-	20%
Σ	100%	100%	100%	100%	100%

Tab. 3. Shares of the respective Constructional Units in the fulfilment of the "Customer Functions"

CU	F1	F2	F3	F4	F5	$\%\Sigma F_i$
CU1	5.00%	3.75%	3.00%	6.00%	4.00%	21.75%
CU2	5.00%	8.75%	3.00%	5.00%	2.00%	23.75%
CU3	2.50%	6.25%	7.00%	5.00%	2.00%	22.75%
CU4	3.75%	2.50%	4.00%	4.00%	-	14.25%
CU5	8.75%	3.75%	3.00%	-	2.00%	17.50%
Σ	25%	25%	20%	20%	10%	100%

Tab. 4.Weighted shares of the respective Constructional Units in the fulfilment of the Customer Functions

CU	Share in Custom.Usefulness (%ΣFi)	Share in Manuf.Costs (%C)	Target Costs Index (TCI)
CU1	21.75%	10%	2.18
CU2	23.75%	20%	1.19
CU3	22.75%	40%	0.57
CU4	14.25%	20%	0.73
CU5	17.50%	10%	1.75
Σ	100%	100%	-

Tab. 5. Calculations of the Target Costs Indexes

CU	Real Costs (RC) [€]	Usefulness (%ΣFi)	Targ.Costs (TC) [€]	Costs diff. (ΔC) [€]
CU1	1000	21.75%	1957.5	957.50
CU2	2000	23.75%	2137.5	137.50
CU3	4000	22.75%	2047.5	-1952.50
CU4	2000	14.25%	1282.5	-717.50
CU5	1000	17.50%	1575.0	575.00
Σ	10000	100%	9000.0	-1000

Tab. 6. Comparison of Real Costs and Target Costs

5) Target Costs Indexes are determined (Tab. 5), and Real Costs of the respective Constructional Units are compared with Target Costs derived from customer requirements (Tab. 6). Those Constructional Units that have Target Cost Index less then one are too expensive from the customer viewpoint, and their costs to be reduced in another step.

3. ENHANCED PROCEDURE

The outlined methodology can be enhanced by several simple modifications based on the above mentioned TTS. (1) We propose to replace the term Customer Function by the term Product Property covering both real functions performed by a product as well as all other required product attributes related not only to the product customers. Any product has to satisfy not only assigned and other stated requirements, but also a number of other obligatory and generally implied requirements [CSN EN ISO 9000]. (2) Similarly we propose to replace too narrow term Manufacturing Cost by a more appropriate term Expended Cost. (3) Next due to both theretical and practical impossibility to separate the shares of the respective CUs in the fulfilment of the Product Properties (Tab. 3), we propose to replace the coresponding and related steps by determination of Values of the respective CUs as described in the following partially modified steps. (4) Finally we propose to add CUn+1 covering holistic Product Properties and corresponding Expended Costs which cannot be covered by single CUs:

1) Structuring of an analysed technical product/system (TS) into individual constructional units and allocation to them relevant ratio of exerted costs by percentage (Tab. 7)

Constructional Units (CU)	Shares in Expended Costs (C)
CU1	$\%C_1$
etc.	etc.

Tab. 7. Shares of the respective CUs in Product Expended Costs (corresponding to Tab. 1)

2) Values V for each CU defined as follows are calculated now:

$$V_i = \frac{Q_{Ji}}{C_i} \quad (1)$$

Q_J – Judged Quality evaluated for the specified weighted requirements, e.g. with use of the systematic Product Design Specification and Evaluation based on TTS [Hosnedl 2010]
C – Expended Costs

CU	Q_J	C	V
CU1	Q_{J1}	C_1	V_1
etc.	etc.	etc.	etc.

Tab. 8. Values of the respective CUi (corresp. to Tabs. 2 - 4)

CU	Share of Value Usefulness ($\%V_{Prod}$)	Share in Exp. Costs (%C)	Target Costs Index (TCI)
CU1	$\%V_1$	$\%C_1$	TCI_1
etc.	etc.	etc.	etc.
$\sum_{1}^{n+1}$	100%	100%	---

Tab. 9. Calculations of the TCIs (comp.to Tab.5)

CU	Real Costs (RC) [€]	Usefulness ($\%V_{Prod}$)	Targ.Costs (TC)[€]	Costs diff. (ΔC) [€]
CU1	RC_1	$\%V_1$	TC_1	ΔC_1
etc.	etc.	etc.	etc.	etc.
$\sum_{1}^{n+1}$	$\sum_{1}^{n+1} RC_i$	---	$\sum_{1}^{n+1} TC_i$	$\sum_{1}^{n+1} \Delta C_i$

Tab. 10. Comparison of Real and Target Costs (comp.to Tab.6)

3) The weighted shares of the respective Constructional Units i of their Values V_i to the total Product Value V_{Prod} are then calculated. For example the share of the Value Usefulness of CU1 makes $\%V_1 = 100*V_1/V_{Prod}$ (Tab. 9 left). The remaining steps of the enhanced procedure are analogous to the current procedure incl. Tabs. 9 and 10.

4. CONCLUSIONS

A described procedure of Target Costing based on TTS (Eder 2007) was developed and verified. We plan to further improve this procedure regarding enhanced knowledge support of prediction of product properties especially cost and more transparent depiction of results in a form of diagrams.

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