

Design to Cost (DTC) approach to Product development

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Abstract

Applied Materials started Value Engineering and other cost containment programs to improve the results of product development activities in the early 1990's. The focus related to cross functional involvement, processes, skills and tools to leverage improvement in the cost, quality and performance of the products. Successful product introductions utilizing tools include (1) Product development process (alpha, beta, gamma) phase (2) Design guidelines (3) Product execution to manufacturing with documentation. In 1995, an additional emphasis was added to the Engrg program to include cost consideration and early product definition based on customer requirements. The new program named Design to Cost (DTC) was introduced to ATD engineering and ATD product development group. This paper explores the elements of DTC and process of progressing as an organization from Design Engineering to Value Engineering and to manufacturing. It also includes the elements & processes for establishing cost target to designs and to meet the cost target goals.

Introduction

Product performance and costs are a major concern of all companies that wish to remain competitive. The negative impact of poor product performance and cost on customer satisfaction and market share is obvious. This paper explores the key principles of DTC to produce design results. How these principles work is a synergistic combination of both tool and process changes. DTC is not a new tool or process but for Hi-tech company's it's new. Historically Hi

tech company's design and develop product utilizing existing processes or drawings based on functionality without consideration of cost and resource impacts. This puts a tremendous burden on other organizations to reduce cost at later stage of the product cycle. The concept of DTC cost estimating solve some of these issues using DTC techniques at the design stage entails estimating costs of new product at the product specific, functional specific and part specific levels based upon the design. The same concept was used in new product development. stage, by setting up cost target by product function, design and fabrication processes. This technique not only control cost, but the process force you to create innovative design and use state-of-the-art manufacturing processes. Clearly the starting point of DTC is the formation of multi-functional product development team. Members encompass of areas (design engineering, Value engineering and Manufacturing engineering) where development results are impacted by day to day decision and trade-offs.

Cost management at Design stage

Design to cost tools and methods are used to design a product with the lowest possible life cycle cost and highest performance, quality, and reliability. Studies have shown the most of the product's cost is determined during the concept & feasibility phase. Design to cost has a much greater effect through cost avoidance on the cost of the product than the post design cost reduction. Once the basic product design has been finalized, post design cost reduction methods can be used to reduce product costs as a part

of a continuous improvement program. Fig 1 shows the product development phases during which design to cost and cost reduction methods contributes to the cost management process. 75% of the product cost is defined during the C&F and Alpha phase, rest 25%

during manufacturing release & volume production. So in order to take the most opportunity for cost savings that is available only during early stages of product development cycle.

Figure 1

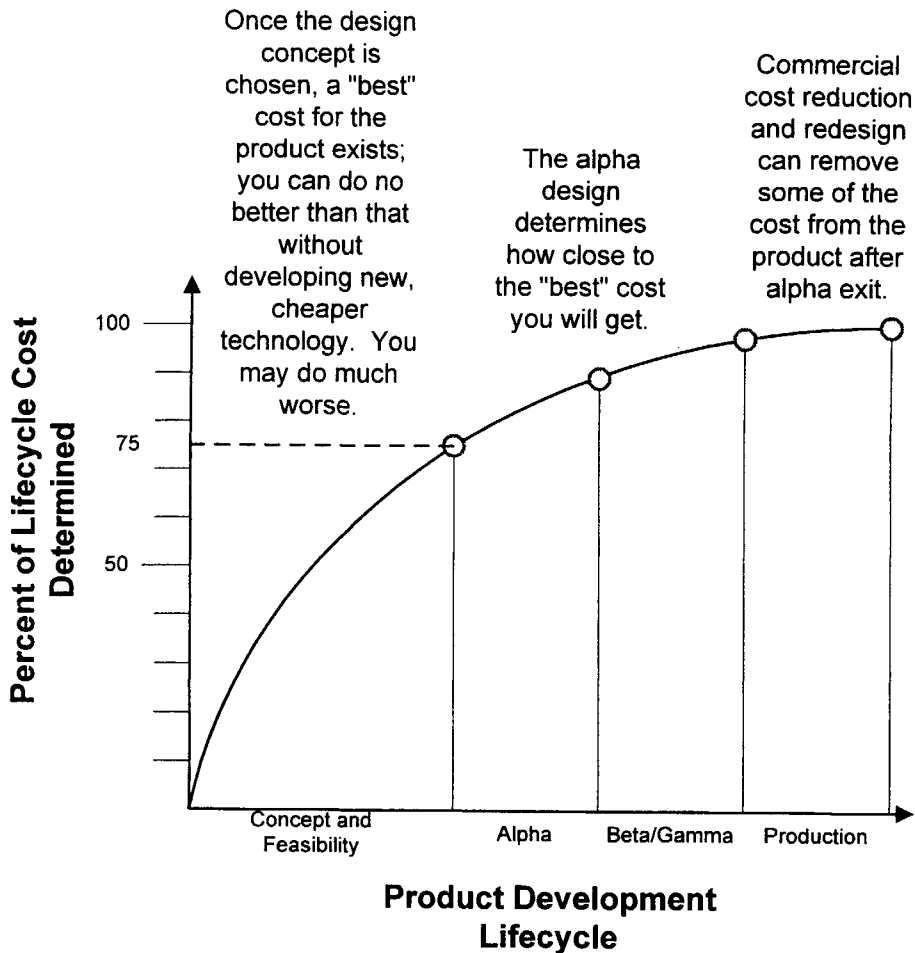
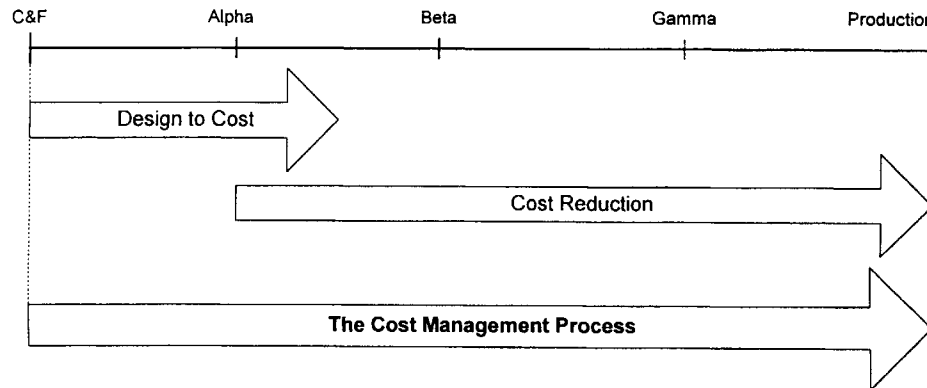
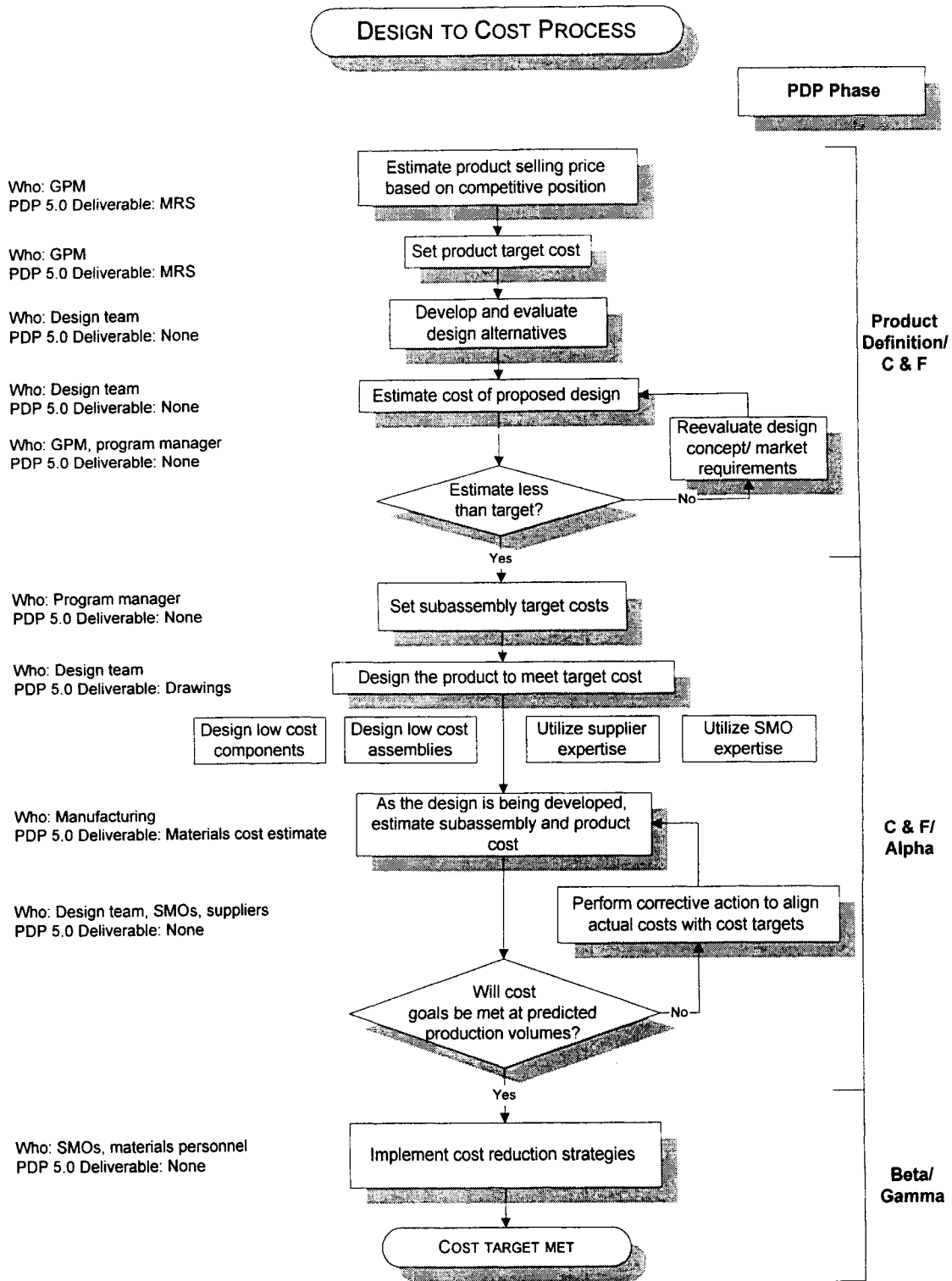


Figure 2



Design to cost process in product development

The design to cost process in new product development is illustrated in the Fig 2. The product development phase and responsible personnel and teams for the cost are the key to success of the product.

The key steps in this process as mentioned above are setting Target cost of the product. The Target costing will define the cost to make the product & gross margin specified at the beginning of product development. The second key step is that the product development team develop and evaluates preliminary design alternatives and their cost by functions. A value engineering member in the team help providing cost estimates using (FAST). Next critical steps is to compare the proposed design cost estimates to Target cost. If the cost estimate goal exceeds the cost goal, the design and/or the cost goal must be re-evaluated. Once the design is finalized the actual cost of the prototype and "should cost" is developed by value engineer. Since the prototype actual cost is significantly higher than the production volume, the should cost model is developed to provide a cost estimate at some production volume. Next the cost goals are compared with the actual cost or should cost data and if they are not met than the corrective actions are put in place. One of the corrective action should be to develop post design cost reduction strategies. The post design cost reduction impact is minimal to product than the design to cost.

Role of Value engineer in DTC

In product development, above mentioned team concept, new tools and processes were utilized, See Fig 3 An example using Value Engineer's cost estimate at the design state is to select the most cost effective design at the various prototype stage and the use of functional analysis. The most important element of DTC is the setting up the global product development database which answers instant access by all functions. This database not only keep track of all cost estimate of the product but compare this cost

to product target cost set for when full production begins. If the estimated cost is greater than the target cost, Value Engineering activities are continued to reduce cost.

In the developing stage, a combination of a Bill-of-material and product specification were collected and all the cost opportunities for design simplification and manufacturing process were discussed. The next stage a comprehensive analysis of the product to get performance, quality and cost factors. The Value Engineering team cost estimates using cost models to make manufacturing process choice and to obtain material, process and tooling costs for the individual piece parts.

This design to cost data is put into the database to compare the target cost to the actual cost at the early stage of the product and when full production begin.

Conclusion

This example shows that it is in the design stage where most of the product cost, quality and reliability are decided.

The paper outlines 4 main phases of DTC in product development #1 product development phase (requirements & target cost), #2 Concept & feasibility (C& F) phase (cost avoidance & DFM), #3 Alpha phase (should cost & evaluate cost) and final as beta/gamma phase (production & cost reduction). Setting up the cost goals and target at the design stage is the key element of DTC. The paper hi-lights that by making the designer responsible for the cost and value engineer helping them achieve DTC by providing should cost & alternative methods. DTC progress clearly results from having a vision of where we are going, a foundation to build on and continuous improvement in all areas. With organizational commitment to these objectives, DTC will be achieved.

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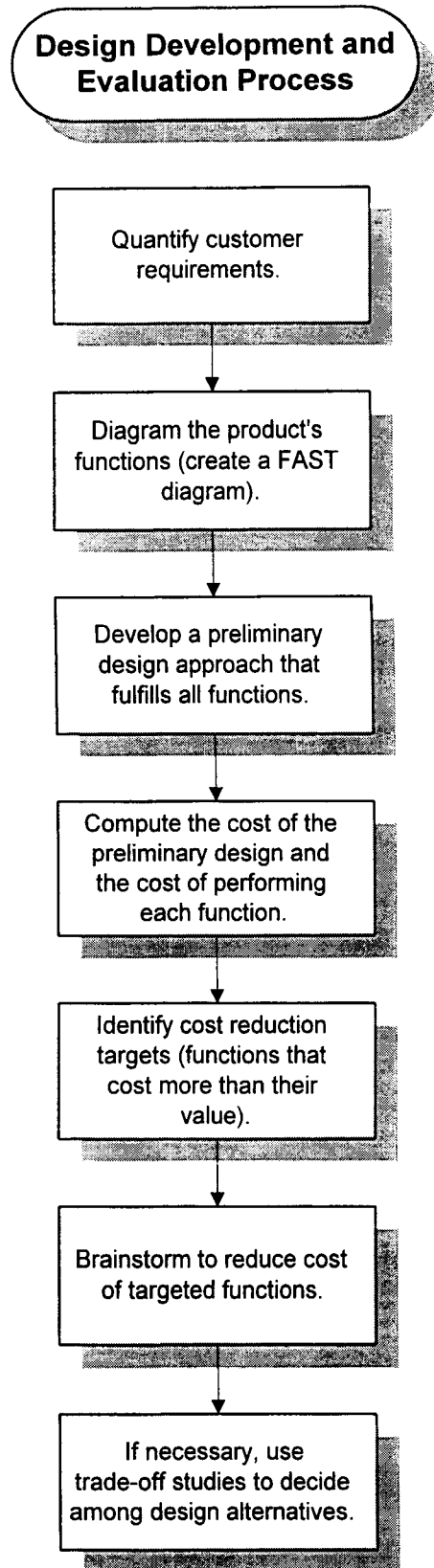


Figure 3