

INTERACTIVE SESSION: TECHNOLOGY

FIREWIRE SURFBOARDS LIGHT UP WITH CAD

Nev Hyman had been building surfboards in Australia for 35 years. In 2005, he teamed up with Mark Price and a group of longtime surfing friends in Carlsbad, California, to form Firewire Surfboards. This company thrives on innovation and was responsible for the first major change in surfboard composition and assembly methods in 40 years. Rather than polyurethane resin and polyurethane foam, Firewire's boards were composed of expanded polystyrene (EPS) foam and epoxy resins. Hyman and Price believed that this composition for the surfboard core, along with aerospace composites for the deck skin and balsa wood rails (the outside edge), created a more flexible and maneuverable product that would attract top surfers and set Firewire apart from its competitors.

FireWire is competing in a crowded field that includes Isle Surfboards, Surftech, Aviso Surf, Boardworks Surf, Channel Island, and Lost Enterprises. FireWire is alone in the reintroduction of balsa wood to the board rails for added flex response time and the ability to maintain speed during precarious maneuvers. Firewire believes it can compete successfully because its surf boards are far lighter, stronger, and more flexible than those of competitors. An additional selling point is the reduced environmental impact: Firewire's materials emit only 2 percent of the harmful compounds of traditional boards and recycling excess EPS foam has earned Firewire international awards and acclaim.

But that isn't enough. To make sure it stays ahead of the competition, Firewire decided to start making custom surfboards instead of just the usual off-the-rack sizes. For the everyday surfer, the durability and flexibility of Firewire's materials was a key selling point. However, custom boards made to surfer specifications are critical in the elite surfboard market, and the ability to claim top-level competitive surfers as customers drives the broader surfboard market as well.

Traditionally, skilled craftsmen called shapers designed and built surfboards by hand, but Firewire started doing some of this work using computer-aided designs (CAD) sent to cutting facilities. The company's computer-aided manufacturing process returned to the shaper a board that was 85–90 percent complete, leaving the artisan to complete the customization and the lamination process.

According to Price, who became Firewire's CEO, there are 29 time-consuming and labor intensive steps in the surfboard manufacturing process. Initially, the multifaceted manufacturing process made it impossible to offer personalized CAD to the average consumer. Customized boards could only be produced for elite competitive customers. There was no way to offer customization to a wider market without overburdening Firewire's CAD system. Moreover, most custom boards had to be ordered by filling out a piece of paper with various dimensions for the requested changes. There was no way to see a visual representation of these adjustments or assess their impact on the board's volume, which directly affects buoyancy, paddling ability, and performance.

Firewire needed a system that would allow customers to experiment with established designs, feed the CAD process, and integrate it with its computer numerical control (CNC) manufacturing process. Enter ShapeLogic Design-to-Order Live! For NX, which provides an online customization system with a Web-based user interface and advanced 3D CAD tools.

Firewire started working with the ShapeLogicNX software in 2009 to develop its own Firewire Surfboards' Custom Board Design (CBD) system, which allows users to easily manipulate board dimensions of established models within design parameters. Any registered customer can choose a standard Firewire model and use drag-and-drop tools to adjust the board's length, mid-point width, nose width, tail width, and thickness, as long as these changes don't degrade the board's design integrity. CBD generates a precise 3D model of the stock model used as the base design along with a 3D portable document format (PDF) file of the customized board. The PDF file documents the board's dimensions and volume. A customer can manipulate the model from all angles and compare the customized board to the standard board to fully understand the design before placing an order. When the customer uses the system to order a custom board, CBD generates a precise solid CAD model of the board that is transmitted directly to the Firewire factory for driving the CNC machines that manufacture the board.

This combination of technologies results in a board that is 97 percent complete, minimizing the

manufacturing time, finishing process, and thus, costs to the consumer. In contrast to the earlier CAD assisted, 10–15 percent hand-finished boards, once a surfer has designed the board of his or her dreams, it can be remade to those exact specifications time and again. Neither the ideal handmade board nor a shaper-finished board can be replicated with this degree of precision.

An additional benefit of Firewire's online design system is the social networking engendered by the sharing of customers' unique design files. Before placing an order, customers can show their modifications to fellow surfers and ask for opinions and advice. After placing an order and using the product, they can report their experiences and (hopefully) tout their design or suggest improvements to other customers. Interactive communication such as this

drives customers to the Firewire site, creating a marketing buzz that boosts sales. Firewire's latest board, the Cornice, was designed by a firm that uses CAD to design wind turbines. Launched in 2015, the Cornice is the latest Firewire offering to combine state-of-the-art design with top notch functionality.

Sources: Kailee Bradstreet, "Firewire Launches the Cornice Surfboard," *Transworld Business*, January 12, 2015; "Case Study: NX CAD Technology Drives Custom Surfboard Design," http://www.plm.automation.siemens.com/en_us, accessed August 9, 2013; www.firewiresurfboards.com, accessed August 9, 2013; "Firewire Partners with NanoTune 'Board Tuning Technology,'" www.surfnewsdaily.com, February 22, 2012; "Firewire Surfboards Custom Board Design Blends Replicability of Machine Made Boards with Uniqueness of Custom Boards," <http://surfingnewsdaily.com>, October 12, 2011; and William Atkinson, "How Firewire Surfboards Refined Its 3D Order Customization," www.ciainsight.com, November 21, 2011.

CASE STUDY QUESTIONS

1. Analyze Firewire using the value chain and competitive forces models.
2. What strategies is Firewire using to differentiate its product, reach its customers, and persuade them to buy its products?
3. What is the role of CAD in Firewire's business model?
4. How did the integration of online custom board design software (CBD), CAD, and computer numerical control (CNC) improve Firewire's operations?

use interactive graphics software to create computer-generated simulations that are so close to reality that users almost believe they are participating in a real-world situation. In many virtual reality systems, the user dons special clothing, headgear, and equipment, depending on the application. The clothing contains sensors that record the user's movements and immediately transmit that information back to the computer. For instance, to walk through a virtual reality simulation of a house, you would need garb that monitors the movement of your feet, hands, and head. You also would need goggles containing video screens and sometimes audio attachments and feeling gloves so that you can be immersed in the computer feedback.

At NYU Langone Medical Center in New York City, students wearing 3-D glasses are able to "dissect" a virtual cadaver projected on a screen. With the help of a computer, they can move through the virtual body, scrutinizing layers of muscles or watching a close-up of a pumping heart along with bright red arteries and deep blue veins. The virtual human body was created by BioDigital Systems, a New York City medical visualization firm. The virtual cadaver being used at Langone is a beta version that BioDigital plans to develop into a searchable, customizable map of the human body for medical educators and physicians. NYU medical school has no current plans to phase out dissection, but the 3-D virtual cadaver is a valuable complementary teaching tool (Singer, 2012).

Ford Motor Company has been using virtual reality to help design its vehicles. In one example of Ford's Immersive Virtual Environment, a designer