

THREE DESIGN TO COST MYTHS

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ABSTRACT

This paper describes three Design to Cost (DTC) myths that companies and individuals use to avoid implementing the DTC and Value Engineering (VE) techniques. The three myths are: limited production, product cost responsibility belongs to production and no budget for DTC/VE activities. A case study is used to dispel these common myths and demonstrate the usefulness of the DTC/VE methodology for all situations.

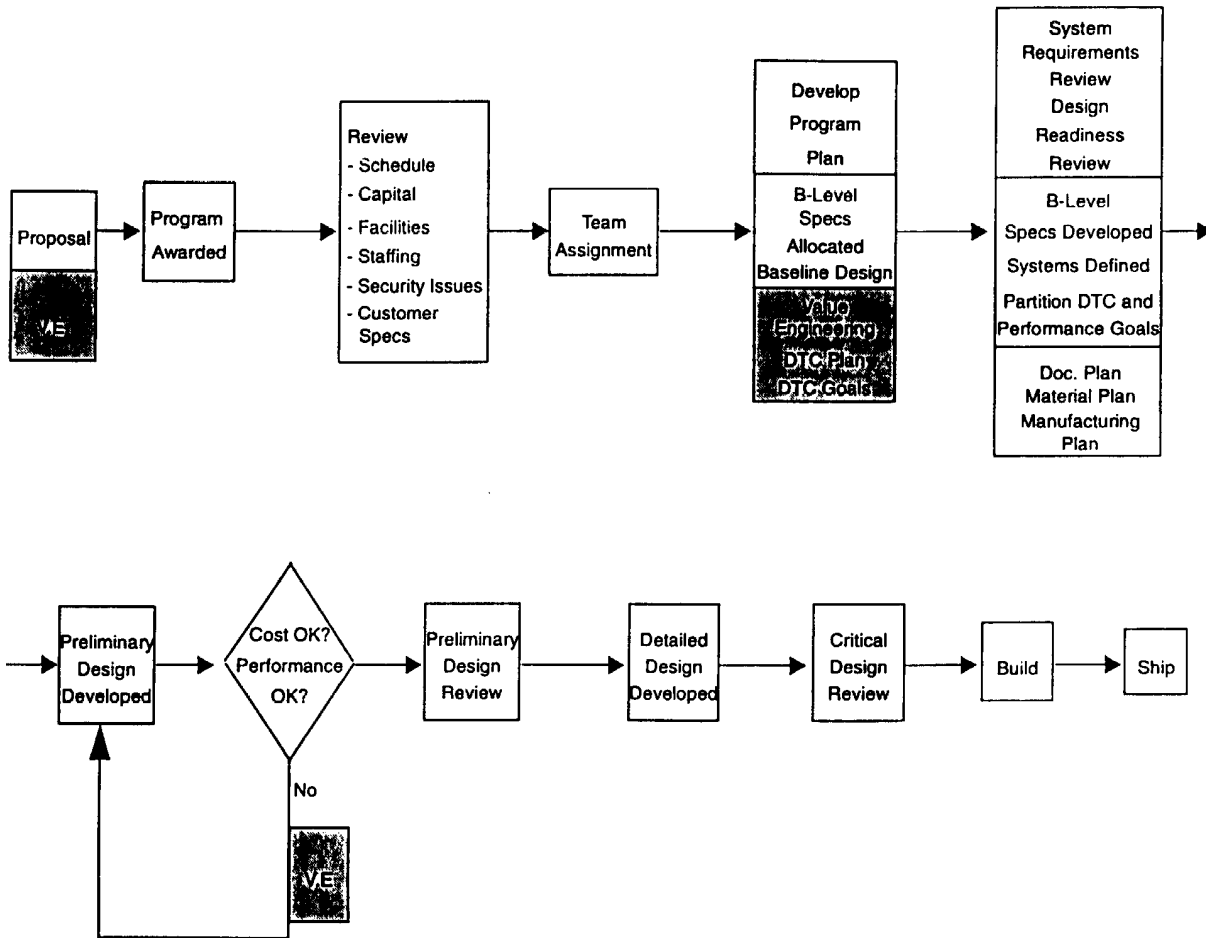
WHAT IS DTC?

The essence of Design to Cost is to make design converge on cost, instead of allowing cost to converge on design. DTC is a management concept that mandates cost success in terms of producing products or systems at a cost deemed to be affordable from the customer's perspective.

Throughout the product development cycle, from concept through delivery, DTC elevates cost to the same level of concern as performance and schedule. Realistic cost goals are established from early trade-off studies with performance and schedule, but not at the expense of the basic function of the product, and never at the expense of quality. In simple terms, DTC is a supporting "best practice" of Concurrent Engineering.

One of the key tools in implementing the DTC methodology is VE. VE is a systematic approach directed at analyzing functions of systems, equipment, facilities, procedures and supplies to implement them at the lowest possible cost, consistent with the requirements for performance, reliability, quality, maintainability, safety, etc. Figure 1 represents a DTC/VE process flow.

Figure 1, DTC/VE Process Flow



WHEN TO USE VE?

The key operatives in VE are cost, cost worth, function and functional worth. Without utilizing VE early in a product development effort, the activities are only focused on cost

reduction; thereby, limiting the improvement potential to 5 - 15% cost savings. With VE and the focus on function (e.g., what is the function of this unit, this PCB, this chip, etc.), the gains can exceed 50%.

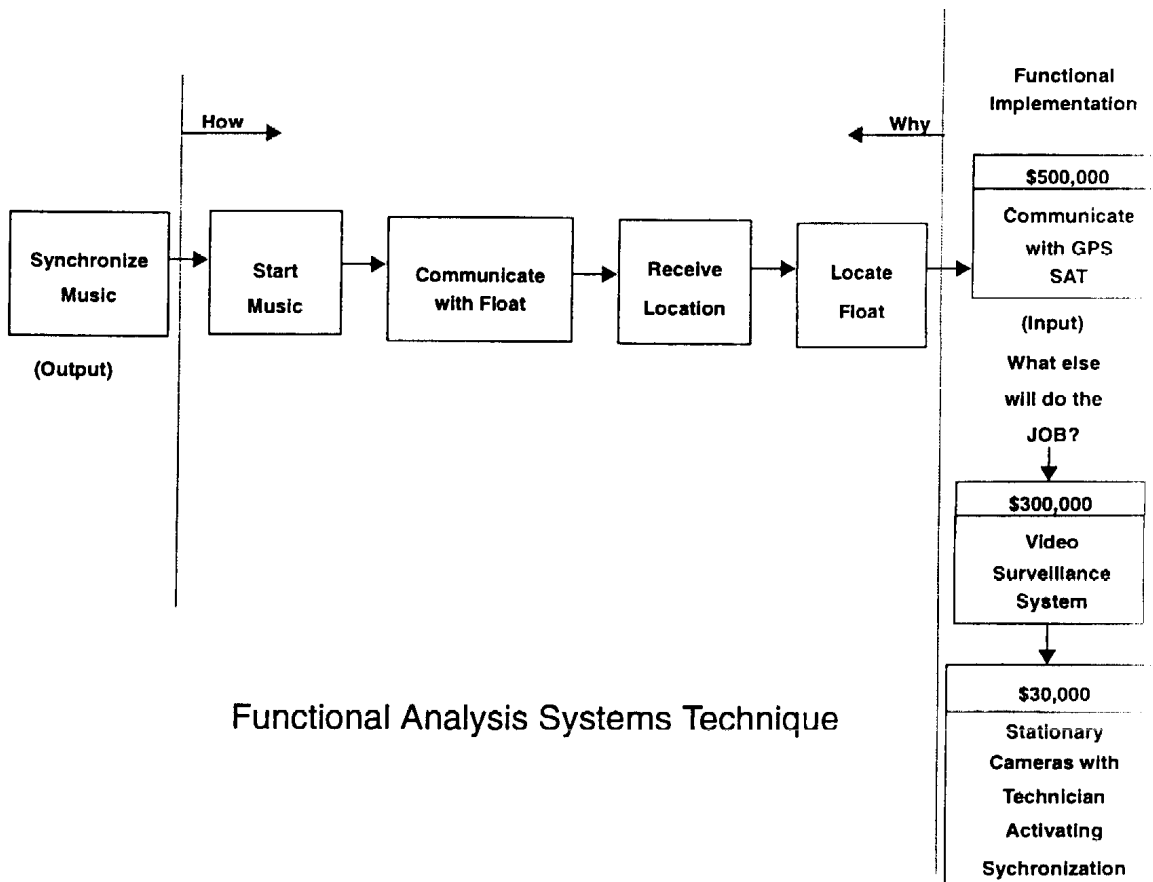
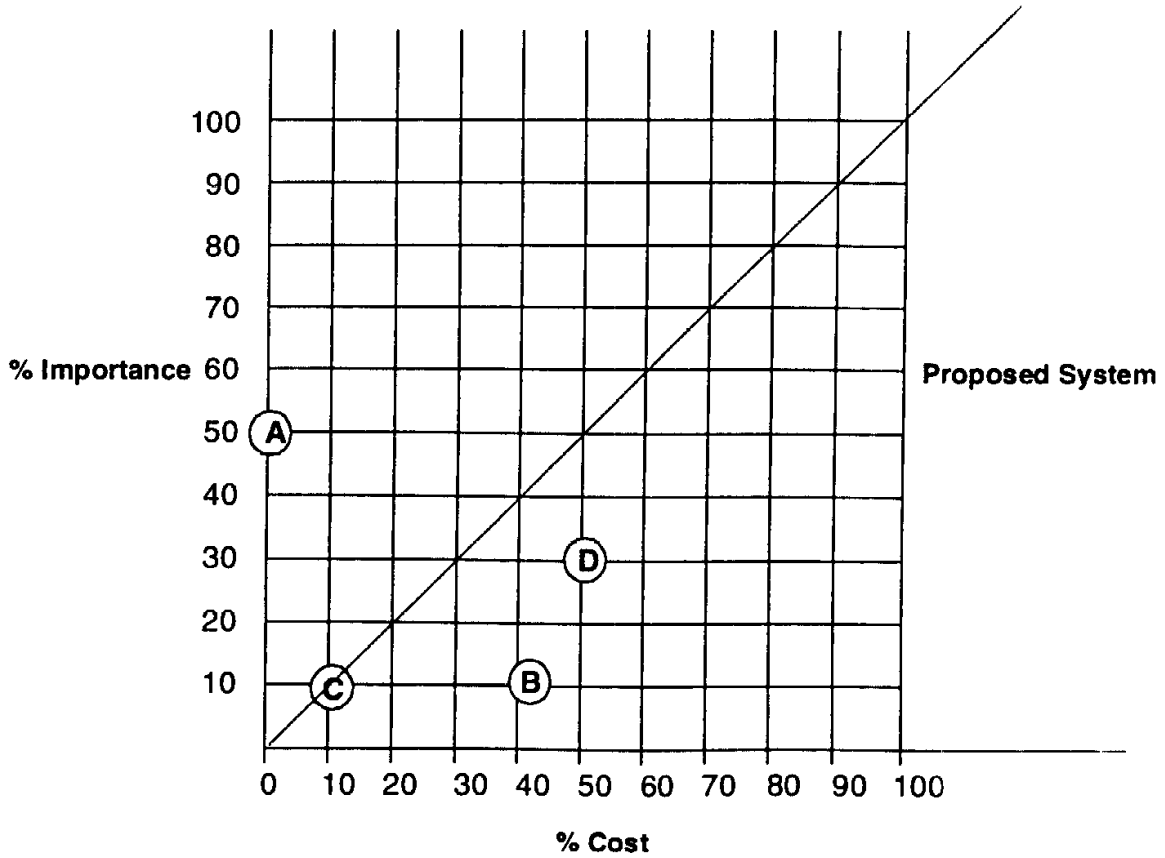


Figure 2 presents a FAST diagram for a tracking system. This example demonstrates how VE, when used early in a program development cycle, can result in lower product cost. Figure 3 graphically depicts how confusing the customer requirements, and their relationship, can be. The real secret is to understand what two or three features or functions the customer

really wants. This usually is accomplished by a survey. Figure 4 shows the results of a survey for the tracking system. It is seen that we are spending too much money for the functions "communicate to float" and "locate float." Therefore, these functions are prime opportunities for cost improvement

Figure 4 Correlation of Cost and Customer Importance



	<u>% Cost</u>	<u>Importance % Customer Survey</u>
A. Start Music	.7 %	50 %
B. Communicate to Float	43 %	10 %
C. Determine Location	9.3 %	10 %
D. Locate Float	47 %	30 %

WHY USE DTC?

The application of DTC is driven by:

- Customers, competitors, division improvement goals, or a combination of these.
- Decreasing military budgets
- More emphasis on commercial products
- Value shopping by our customers
- Staying in business
- Smart engineering practice
- Fierce competition

WHAT ARE THE THREE MYTHS?

Myth I — *DTC/VE methods don't really apply because we have limited production.*

Many people believe that DTC/VE activities are not worth the effort when the build quantity is small, say one to ten units. Is this a valid conclusion? Studies show that DTC/VE helps product teams meet cost, technical performance and schedule goals. Thus, focusing on the product cost is equally important for a ten-unit production as well as a 100-unit production. Let's look at some case studies that represent actual program performance. Company names are not included to ensure anonymity

CASE I

Background

- No DTC/VE activity; therefore, little or no focus on

product cost

- Quantity = 10 units
- Cost goal per unit = \$20,000
- Manufacturing not involved until drawing release, due to low volume production
- Engineers made the original material estimates based on vendor phone conversations

Final Outcome

- Since there was no concerted DTC/VE effort resulting in product cost focus, no one really worried about product cost until the production phase.
- Since Manufacturing was not involved early in the design phase, they could not tell engineers that their design would require new surface mount technology processes and 75% more labor for tooling and set-up. Early Manufacturing involvement could have reduced these extra costs.
- The material quotes the engineers received from vendors were off by a factor of two, because the vendors assumed high production quantities to amortize tooling costs.

Final Cost Results

The \$20,000 per unit was increased to \$35,000, with a total production cost of \$350,000, requiring a redesign effort of \$500,000 and six months schedule slip.

Does this sound like something you have experienced? Do you think a DTC/VE focus would have provided better cost results?

Figure 5 Cost Comparisons

	GOAL	CASE 1	CASE 2
Development Cost	\$1M	\$1M	\$1.1M
Redesign Efforts	0	\$.5M	\$.1M
Production Cost (10 Units)	\$.2M	\$.35M	\$.2M
Schedule	12 months	18 months	12 months
Total Program Cost	\$1.2M	\$1.85M	\$1.4M

CASE II

Background

- The Program Manager kicked-off the program start-up with a brief discussion of DTC/VE. Later, key program people attended a one-day DTC/VE class.
- Manufacturing was involved early and gave the design engineers feedback on the impact of their design decisions on the manufacturing cost.
- As part of the product team, the materials engineer was involved early on costing estimates, resulting in an early warning of a cost problem.
- The team was then focused on reducing the product cost. Figure 5 presents a comparison between CASE I and CASE II cost results.

Myth II — *“Product cost responsibility belongs to production, while development cost control belongs to engineering.”*

A successful DTC strategy allocates portions of the overall cost goal to specific units, and then within the unit to the primary cost drivers. Team members who are responsible for the design and manufacturing of these assemblies accept responsibility and accountability for meeting cost goals. Responsibility for the overall cost goals is divided among smaller units, making it easier to track and manage cost.

In successful DTC implementation, a team member is assigned the role of DTC manager, and is responsible for implementing the DTC methodology. The DTC manager can

be the program/project manager, or another individual. While there is a DTC leader, the majority of the work to meet the DTC goals will be accomplished by the program team members as an integral part of their daily activities. In summary, product cost responsibility is managed and belongs to the entire team.

Myth III — “*We don't have the budget for DTC/VE activities.*”

Let's look at the case study again. Figure 5 presents a comparison of the financial results for Cases I and II. Yes, Case II requires more labor (\$100,000), and more development time; however, it results in a \$20,000 product cost (versus \$35,000 Case I product cost), and only \$100,000 redesign cost (versus \$500,000 Case I redesign cost). Overall, Case II, using DTC/VE methods, results in \$400,000 less total program cost, in less time and a satisfied customer.

SUMMARY

Below is a summary of the key elements for successful implementation of the DTC methodologies:

- Organize for DTC with the DTC leader reporting to the Program Manager.
- Understand that early/stable product definition and DTC goals are critical for success.
- Utilize VE as a key tool in the DTC methodology.
- Perform trade-off studies.
- Recognize that opportunities for maximum DTC leverage are early in the product development schedule.
- Educate and involve appropriate team members (i.e., Engineering, Manufacturing, Materials, Purchasing, etc.).
- Involve major subcontractors early in DTC allocation activities.
- Account for DTC activities in the program schedule.
- Assign cost goals to teams.
- Recognize that DTC is a team effort, but individuals are accountable for their assigned units.
- Ensure that DTC is equal in importance to schedule and performance.
- Track current design costs versus goals, with an audit trail of DTC results on a monthly basis.

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