Statements on Management Accounting

STRATEGIC COST MANAGEMENT

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TITLE

Tools and Techniques for Implementing Target Costing

CREDITS

This statement was approved for issuance as a Statement on Management Accounting by the Management Accounting Committee (MAC) of the Institute of Management Accountants (IMA®). IMA appreciates the collaborative efforts of the Cost Management Competency Center at Arthur Andersen LLP and the work of Dr. C.J. McNair, CMA, of Babson College, who drafted the manuscript.

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Statements on Management Accounting

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Tools and Techniques for Implementing Target Costing

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I. RATIONALE

Today, competition among companies in many industries is turning global. The companies competing in this global market are now in a highly competitive race in terms of quality levels, and to get ahead each company must come up with technological innovations. Because technological innovation has become a key part of this race, competing companies are also faced with severe “cost competition” as they seek to provide customers with desired quality at an affordable cost.

Thus, for companies to survive, they must now set prices that are competitive in today’s market while also setting costs that allow a sufficient profit margin. As prices are increasingly determined by market competition, costs must be carefully managed to create profits.

New forms of management tools and techniques are emerging to help managers take on this difficult task. Primary among these new approaches is target costing. Driven by the voice of the customer to better understand what product and service attributes are needed, target costing becomes the means to long-term growth attained by doing what the customer wants, better and faster than the competition.

An organization that implements and masters target costing will continuously be ahead of the competition as it fine-tunes its integral efforts to those most likely to be rewarded by the market. It is key to proactively building a competitive advantage.

II. SCOPE

This Statement on Management Accounting (SMA) is addressed to financial professionals and others who may lead or participate in efforts to implement target costing in their organizations. It supplements the Institute of Management Accountants’ *Implementing Target Costing*, published in 1998, which describes the target costing process, as well as *Target Costing—The Next Frontier in Strategic Cost Management*, published by the Consortium for Advanced Manufacturing-International (CAM-I) in 1997.

The focus of this publication is on core tools and techniques that improve the effectiveness of target costing. The focus is on core tools because it is beyond the scope of this guideline to discuss all the tools and techniques that support the implementation of target costing.

This SMA assumes the reader is already familiar with basic target costing concepts. It is intended for organizations that have already decided to implement target costing. The tools and techniques discussed apply to:

- all levels of an enterprise;
- all functions of an enterprise;
- enterprises in all business sectors; and
- small and large organizations.

This guideline will be useful to those who may lead or participate in efforts to implement target costing. It will help them to:

- develop a framework for planning and managing the implementation of target costing;
- learn about the various core tools and techniques to improve the effectiveness of target costing; and
- understand the roles and responsibilities of financial professionals in the target costing process.

III. THE ROLE OF MANAGEMENT ACCOUNTING

Target costing is an integrative approach to product design and development that requires the active and ongoing participation of individuals from across the organization. It builds from a sound understanding of current costs, trade-offs among cost, quality, and functionality, and the changing requirements of customers. It serves to coordinate design team efforts, communicate needs to all involved parties, and clearly define the overall objectives and challenges facing the organization during product launch and maintenance.

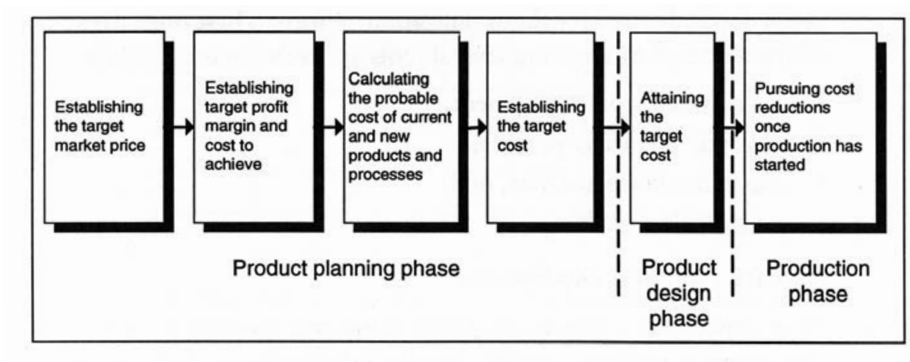
Within this customer-driven, product-focused environment, financial professionals provide the technical expertise required to ensure that the defined costs are reliable, that the trade-offs being made meet basic functionality and quality requirements, and that economic analysis is used as the basis for key decisions. The role of the financial professional in implementing target costing includes the following efforts and objectives:

- ensuring that the target costing initiatives are based on strategic criteria and are designed to support company objectives;
- providing economic expertise where needed to prioritize and assess specific product or service attributes;
- creating a system of financial and performance measurements that support ongoing monitoring of pre- and post-launch activities against objectives set during the target costing process;
- providing historical costs and estimated future costs for specific product or service attributes;
- identifying gaps in current versus required costs and functionality, and developing economic and performance-based assessments of the impact of these gaps;
- ensuring that internal and external information is validated and analyzed prior to use within the target costing process;
- developing ongoing product cost systems that will tie in with continuous improvement goals for the product launch;
- supporting development of target price and profit projections, including assuring that the numbers are objective, reliable, and accurate; and
- serving on the product design team to provide expertise to support pre- and post-launch management of the product within target-cost-defined parameters.

In target costing, the financial professional serves as a team member with unique economic expertise that can help to develop preliminary cost estimates, validate assumptions using current and historical cost databases, and analyze the impact of various alternatives on the product/service costs. New forms of cost information are used to accomplish many of these tasks:

- *Life-cycle costing* accumulates and analyzes product costs from birth to death of a product using the life stages of a product as the structuring cost object.
- *Value-chain costing* integrates cost information across traditional organizational boundaries to include suppliers, dealers, and customers. It focuses attention on the cost and contribution required from each value-chain member toward the achievement of target cost and strategic objectives.
- *Feature/function costing* requires the decomposition and assignment of cost reduction targets to product components based on their relationship to customer requirements and the relative importance of these needs.
- *Design driver costing* focuses attention on the impact of design on life-cycle and value-chain costs, as well as the impact of changes in prod-

EXHIBIT 1. TARGET COSTING PROCESS STEPS



uct attributes on the final cost of the product.

- *Operations costing* provides cost information on a particular manufacturing operation.
- *Activity-based costing* identifies the drivers of indirect manufacturing, marketing, and support costs. It focuses attention on how product designs lead to the consumption of various activities, which in turn creates cost.

Tightly linked to the other cost management tools, target costing is an important means by which finance professionals can help their organization *avoid* future costs. This proactive position provides for optimal impact as well as creates a solid platform for the inclusion of financial professionals on teams charged with developing, managing, and measuring product or service performance.

IV. TARGET COSTING PROCESS STEPS

The target costing process has six key steps. These steps, along with the pre-project preparation, represent a standard work plan, a framework for training, and implementation. While each target costing initiative is unique, an organization's actual implementation will likely include most or all six steps outlined in Exhibit 1, although not necessarily in the order presented. Keeping this in mind, the six basic steps involved in implementing target costing are:

- establishing the target market price;
- establishing the target profit margin and cost to achieve;
- calculating the probable cost of current and new products and processes;
- establishing the target cost;
- attaining the target cost; and
- pursuing cost reductions once production has started.

While organizations can modify these core activities to meet a particular situation, they are recommended as a guide for structuring the implementation of target costing initiatives.

V. IMPLEMENTATION TOOLS AND TECHNIQUES

Establishing the Target Market Price

Cost considerations play a minor role, at best, in determining the target price under target costing. Instead, target costing uses product or service features[1] to identify a target market price. Driven by the market, and by expected relationships between supply, demand, and price sensitivity for the product, the determination of the target market price incorporates several objectives, including:

- identifying market and customer wants and needs;
- determining how much customers are willing to pay for alternative features;
- transforming the desires of the customer/user into the language required to implement a product; and
- assessing what the competitive offerings are.

At the heart of the target-price-setting process is the concept of perceived value. Customers can be expected to pay more for a new product than its predecessor, but only if its perceived value is greater. Understanding what attributes lead to specific value, and therefore price, is an essential part of setting a market price that yields optimal return for the organization's efforts. These objectives can be achieved by applying several tools and techniques, including:

- quality function deployment;
- analytic hierarchy process;
- customer voice analysis; and
- relationship matrix.

Quality Function Deployment

Since customers often make fairly subjective statements when evaluating a product, quality function deployment (QFD) is a methodology useful for translating customer preferences systematically into a number of objective design requirements. These requirements can then be communicated to the design and production teams to ensure that everyone is working toward the same objectives and outcomes.

QFD brings together the relationships between competitive offerings, customer requirements, and design parameters, through a set of matrices. These matrices are used iteratively throughout the target costing process. In the product planning phase, these matrices help determine exactly what the customer desires, how well competitors are satisfying the customer, and where unfulfilled niches exist in the marketplace. A QFD matrix developed for the product planning phase of a fax machine is shown in Exhibit 2.

This matrix summarizes information about product functions and their associated customer rankings. It also shows the correlation between competitor design parameters and customer requirements. Additionally, information is provided about how customers evaluate competitor offerings on these same features. The QFD matrix shows that the customer requirement of receive/send speed has a high correlation with the design of modem speed and memory. Similarly, printing speed is correlated to the print engine design parameters.

QFD is used successfully by both product- and service-based organizations. For example, it has been used in the manufacture of automobiles, electronics, home appliances, clothing, integrated circuits, synthetic rubber, construction equipment, and agricultural engines. QFD has also been used to design retail outlets, schools, and plant layouts.

Exhibit 3 provides a summary of the critical processes, tasks, responsibilities, and stages involved in QFD. *Columns* represent the organiza-

1 A feature is a physical or aesthetic attribute of the product desired by the customer. Decomposing a target cost by product features allows organizations to view these costs from a customer's perspective.

EXHIBIT 2. QFD MATRIX IN PRODUCT PLANNING OF A FAX MACHINE

Design Parameters / Customer Requirements	Display Panel	Print Engine	Modem Speed	Paper Tray	Memory Board	Interface Card	Competitor Ranking 1	2	3	4	5	Customer Ranking
Ease of setup	◆					●		□	■			5
Memory			◆		●	◆		■			□	3
Receive/send speed			◆		◆		■			□		4
Printing speed		◆				○	■				□	4
Copy settings	●				◆				■	□		3
Handset	◆					○		■		□		2
Paper supply		●		◆			□			■		3
PC interface			○		●	◆			□	■		2

Correlation of design parameters and rankings

- ◆ = strong correlation
- ● = moderate correlation
- ○ = weak correlation

Comparative competitive rankings

- ■ = competitor ranking
- □ = our ranking

Source: Ansari, et al., 1996: 152.

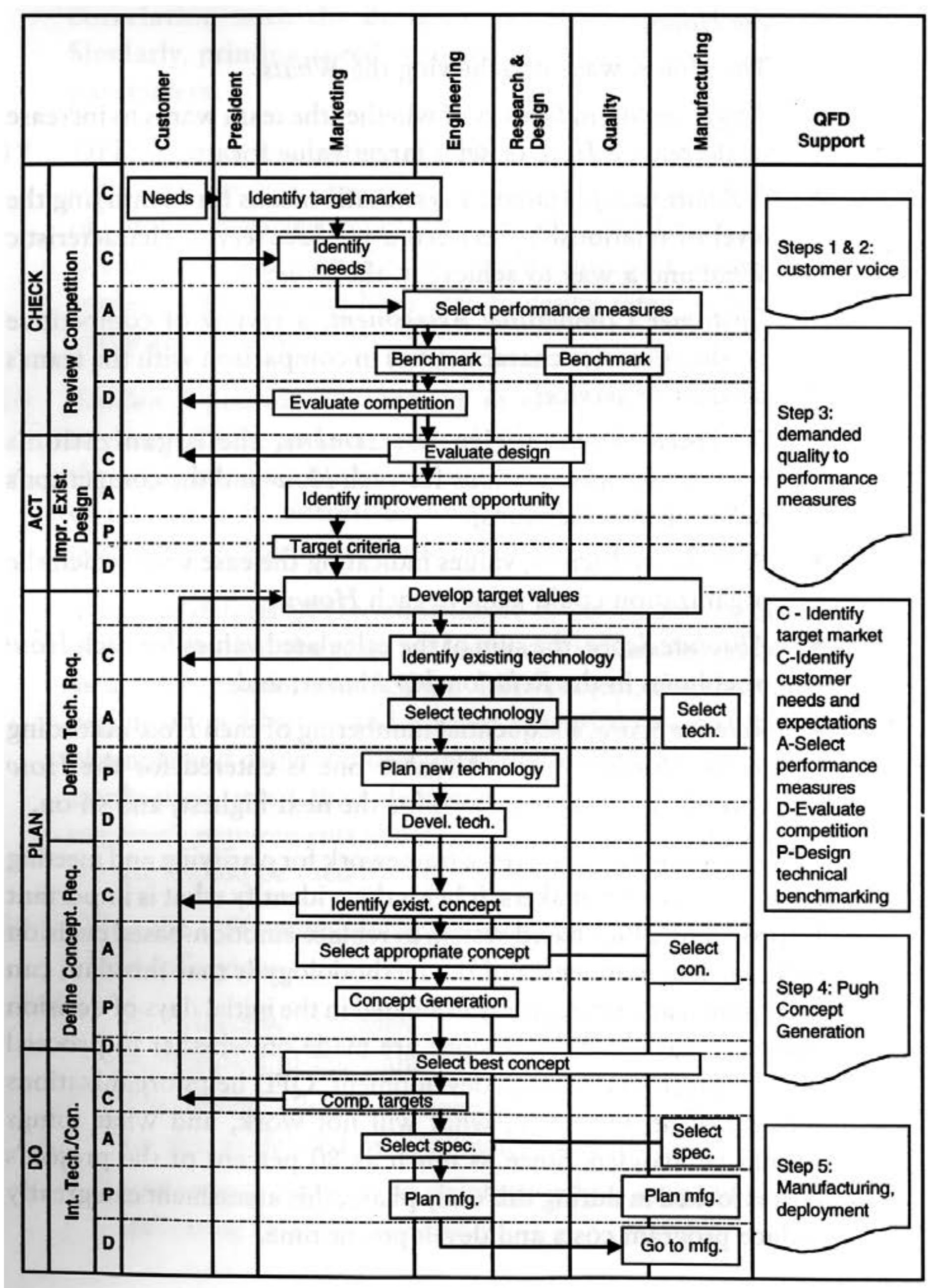
tion's functional units, while *rectangles* in the flowchart identify activities and required interdepartmental participation. *Arrows* indicate the flow of documents or decisions.

The chart defines QFD team structure as well as the core documents and information the team will require to complete tasks. Serving as a road map for managing a QFD project, the chart helps an organization identify and answer several core questions in the planning and design process, including which customers are being emphasized, what their demands are, how much one customer segment's requirements should drive the design process, and what criteria should be used to make these decisions.

Using the QFD methodology, a model is developed that consists of the following:

- An *Objective Statement*, a description of the goal, problem, or objective of the team effort;
- The *Whats*, a list of characteristics of a product, process, or service, as defined by customers;
- *Importance Ratings*, or weighted values assigned the *Whats*, indicating relative importance;
- A *Correlation Matrix*, which shows the relationship between the *Hows*;
- The *Hows*, ways of achieving the *Whats*;
- *Target Goals*, indicators of whether the team wants to increase or decrease a *How* or set a target value for it;
- A *Relationship Matrix*, a systematic means for

EXHIBIT 3. PRODUCT DESIGN PROCESS CHART



Source: Terninko, 1997: 27.

identifying the level of relationship between a product/service characteristic *What* and a way to achieve it, the *How*;
- *Customer Competitive Assessment*, a review of competitive products/service characteristics in comparison with the team's product or service;
- *Technical Competitive Assessment*, the organization's engineering specifications for each *How* and the competitor's technical specifications;
- *Probability Factors*, values indicating the ease with which the organization could achieve each *How*;
- *Absolute Score*, the sum of the calculated values for each *How* or column in the *Relationship Matrix*; and
- *Relative Score*, a sequential numbering of each *How* according to its *Absolute Score*. Number one is entered for the *How* with the highest score, two for the next highest, and so on.

QFD methodology provides a framework for clarifying and meeting goals. For decision makers, it helps them identify what is important by providing a fact-based system to replace emotion-based decision making. The uniqueness of the methodology is that this data can be captured and strategically evaluated in the initial days of decision making. This is when decisions are made on whether to proceed with production or service development. QFD helps organizations identify what will work, what will not work, and what things should be avoided. Since as much as 80 percent of the project's cost is locked in during this early phase, this assessment can greatly reduce program costs and development time.

For example, Toyota has used QFD since 1977. The results have been impressive. Between 1977 and 1994, Toyota Autobody introduced four new van-type vehicles. Using 1977 as the base year, Toyota reported a 20 percent reduction in start-up costs on the launch of the new van in October 1979, a 38 percent reduction in November 1982, and a cumulative 61 percent reduction in April 1984. During this period, the product development cycle (time to market) was reduced by one-third with a corresponding improvement in quality due to a reduction in the number of engineering changes.

Analytic Hierarchy Process

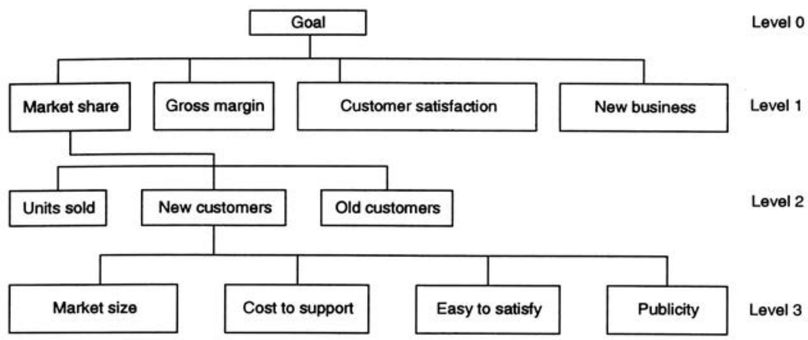
The analytic hierarchy process (AHP) is a multi-criteria, decision-making technique that combines qualitative and quantitative factors in the overall evaluation of alternatives. AHP is an excellent tool for considering different characteristic combinations of customer segments. By examining these characteristics, an organization can uncover new market segments and determine the relative importance of each.

The AHP methodology comprises four steps:

- building a decision hierarchy by breaking the general problem into individual criteria;
- gathering relational data for decision criteria and encoding them using the AHP relational scale;
- estimating the relative priorities (weights) of decision criteria and alternatives; and
- performing a composition of priorities for the criteria that gives the rank of alternatives relative to the top-most objective.

AHP begins with subject matter experts building a hierarchical representation of the decision problem. At the top of this hierarchy is the overall objective, and the decision alternatives are at the bottom. Between the top and bottom levels are the relevant attributes of the decision problem that provide significant input to the decision process. The hierarchy can be quite detailed, though most applications need no more than

EXHIBIT 4. HIERARCHY OF DEFINED CRITERIA



three levels, as shown in Exhibit 4.

Once the levels and elements have been determined, the subject matter experts assign relative weights to each defined characteristic using a consensus method based on the following nine-point scale of importance.

1. Equal importance—the row and column have the same impact upon the higher order need.
2. Between 1 and 3.
3. Moderate importance—experience and judgment slightly favor the row over the column.
4. Between 3 and 5.
5. Strong importance—experience and judgment strongly favor the row over the column.
6. Between 5 and 7.
7. Very strong importance—the row is strongly favored and its dominance is demonstrated in practice.
8. Between 7 and 9.
9. Extreme importance—the evidence favoring the row is of the highest possible order of affirmation.

Using a series of calculations, a resulting two-way comparison table is normalized (the fraction of the characteristic as a percentage of the total for each column). The average of the normalized scores in the rows ranks the importance of the criteria. As shown in Exhibit 5, market size, cost to support, ease to satisfy, and publicity are 0.604, 0.119, 0.066, and 0.211, respectively. Market size is nearly three times more important than publicity.

Once key criteria are identified, potential customers can be ranked, as illustrated in Exhibit 6. The left two columns show the criteria and their calculated weights. The importance of each customer for each criterion is recorded in the next three columns. The weighted importance of each customer for each criterion is the product of the importance of the criterion and the importance of each customer for that criterion. The column totals are the weighted importance for each of the customers. The exhibit illustrates that the market size criterion is the most important and the consultant is the most desirable customer for this criterion. By helping organizations determine the relative importance of customer segments, AHP allows firms to better determine whom to talk to and how much weight to assign to their opinions.

EXHIBIT 5. DETERMINING THE PRIORITY OF CRITERIA

	Market Size	Cost to Support	Easy to Satisfy	Publicity	Total	Normalized Average
Market size	0.608	0.588	0.600	0.621	2.417	0.604
Cost to support	0.122	0.118	0.133	0.103	0.476	0.119
Easy to satisfy	0.067	0.059	0.067	0.069	0.262	0.066
Publicity	0.203	0.235	0.200	0.207	0.845	0.211
Total	1.000	1.000	1.000	1.000	4.000	1.000

Source: Terninko, 1997: 41.

Customer Voice Analysis

Customer voice analysis helps an organization to better understand customers' expectations, voiced desires, and as yet unperceived needs. These qualities, or attributes, become the *"whats"* of QFD—the individual characteristics of the product or service that drive customer satisfaction and value perceptions. If an inaccurate representation of customer desires is obtained, the QFD process will fine-tune the system to bring forth the wrong product or service. Therefore, obtaining the voice of the customer accurately is critical.

Customer voice analysis aids the development of an accurate list of product or service characteristics. As illustrated in Exhibit 7, customer voice analysis makes the list of *"whats"* more manageable, focuses the QFD process, and helps clarify meanings.

EXHIBIT 6. RANKING CUSTOMERS BY CRITERIA

Criteria	Priority	Teacher	Student	Consultant		Teacher	Student	Consultant
Market size	0.604	0.090	0.010	0.900		0.054	0.006	0.544
Cost to support	0.119	0.609	0.304	0.087		0.072	0.036	0.010
Easy to satisfy	0.066	0.267	0.667	0.067		0.017	0.044	0.004
Publicity	0.211	0.177	0.085	0.737		0.037	0.018	0.156
Total	1.000				Importance	0.180	0.104	0.714

Source: Terninko, 1997: 46.

EXHIBIT 7. VOICE OF CUSTOMER ANALYSIS TABLE

Info about person	Voice of customer	I = inferred E = explicit — CONTEXT OF APPLICATION						INTEGRATED DATA
		WHO	WHAT	WHERE	WHEN	WHY	HOW	
53 years	I can move it	E Instructor	E Work-shop	E Bldg. 255	For 5 days	Historic record		Stays up long time
Consultant	Works on my walls	Trainers	Lecture		Moved several times	E Limited work space		Sticks to coated walls
1.9m tall		I Tall		Easy to clean walls				Many moves possible
12345A		I Short						Stays on wall 48 hours
								Repositionable 4 times no change in properties

Source: Terninko, 1997: 54.

Once the primary list of *"whats"* is identified, attention turns to rating these qualities systematically. The resulting rankings play a key role in the QFD process, serving as weighting factors that are used downstream as multipliers for other analysis. It is critical that these rankings accurately reflect the customers' opinions. Exhibit 8 provides an illustration of the delivery qualities and their rankings for a large aerospace company.

Puritan-Bennett used customer voice analysis to develop a new spirometer. Information about customer demands came from physicians and nurses, supplemented by dealer and distributor input. During the design process, there were many lively discussions over which engineering solution a product feature should use. Customer voice analysis ensured that decisions always favored the customer. With a better design and reduced selling price, Puritan-Bennett took away the competitor's price edge and fulfilled a need that neither company had previously satisfied.

Relationship Matrix

A relationship matrix focuses attention on how the various customer requirements will be met using tangible and intangible product or process characteristics. Since many customer requirements are too unclear or poorly defined to provide guidance to the organization, they must be changed into the language of engineering. Performance or technical measurements evaluating the product's performance, based on demanded quality, are used for this purpose.

At least one quantifiable performance measure is typically identified for each demanded quality. For instance, if the demanded quality for an easel pad includes "stay on wall," two perfor-

EXHIBIT 8. RATINGS WITHIN A CUSTOMER VOICE ANALYSIS

What are the important elements of delivery?	Importance Rating (1 to 5)
On-time	3
Quantity	3
Received condition marking	2
Marking	1
No inspection	5
Paperwork	2
Cost and logistics	4

Source: L. Guinta and N. Praizler, 1993: 55.

mance measures can be envisioned: "time on walls" and "number of walls." Test procedures can then be developed to understand how long the product remains on a variety of different wall surfaces.

Defining how well performance measures that detail the technical features of the product will relate to the demanded qualities is key to transforming customer information into specific, objective design language. Without this transformation, product characteristics and potential "price-creating" value cannot be used to drive internal efforts.

A relationship matrix details the strength of each performance measure in terms of its predictive ability for each customer-demanded quality. For each row *demanded quality* and column *performance measure* intersection, the following question should be asked: If I know the value for performance measure X, how well will it predict the customer's satisfaction with the product's ability to satisfy demanded quality Y?

Four options are offered in the example illustrated in Exhibit 9: a strong relationship, a medium relationship, a weak relationship, and no relationship. The use of symbols for these weightings, similar to a *Consumer Reports* evaluation model, facilitates the identification of patterns of relationships in the matrix.

Important demanded qualities should have a performance measure with at least a medium relationship. Relatedly, more than 50 percent of the cells should represent no relationship, in keeping with the Pareto principle that most of the value will come from the critical few qualities and measures. If a row is blank in the relationship matrix, it means that the demanded quality will not influence the design. This could be a critical omission. A blank column, on the other hand, indicates that resources would be wasted meas-

EXHIBIT 9. RELATIONSHIP MATRIX

Demanded quality / Performance measurement	Write on with 12 pens		Sheet removal	Shear various surfaces	Peel energy		Blackboard stability	Packaging test
Smear-free	◎	■	■	■	■	■	■	■
Common markers	●	■	■	■	■	■	■	■
Freestanding	■	■	■	■	■	■	●	■
Stays on wall	■	■	◎	●	●	■	■	■
Easily removed from wall	■	■	●	■	■	■	■	■
Opens easily	■	■	■	■	■	■	■	●
Protects	■	■	■	■	■	■	■	○

Predictive quality of performance measure

● = strong
◎ = medium
○ = weak
■ = none

Source: Terninko, 1997: 90.

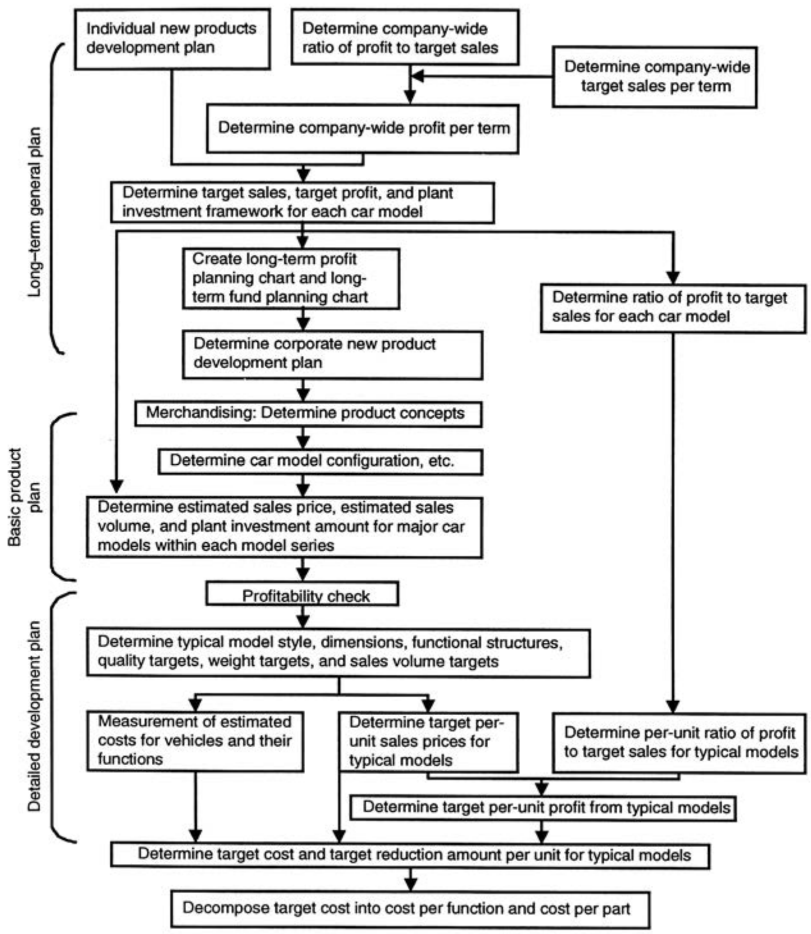
uring something that does not directly satisfy customer needs.

Narrowing the total list of potential measures to the critical few is important in order to focus design efforts and ensure that the needs of target customers are met. If multiple customer segments are to be addressed, the answers to these questions can be expected to differ by segment. The final choice of performance criteria will then need to be adjusted to accommodate the optimal level of satisfaction for the largest number of potential customers, incorporating the least amount of variety and complexity in the final product design.

Establishing the Target Profit Margin and Cost to Achieve

After the target price is set, the focus shifts to establishing the target profit margin and specification of the achievable cost objective. The overall goal is to ensure that the profitability and return on investment goals of the organization are met by the new product or service. Specific objectives of this phase include:

EXHIBIT 10. TARGET COSTING AND PROFIT MANAGEMENT PROCESS



Source: Monden, 1995: 50.

- determining return on sales objectives; and
- linking capital investment planning to profitability and the costs associated with product development and delivery.

The long-term general profit plan of the organization is the backdrop for the development of product-line-specific objectives. Specifically, target profit margins for product line models and the various strategic project plans that together make up the organization's basic management structure must be determined. Strategic project plans include new product development plans for each product or service, plant investment plans, and capital procurement plans. New product development plans are required for each year of the projected product life.

For example, at Nissan, the corporate development plan coordinates the new-product life-cycle plans for each vehicle model with long-term profit plans as part of the long-term profit planning process. Corporate new-product development plans are required for each year in the projected product life and cover all full model changes or minor changes that are planned for all target models. Thus, all production and sales plans for the company's vehicle models are coordinated under one plan that takes the perspective of the company's overall business strategy.

Coordinating all of an organization's production and sales plans ensures that these efforts reflect the strategic business perspective. Exhibit 10 details the role of the target profit management process within a target costing system of a major automobile manufacturer.

Target profit margins must be realistic and sufficient to offset the life-cycle costs of the product. A useful tool used for establishing target profit margins is a multi-year product/profit plan.

Multi-Year Product/Profit Plan

A multi-year product/profit plan integrates the various product plans, establishes baseline targets for each product over its useful life, and ensures that the timing of new product releases are staggered to prevent bunching, while supporting the effective use of company resources. The plan has a series of inputs and outputs, specifically:

Inputs:

- life-cycle plans for the proposed new products;
- current position of existing products on cash flow/product portfolio charts; and
- estimated values for the company's overall personnel capacity (for design, prototype development, and production setup work), manufacturing plant capacity, and new plant investment capacity (including capital procurement ability).

Outputs:

- multi-year general profit plan (exact timeframe varies by the nature of the planning cycle in a given industry);
- products/services to be developed and introduced over a certain time period;
- target profit for each product or product series;
- target return-on-sales ratio for each product;
- plant investment plan for each product;
- personnel plan; and
- overall new product introduction plan.

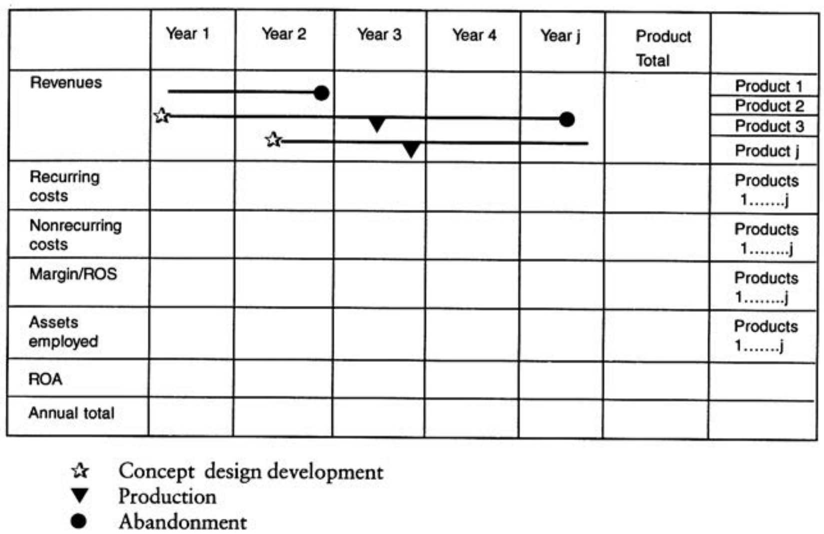
Exhibit 11 illustrates a multi-year product/profit plan structure. It is an annual product mix that shows aggregate target profits by year for each product. The sum of all products in a given year is the annual profit plan, while the total of annual profits by products is the product life-cycle profit. The product level profit includes all directly traceable recurring costs (such as materials) and conversion, and nonrecurring traceable costs (such as special tooling and dedicated machinery and other costs.)

Having laid out the parameters for an individual product within the context of the overall company strategic profit and product plans, attention can turn to calculating the probable cost of current and new products and processes.

Calculating the Probable Cost of Current and New Products and Processes

A key step in the product planning phase involves the examination of the organization's cost information in order to generate reliable cost estimates for the probable costs of current and new products and processes. These esti-

EXHIBIT 11. MULTI-YEAR PRODUCT/PROFIT PLAN



Source: Ansari, et al., 1996: 137.

mates may include production costs, R&D costs, physical distribution costs, and end-user costs. The underlying objectives during this phase include the following:

- determining what a new product's costs would be using existing product specifications and manufacturing processes;
- cost modeling; and
- analyzing internal costs.

Several core tools and techniques typically used in this effort include:

- process (operational) costing;
- component cost analysis; and
- cost tables.

Process (Operational) Costing

Process (operational) costing can be used to identify the cost drivers[2] for each step of the manufacturing process. Process costing makes no attempt to account for the costs of individual units or specific groups of products. Instead, all costs are accumulated by operations or processes. These costs are subsequently allocated from processes to products on a systematic basis.

Process costing directly considers the effects of customer requirements and differentiates the value-added costs likely to be incurred by serving one group of customers versus another. The technique includes the impact of requirements on process characteristics such as capacity. The result of this effort is an economic model of the organization that clearly defines customer needs

2 Process cost drivers are process parameters that affect the efficiency or effectiveness of a process. Process cost drivers affect process costs independently of any particular product mix.

EXHIBIT 12. RATE MASTER LIST FOR PROCESS COSTS

Direct department	Process	Unit of measure	Annual estimated rate for variable processing costs	Annual estimated rate for fixed processing costs	Estimated equipment depreciation cost	Unit for annual estimates	Estimated processing cost rates	
							Variable cost rate	Fixed cost rate
Team 1	Lathe	Labor-hours	56,683,000	37,580,000	16,793,000	20,000	47.2	17.3
Team 1	NC lathe	Labor-hours	57,533,000	35,980,000	15,853,000	20,000	47.9	16.8
Team 1	Vertical milling machine	Labor-hours	59,404,000	37,341,000	15,324,000	20,000	49.5	18.3
Team 1	Horizontal milling machine	Labor-hours	59,344,000	37,146,000	15,314,000	20,000	49.5	18.3
Team 1	NC vertical milling machine	Labor-hours	57,052,000	36,440,000	17,454,000	20,000	47.5	15.8
Team 1	NC horizontal milling machine	Labor-hours	59,288,000	39,608,000	18,291,000	20,000	49.4	17.8
Team 1	Drill press	Labor-hours	56,407,000	38,381,000	17,845,000	20,000	47.0	17.1
Team 1	Vertical boring machine	Labor-hours	57,747,000	38,827,000	16,544,000	20,000	48.1	18.6
Team 1	Horizontal boring machine	Labor-hours	56,691,000	36,406,000	18,388,000	20,000	47.2	15.0
Team 1	NC vertical boring machine	Labor-hours	58,614,000	38,677,000	19,478,000	20,000	48.8	16.0
Team 2	Cutting	Labor-hours	57,284,000	39,917,000	17,656,000	20,000	47.7	18.4
Team 2	Punching	Labor-hours	66,580,000	53,563,000	6,483,000	20,000	55.5	30.2
Team 2	Bending	Labor-hours	66,580,000	53,563,000	6,483,000	20,000	55.5	30.2
Team 2	Restricting	Labor-hours	66,580,000	53,563,000	6,483,000	20,000	55.5	30.2
Team 3	Lathe turning	Labor-hours	25,416,000	22,961,000	1,745,000	12,000	35.5	29.5
Team 3	Drilling	Labor-hours	25,416,000	22,961,000	1,745,000	12,000	35.5	29.5
Team 3	Boring	Labor-hours	25,416,000	22,961,000	1,745,000	12,000	35.5	29.5
Team 3	Milling	Labor-hours	25,416,000	22,961,000	1,745,000	12,000	35.5	29.5

Source: Monden, 1995: 256.

and the processes required to satisfy those needs. The model integrates marketing, operational, and financial data to better understand the total cost caused by a potential change to the product matrix.

An advantage of placing the costing emphasis on processes is that the trade-offs between competing products can be better identified. As the flow of a new product is tracked through an existing facility, the target costing team can begin to isolate its impact on existing products to determine where the new demand on resources will trigger constraints on overall throughput.

The creation of cost estimates for existing or new processes provides the basis for developing capital acquisition plans and finalizing product profitability analysis. Exhibit 12 provides an example of a process-specific cost list that details prime assumptions and current demand for parts of the process affected by a new product.

Whether process costing is used to understand the overall impact of a new product on the existing plant or to estimate the cost implications of various design decisions, it plays a pivotal role in creating the probable cost estimate for current and new products and processes.

Component Cost Analysis

Component cost analysis decomposes the prod-

EXHIBIT 13. COMPONENT COST ANALYSIS

Components	C_1	C_2	C_3	C_4	C_n	Cost	Available Until
C_1		+	-	+		$aaa	1997
C_2	+			-		bbb	1999
C_3	-					ccc	1996
C_4		-				ddd	2005
C_n	+					nnn	2004

Source: Ansari, et al., 1996: 137.

uct level target cost into the major component and parts categories. For example, a target cost list might be broken down by the following major component categories and then by more detailed parts categories:

- Breakdown of chassis functions: front axle, front brakes, rear brakes, etc.;
- Breakdown of body functions: white body metal, bumpers, window glass, etc.; and
- Breakdown of interior functions: seats, air conditioning, interior panels, audio system, etc.

A major component category may be further broken down into detailed part categories, for example, breakdown of seat systems: frame, slide rails, reclining mechanism, trim covers, etc.

Component cost analysis is particularly useful for assembly industries that purchase thousands of components, parts, and subassemblies. Component analysis has several important uses. First, it identifies the expensive components of a product. Second, it focuses on the cost relationships between components. This helps to determine if decreasing the cost of one component increases the cost of another component. Finally, it ensures that no outdated or soon to be out-of-production components are used.

Exhibit 13 illustrates a component cost matrix. The *cost* column reveals the component cost, and the *availability* column provides the last available date for the component before it becomes unavailable. The plus or minus entries highlight positive or negative relationships between the costs of components. A plus sign indicates that as the cost of the component in row 1 is reduced, the cost of the component in the column increases. For example, when the cost of component C_1 is reduced, the cost of component C_2 increases, but the cost of component C_3 decreases.

Inputs and outputs required for effective component cost analysis include:

Inputs:
- function-specific target cost outline;
- actual costs of internal components in existing or similar products;
- current costs of purchased components in existing or similar products;
- component functional drawings and concept

EXHIBIT 14. COMPONENT COST BREAKDOWN

		Cost	
Component	**Function**	**Amount**	**Percent**
Brew basket	Grinds and filters coffee	$ 9	18%
Carafe	Holds and keeps coffee warm	2	4
Coffee warmer	Keeps coffee warm	3	6
Body shape and water well	Holds water and encasement	9	18
Heating element	Warms water and pushes it	4	8
Electronic display panel	Controls grinder/clock settings	23	46
Total		$50	100%

Source: Ansari, Bell, Klammer, and Lawrence, 1997: TC-15.

manuals that show that the QFD objectives are being met;
- component-specific comparison of specifications for current and proposed models;
- planned volume of products that will use common components; and
- component availability information.

Outputs:
- component-specific target costs of in-house components;
- component-specific target costs of purchased components; and
- component-specific target costs for the complete product.

Exhibit 14 provides a breakdown of component costs for a hypothetical coffeemaker. This information can be used to identify and prioritize cost-reduction efforts at the component level. Care must be taken to ensure that the sum of the component-level target costs does not exceed the target cost of the product. Often an increase in the cost of one component requires an exploration of ways to reduce the costs of other components by an equivalent amount.

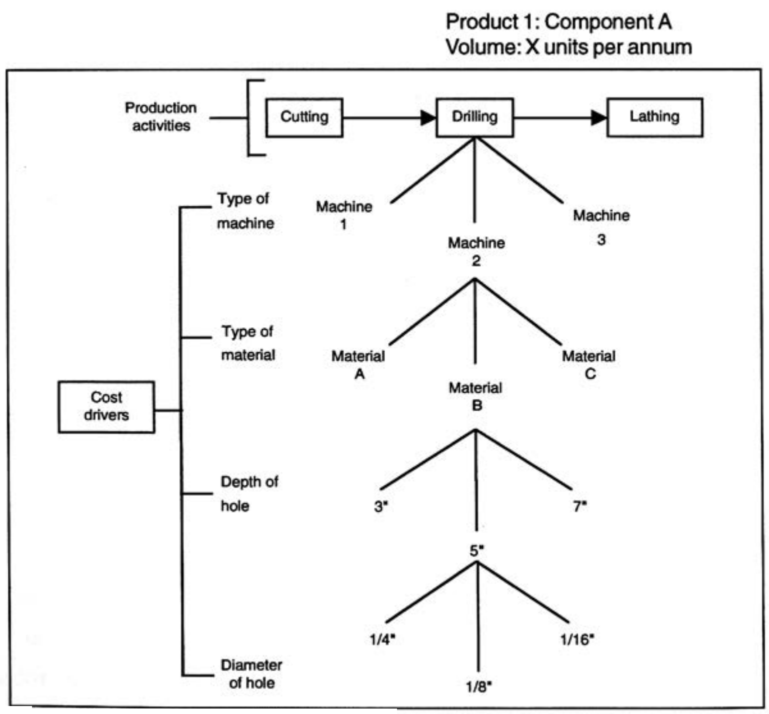
Cost Tables

Calculating the probable cost of current and new products and processes depends, in large part, on reliable historical data. Cost tables enable estimating costs for materials, parts, utilities, and conversion. In essence, a cost table is a database that defines and depicts the cost effects of using different materials, production methods, and product designs.

Exhibit 15 shows one branch of a hypothetical cost table. Additional branches would stem from each of the cost driver alternatives under *"drilling activity."* In addition, similar branches would be prepared for *"cutting"* and *"lathing."* At each stage, the cost table would show unit product cost split into direct material, direct labor, and production overhead.

There are two general types of cost tables: approximate cost tables and detailed cost tables. Approximate cost tables emphasize a small number of key variables that are known to

EXHIBIT 15. COST TABLE STRUCTURE



Source: Yoshikawa, et al., 1996: F3-25.

have significant impacts on the final cost of a product, such as the impact of different engine specifications on the cost to design and produce a motorcycle.

Relatedly, a detailed cost table includes the relationship between a large number of variables and their relevant costs. Typically developed over many years, cost tables are used from the original design throughout the life cycle of the product. They are updated on an ongoing basis, serving as a critical decision-making aid in the design and ongoing management of a product portfolio.

Cost tables are typically developed using both internal and external expertise from across multiple functions, perspectives, and organizations. Since upwards of 80 percent of a product's life-cycle cost is set before the product is launched into production, the time and effort required to develop and maintain cost tables is an essential investment in current and future profitability.

Combined with computer-aided design (CAD), cost tables can provide for real-time analysis of the cost implications for a proposed change in product or component design or redesign.

Finally, cost tables are often used to support "what if" (sensitivity) analysis at all stages of the product life cycle.

Toyota uses cost tables in five key production steps: machining, casting, body assembly, forging, and general assembly. The cost tables detail the machine rates for each step of the production process. These rates include labor, electricity, supplies, and depreciation costs. The exact form of Toyota's cost tables depends on the type of production step being analyzed; for example, for stamping, the cost table contains the cost per stroke while for machinery it contains the cost per machine hour. Toyota's cost tables are highly detailed, and, in most cases, each production line has its own cost table.

Establishing the Target Cost

Once the target market price and target profit have been established, the target cost can be calculated. The target cost reflects the relative competitive position of the organization. It also represents the cost at which the product must be manufactured if it is to achieve the target profit margin when sold. The target cost acts as a signal to all involved in the target costing process as to the magnitude of the cost reduction objective that eventually must be achieved. The established target cost should be attainable, but only with considerable effort. Objectives that drive the achievement of these goals include:

- setting continuous improvement targets;
- measuring performance; and
- communicating cost requirements.

Target costs can be calculated using the target return-on-sales ratio or a compilation of estimated costs. In the former case, one of two primary formulas can be used to set a sales-price-based target cost:

Target cost = target sales price x (1 – target return-on-sales ratio)

or

Target cost = target sales price – target operating profit.

Relatedly, the target cost can also be calculated by subtracting the per-unit profit improvement target from the estimated cost, then isolating those costs.

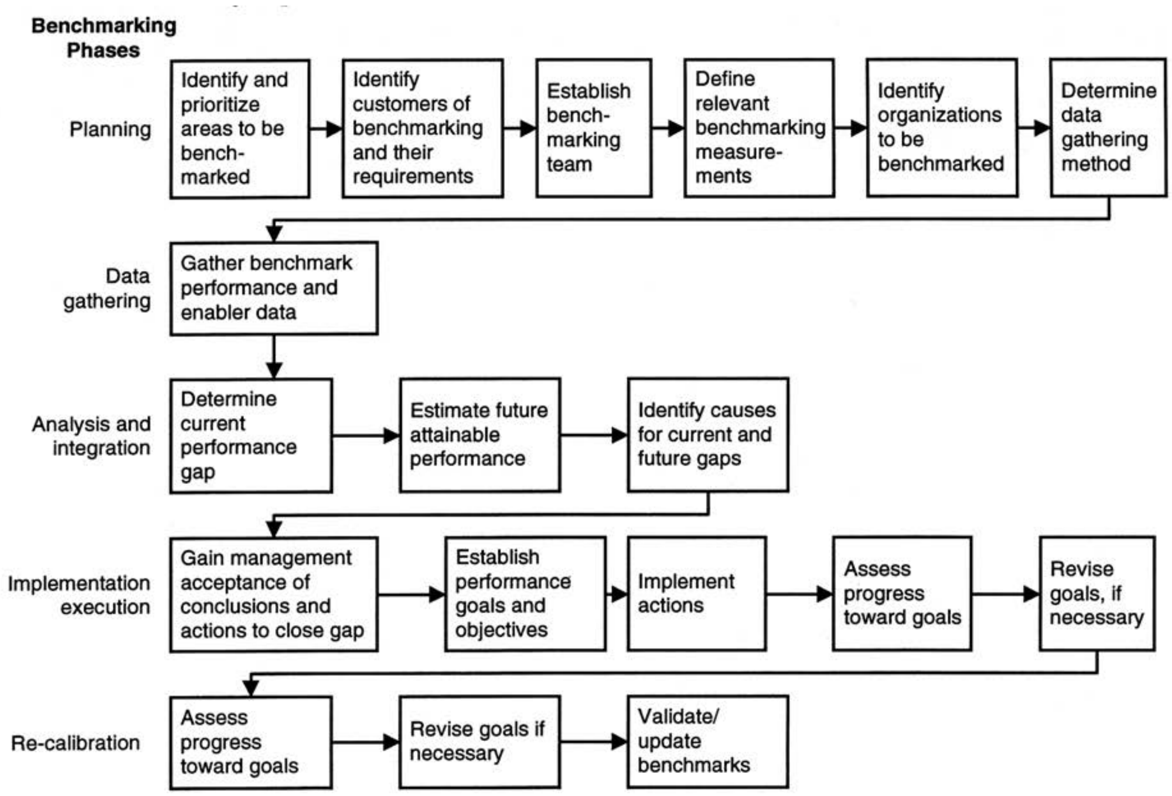
Having established the basic parameters for the target costing system and identified the appropriate level of execution at which it should be carried out, attention turns to establishing specific cost and performance targets. A useful tool that can be used in this step is benchmarking.

Benchmarking

One of the most important aspects of creating a target cost for a product or service is guaranteeing, at both the total and component level, that functionality and costs are competitively established. Benchmarking, which compares costs of specific products, activities, and outcomes to those of competitive or best-practice companies, provides valuable input to target costing in this effort. Issues that can be addressed through benchmarking studies include:

- identification of the best practice in completing core and support activities for the product or service;
- establishment of objective cost targets and performance metrics for component suppliers and internal processes;
- definition of quality and delivery parameters for similar products, processes, or components across comparable industries;

EXHIBIT 16. BENCHMARKING STEPS



Source: IMA, *Effective Benchmarking*.

- identification of process improvements that can provide quantum improvements in overall cost and profit performance;
- development of innovative analysis and design techniques based on benchmarking site visits and case studies; and
- creation of an ongoing network of organizations capable of supporting current and future improvements and target costing initiatives.

The benchmarking process has been formalized into several steps by the leading practitioners. They all use an integrated approach to benchmarking reflected in the following five general steps: planning, data gathering, analysis and integration, implementation/execution, and re-calibration, as illustrated in Exhibit 16.

Organizations that are at a significant competitive disadvantage will benefit most from estimating benchmark costs and calculating the difference between those costs and their target cost. If the disadvantage is significant, it might not be possible to reach the benchmark costs in a single generation of product design. Such organizations will have to adopt a multi-release strategy of product design, setting ever more aggressive cost targets for each release. The narrowing gap between the benchmark and the target cost would demonstrate the achievement of competitive parity.

Attaining the Target Cost

Once the target cost has been established, the goal is to develop a new product concept that attains the target cost while meeting all customer requirements. The process of attaining the target cost is supported by various methods that reveal cost-reduction potentials and show ways to transform those potentials into design alternatives. Key objectives at this stage of the target costing effort include:

- optimize the relationship between materials, parts, and manufacturing processes;
- minimize costs;
- focus design efforts on market-driven variables for quality and cost of ownership;
- link product development with customer desires and to achieving a sustainable competitive advantage;
- link the product development process so that it assures product quality; and
- estimate the cost prior to implementation.

Turning the allowable cost target into an *achievable cost* requires three primary steps: (1) compute the cost gap; (2) design costs out of the product; and (3) release the design to manufacturing and undertake continuous improvement.

Computing the Cost Gap

Calculating the difference between the target cost (calculated from the target price and profit margin) and current cost estimates is the first step in attaining target costs. Using the total, fully absorbed costs as the baseline, current costs represent the "as-is" estimate of the cost of producing the product or providing the service.

The resulting cost gap is decomposed into two primary parts: life-cycle costs and value-chain costs. Life-cycle decompositions emphasize the total product cost of the birth-to-death activities performed in research, manufacturing, distribution, service, general support, and disposal. Conversely, value-chain analysis examines costs based on whether they are incurred and controlled by the organization or by one of its value-chain partners (e.g., suppliers, dealers, or disposers). As noted by Ansari, "The two breakdowns take the same total cost but provide two different kaleidoscopic views of the product cost. Each helps to highlight where cost reduction efforts need to be focused." Exhibit 17 provides a detailed illustration of the cost gap analysis effort.

Designing Costs Out of the Product

Reducing costs through the product design stage is the most critical step in attaining target costs. The key to achieving desired reductions lies in the answer to one specific question: *How does the design of this product affect all costs associated with the product from its inception to its final disposal?* Identifying all costs, whether incurred in distribution, selling, warehousing, service, support, or recycling, is essential as all of these cost elements, which are generated by the different functions, are affected by the design chosen.

For instance, the weight and control panel are two elements of a convection oven that are affected by the product's design. A heavy oven will increase loading, transportation, and installation costs if two people are required to perform these activities. Relatedly, an elaborate control panel

EXHIBIT 17. COMPUTING THE COST GAP

Value chain →	*Inside*			*Outside*			*Total*		
Life cycle ↓	Allowable	Current	Gap	Allowable	Current	Gap	Allowable	Current	Gap
Research and development	$ 3.60 (4%)	$ 5	$ 1.40				$ 3.60	$ 5	$ 1.40
Manufacturing	15.30 (17%)	20	4.70	$21.60 (24%)	$30	$8.40	36.90	50	13.10
Selling and distribution	5.40 (6%)	6	0.60	12.60 (14%)	17	4.40	18.00	23	5.00
Service and support	9.00 (10%)	10	1.00				9.00	10	1.00
General business overhead	18.00 (20%)	19	1.00				18.00	19	1.00
Recycling costs	4.50 (5%)	7	2.50				4.50	7	2.50
Total	$55.80 (62%)	$67	$11.20	$34.20 (38%)	$47	$12.80	$90.00	$114	$24.00

Source: Ansari, et al., 1996: 146.

will increase the time required to explain the product's use to customers, as well as increasing the potential for product support and repair costs, due to failures in electronic and mechanical components. Finally, the materials used may ultimately pose an environmental hazard that has to be handled at the point of disposal. All these factors add to the product's cost with little or no improvement in customer satisfaction.

Releasing Design to Manufacturing and Undertaking Continuous Improvement

The final stage in attaining the target cost is to continue to make product and process improvements that will reduce costs beyond the point where it is possible through design alone. It includes eliminating waste (scrap, rework, etc.), improving production yield (i.e., getting more production from raw materials), and other such measures.

Achieving cost reductions before production begins is aided by the use of two specific tools and techniques: (1) design for manufacture and assembly and (2) value engineering.

Design for Manufacture and Assembly (DFMA)

DFMA is an approach to product design that can improve an organization's ability to compete based on its manufacturing capability. Specifically, DFMA focuses on reducing costs by making products easier to manufacture while holding functionality at specified levels. DFMA guides development of the detailed product design, ensuring that at every stage of the assembly and manufacture process minimal cost and waste elimination targets will be reached. The DFMA methodology is based on five basic principles:

- Reduce the number of parts by combining parts (i.e., multifunction parts). Seek to combine parts unless separate parts are necessary because they must be of a different material, move relative to each other, or are necessary to ease assembly or disassembly.

- Assemble from the top down, rather than from the side or bottom.
- Design symmetry into parts so that they may be assembled in many orientations. If this is not possible, be sure they are very symmetrical so they can be easily oriented and fed.
- Design parts to be easily handled and inserted without restricted access.
- Use flexible manufacturing processes wherever possible (e.g., powder metal processing, injection molding, stamping).

Without DFMA, the projected benefits of a new product design may not be attained. For instance, at an organization making a variety of mechanical counters, a product was designed that required extreme dexterity to manufacture because multiple wires had to be encapsulated in a snap-together casing. Once the casing was assembled, it could not be disassembled (it became scrap). As the product rolled out to manufacturing, it was found that only one person could produce it reliably. No one else in the plant could consistently accomplish the task of getting all the wires into the casing before its closure. The entire production of this item was limited by poor execution of a good design concept—a failure to apply DFMA.

DFMA enables the attainment of cost targets by finding unique, low-cost, yet robust ways to transform product concepts into reality. The benefits it can provide include:

- elimination of excess parts;
- active inclusion or development of common parts for a wide range of applications;
- through disassembly, reduction of life-cycle costs for maintaining the product in the field;
- reduction of potential defects and related engineering-change notices to correct design or assembly problems;
- increase in assembly efficiency and effectiveness; and
- improve throughput and time-to-market.

DFMA methodology has been successfully applied at many organizations, including several different development programs within the Boeing Company. In each case, cross-functional teams were established to develop a new product that either enhanced performance and/or reduced cost. These specific examples include 737 flight deck air valve, 737 windshield replacement, and 737/757 passenger cabin sidewall panel assemblies. The teams applied the DFMA process in developing their new products. Exhibit 18 shows the top level results from these three different programs.

Value Engineering (VE)

VE is used by organizations to increase product functionality and quality while at the same time reducing costs. The scope of VE includes design costs reduction, process improvements, and working with suppliers. The output of VE is a series of improvement plans that raise the value of the target product. Emphasizing functionality and meeting customer requirements within the allowable cost parameters, VE goes beyond the particular styles or configurations of current products to consider the functions that lie at the heart of the product in order to come up with innovative ways to achieve desired functionality with less cost or effort.

As suggested by Exhibit 19, VE studies the various requirements of functionality and quality that occur during the entire life cycle of a product. These include:

EXHIBIT 18. BOEING DFMA APPLICATION RESULTS SUMMARY

Measure	*Program*		
	Valve	Windshield	Sidewall Panel
Cost reduction	90%	25%	42%
Part count reduction	79%	10%	45%
Assembly time reduction	94%	70%	22%
Team size	3 people	7 people	5 people
Study duration	**Five months**	**Six weeks**	**Five months**

Source: Behun, 1995: 101.

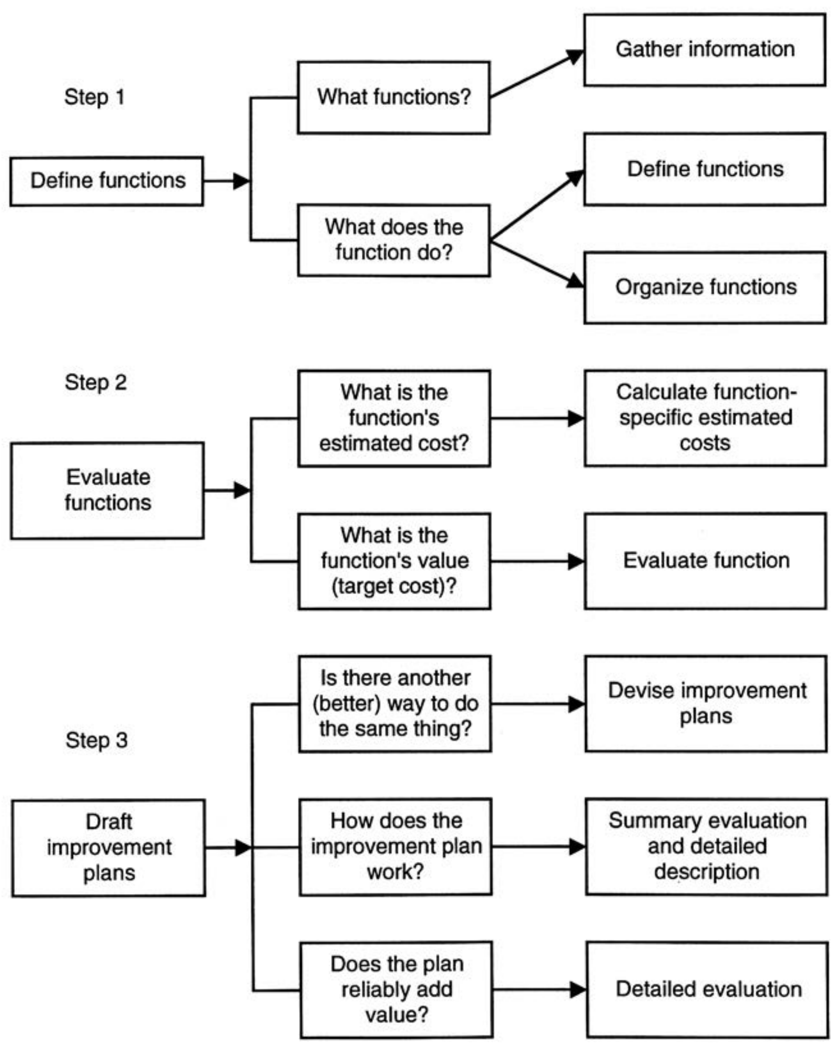
- *user requirements:* use-objectives, use-conditions and environments, performance features, reliability, safety, durability, design, shape, color, etc.;
- *sales requirements:* selling points, competitive performance features, competitive pricing, and related factors,
- *design-related requirements:* performance levels, added-function levels, etc.;
- *manufacturing-related requirements:* processing technologies, manufacturing processes, and related labor hours, materials, and purchased parts;
- *distribution-related requirements:* packaging, loading, storage, transportation, etc.;
- *cost-related requirements:* management of progress toward achieving target costs; and
- *legal and regulatory requirements:* patents and utility models, environmental protection laws, industry regulations, government guidelines, and related factors.

Exhibit 20 illustrates an example of VE cost-cutting ideas that focus on reducing the number of parts, simplifying the assembly, and not over-engineering the product beyond what will meet a customer's needs.

Isuzu is a significant user of VE. The development of their NAVI-5 transmission system, which combines the higher fuel efficiency and performance of a manual transmission with the convenience of an automatic transmission, used VE concepts. Specifically, VE was used to develop a Gemini (ceramic) heater that would reduce the time it took to warm up a car's interior by focusing early heat from the engine through a secondary heating system that directed warm air at occupants' feet until the engine was warm enough to support the traditional heating system. Also, VE was used to develop a gear lever that would fold down while the vehicle was stationary but that would not collapse while the vehicle was in motion.

Having made the improvements required to transform the target costs into achievable costs, attention can now turn to achieving continuous improvements on the plant floor.

EXHIBIT 19. VALUE ENGINEERING (VE) FRAMEWORK



Source: Monden, 1995: 220.

Pursuing Cost Reductions Once Production Has Started

The start of production signals the beginning of the cost maintenance phase, which emphasizes the stabilization of or continuous improvement in product- and component-level costs. The objective at this stage is to pursue cost reductions relentlessly at every stage of manufacturing to close any remaining gaps between targeted and actual profits.

EXHIBIT 20. VALUE ENGINEERING (VE) IDEAS TO REDUCE COSTS

Panel Subcomponent	*Cost Reduction Idea*
Power supply	**Reduce** wattage – more than needed in current design.
Flexible circuit	**Eliminate** flexible circuit. Use wiring harness.
Printed wire board	**Standardize** board specifications. Use mass-produced unit.
Clock timer	**Combine** with printed wire board.
Central processor chip	**Substitute** standard 8088 chip instead of custom design.
Heater connector	**Rearrange** layout of board to heater connection.

Source: Ansari, Bell, Klammer, Lawrence, 1997: TC-20.

Organizations that have successfully implemented target costing, such as Texas Instruments and Toyota, note the importance of cost information in cost reduction initiatives. Key objectives at this stage include:

- providing improved product cost information;
- providing improved performance monitoring; and
- improving understanding of the true cost structure.

A useful tool for this cost reduction effort is activity-based costing/activity-based management (ABC/ABM).

ABC and ABM

Achieving cost reduction objectives requires information that identifies the causes of current cost and the potential impact of attacking these cost drivers. ABC and ABM are valuable target costing tools because they focus attention on how product design leads to the consumption of various activities and, therefore, increases overall costs. For instance, material handling is related to the number of unique parts purchased, which is a function of design complexity.

ABC and ABM can also be used to increase the understanding of cost items such as manufacturing overhead, marketing, distribution, service and support, and general business overhead. Where ABC and ABM provide inputs to a decision technique for improving the use of current and anticipated resources, target costing applies this information to change the nature and amount of currently available resources.

Exhibit 21 details the relationship between ABC, ABM, and target costing. The interaction of reductions in direct costs that remain the primary focus of target costing and the cuts in, or

EXHIBIT 21. RELATIONSHIPS BETWEEN ABC, ABM, AND TARGET COSTING

Tools	*Main Purpose*	*Cost Elements*	*Emphasis*
ABC	Product profitability analysis	Overhead	Cost assignment for managerial decision making
ABM	Process reengineering	Overhead and direct costs	Process improvement
Target costing	Strategic cost management	Overhead and direct costs	Cost reduction

Source: Sakurai, 1996: 124.

improvement of, indirect costs and activities under ABC and ABM creates an ongoing basis for improvement and development of a competitive cost and profit profile for existing and new products.

At almost every turn, target costing can utilize information available in ABC and ABM systems to identify current actual costs, analyze the causes of that cost, and find ways to reduce overall indirect costs by changing the ways products are designed, developed, manufactured, and sold. Using ABC and ABM in the target costing process provides the following benefits:

- quantification of costs, both value-added and nonvalue-added, by activity, cost element, component, and product;
- identification and estimation of the costs to meet specific customer functionality and quality requirements;
- analysis of the costs of complexity;
- measurement of the impact of QFD, DFMA, and VE initiatives on current and projected costs;
- enhanced ability to take action to reduce overhead costs;
- support of cost of quality and related analysis, which reflect trade-offs made by the organization to hit cost targets;
- sensitivity analysis, which incorporates the underlying behavior of cost and the cost of idle or unused capacity to increase the accuracy of target cost estimates; and
- creation of cross-functional, process-oriented costing tools that support brainstorming, concurrent engineering, and kaizen costing efforts.

ABC and ABM are important tools that support target costing at Caterpillar. Both tools are applied on a prospective basis to estimate product and process costs. During the early stages of product development, ABC is used to estimate product cost at a general level. This is useful for preliminary evaluation of product feasibility. As product and process definition become more precise, predictive ABM process cost models are applied to estimate the costs of particular functions and components using particular processes. This has been particularly valuable to engineers as they work to reduce product and process cost, improve utilization of current machines and equipment, and eliminate waste and process variation.

VI. CONCLUSION

Target costing seeks to anticipate costs before they are incurred, continually improve product and process designs, externally focus the organization on customer requirements and competitive threats, and systematically link an organization to its suppliers, dealers, customers, and recyclers in a cohesive, integrated profit and cost planning system.

Target costing is the means to achieve competitive advantage through active management of the unavoidable trade-offs and constraints faced by any organization providing goods and services to the market. Emphasizing proactive, rather than reactive, cost containment, target costing ensures short- and long-term profitability and success by putting customer needs and functionality first, using them to drive the design, development, manufacture, and provision of products. Target costing redefines the competitive playing field—a challenge that cannot be avoided, only enjoined.

VII. BIBLIOGRAPHY

Ansari, S., J. Bell, T. Klammer, and C. Lawrence. "Target Costing" in *Management Accounting: A Strategic Focus*. Homewood, IL: Irwin, 1997.

Ansari, et al. *Target Costing—The Next Frontier in Strategic Cost Management*. Homewood, IL: Irwin and Bedford, TX: Consortium for Advanced Manufacturing-International (CAM-I), 1996.

Behun, J.R., ed. "Design for Manufacturability." *Design Engineering*, Vol. 81. New York: The American Society of Mechanical Engineers, 1995.

Cooper, R., and R. Slagmulder. *Target Costing and Value Engineering*. Portland, OR: Productivity Press and Montvale, NJ: Institute of Management Accountants, 1997.

Cooper, R. "Nissan Motor Company, Ltd.: Target Costing System." Harvard Business School Case #9-194-040, 1994.

Dutton, J. John, and Mark Ferguson. "Target Costing at Texas Instruments." *Journal of Cost Management*, Fall 1996, pp. 33-38.

Fisher, Joseph. "Implementing Target Costing." *Journal of Cost Management*, Summer 1995, pp. 50-59.

Guinta, L.R., and N.C. Praizler. *The QFD Book*. New York: AMACOM Books, 1993.

Institute of Management Accountants. Statement on Management Accounting, *Implementing Activity-Based Management: Avoiding the Pitfalls*. Montvale, NJ: May 1998.

IMA. Statement on Management Accounting, *Implementing Target Costing*. Montvale, NJ: November 1998.

Monden, Y. *Cost Reduction Systems*. Portland, OR: Productivity Press, 1995.

Sakurai, M. *Integrated Cost Management*. Portland, OR: Productivity Press, 1996.

Tanka Takao. "Target Costing at Toyota." *Journal of Cost Management*, Spring 1993, pp. 4-11.

Terninko, J. *Step-by-Step QFD: Customer-Driven Product Design*. Boca Raton, FL: St. Lucie Press, 1997.

Yoshikawa, R., J. Innes, and F. Mitchell. "Japanese Cost Management Practices." *Handbook of Cost Management*. New York: Warren, Gorham and Lamont, 1996: p. F-3.

Yutaka, Kato, Germain Boer, and Chee W. Chow. "Target Costing: An Integrated Management Process." *Journal of Cost Management*, Spring 1995, pp. 39-51.