



In contemporary high-tech markets, a continuous stream of new products and technologies hits the market at regular intervals, challenging established positions and hierarchies.

computer products and services markets because these markets are supposed to exhibit strong network effects. Yet we found that not only did quality prevail in these markets, but network effects enhanced the role of quality. In other words, network effects drove customers to quality and superior brands.

How Quality Wins

If network effects were dominant, an early entrant would dominate a market, and there would be no subsequent changes in market leadership. But in the markets we studied, there were frequent changes in market leadership:

- The average duration of market leadership ranged from 5.5 years in operating systems to as short as two years in Web browsers.
- The average duration for market leadership in the markets we studied was only 3.8 years.
- In 10 markets, there were multiple switches in market share leadership.
- Overall, there were a total of 34 switches in market share leadership.

To the extent that there were changes in market leadership, were those changes related to quality? Based on our study, the answer is yes. Consider the market share flows of the three major word processing brands between the mid-1980s and 1990s: Microsoft Word, WordStar and WordPerfect. The quality of WordStar, the early market leader, started slipping in 1984 and never recovered. Consequently, it lost its dominant market position for good by 1988, leaving Word and WordPerfect to battle it out for quality and market share for the next few years. By 1991, Word was the clear leader in quality and, a couple of years later, became

[INNOVATION STRATEGY]

How Quality Drives the Rise and Fall of High-Tech Products

The conventional wisdom is that products that have a strong established base of users can often trump higher-quality alternatives. But recent research suggests otherwise.

BY GERARD J. TELLIS, EDEN YIN AND RAKESH NIRAJ

Why does the free Linux operating system not make more headway against Microsoft Windows? Why does Apple still only sell a minority of the personal computers in the United States despite its devoted followers and the runaway success of its iPad, iPhone and iPod? One answer involves what economists call network effects—a term that refers to the additional benefits that accrue to a product or its accessories with an increasing number of users. For example, far more programs run on Microsoft Windows than on Linux.

In economics, the conventional wisdom is that network effects can and often do overwhelm quality considerations, enabling early market entrants to dominate a market even with inferior products. The classic example is the success of the QWERTY keyboard over the supposedly superior Dvorak keyboard. Some economists have argued that new consumers

choose their brand primarily on the direct or indirect benefits accruing from the network of current users, rather than solely from the intrinsic quality of the brand.

However, based on our historical analysis of 19 markets for technology hardware, software and services in the 1980s and 1990s, we found that while network effects do affect market share flows, quality prevails. In our study, we defined quality as a composite of the brand attributes (such as reliability, performance and convenience) that customers valued. We then derived our measure of quality from the reviews in four of the most respected and widely circulated computer magazines of the time. We selected the personal

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▶G.J. Tellis, E. Yin and R. Niraj, "Does Quality Win? Network Effects Versus Quality in High-Tech Markets," *Journal of Marketing Research* 46, no. 2 (April 2009): 135-149.

the undisputed leader in market share.

The other markets we studied showed a similar dynamic. Out of the 34 switches in market share leadership in our study, 18% were related to a switch in quality leadership during the same year, 50% were related to a switch in quality leadership in prior years and 20% were related to the subdominant brand already having had superior quality to the dominant brand. Only about 12% of the switches in market share leadership had no relationships to quality changes. Further statistical analyses confirmed the link between quality and market share: Switches in quality leadership that occurred two years earlier had the most impact on switches in market share leadership. We also found that, in cases where a small brand's quality exceeded that of a larger-share brand's, the greater the quality difference between the two, the more probable was a switch in market share leadership.

In the high-tech markets we studied, we found that the best quality product — not the first to enter and build a network of users — ultimately dominated the market. While network effects exist, there are several ways in which contemporary high-tech markets operate differently from some economists' assumptions. First, there is a continuous stream of new products and technologies that hits the market at regular intervals, challenging established positions and hierarchies. Second, because the majority of consumers find it difficult to make a choice among competing brands, they look around for information. They often rely on experts or informed consumers who have reviewed or bought a similar product relatively recently. A consequence of the reliance on experts or informed consumers is that the uninformed consumers tend to buy better quality products than they would have chosen without the benefit of others' expertise. That effect then propagates through the network over time. As a result, network effects in these markets actually enhance the

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speed with which good-quality products assume market leadership.

Implications for Managers

Managers in high-tech industries frequently need to balance product quality and time-to-market. The current practice, influenced by a belief in network effects, often is to rush to market even at the cost of quality, in order to gain an early advantage by building a network of users. This practice may contribute to the high failure rate of new high-tech products. Based on our research, we recommend a very different approach. First, managers need to put more emphasis on the quality of their new products than on the speed to market. Second, they should attempt to generate positive word of mouth about their products among users — especially influential and quality-conscious users — through mechanisms now offered by the Web and user-generated social media.

At the brand level, our theory helps explain why late entrants such as Apple's iPod and Microsoft's Word can be successful. When the iPod was introduced in 2001, it was a late entrant in the MP3 player market. It went up against earlier MP3 players, including one by Sony, which had a good reputation for music players because it had pioneered the Walkman. Prior to the iPod, Apple had no significant experience, users or reputation in music. However, the iPod succeeded because of the superior convenience of the product, software and accessories relative to prevailing competitors. Once it built a cadre of users, Apple was able to leverage the user network to spread good word of mouth.

Even though our study was conducted in the context of high-tech products, the findings have wide implications and applications to other areas. As technologies advance, human society is increasingly wired through new social networks using

new media. Our findings suggest that networks enhance rather than stymie the role of quality — and argue against rushing products to market.

Gerard J. Tellis is a professor of marketing, Neely Chair of American Enterprise and the director of the Center for Global Innovation at the University of Southern California's Marshall School of Business in Los Angeles. Eden Yin is a university senior lecturer in marketing at Cambridge Judge Business School, University of Cambridge, Cambridge, United Kingdom. Rakesh Niraj is an assistant professor of marketing and policy studies at the Weatherhead School of Management at Case Western Reserve University in Cleveland, Ohio. The authors' research study was supported by a grant from Don Murray at the USC Marshall Center for Global Innovation. Comment on this article at <http://sloanreview.mit.edu/xJ52A03>, or contact the authors at smrfeedback@mit.edu.

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[PRICING]

The Big Difference a Penny Makes

Should you price a consumer product at a price that ends in 99 cents — or price it at a round dollar amount?

What's the difference between \$9.99 and \$10.00? Not much, objectively. There's little you can buy with a penny these days. But a study by three researchers finds that many restaurant managers believe that price endings such as 99 cents or a round dollar number communicate a significant message to consumers.

Robert M. Schindler,



a professor of marketing at the School of Business at Rutgers University-Camden; H.G. Parsa, a professor at the Rosen College of Hospitality Management at the University of Central Florida; and Sandra Naipaul, an assistant professor at the Rosen College of Hospitality Management, surveyed 112 U.S. restaurant managers. The researchers found that a large majority

of restaurant managers believe that consumers pay less attention to the right-hand digits in a price and instead pay more attention to the digits to the left of the decimal point. What's more, the majority of the restaurant managers surveyed believed that consumers associate prices ending in 99 cents with good value. (And, in fact, some previous research has found that using price endings that are just below a round number — such as 99 cents — can lead to increased sales.) Nonetheless, the professors found that almost one-third of the restaurant managers surveyed use "round" price endings (such as \$10.00 or \$7.50) more often than prices that have "just-below" endings such as 99 cents or 95 cents.

Why is that? Well, 42.9% of all the restaurant managers surveyed — and 82.9% of those who more often used "round"

price endings — believe that customers associate prices that end in .00 with high quality. Also, some of the managers who more often use "round" price endings indicated that they saw such rounded prices as more honest or as more conducive to a classy image — or that they simply make price communications, calculations and making change easier. Slightly more than half of the managers in more upscale restaurants responding to the survey (which also included managers of inexpensive, quick-service restaurants) said they used round price endings more often.

Schindler, Parsa and Naipaul's paper on their research, "Hospitality Managers' Price-Ending Beliefs: A Survey and Applications," will be forthcoming in the journal *Cornell Hospitality Quarterly*, Schindler noted.

— Martha E. Mangelsdorf