Customer Driven Engineering

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Paying attention to consumer wants should be a given in product design. Yet it has only been recently that companies have fashioned systems to give engineers a wider role in both sounding out customers and in deciding the design features to satisfy those consumer preferences.

Design News: **Just how do you define Customer Driven Engineering?**
Hauser: It is a system that tries to coordinate the marketing function with engineering decision-making so that the final product fulfills consumer preferences while still meeting optimum engineering and manufacturing standards.

Q: In your writings, you describe a "house of quality" that product designers assemble in weighing the tradeoffs between consumer wants and the engineering needed to satisfy them. How do you build that house?
A: The objective is to develop an explicit diagram of information that a design team needs to make the right decisions on a product. You begin by assembling "customer attributes," descriptions of desired benefits and characteristics in the customer's own words. A typical application can have dozens of customer attributes associated with it. Take a car door, for example. People want a door that is "easy to close," "stays open on a hill," "doesn't leak when it rains," and creates "little or no road noise."

Gathering information on such attributes can be as simple as engineers going out and talking to people or having trained interviewers question consumers, with engineers observing behind a one-way window. Whatever the technique, it is very important that engineers get close to the customer—whether it be a consumer or an OEM buyer—because there is great danger of mistakes or biases creeping in when an engineer is confined to reading a market research report. A lot gets lost in the translation.

Once those customer wishes are gathered—and ranked in order of importance—then engineers can identify the engineering characteristics that respond to those preferences. In addition, the design team should also request benchmark studies in which the customer is asked to evaluate the company's current product against the competition's. For example, IBM might think its PS/2 keyboard is the easiest to use, but the firm had better verify that assumption by asking user groups to evaluate several models for ease of use. Once you've got such information, the engineering decisions are often quite easy to make, though, of course, you may have to develop several variations or models of a product, as automakers do to satisfy different audiences.

Q: What goes on in trying to decide which engineering characteristics can best fulfill those customer attributes?
A: It is a series of tradeoffs, affected, of course, by the costs involved. You can do some things very inexpensively that make a big impact on satisfying the consumers. Other engineering steps may not be worth the expense for the return you get. Some engineering teams will assign relative weights to the engineering characteristics. Using the car door example noted earlier, the designers might determine that the energy needed to close the door is roughly twice as important a factor to consider than check force on a 10-deg slope. By comparing weighted characteristics to actual component costs, design teams set priorities to improve components.

Q: What was the origin of the Customer Driven Engineering system?
A: It was developed around 1972 at the Kobe Shipyard by Mitsubishi Heavy Industries and perfected through applications by Toyota and its suppliers, as well as Japanese manufacturers of consumer electronics, home appliances, integrated circuits, construction equipment and agricultural engines. Indeed, Toyota's success in dramatically improving rust prevention in its cars is often cited as the prime example of the benefits of the Customer Driven Engineering approach. Using the house of quality ideas discussed earlier, designers broke down "body durability" into 53 items, covering everything from climate to modes of operation. They obtained customer evaluations and ran experiments on nearly every detail of production, from pump operation to temperature control and coating composition. They went so far as to determine the acid damage that might be caused by carrying spoiled fruit in the trunk.

Then the company focused decisions on sheet metal details, coating materials and other aspects of rust prevention most important to customers. The result: Toyota now has the reputation of making one of the most corrosion-resistant cars on the road. In fact, the rust study was the beginning of a whole series of improvements that Toyota made by systematically looking at customer attributes and the engineering characteristics needed to satisfy them.

Q: Have U.S. companies begun to use this same consumer-driven system?
A: Yes. In the last three to four years, the system has been adopted by Ford, General Motors, Digital Equipment Corp., Hewlett Packard, AT&T, ITT, Xerox, the Budd Company, and Cummings Engine, just to name a few. Where the system has taken root, both top management and engineers have found it a very effective technique.

The support of top management is vital. But once you get it, the approach gives engineers a strong say in the design process because the technique is developed by engineers for engineers. It also is a way to integrate engineers with others in the product development team, including marketing and manufacturing—a process that everyone seems to be pushing for today. □

For more details, see Professor Hauser's article in the May-June 1988 issue of HARVARD BUSINESS REVIEW.