



BY JOSHUA ISRAELSOHN, CONTRIBUTING TECHNICAL EDITOR

## What does “better” mean?

Since the days of Scottish inventor and engineer James Watt, engineering practice has focused on balancing multiple goals: improving performance, increasing robustness, expanding function, and reducing cost. As has been the case for the two centuries since Watt, the market decides for each product the value of any particular combination of these four attributes. Alas, thus far, no one has extracted a useful value predictor from the historic market data.

Engineers can and do observe market behaviors, however, and they glean trends that help inform engineering judgments. During the last 20 years or more, the trend in consumer products has been to push the balance to favor cost reduction, product-function expansion, and performance improvement, often at the cost of robustness. The assumption has been that rapid advances in technology will render products obsolete before their marginal robustness becomes an issue. As successful as this strategy has been, its usefulness may be running out for two reasons.

A number of consumer products have evolved to the point at which existing performance levels and features are entirely adequate for most users. Further efforts to increase value along these two axes may not enjoy correspondingly greater traction in the market.

For example, a low-end home computer selling for a fifth of the original IBM model 5150 PC's price operates with a clock nearly three orders of magnitude faster, a dual-core processor with eight times wider datapaths, and four orders of magnitude larger mem-

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ory. A direct comparison of the two machines is not the point. Consider these devices rather as milestones, with many in between, measuring the progress the industry has made during 26 years of innovation. The market's response to this innovation has been tremendous. Consider, however, how customers might value a doubling of any of the machine's capabilities. Can household customers benefit from a further doubling of clock speed or disk space? Would four cores change their typical experience enough to justify the expense?

Once a machine's capabilities are sufficient that they no longer limit the

customer's use, the incremental value of increasing capability sharply drops. This situation is true of home computers as well as mobile handsets, home-entertainment equipment, appliances, and a host of other products.

As more products reach this point, at which typical models are entirely adequate to meet the market's needs, product robustness—or a lack thereof—becomes more conspicuous. This concept is particularly true in this modern age of so-called viral marketing. In this environment, the picks and pans of ordinary users can influence purchasing decisions more effectively than can your company's advertising efforts—particularly the pans.

Nothing taints a customer's otherwise positive experience of a product or his or her assessment of its manufacturer more than a failure within the device's expected lifetime. Common failures for consumer and portable devices include failures of electromechanical parts, such as switches, keypads, and connectors. ESD (electrostatic discharge) and power-supply surges induce another common class of failure mode. Rarely do I hear of consumer electronics failing at the core function. Rather, it's at the device's periphery—the bits that stand between the functional core and the outside world—where one often finds the products' weaknesses and opportunities to make products better. **EDN**

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