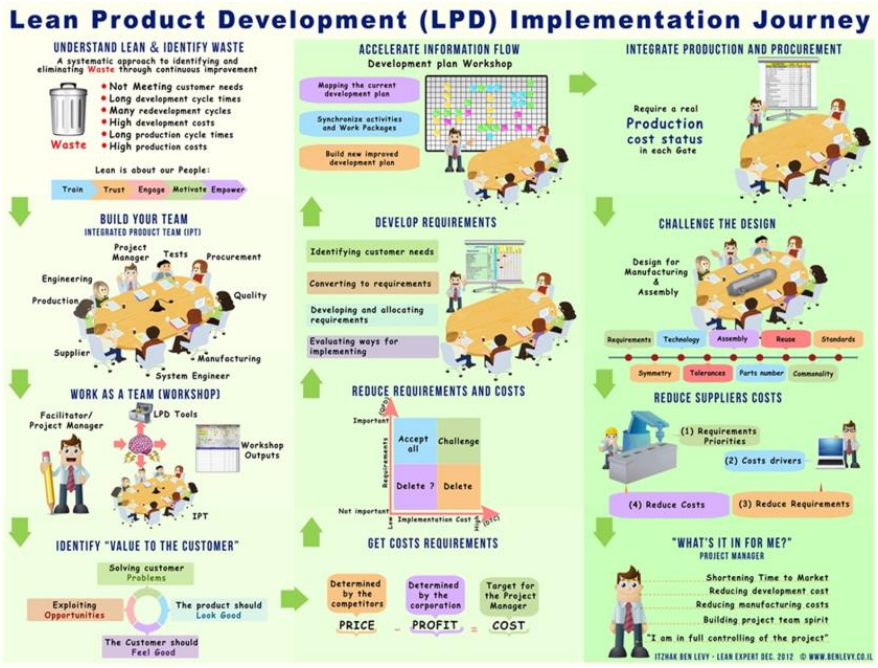
Reducing product cost by using QFD

Abstract

Most of development processes ends with high product recurring costs. When analyzing the development processes, we discover that the main reasons for the high cost are related directly to requirements. Development teams are not aware of customer values, needs and priorities, and most of the time; they don't have cost targets from the project manager. This causes delays in product delivery, high development costs and high product costs. In the Lean Product Development (LPD) methodology, (Figure 1), focusing on requirements take a large portion of the activities as the requirement influences all development processes. I facilitated dozens of cost reduction workshops, and the purpose of this paper is to illustrate from my experience how implementing QFD with Design to Cost (DTC), during the development process, can help with products cost reduction.

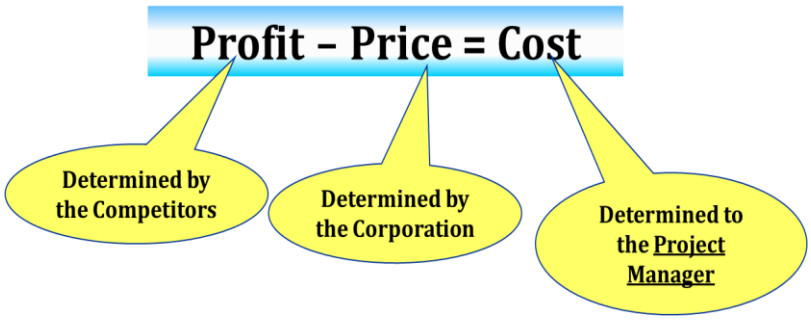


(Figure 1)

External and internal requirements

Project managers have two main customers: The first one is the external customer who dictates the product requirements, time table and price. The second customer is his organization, (which performs the development and manufacturing of the product), this establishes development

budget and product target costs, See (Figure 2). Usually product development teams focus mainly with complying the external customer requirements, while the product cost is derived from the design, and usually above the expectation. This leads to high product cost, which lower the profit and sometimes even creates losses.



(Figure 2)

Nearly 80% of product cost is determined during the early stages of development, (from project initiation, until the end of the preliminary design) when most of the requirements are developed and set. The first activity in the development process is to understand customer requirements using QFD methodology. The development process continues with the preliminary design phase. It starts with developing the internal technical requirements that derive from customer requirements, and continue with the preliminary design of the product that applies to the internal requirements. This is the most effective phase for cost reduction. Most of the time, customers' requirements cannot be modified, while the internal technical requirements are flexible and can be changed. There are several reasons:

- The internal technical requirements link directly to the way of implementing those requirements. Changing the preliminary design enables the change of requirements.
- Engineers try to always be on the safe side and tend to over design or over spec.
- Engineers trend for over design due to "potential growth", which is rarely needed because of current products has relative short life cycle.

At the end of preliminary design, we must balance between requirements and manufacturing cost of the preliminary design. If target cost is not achieved, a cost reduction workshop should be conducted, because in this design phase, flexibility for changes is very high and costs per change are relatively low.

Design to Cost, (DTC)

The concept of Design to Cost, (DTC), is a managerial tool that establishes rigorous cost goals during the development life cycle. In reality, DTC is also an engineering oriented concept that attempts to solve a problem: with a given product cost and requirements :what product can be designed? It emphasizes meeting specific cost targets at various stages in the product's development life cycle. DTC deals with product cost, (product recurring cost), and not development costs. Since DTC is only a managerial technique, we have to add tools like QFD or DFX to enable us reduce cost whenever there is deviation from the target cost.

Cost reduction workshop

A cost reduction workshop is a concentrated effort which is done by selected team members that focuses on achieving a step function in product cost reduction. Integrating QFD methodology with DTC methodology creates an integrated cost reduction methodology that takes the best from each managerial tool. By challenging the internal requirements to customer needs and priorities, and eliminating low priority requirements with high manufacturing cost, we can reduce product cost by 30%.

Figure 3

The workshop take one or two days and includes about 15 people. The participants come from all disciplines involved in product definition, design and manufacturing. The cost reduction workshop has three basic elements: (See Figure 3).

- Multidisciplinary team (Integrated Product Team)

- Facilitator who facilitates the workshop
- Relevant QFD tools and methodologies

The workshop is a structural process that involves a step-by-step assessment of requirements, architecture, manufacturing, purchasing and other cost drivers. The workshop has the following phases:

- Challenging internal requirement against customer requirements and needs (using customer voice table)
- Eliminating over design requirements
- Prioritize requirements
- Assigning production implementation cost for each requirement
- Brainstorming for ideas, and identifying opportunities for cost reduction.
    - High priority requirements with low implementation costs are accepted immediately
    - Low priority requirements with high implementation costs are deleted immediately
    - Low priority requirements with low implementation costs have potential for elimination during the development process
    - High priority requirements with high implementation cost are selected for deeper engineering evaluation of the requirements and cost reduction (See Figure 4)

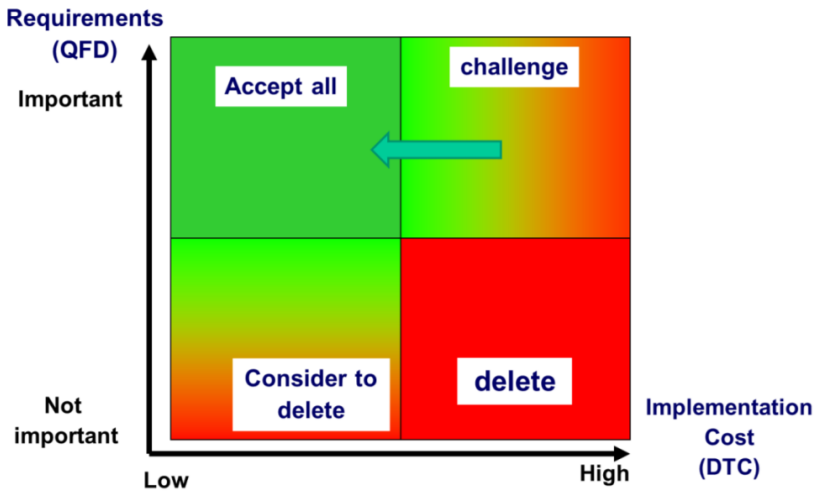


Figure 4

Assigning production implementation costs for each requirement, generates brainstorming and group dynamics; evaluating alternatives and concepts which creates many cost reduction ideas. By comparing the ideas to the product target cost, provides a measurable tool for trade of

implementation decisions. The workshop overcomes limitations of absolute design rules, and promotes creative solutions to the design challenges. It provides a quantitative tool that can place a dollar figure on various requirement design proposals.

The outcome result of the workshop is a "to do list" table of ideas, activities including responsibilities and time table, (See Figure 5).

No	Problems, Ideas, Opportunities	Activities	Saving $	Saving hr.	Owner	Time Table
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						

Figure 5

A month after the workshop, a follow up meeting should take place to verify that the ideas have been implemented within the design and the target cost has been achieved. The PDR (preliminary design review), will not be accomplished until the team shows that the target cost can be achieved in the architecture and technology of the preliminary design.

The workshop requires a culture change that brings manufacturing capability and cost into designer focus on the one hand, and makes the manufacturing and logistic organizations full partners in design concepts and responsibility on the other.

Summary

Target cost must be an independent design requirement that is as important as customer requirements. Integrating the cost target with the engineering requirements, creates an effective tool for cost reduction. The QFD methodology assists us in better understanding the reason for customer requirements and lead us to design affordable products, that meet organization profit goal. The project manager must track and measure the current design cost status against its goals at periodic intervals. This can be easy implemented within the organization, and can show cost reduction results in a short term. The workshop can be applied on each stage of the design, but the best benefit is at the concept design stage where at least 70% of the final product cost is determined.