

# Design to value in medical devices

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*As price pressures increase, medical device makers need to rethink product development processes. Design to Value can help get costs under control—and deliver exactly what customers value.*

*“If medical device companies want to continue to make money as prices face continued pressure, their only option is to take cost out.”* This comment from the head of procurement at a major US healthcare provider neatly sums up today’s situation in the medical device industry. The sector has always been challenging, with increasingly complex technologies and tough quality and regulatory hurdles. Until recently, however, device makers who overcame those barriers could sell their products at prices that made the effort worthwhile.

Today, medical device companies operate in a different world. In developed countries, healthcare systems are under acute financial pressure. Healthcare providers are responding by exploring every opportunity to increase efficiencies and reduce costs.

Developing economies are transforming the environment, too. As growth slows in established markets, opportunities are arising elsewhere. A rapidly growing middle class is demanding more medical devices of all types, but price sensitivity in these markets is acute. A sophisticated regional industry is growing to serve this demand, and ambitious new players from China and India are now keen to take their low-cost designs to enthusiastic hospital buyers in Europe and North America.

Now device makers have to find new ways to maintain their competitiveness. Like other industries before them—the automotive sector, consumer electronics and telecommunications, for example—they are paying new attention to the detailed design of their product ranges, looking for opportunities to eliminate excess cost wherever possible, to gain the flexibility to sell profitably in cash-strapped traditional markets and price-conscious new ones. History has shown that the winners will be those who can deliver exactly what the customer wants—nothing less, nothing more—at the best possible price.

### **Cheaper, but for whom?**

This new game is challenging in developed and emerging markets alike. Success in emerging markets requires a deep understanding of stakeholders' needs—which is hard to get from a design office halfway around the world. One maker of electronic pacemakers, for example, developed a low-cost device aimed at the potentially huge tier-II market of lower-income customers in developing countries. By replacing the conventional programmable control with a simpler electro-mechanical version, the company dramatically reduced the cost of the device. The device was a market failure, however. Few customers in target regions could afford the combined cost of the pacemaker and the surgery to fit it. Few local hospitals had the capabilities to implant the devices, and those that did were suspicious of the mechanical controllers, worrying that they would need to carry out expensive secondary operations if devices failed. The company has since launched a programmable device, aimed squarely at the richer tier-I market. Surgeons, the gatekeepers in pacemaker selection, were more comfortable with the programmable devices, which they knew from their training in western hospitals. The programmable pacemaker has performed much better, capturing three quarters of its target market.

Even companies that are close to customers can misunderstand their needs. A US maker of electrotherapy devices, for example, embarked on a clever modularization program that allowed one device to be configured in many different ways at the time of purchase, or upgraded later as user needs changed. When it launched the product, however, more than nine out of ten customers chose the same basic configuration, and then rarely came back for

more modules later. In the end, the modular architecture simply added cost to the product, and it lost out in the market to competitors with simpler designs.

Companies that do attempt to match product features and capabilities more closely to their customers' perceptions of value must answer a difficult question: Who are their customers? Fragmented decision-making in many healthcare markets makes it extremely difficult for companies to understand the requirements of all key stakeholders. To be selected for use, a device might have to be approved by a national or regional authority, selected by a healthcare provider, specified by a particular clinical team, and then chosen by doctors, often in consultation with patients. Finally, it may be the patient's own reactions to the device that define its success in use.

Each of these stakeholders will have an incomplete picture of product attributes: payors might not understand the importance of usability in patient compliance, while a physician may be unaware of the ongoing cost of supporting a product in the field. As a result, the incentives to purchase in many medical device markets may be fundamentally different from the benefits ultimately enjoyed by end users.

## Where does the value lie?

To overcome these problems, medical device companies need new tools and a new way of thinking about product design. In particular, they need to be able to do two things effectively. First, they must find ways to understand exactly which product features their customers need and, critically, how much they are willing to pay for them.

Second, they must identify the most cost-effective ways of delivering those features to maximize available product margin. For many design and engineering teams in the medical device sector, this second requirement is particularly challenging. Years of focus on extending the technical capabilities of their products, with relatively little attention to design for manufacture or other cost-reducing strategies, have left them ill-equipped to find the powerful insights that drive cost out of their designs. These teams must find new ways of looking at the whole product design process, adopting best practices from their own industry and beyond.

Today, some smart medical device companies are recognizing that, by making this link between the true cost of features and their customers' perception of value, they can reliably deliver products that cost less and offer customers more. We call this approach Design to Value (DTV). Medical device makers have used it to deliver gross margin improvements of 20-25% over a typical 18- to 24-month period. Along the way, they have exploited quick savings that made the improvement projects self-funding. At the end of the process, they also have stronger product development functions, with departments working

more effectively together and momentum in the organization for broader product and portfolio improvements.

## What customers want

For all but the simplest products, purchasing decisions involve complex and subtle tradeoffs among features. Customers can rarely articulate the value they attribute to a particular feature in isolation. Fortunately, modern market research techniques can give a good indication of how the customer's perception of value is built.

Medical device companies have developed approaches to tackle the complex, multi-stakeholder environment. They first identify critical stakeholder segments for each stage of the product lifecycle, and define the influence of each on purchasing decisions. Stakeholders can be divided into two basic groups: gatekeepers, for whom a product has to meet a basic set of feature and cost criteria, and decision-makers who will actually make the final selection based on the differentiating features of the product.

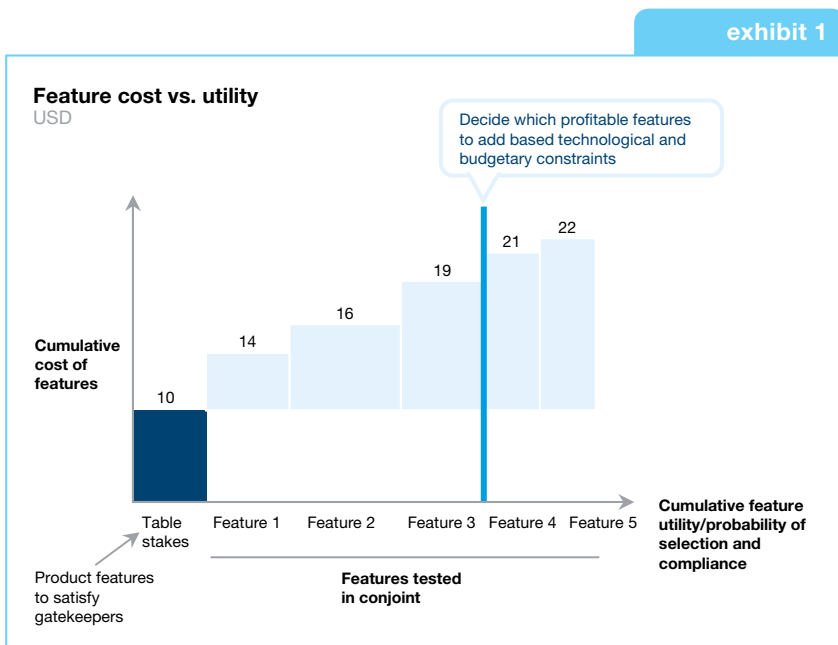
For example, one maker of patient-operated blood-testing equipment identified four key segments across its product lifecycle. During the reseller adoption stage, pharmacies were a key gatekeeper, important in choosing the product, as were payors, who would fund it in their insurance schemes. Decision-makers included the patients themselves, who made final selection but were heavily influenced by their personal physicians.

Interviews and conjoint studies with representatives from each key stakeholder group then help companies to understand their differing priorities. In the blood-testing example, pharmacies valued the opportunity to maximize revenues, through ongoing sales of consumables for the meter. Payors tended to assume that all devices were equally effective, and focused their attention on the price of the device and its consumables. Health care providers were interested primarily in features that would ensure compliance with the prescribed testing regime. Patients, meanwhile, varied greatly in their requirements according to the nature of their disease. To understand what really drove their decision-making, the company needed to dig a little deeper.

Conjoint analysis is one technique that can provide a rich understanding of consumer needs. Customers consider various hypothetical product configurations and price points and choose between them. Regression techniques applied to their responses isolate the effects of individual features on the customers' perceptions of value. The results can be compellingly simple: an incremental "profit" value for each of a product's features.

Some medical device companies are now using conjoint techniques to navigate their complex stakeholder environments. The blood-testing company, for example, used the conjoint technique to test various product configurations in four different customers, segmented according to the nature and severity of their disease.

The conjoint analyses with each stakeholder group allow companies to construct a multi-attribute utility cost curve for each stakeholder. After including a basic set of product features to satisfy gatekeepers, this curve ranks each feature by the utility it provides to stakeholders and the cost of each feature. The curve can guide decisions about which features to include to maximize utility and minimize cost (see Exhibit 1).

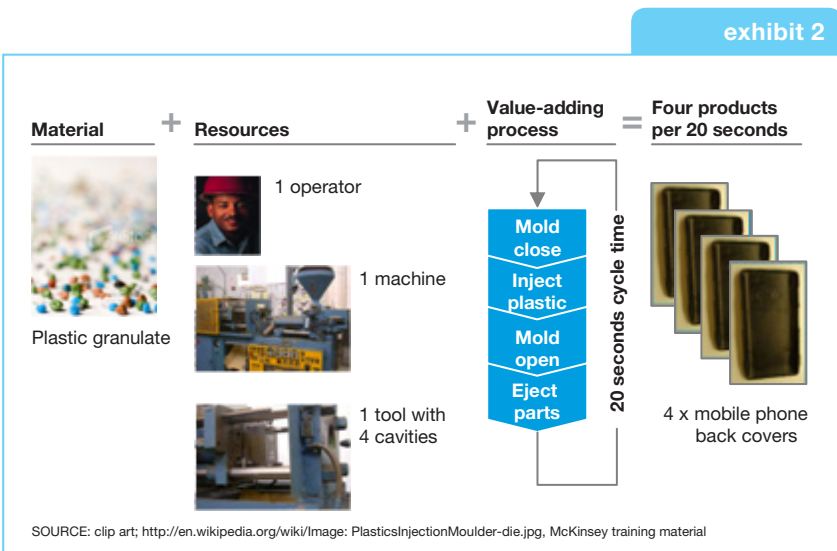


A manufacturer of medical imaging equipment used conjoint studies in key customer segments to identify the factors most likely to build market share. The company found that price, brand name and image quality were the three most important decision attributes in the segment. Even though the company's products already ranked among the best in its segment in terms of image quality, the conjoint demonstrated that a moderate increase in quality had the potential to lift market share by 11%. Likewise, reducing downtime from four to two hours per month could increase market share by 7%, as could a 25% reduction in radiation dose, which would offer health benefits for patients.

## What it really costs

The second critical element in the design-to-value equation is cost. Leading companies strive to deliver the features their customers most value at the lowest possible cost, overcoming the limitations of conventional cost engineering by adopting a clean-sheet approach.

While many companies invest heavily in product cost reduction, they usually do so by examining existing designs and identifying opportunities for incremental savings. Using Design to Value, companies first work to understand the likely limits of product cost reduction. Starting with a blank sheet and using knowledge of industry best practices for materials, processing and labor costs, they can build an estimate of the most efficient way to deliver the desired feature set (see Exhibit 2).



By comparing current or projected manufacturing costs with those in the clean-sheet model, companies can quickly gain insight into the areas of design most likely to yield the largest cost reductions. Opportunities identified in this way are often larger than those found in conventional cost engineering, since the technique encourages companies to consider changes to underlying product architecture and technology as well as individual components.

Clean-sheet analysis of its printed circuit board designs showed one device maker that it could reduce the eight separate boards in its existing design to just five, reducing the costs of the boards themselves, cutting assembly complexity and allowing the product's casing to be streamlined and simplified.

## Tearing it down

Competitive teardowns are an important activity in many industry sectors. Pulling a competitor's product apart piece by piece and comparing it with one's own is nothing new, but it continues to deliver insights into opportunities for improvement or a new competitive edge. Some, such as the automotive industry, have spent millions raising the teardown process to an art. As competition increases and cost constraints tighten, companies in the medical devices sector are beginning to use this approach more widely.

In the design to value process, teardowns take on a new and central role as a context for cross-functional discussion and decision-making by engineering and marketing functions. Through teardowns of their own and competitor products, involving everyone associated with the product, including engineering, marketing, sales, manufacturing, quality assurance, and supply chain, companies can leverage all available expertise to optimize product design. Suppliers may even have roles to play in these workshops, as they may provide new perspectives on cost and functionality trade-offs (see sidebar: Medical device teardown case example).

The teardown process can be as useful with existing product lines as with new ones. In practice, comparisons of existing products often provide a range of ideas that can be implemented quickly into the current design, while helping to generate a "wish list" of changes for forthcoming models.

In a competitive teardown of blood pressure monitors, one company compared its product with two competitors from the same segment. In a daylong session, the company identified 22 separate improvement ideas that could reduce manufactured cost by 18% without impacting customer value. Some of the ideas were simple and easy to implement: reducing complexity in the packaging and printed materials, switching to unbranded batteries, or replacing sewn labels with screen printing, for example. Others required more fundamental changes to the product: eliminating PCBs, reducing the size and thickness of the housing, or introducing surface mount components to reduce manufacturing costs. Finally, the company identified areas where it could eliminate features that were less valuable to users, such as an external power supply connector that was rarely used on what was essentially a portable device.

The teardown can also be a powerful source of other product improvement ideas. It helped one company realize that it would be cheaper to replace the custom-made black-and-white LCD screen on its product with an off-the-shelf color one that was more flexible and easier to use.

Discussions among functions during the teardown can also drive improvements. Conversations between the sales and design in the same company revealed the users found the elegant design of the product's accessories particularly appealing. Eliminating the drawers where these accessories were stored and mounting them on external hooks, the company cut costs and emphasized one of the product's most compelling features.

\* \* \*

The design to value approach is already helping medical device companies gain a much richer understanding of customer needs—and meet those needs more cost-effectively. While the approach has been proven in individual projects, some companies are now going further by building design to value skills and processes into their product development organizations (see sidebar: Making DTV happen). In a demanding but increasingly price-sensitive market, the ability to focus keenly on customer value can offer critical competitive advantages.

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## Making DTV happen

Companies are using Design to Value tools selectively to cut costs, raise margins and build market share. A small group of companies are going further, increasing margins by 20-25% across their entire product ranges. These companies do several things differently from their more cautious competitors:

- They set transformational goals for their products, using clean-sheet models to identify the minimum possible product costs and challenging design teams to achieve



these levels, rather than being satisfied with incremental improvements.

- They emphasize impact and execution, with robust targets to check the progress of improvement ideas, and regular management reviews to highlight progress and remove roadblocks. This approach helps to deliver impact rapidly; ideas are often executed within a month of their identification, but it can also ensure ongoing improvement, with continual idea generation and feature modification throughout a product's lifecycle.
- They maintain an external perspective, understanding all decision-makers and stakeholders early in the product development cycle and revisiting the stakeholders regularly. They also repeatedly conduct teardowns on competitor products to understand design approaches, feature packages and cost positions. If customer insight or teardown skills are lacking, they train or hire external talent.
- They work to foster internal alignment, too. For example, one company encountered resistance to lower-cost products. Salespeople feared that the new products would cannibalize higher-cost alternatives. Once the sales team understood that the new product was aimed at a different customer tier, and that it gave them access to a new market and a competitive weapon to defend against new market entrants, they became fully supportive of the approach.
- They change their management systems and culture, with regular

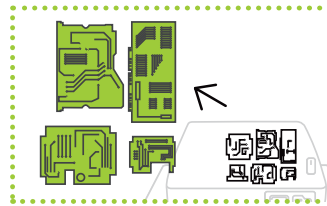
reviews of progress and incentives that encourage different functions to work closely together and ensure that quality, manufacturability and customer acceptance criteria are considered alongside cost.

- They implement a deliberate program to build Design to Value into their organizational DNA. Some companies establish a center of DTV excellence that provides specific skills and support to design teams. Others use specific projects as “gold standard examples,” helping to educate the wider organization on the power of the approach.

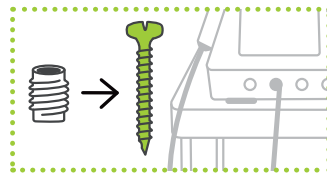
# Medical device teardown example

A medical-products company planned a series of tear downs to improve the design of its therapeutic medical device. To generate new ideas, executives invited colleagues from purchasing, marketing, engineering, and sales to see how their product stacked up against four rivals.

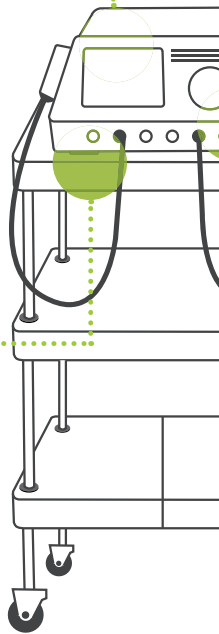
Seeing the products together was an “Aha!” moment for the purchasers, who quickly identified a series of straightforward design changes that, while invisible to customers, would significantly lower the cost of manufacturing the device. Meanwhile, seeing the configurations of



**Fewer printed circuit boards (PCB):** 14% reduction in PCB cost



**Self-tapping screws versus threaded inserts:** 50% cheaper



competitors' circuit boards spurred the team's salespeople, marketers, and engineers to discuss the manufacturing implications of the company's modular approach to design. The engineers had long assumed that being able to mix and match various features after final assembly was advantageous and had emphasized this capability in the product's design. Yet the salespeople reported that most customers hardly ever ordered more than a handful of modules at purchase and rarely ordered more after assembly.

**The conversations ultimately led to simplifications in the product's circuitry that lowered purchasing costs by 23% and helped marketers identify a new customer segment where the product might command a higher price.**

