

Designing New Technologies for a Better Life

A new breed of development puts its faith in entrepreneurship - with surprising results.

World Ark, March/April 2008

By Lauren Wilcox

In 1985, a young mechanical engineer named Martin Fisher traveled to Kenya on a Fulbright scholarship. Fisher planned to stay for a few months, putting his degree to meaningful use working on projects for the rural poor, but he soon found himself absorbed in the world of international development. Months turned into years as Fisher worked on rural water projects with communal wells, helped women's groups start small businesses and helped produce farm equipment to give to farmers.

But after a few years, Fisher took a hard look at the work he and his colleagues had done and found it disappointing. Although the projects were successful in the short-term, they turned out to be "totally unsustainable," Fisher explained. "We would walk away from these things and they would collapse." Communal pumps would break, and no one would repair them. Efforts to provide people with things that they desperately needed — water pumps, homes, farm equipment — were simply temporary fixes, no matter how inexpensive, simple or well-intentioned.

What, he wondered, did poor people really need? Rather than beginning yet another attempt at a charitable solution, Fisher put this question directly to the poor, trying to determine what would be most useful to them.

What he found surprised him. Designing products to help the poor, Fisher discovered, was in some ways a through-the-looking-glass experience, a reversal of traditional assumptions. Where design efforts for the poor often focused on saving them time and labor, poor people had both time and labor in abundance. Where design traditionally emphasized quality and durability, the extremely poor, whose lives and needs often changed unexpectedly, preferred affordability. Above all, Fisher found, the innovations that had the most impact were often those that helped individuals earn money, not those that solved quality-of-life issues or were the basis of a community project.

Today, two decades later, Fisher and a small but growing contingent of designers, engineers, businesspeople and nonprofit workers are pioneering a new approach to international development: designing and distributing affordable, useful and in many cases, income-producing products to the extremely poor. Garnering national attention with the recent exhibit, "Design for the Other 90%," at the Cooper-Hewitt Museum in New York City, the nascent movement is not simply a design revolution, or an ambitious business plan, but a combination of both. It has also begun to change some of the basic assumptions about design, business and solutions to poverty.

The Evolution of a Trend

The emerging trend has its roots in an influential book by the economist E.F. Schumacher, *Small Is Beautiful*, published in 1973, which emphasized, in part, the importance of scale in problem solving — that the size and scope of a solution could be tailored to the size and scope of the task. In the Western World, which had been dominated by the momentum of big business, growth and high technology, Schumacher's notions about scale quietly began to find purchase.

A school of thought called the appropriate technology movement, inspired by Schumacher's ideas, spread throughout the developing world; it called for local technologies to address local needs, rather than importing less relevant, mass-produced products at greater expense and waste.

While the appropriate technology movement fell short of many of its goals, the theories and ideas had a lasting influence on development work. Designers and engineers began focusing more on practical, local, small-scale solutions to help the very poor. In recent years, these efforts have gathered momentum.

In addition to the technologies on exhibit at Cooper-Hewitt, which showcased low-tech design solutions to problems facing the poor, a number of independent companies and universities, including the Massachusetts Institute of Technology, have been at work on these solutions as well. Amy Smith, a senior lecturer at MIT, founded the D-Lab program, which introduces students to engineering challenges in the developing world. Smith has designed several tools and medical devices for use in developing countries.

As the movement evolves, some basic principles for this kind of design have begun to emerge. They come from Schumacher's ideas, as well as trial and error and countless conversations with people living in poverty.

RULE#1:

Good Design Should Increase Income

For Fisher, the most important function of good design for the poor is that it must increase their income. "A poor person has only one need," he says, "and that is a way to make more money." Paul Polak, a psychiatrist who founded the development organization International Development Enterprises (IDE), came to the same conclusion, which he calls "ridiculously simple and obvious," after years of talking to people in countries around the world. They were poor, they told him, because they were unable to make enough money.

As Fisher points out, most of the very poor are entrepreneurs already, by necessity. In many countries in Africa, for example, the formal private sector provides only a tiny percentage of jobs. The rest are part of a vast, informal cash economy, in which the overwhelming majority of people get along by doing handiwork and petty trade with very few resources or help, and growing food on a small plot of land to help feed themselves and their families. Anything that broadens their opportunities to make money, even slightly, is invaluable.

To many in the world of international development, that is a novel idea. “There is a tendency,” Fisher says, “to put on our socialist hats when we think about poor people” — to think about what we can give them rather than what they can get for themselves. But in Fisher’s and Polak’s experience, what poor people want above all is something that will help them help themselves.

RULE#2:

Cheap Is Beautiful, Too

Another principle of design for the poor is that the product must be affordable. Polak discovered how important affordability was when he sold two kinds of lug wrenches to Somalian donkey-cart owners. One was a \$12 wrench with a lifetime guarantee, and the other was a \$6 wrench that would soon break. To his surprise, he says, the cheap wrenches sold “like hotcakes.”

The reason, he found, was that the donkeycart owners preferred to buy a wrench they could afford today, to make more money for tomorrow, than a wrench they would have to save for, and risk going out of business from a flat tire in the meantime. For someone living hand-to-mouth with no savings, the short-term outlook is far more important than the long-term, and the more affordable option will always be more attractive.

This rule of affordability applies not just to simple tools, but to larger pieces of equipment. Martin Fisher, after his work in Africa, went on to found KickStart, a company that produces treadle-operated water pumps that can dramatically increase the production of subsistence farmers. His reference point for the price of these pumps is the price of a chicken in the local market. No matter how poor a person is, Fisher says, “they can usually afford, once a year, to have a chicken as a treat.” By pricing treadle pumps this way, and manufacturing them accordingly, he produces an item within a farmer’s price range, one that he or she can buy without layaway or credit.

And, says Fisher, products that increase income should be cheap, but not free. At first glance, this seems grossly unfair. If a person is so poor that it takes a year to save for a treadle pump, why not just give it to them? But simply awarding an item to someone and asking nothing in return, say Polak and Fisher, only perpetuates the problem.

“To begin with,” says Fisher, “it’s not really fair. How do you pick one person and not another? Also, it’s not sustainable. It creates dependency.” He explains that people who buy or work for things tend to be much more invested in them than people who receive them as outright charity.

And as Polak has observed, a system that subsidizes low-cost goods to give to the poor is vulnerable to corruption. Demand is much greater than supply, so the goods may go to people who have connections, or who have bribed the suppliers. Setting up a supply chain, on the other hand, creates jobs and is much more sustainable.

There are notable exceptions to this rule — health care and disaster relief are obvious ones — but in general, says Fisher, if an item is going to be used to increase income, it should have a price.

RULE#3: Scalability

Another general guideline is one that Polak identified through his work in India and Africa. Too often, he says, designers still assume that bigger and fancier is better, and that throwing more money and technology at a problem is the best way to solve it. Instead, says Polak, items should be small in scale, small enough for a subsistence-level enterprise. But, he adds, they should also be expandable, as the enterprise grows. In other words, they should be scalable to a poor person's needs.

To illustrate, Polak describes the dilemma of Peter, a poor Zambian farmer, making \$300 a year, who lives far from the market where he sells his produce. If he could buy a horse, he could make an extra \$600 a year. But a horse costs \$500, which he can't afford. What can he do?

“Let me throw out some crazy ideas,” Polak writes in his forthcoming book, *Out of Poverty*. “What if Peter could buy a quarter-horse?” Polak does not mean that breed of horse usually found in rodeos and cattle drives. He literally means a horse that's a quarter the size of a standard equine. “Let's assume that he could buy such a miniature horse for one hundred and fifty dollars and that it could pack sixty kilograms. Peter would earn less money each trip, but he could gradually use his profits to buy more miniature horses.”

Of course, Polak continues, the horse would be even more useful to Peter if it were one-twelfth the size and price of a regular horse, and he could add to his team as his income gradually increased. It would be even better, he concludes, if Peter could somehow harness the power of an ordinary ant and assemble a team of a million ants.

Harnessing ants is nonsense, of course, but very useful in illustrating the principle. A lot of technology is designed for big, corporate-run operations. Take agriculture, for example; most irrigation systems and cultivation equipment are large-scale and expensive. But 80 percent of Africa's poor are rural subsistence farmers, and their farms are tiny — two acres, one acre or even half an acre. A functional irrigation system can transform a small farm from a patchy, seasonal garden into a year-round enterprise, but until recently there was hardly anything available that cheap and that small. One of Polak's projects has been to develop efficient, “miniature” versions of giant water-collection and irrigation systems for poor farmers, who can expand their system piece-by-piece as their income grows.

The principle also extends to other material property, like housing, where a modular design that can be added onto, brick-by-brick (Polak compares it to a Lego set), is far more useful than a bigger, nicer design that, however economically designed, is still prohibitively expensive for a one-time purchase by the very poor.

Short-term Versus Long-term

These principles are not immutable. Certainly, not every design for the poor needs to be income-related. There are many good designs that solve needs unrelated to income; several were featured in the Cooper-Hewitt's exhibit and the accompanying catalog, like shelters for disaster victims. And, as noted above, not all products should be sold — particularly those that address public health issues, like mosquito nets, which must be distributed as widely as possible for free in order to be effective at curbing malaria.

In thinking about design for the poor, it can be useful to distinguish between products that solve short-term, urgent needs, and those that contribute to deeper change. The cover of the exhibit catalog, for example, depicts a device called the Life Straw, a handheld filtration device being used by a woman in a flowered dress who is kneeling in a stream to drink. This is a remarkable device, and would be useful in certain situations, but it is not a permanent solution to the problem of clean drinking water.

It is useful, however, to demonstrate the potential of technology, which can provide dramatic solutions to such basic, awful problems as thirst in a land of undrinkable water. As the exhibit's title points out, design has, by and large, been used on much less urgent problems, for people with much more money. And yet there are a great many problems in the developing world in need of simple, elegant solutions. Good design is not just about stylish furniture or sleek cars. At its best, good design can transform lives. The most successful designs for poor people, say people like Martin Fisher, are those that help them transform their own lives.

Designing a Better Farm

With these principles in mind, what is the best way to help the rural poor in their efforts to earn a living? Most of the rural poor with whom Polak and Fisher worked with were subsistence farmers (as are many of the world's poor). Many of these farmers voiced their frustrations with the limitations of their farms. They often relied on irrigation by buckets and had no way to store water. Their growing season was confined to the rainy season, which limited marketability, as local markets were flooded with produce during those times.

But with a low-cost, low-tech, year-round irrigation system, farmers could grow and sell produce even in the off-season, dramatically increasing their marketability and their income. Both Polak's organization, IDE, and Fisher's, KickStart, have worked extensively designing such systems.

IDE and KickStart (independently of each other) developed a version of an inexpensive foot-powered treadle pump. Polak also recently developed a low-cost, expandable water storage system, and KickStart, Fisher's company, has recently developed a hip-operated water pump, even less expensive than the treadle pump.

But designing a good product, it turned out, was only part of the challenge.

In order to provide a steady, dependable supply of products, the engineers had to also design a profitable supply chain, often completely from scratch — producers, wholesalers, resellers, salespeople. There were hurdles almost every step of the way.

For starters, it proved difficult to get big companies to “think small.” For many big companies, says Polak, producing a low-cost, low-tech and comparatively low-quality product is simply anathema. They feel it would compromise their brand and their reputation, and they believe a market made up of poor people isn’t big enough to justify it. Polak adds that in universities around the world, virtually all agriculture research and development focuses on large-scale, high-tech farming.

And yet, as Polak also points out, 85 percent of all farms worldwide are smaller than five acres. In developing countries, these small farms produce more than half of the countries’ meat, produce and dairy. In aggregate, this is a huge market with huge potential.

The experience that Polak and his company had in Bangladesh provides a good example of the entire process. There, they were able to recruit 75 small-scale manufacturers to produce low-cost treadle pumps and to convince local retailers to carry them. Then, to convince poor farmers to take a chance on buying the newfangled gadget, IDE created demonstration plots, hired traveling troubadours to compose and sing songs celebrating the pump and even produced a feature-length film, in which the pump played a central role, that played to a million rural people a year with the help of a generator and a portable screen.

Once farmers began using the pump and saw that it worked, the marketing became much easier. The supply chain began to work, profitably, for everyone. And farmers, within a year, began to see results that made their investment worthwhile.

As it turns out, being able to produce fruits, vegetables, and spices for a year-round market has had a dramatic effect on a poor farmer’s income. Bahadur, a farmer who worked with Polak in Bangladesh, bought a low-cost drip irrigation system and grew cucumbers and other high-dollar crops by using it to access a stream on his property. Once he figured out how to sell these crops in the market — he worked out a system of retail, wholesale and hawkers — he began turning a profit of \$500, and then \$1,000 a year. He built a new two-story house for his family. His two sons finished high school. The family business has expanded to cattle, goats and tilapia.

What companies like KickStart and IDE are banking on is the idea that the single most effective way to promote a region’s development is to increase personal income. Building an entrepreneurial middle class, these companies say, can be an effective way to do that. Clean water, housing, education — people will naturally spend money on these as their income increases. And once a community is richer, it will work to get better roads, better schools and so on. In small numbers, they say, they have seen this happen.

Projects that are market-driven, like these, are rarely as simple as they sound. In some ways, good design for the extremely poor is as much about designing a workable and sustainable economic system as it is a clever product. And building a workable economic system from the ground up is an enormous project, fraught with complications. It does not happen overnight, or without substantial resources. It is vulnerable to corruption and exploitation.

Still, the basic message of work like Polak's and Fisher's — that poor people should be characterized not by their need for charity, but rather by their struggle to make a living — makes sense. For some years now, many nonprofits working in international development have integrated microenterprise concepts — helping people set up and run their own small businesses — into their projects. Well designed products are an important part of the success of such enterprises, and the infrastructure of a nonprofit can be an effective way to distribute them. (While nonprofits rarely ask people to pay for such products, they often require another form of commitment. Heifer International requires training and the promise to pass along some of the results of their work to others in need.)

Regina Kamau, a Kenyan woman who monitors project impact for KickStart, describes a news spot she saw on Nigerian television, about efforts by the government to transfer slum-dwellers out of their slums and into new subsidized housing. A man living in the slums was asked if he was looking forward to the move. He wasn't, he said. In his new place, he would have electric bills, water bills, all the things that he couldn't afford currently in the slums. What the government should do, he said, was show him how to make money.

“My problem is not housing,” he told the reporter. “My problem is money. If I had money, I wouldn't be living here.”