HRD's Role in Concurrent Engineering

BY RICHARD E. ANDERSON

IT'S TIME TO GET OUT YOUR HRD TOOL KITS. INSIDE, YOU'LL FIND WHAT YOU NEED TO PROVIDE THE SAME SUPPORT FOR CONCURRENT ENGINEERING THAT YOU GIVE TO YOUR ORGANIZATION'S TOTAL-QUALITY EFFORT.

If you were to randomly ask HR professionals what they've done lately to support concurrent engineering in their organizations, you'd probably see a lot of frowns, furrowed brows, and fingers pointing at technical-training departments.

Not all HR people can define concurrent engineering, which is an approach to product development in which engineers work on design and manufacturability at the same time. Concurrent engineering differs from traditional product development, which separates design and manufacturability. The ultimate goal of concurrent engineering is to reduce time-to-market while improving quality.

HRD's role in concurrent engineering is not always clear. As in TQM efforts, HR people can help overcome cultural barriers to concurrent engineering and gain employees' commitment to it. In fact, concurrent engineering requires the same team skills as TQM and some tactics right out of standard HRD tool kits.

A major area in which HRD can contribute to concurrent engineering is organization process, which has to do with training in

- team and team-leader skills
- executive skills
- project management
- problem solving
- conflict resolution
- facilitation
- change management
- transitional management
- career coaching
- the presentation of business-information briefings.

HRD can use organization process to help break down the "people barriers" that arise from the differences between concurrent engineering and traditional product design.

Firms are turning to concurrent engineering as a way to speed up product development, lessen the likelihood of having to make costly engineering changes later in the process, and reduce time-to-market. In concurrent engineering, designers and manufacturing engineers work as a team to collaborate on a product's components and specifications. But getting designers and engineers to work together effectively isn't always easy. Organization process can help.

A critical step is to merge the separate units of design and manufacturing. But combining the two operations can be difficult, both logistically and in relation to issues of diversity.

Traditional product design encourages a sort of "hands-off" policy between designers and manufacturing engineers. Design engineers frequently work in off-site design centers or in secured areas on-site. Also, designers tend to view themselves as elite; they can experience culture shock when placed elbow-to-elbow with manufacturing engineers in plant environments. That's when the people barriers may build up—especially when the manufacturing engineers are ex-designers who "didn't hack it," and when people without college degrees have been promoted from the shop floor to become engineers.

In such cases, product designers may feel they've lost status and power when asked to work with manufacturing. Manufacturing engineers may feel they've got a chance to "even the score" with the ivory-tower techies who threw elegant

designs at them and said, "Build them," but offered no assistance.

External suppliers enter the picture when the actual manufacturing of a product is done outside the plant. In such cases, it may be advisable to include suppliers in the early stages of a product's design so that they can provide both design services and production knowledge.

But as each new viewpoint is added to the mix of a cross-functional team, diversity and complexity increases.

That diversity can cause conflicts between team members and prevent team cohesiveness. Diversity also can impede problem solving; teams may sacrifice innovative thinking in favor of achieving harmony among their members.

The good news is that HR people can help team members cope with and resolve diversity-related issues through organization process. When people work in teams, they tend to address problems early on. And in concurrent engineering, early problem resolution is reflected in fewer costs due to last-minute delays in the production cycle.

Real-world examples

John Deere & Company. In the mid-1980s, Deere introduced several concurrent-engineering efforts. A major one, in Deere's Harvester Works division, aimed at speeding the development of the 9000 Series Combine.

Sixty manufacturing engineers moved out of the factory and into the Product Engineering Center, three-and-a-half miles away, to work with designers. Though housed together, the design- and production-engineering groups at first worked separated by an aisle, preserving their distinct functional identities.

Later, to break down the functional barriers, the designers and engineers formed teams that included people in the purchasing, supply, and service areas as well as employees from the shop floor. Responsibility for the new 9000 Series Combine design became a shared one, rather than being shouldered only by the designers, as in the past.

The successful transition from Deere's old way of developing products to concurrent engineering depended greatly on skills training and organization development support.

Mike Wyffels, manager of engineering at Harvester Works, says, "At first, the training focused on the technical area. But then we realized 'soft' issues were more important. Soft-skills training was the cornerstone of making the process work."

Deere increased the training budget and staff to provide training in soft skills such as team building and problem solving. Training goals and measurements were established for all employees. The ultimate aim of the training was, and still is, to eliminate the cultural and social roadblocks to change.

The training helped reeducate Deere's managers so they could effectively operate during the transition

from traditional product design to concurrent engineering, and so they could work effectively with teams made up of professional and shop-floor employees. Eventually, the role of manager shifted from controller to facilitator. And Harvester Works' organizational culture began moving away from hierarchy and toward self-directed teams.

But success doesn't always spread like wildfire, says Wyffels. He cautions that if an organization wants to make real progress, it has to address the cultural aspects of change, an area in which HRD made significant contributions at Deere.

One way HR people supported Deere's change effort was by joining concurrent-engineering teams to serve as facilitators in conflict resolution. Deere continues to train team facilitators, both salaried people and hourly-wage employees.

Business training also supports the teams. Managers now give teams information that previously was kept confidential. The aim is to ensure that team members understand their roles in the context of business goals, market needs, and the company's bottom line.

Ingersoll-Rand. Another company that has experienced—and resolved—team strife associated with change is Ingersoll-Rand, which launched Operation Lightning as a plan for using concurrent engineering in developing a new power tool in record time. A case study by the Boston-based Corporate Design Foundation quotes team leader Jim Stryker, describing one of the early meetings:

"We asked everyone in the room to stand; everybody stood. Then we said, 'Here's our product, this is why we want to make it, and here's how much money we can earn from it. Everyone in favor of moving forward, please sit down.' Everyone sat, except the manager of engineering. Consequently, we started the process off with an organizational blackball that said we couldn't do it."

Eventually, the company did it, but not without conflicts. Using organization-process skills, team members created innovative ways to help resolve their conflicts and learn to trust each other. They attended horse races and hockey games together and visited the team leader's home to swim, play basketball, and cook outdoors. In fact, the team officially recognizes barbecues as instrumental to team building and the success of their project.

Cadillac Motor Division. When Cadillac Motor Division of General Motors began concurrent engineering in 1985, it laid out a strategy for building a team culture. That strategy involved the following steps: selling the team concept to executives; forming a concurrent-engineering steering committee; and creating about 55 concurrent-engineering teams, three-quarters of which would include external suppliers. In addition, the company encouraged team members to visit Cadillac dealers and listen to what customers in the showrooms were saying.

From the beginning, Cadillac's trainers were active in supporting the program. They delivered training in concurrent-engineering practices to more than 1,000 employees. A series of concurrent-engineering workshops helped the participants put concurrent engineering into practice. The employees began actual work projects during the training sessions and then continued implementing them back on the job.

Similar to the teams at Ingersoll-Rand, Cadillac's teams tried novel approaches to team building. For example, they established "jeans days," on which engineers traded their suits and ties for jeans and work shirts and joined assemblers on the plant floor.

Working side by side with shop-floor employees gave the engineers firsthand knowledge of design glitches. They got coaching in assembly practices from line operators. And the engineers developed a real-world understanding of their primary internal customers, Cadillac's assemblers.

By now, most people have heard of the outcome. Cadillac's culture shift to concurrent engineering and quality improvement led to a Malcolm Baldrige National Quality Award in 1990.

Ford Motor. Ford Motor's successful introduction of the Taurus and Sable models was driven by quality improvement. But the training that supported Ford's quality movement stimulated the team environment and team skills that made possible the concurrent-engineering program, Team Taurus.

From the start, former Ford Chairman and CEO Donald Petersen recognized the strategic role HRD would play in the effort and showed his support for training and organization development.

In his book, *A Better Idea,* Petersen outlines Ford's strategy:

- creating a seminar for the top 2,000 executives
- employing a facilitator for the senior-executive committee, which guided the change program
- creating an employee-involvement seminar for managers
- emphasizing cross-functional cooperation through the use of the Myers-Briggs Type Indicator and by sending feedback "valentines" on critical issues across functional groups
- providing training for hourly-wage workers in problem solving and employee involvement
- having Petersen himself and the number-two person at Ford at the time, Harold Polling, participate together in the Myers-Briggs Type Indicator and in facilitation training, to show cooperation between two executives from different functional backgrounds and management styles.

Ford also enlisted external facilitators and consultants to deliver training in team building, problem solving, and conflict management.

To stimulate cooperation between work areas and functions, Ford targeted what it called the "chimneys of power," internal fiefdoms created by an emphasis on functional rather than organizational goals. The company proceeded to engage in "chimney breaking," which HRD supported with intensive training in conflict management for functional areas that were considered to be entrenched in old, now dysfunctional, ways of doing things.

Ford went on to reorganize the engineering process and review the process for product-design approval. An interface group of design engineers and manufacturing engineers used the facilitation and conflict-management skills learned in training to resolve differences.

The changes set the stage for the design and implementation of Team Taurus, which was Ford's first real attempt at multifunctional development using concurrent-engineering methods. Team Taurus sought design ideas from disparate functional areas, suppliers, and customers. The team received 400 suggestions from the Taurus plant in Atlanta alone, five years before production even began.

Ford now incorporates the areas of quality, cost, and time-to-market in one process, Concept-to-Customer. HRD supports Concept-to-Customer through extensive, ongoing training.

Technical capability and QFD

At the heart of concurrent engineering are the capabilities of a company's technical workers. But many companies have found that innovation, manufacturing, and quality can fit comfortably together in one somewhat nontechnical process, quality function deployment—a key area for HRD support. HRD is the linchpin between concurrent engineering and TQM, whether QFD training is delivered in-house or by external consultants.

QFD enhances TQM by emphasizing that quality is defined by the customer and that it is best achieved when a product or service is designed to increase customer satisfaction. QFD shifts quality from a find-and-fix mode to one of prevention. And QFD is a team function; it's not just for engineers.

Because design engineers have traditionally been isolated from the marketplace, they often have produced technically driven designs that were unduly complicated and out of sync with customer needs. Using QFD, designers can convert customer needs into specific engineering requirements. A customer-driven QFD matrix can help concurrent-engineering teams translate such customer needs as "a roomy front seat" into "headroom, hip room, and seat angle," before concept specifications are finalized.

Since 1987, Ford has been a leader in the use of QFD. By January 1991, more than 5,000 Ford employees had received QFD training; 400 QFD projects were underway. Today at Ford, QFD is considered a condition of employment for engineers, and it's an important ingredient in customer-oriented team efforts.

General Motors, Hewlett-Packard, Digital Equipment, IBM, and other corporations also apply QFD regularly when introducing new products or upgrading existing ones.

Information technology and electronic communication

Contrary to many people's view, concurrent engineering isn't technology driven. It's a people process. Information technology supports concurrent engineering, not the other way around.

For concurrent engineering to be effective, designers and manufacturing or production engineers have to be able to share information. They should feel a sense of commonality. To achieve those aims, it's necessary to break down the walls separating

them by their work functions.

In some companies, the design and production engineering units can't be combined because it's geographically unfeasible. The next best thing is electronic communication.

A design group at AT&T has experienced success in working concurrently, even though the group is located at Bell Laboratories in New Jersey and the manufacturing operation is 1,500 miles away in Denver. Through shared, computerized design tools and frequent communication via fax, electronic-mail, teleconferencing, and high-speed data links, the two areas have been able to achieve their goal, which was to improve circuit-pack design and manufacturability.

Many organizations have the capabilities to build such networks but lack the necessary open and cooperative work environment. HRD workshops in communication skills can help concurrent-engineering teams create a favorable climate for network communication.

The training also should address the technical aspects of electronic communication. Systems experts should describe the firm's software capabilities for supporting a wide range of concurrent-engineering tools, including network communication. The people who are going to install the software systems also can benefit from the soft-skills training given to the concurrent-engineering teams.

Of course, just because software systems are made available doesn't mean they'll be used. Skills training in software usage is essential. But it's important to consider that such training can require a sizeable investment, may take months, and doesn't necessarily reduce time-to-market.

Product designers may like the flexibility of computer-aided design systems because the software enables them to experiment with more design options. Though CAD software may improve design quality, it also may extend development time.

Change and career development

The experiences of Cadillac, Ford, John Deere, and other companies show the broad spectrum of training options that exist with concurrent engineering. Ideally, concurrent engineering should be part of an overall change strategy leading to a renovated product-development process.

In reality, many companies aren't prepared to deal with the culture shock that usually accompanies the overthrow of entrenched routines. They tend to end up providing quick, one-shot programs that do little to alter the old methods of product development.

True change depends greatly on training. In conservative work environments, HRD support can help raise an awareness of the need for change. In an organization that wants to improve its competitiveness

quickly, the human resource department can help implement an all-out change effort.

But for concurrent engineering to be truly effective, it requires more than skills and awareness training. It takes long-term career development and a rethinking of organizational succession planning.

In some organizations, career development is neglected in favor of functional development, in which people advance only in their areas of specialty. They acquire knowledge of and a commitment to their own functions, but learn little about other work areas, other business issues, and the organization as a whole.

Functional advancement grows tall, narrow hats with labels that say, "Not Invented Here," instead of broad-brimmed hats that have bands of empathy. Engineers who are confined to certain functional areas aren't likely to bridge the chasm between design and manufacturing. The result is a no-win situation for the engineers and for the organization.

The antidote is an HRD strategy for cross-training, rotation, and career flexibility. Two companies that provide cross-training and rotate design engineers into field engineering and manufacturing are Xerox Corporation and Apple Computers. At both companies, manufacturing people also are rotated into the field and design areas. All new hires in design engineering are required to spend at least six months in manufacturing before moving into their design jobs.

In Japan, engineers and research people are routinely exposed to cross-functional career development. Japanese companies tend to develop "generalist engineers" with backgrounds and capabilities in both design and manufacturing. The approach seems to work at the top, too. At Honda in Japan, the head of research and development often moves into the top executive spot.

The design phase of product development, in which concurrent engineering and quality control are applied, typically represents about 5 percent of a product's cost. But design decisions made in that phase affect at least 70 percent of the overall production cost. Clearly, getting it right the first time is important. And getting it right the first time depends more on people and their organizational skills than on technology.

HRD couldn't ask for a greater opportunity to demonstrate its ability to contribute favorably to an organization's business results. ■

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