*Western Region*

# Reducing the Time-to-Market Cycle

## *Decrease time and costs through teamwork, management leadership, and other steps.*

Charles O'Neal

How do you meet the challenge of compressing the time-to-market cycle while reducing cost and improving product quality? Two basic themes emerged from AME's Seattle seminar presentations on this topic — both relating to the front end of the product development/delivery process. First, bring the customer into the process at the beginning. Second, move from serial to parallel processes in product development, design, and manufacturing. These themes define the market-driven organization.

### *Assessing Customer Needs*

Most companies consider themselves to be market driven, yet few reflect this quality in practice, observed Mike Oilar, vice president, Market Decisions Corporation. Why? Because they feel they already know the needs of their customers and capabilities of their competitors.

As a result of this attitude, product planning (including QFD planning) is introduced from the back room — engineering and manufacturing — without information from customers and competitors that's needed to make the right decisions. These decisions include defining and quantifying market segments, determining customer requirements, and determining position relative to key competitors — all affecting products and time to market.

Why is being market driven so important? Because customer purchase decisions are based on customer value. That value is judged by the customer, not on actual performance, but on the customer's perception of that performance relative to competitive offerings.

The entire product development process must be based on market understanding. It results from taking apart and evaluating your product, your competitor's product, your market, and your customer's use of your product.

Market segmentation — identifying and prioritizing user needs — must go beyond superficial demographics and reach down into customer needs that call for different product designs, defining new market segments. Once defined, these segments must be kept separate as the product is developed. Market data should guide product design decisions (see Figure 1).

A differential analysis, or trade-off approach, can be helpful in prioritizing customer needs. The target group selects the most important (top three) and least important (bottom three) features desired. This process brings critical features to the top of the list for design emphasis. It also provides information for segmentation by indicating substantial target groups desiring (or not desiring) certain enhancements.

### *Focus on the Customer*

John Roundhill, chief project engineer for the Boeing 777, presented an excellent case study-in-process of the market driven approach to product development. With competitors planning to launch new products in 1991 and 1993, Boeing's challenge is to develop a product that satisfies customer needs over a 20-year profit horizon and 40-year life cycle, with sufficiently attractive features to convince them to wait until 1995 for delivery.

Boeing took a quantum leap in customer involvement by going directly to the major airlines for help. It brought eight airlines into the product definition stage (each has a representative who manages in-house information development). The other 70 airlines were kept informed of the process.

A key initial customer, United Airlines, joined the Boeing design team. United co-located 53 engineers at the Boeing facility and the organizations have an open relationship with access to sensitive information. Additional customer input comes regularly from target groups of frequent fliers (users). Boeing's primary thrust is to "get it right the first time" as it is released to the market in 1995. (An article noting Boeing's work with Ingersoll Milling Machine Company is in the Summer, 1991 issue of *Target.*)

### *The Role of QFD*

Quality Function Deployment's (QFD) role in supporting product development was demonstrated by Bob Adams, director of sales and marketing, Rockwell International, and Chris Fosse, vice president of total quality at Blount, Inc. Both organizations began using QFD in the mid-1980s. QFD reduces the product development cycle by providing — in advance — a clear, concise product specification based entirely on what the customer wants and doesn't want. Preserving the integrity of customers' needs throughout the development process, QFD is a cross-functional, team-based discipline that shortens cycle time and improves organizational buy-in through common ownership of problems.

Blount found the "customer was missing" in a 1984 examination of its product development process. Heeding a corporate charge to "define a state-of-the-art company-wide system that links the marketplace to all internal functions," Blount employees applied QFD to new product development and analyses of existing products.

The results are very encouraging. During the three-year period prior to QFD use (1982-5), six of Blount's ten major product lines were losing market share. Only one product line lost position during the following three years, while eight gained market share.

## Identify User Needs

- Begin early in the development cycle, before you develop preconceived ideas regarding the product.
- Ways to identify needs: Ask for problems with current products, identify unmet needs, project future needs, and propose product configurations.
- Concentrate on unaided questions; participants' answers will produce lists of features/needs to be quantified.
- Concentrate on needs, rather than features. Don't ask, "What do you want the machine to do?" Instead, ask, "What are you trying to accomplish with the machine?" Use the needs to develop features. Remember, participants are experts in the use of the machine.

## Prioritize Needs

- Can be done in a focus group, although better done in a quantitative (larger sample) study.
- Ratings provide a good starting point, weed out non-important needs/features, and avoid the "everything is important" syndrome.
- Rankings are critical to prioritization success. Opportunity cost is introduced — to pick one as most important, others must be traded off. Watch for super-critical items that will throw off the scale.

***Figure 1.*** *Source: Market Decisions Corporation.*

### *No Silver Bullets*

A four-person team from General Electric looked at the rest of the world to see what leading companies were doing to reduce cycle time in 1990. More than 60 companies were examined. Gerry Hock, a member of the study team, discussed ten of the more significant "best practices" they found:

1. Time is a key performance measure; it must be a top-level strategic objective.
2. Use small, dedicated, experienced, decision-oriented teams (empowered, with key suppliers as members and exposure to customers).
3. Teams are multi-functional and co-located (proximity and mobility are important — teams perceive common threats and they are rewarded as a team).
4. Separate research from development; technology generation should be an off-line process; products are developed using technology that is finished research.
5. Leverage proven product/process technologies. Design new products, not new parts.
6. Flexible product/process technology enables rapid, frequent product introduction (making small changes frequently rather than infrequent major changes).
7. Freeze the product specification, including time milestones, after product definition. Avoid "feature creep;" hold changes to make the product better or cheaper until the next product release.
8. Senior management doesn't micromanage product introduction; it provides resources, removes roadblocks, and enables the team (empowers the team, defines guidelines, and lets them go).
9. Don't let support processes delay development. Procedural or cultural changes may be required to provide direct access to team members.
10. Share post-mortem (or postpartum) findings, good and bad, across the business; communicate at each milestone, not just at the end of a project.

The beauty of these findings is that none of the practices cost money. They result from the way you organize, manage, and practice.

### *Innovation Cycle Time*

Innovation cycle time's importance to profitability was demonstrated by Marv Patterson, Hewlett-Packard's director of corporate engineering. The cycle extends from the time technology becomes available to meet a customer need (To) and continues until the need is satisfied (Ts). When the product definition is frozen, the product life cycle length is established. Break-even time (BET) is when net income from sales generates sufficient profits (B) to regain the original investment (A).

Factors determining product life cycle (PLC), sales revenue, and investment include what is defined as the product, how soon development begins, and how quickly development is completed. While most development activity focuses on shortening the time between the beginning of product development (Tb) and product release (Tr), it may be more productive to shorten "To" by looking for opportunities, to decrease "Tp" (the time at which an opportunity is perceived) by perceiving opportunities more quickly than the competition, and to reduce "Tb" by starting project activities more quickly. Each of these activities will extend PLC, increase cash flow, satisfy customers sooner, and result in a higher return on investment.

Product development can be viewed as an information assembly line, Patterson said. Most of the techniques used in reducing manufacturing time and cost may be applied to product development cycle time and cost reduction.

### *Cost/Time Management*

Only run time, one of cycle time's basic components (also including move, setup, wait, and queue time), adds customer value in the factory or office. The other four elements represent waste. They account for about 95 percent of total process costs. S.S. (Cheri) Cherukuri, a senior consultant, and Kaz Reza, international marketing manager, both of Westinghouse, described cost/time management process for attacking waste in these five elements. A cost/time profile plots cost (y axis) and cycle time (x axis). The three cost elements are material costs (y intercept), waiting time (horizontal line), and labor (slope of curve). The area under the curve represents investment — both visible and hidden overhead costs. The objective: Shrink the profile in both dimensions simultaneously by waste elimination.

Applying it to a new generation process control system, Westinghouse reduced development time to 2.5 years (compared to a 4.5 year industry average), at a 30 percent

lower development cost, with high-quality performance and a ten percent increase in market share.

### Concurrent Engineering

Bart Huthwaite of the Institute for Competitive Design pointed out three fundamentals for reducing product development cycle time and assuring competitiveness:

1. Begin the process at the early concept design stage.
2. Focus on total cost reduction including hidden design costs.
3. Involve an empowered, cross-functional design team from the early concept stage.

Product design drives 75-80 percent of total cost, while accounting for only about five percent of product cost as an activity. Huthwaite said most concurrent engineering (CE) teams have never designed anything before. They need training, especially at the early concept stage. Teams also need mind-set change to view the ripple effect of product design on the entire organization.

### NeXT's Warp 9

With these CE guidelines as a backdrop, Randy Heffner, vice president of manufacturing for NeXT, illustrated their application to development of NeXT's current Warp 9 (code name) computer. Product definition was based on extensive marketing research including customer request information, case studies with target customers, and advisory groups.

Product targets focused on speed (a 2.75 improvement factor), price (50 percent reduction), enhanced color capabilities ("dazzling color"), and significantly greater third-party applications.

Heffner served as project leader of a cross-functional team with representatives from marketing, R&D, manufacturing, and materials. Parallel processes dominated the entire product development. Key suppliers were brought in early to develop leading edge technologies while meeting pricing and shipping schedule objectives. R&D and manufacturing co-developed the product and process with all prototypes built in manufacturing. They designed this all-new product for easy assembly (five to seven minutes) and easy servicing (15 minute mean time). It was built in a highly automated facility and introduced on schedule.

Major factors contributing to Warp 9's success: high company priority, high-level product champion, project team credibility, a cross-functional approach, product and process co-development, disciplined feature freeze, and team empowerment.

### Adding Automation

Concurrent engineering's impact on quality, cost, and cycle time was highlighted by Jose Castro, product and technical manager, and Peter Hoogerhuis, director of consulting service, Mentor Graphics. They introduced the concept of automated concurrent engineering (ACE): "a goal approached in applying automation technology to optimize the process by which products and their related manufacturing and support processes are developed." As the time-to-market cycle continues to decrease, reviewing designs for all the "ilities" — manufacturability, testability, etc. — becomes a major cost and time issue. This issue is addressed by ACE. A key ACE element is a framework technology — software providing a common set of services between the computer system and the application and tools. Results of a Mentor Graphics application in the medical electronics industry are shown in Figure 2.

### Pushing the Limit

The computer software industry is dynamic and fiercely competitive. Low entry barriers, diverse products, and informed users characterize the market. Lewis Levin, director of application tools for Microsoft, walked through the product development process needed to compete. Close teamwork — in location and interaction — is essential. Each Microsoft design team has five to 20 members and its own test team of five to 15 members. Product team responsibilities include program management, product marketing, development, testing, and user education.

Software development presents unique challenges compared to a tangible product. Design and development are the product. Design is not separated from manufacturing. Many of the design decisions are not embodied in the document, but in the product itself. Design specs bound the problem but leave out much detail, with much of the design work left to the developer — the source of much of the technical innovation. A usability lab provides visible, timely feedback from target users — and useful "aha" experiences.

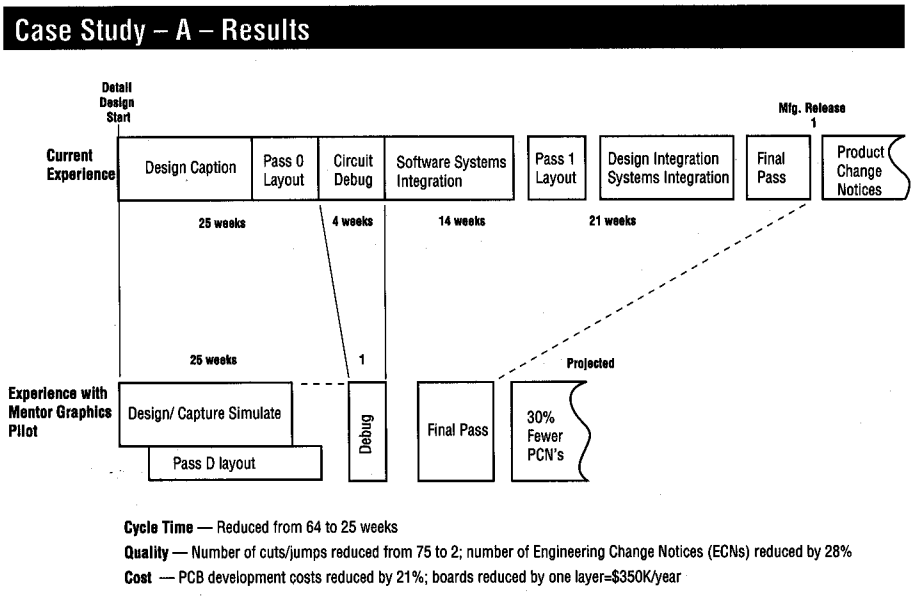


***Figure 2.*** *Cycle time, quality, and cost results from a concurrent engineering case study. Source: Mentor Graphics.*

Microsoft compressed its development cycle to approximately 15 months with many activities performed concurrently. More compression probably will come from shortening the cycle between projects — the time from the disbanding of a project team to new team formation and effective interaction.

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