

THE EDITOR'S CORNER

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The Innovator's Dilemma

To my knowledge, Clayton Christensen is the first management consultant to suggest that dominant, wellmanaged firms can fail because of what they do right. They can listen to their customers, carefully study market trends, invest aggressively in new technologies that provide more and better products, systematically develop projects that promise the most return—and still fail. In his book, *The Innovator's Dilemma* (1998, 225 pages, \$27.50, Harvard Business School Publishers), Christensen coins the term "sustaining technologies" for management techniques that have been proven over time to foster improved product performance. In contrast, "disruptive technologies" take a quantum leap or offer a substantial qualitative difference compared to established systems. When successful, disruptive technologies gradually wrest control from sustaining technologies and eventually bring about their failure. This idea is akin to what the economist, Schumpeter, called "creative destruction".

Christensen gathers much of his evidence from the fast-moving hard-disk-drive industry, but he has found ample corroborating evidence in businesses as diverse as retail merchandisers, motorcycle and excavator manufacturers, and pharmaceutical companies. In general, the disruptive technologies initially underperform established products in mainstream markets, but they have features that some fringe (and generally new) customers value—such as simplicity, reliability, reduced size, convenience, and cheaper price. Small wonder that the leading companies don't enthusiastically endorse disruptive technologies. These tend to produce less profit, and they don't appeal to the established clients who buy most of the production. Disruptive technologies also require an uncomfortable period of learning and adjustment that dominant companies won't tolerate.

Eli Lilly offers a textbook case of how an entrenched company can be displaced by a disruptive technology. Lilly was the first company to create genetically altered bacteria capable of producing a 100% pure structural equivalent for human insulin proteins. The new product received only a tepid response, however, because most diabetics were not terribly dissatisfied or physically compromised by pork insulin, and they were unwilling to pay a 25% premium for a purer product. Meanwhile, Novo, a small Danish insulin maker, developed a line of pens that greatly simplified the injection of insulin. Previously, diabetics would have to withdraw liquid, measure the dosage, eliminate bubbles from the syringe, inject the insulin, and then repeat the procedure with a second, slower-acting insulin. The Novo pen injects a mixture of two precisely measured types of insulin, reducing the time of the procedure from several minutes to less than 10 seconds. Diabetics were willing to pay a 30% premium for this delivery system, and Novo has continued to greatly increase its market share at Lilly's expense. It wasn't through lack of attention that Lilly lost its dominance. Lilly listened carefully to its customers—mainly endocrinologists, whose patients were likely to have the most advanced and intractable problems. These doctors constantly pushed for insulin of greater purity, and Lilly responded accordingly, while neglecting the convenience, reliability, and functionality offered by the Novo pens.

In orthodontics, several technologies have sprung up within the past 30 years to "disrupt" the way treatment is rendered. The Straight-Wire Appliance comes to mind, as do Nitinol wires. In the early 1970s, few clinicians were clamoring for archwires that could not be bent or for brackets with varying dimensions and angulations. To their credit, orthodontists embraced these once-disruptive technologies after their advantages were published and disseminated, and it is now difficult to

imagine practicing without them. As manufacturers commoditized the new products, they became sustaining technologies. Companies that couldn't or wouldn't keep up lost significant market share.

The imaging and wire-bending Orthomate procedure featured in this month's issue, in an article by Drs. Rummel, Wiechmann, and Sachdeva, may be another such technology. Today, orthodontists seem quite happy with labially placed appliances and one-size-fits-all archwires and brackets. Hardly anyone has appealed for the ability to produce individualized archwires with exact 1st-, 2nd-, and 3rd-order bends. Nevertheless, here is a product that can make all of that possible. It may be the answer to a question nobody is even asking – but that is a sign of a disruptive technology.

The innovator's dilemma is that disruptive technologies are inherently risky, because they don't make good economic sense in a market of sustaining technologies. The Orthomate system has the potential to eliminate much of the guesswork in appliance design and placement and to produce a truly customized orthodontic appliance, with the correction built into the archwire rather than into the brackets. But there is certainly a learning curve associated with its use, and a premium to be paid in terms of time, effort, and expense. At the moment, no one can predict whether orthodontists will be willing to pay such a premium for this new technology, much less to change the way they practice. □