Managing Across Cultures

How do you design food-processing equipment if you know next to nothing about the culture in which it will be used? By Jean Thilmany

bright, motivated engineers are uniquely easy to manage. Just ask Bruce Humphrys, the executive director of Compatible Technology International in St. Paul, Minn. CTI’s engineers design simple food-processing equipment for people in Third World countries. The engineers volunteer their services and are exceptionally motivated. In fact, they won’t stop puzzling through a new technology until it’s perfected.

Sometimes, managing motivated engineers means having to tell them it’s time to stop tinkering with one design and move on to the next, Humphrys added. Managing means knowing when to say when. The equipment will never meet the engineers’ exacting specifications, after all.

Humphrys’s problem isn’t overseeing and organizing the 100 engineers, food scientists, and technicians who volunteer, a mostly male group he refers to as “the guys.” The nonprofit’s management challenge comes in understanding exactly what people in distant cultures need and want.

The 23-year-old organization, founded by a group of General Mills researchers headed by food scientist George Ewing, develops simple food-processing technologies that are uniquely useful in the developing world. A food grinder developed for rural villagers is a simple metal cylinder with a blade at the bottom and a crankshaft. Food goes into the cylindrical bin and the user turns the crank. The ground food falls from the bottom: a hand-powered, very basic Cuisinart.

Volunteers have come up with corn processing and storage methods for Guatemalan farmers, created the simple food grinder that can be easily flown to a remote location and set up by villagers, and engineered a basic potato dryer.

Such projects are a lesson in creative engineering and a crash course in cross-cultural understanding. They have their own set of management rules, often written on the fly.

“The cultural sensitivity of our volunteers is high,”

Breadfruit grows abundantly in Haiti, but isn’t much used as a food source there. A group of student engineers set out to change that with the use of a simple technology.

Humphrys said. “Yet, no matter how sensitive we Midwesterners might be, we still have an American Midwest sensitivity that we have a hard time abandoning.”

The challenge comes because the engineers in St. Paul are creating technologies for people in cultures that they have no experience with. Engineers don’t know enough
about daily life in these countries to envision exactly how villagers might use their technologies. They have no idea of a villager’s needs. Even traveling to a village, to experience life there, isn’t enough.

“Our guys visited a group of Guatemalan women hand-shelling corn. They saw the hard time they were having, how labor-intensive the shelling was, and on the spot they developed a sheller,” Humphrys said.

The sheller consisted of a piece of wood with a hole in the middle. The women pushed the ear of corn through the hole, shaving the kernels from the cob. When the engineers passed out their device, the women said thanks and put the sheller to work.

But when the volunteers returned to that village several months later, they found the group still hand-cutting kernels from corn.

“The women told them, ‘Thanks for your invention, it’s much easier. But this is the time we use to talk about men, school, and kids, and your device makes our work too fast for that,’” Humphrys said.

“You have to realize that there’s an environment these things will be used in,” he added. “Not everyone in the world is intent on doing things faster and easier.”

A project may kick off when someone like a Peace Corps volunteer or a missionary who’s lived in a particular place asks CTI members to build a simple technology that addresses a local problem.

Depending on the location and the type of the project, it’s handed off to one of the four committees: the Asia, Africa, Americas, or technology group.

Volunteers sometimes travel to a location to figure out how a piece of equipment might be used. Oftentimes, however, the budget doesn’t allow for overseas trips. Committees meet monthly, and during the interim committee members experiment alone or in groups with parts of a project. Then they make progress reports at the monthly meetings.

“Management is best accomplished when a project with a particular need is attached to a competent volunteer who has an interest in that need,” Humphrys said. “In terms of getting the project done, that’s all the management we need in terms of overseeing the engineer.”

Making It Simple

Projects sound easy in execution: highly trained engineers and food scientists—many with an illustrious career’s worth of experience to contribute—volunteering to design fairly straightforward tools. But sometimes the simplest tools are the most difficult to design, Humphrys said. And the same goes for the organization’s projects. They can seem fairly basic and inexpensive to carry out, but that’s often not the case.

“Engineering is a structured pursuit,” Humphrys said. “We give these engineers broad instruction, not detailed. Our guys are creative, so they can design a simple, broad project with few detailed instructions. Other engineers might need more detailed instructions, like exact constraints and specifications.”

Many engineers can design a complicated piece of machinery based on a set of specifications for an understood use. It takes an engineering genius to design a basic technology like a food chopper to make it simple enough to be set up and modified by someone who’s never seen higher technology than a rake, Humphrys said.

“The people we’re designing for have had no exposure to basic technologies we’ve taken for granted for 200 years,” he said.

Of course, CTI’s engineers can’t just fire off an e-mail to villagers asking if a certain design element makes sense. Much of the design has to happen in a vacuum. Still, engineers can get in touch with villagers, even if the process is difficult.

“Even 10 or 15 years ago, it was hard to do our work in the Third World because of the paucity of communication,” Humphrys said. “Now we can be in contact with people all over the world through cell-phones or through an Internet café someone might be able to get to.”

Still, brainstorming with villagers doesn’t happen with lightning speed. This can lead to some design flaws and much rejiggering.

Testing the technologies also happens in a vacuum. For instance, all CTI-designed technologies are man-powered. But two retired male engineers who test a product in Minnesota won’t have the same build and stamina as the two school kids in Nicaragua who might use the equipment every day.

“When we test here we get empirical data, but that

Left: A simple food dryer was designed by senior engineering students at St. Thomas University in St. Paul, Minn., who then traveled to the Caribbean to see if it was useful to people there. Facing page: Sometimes a simple technology, like a bare-bones food grinder, can be the toughest to design.
doesn't really tell us anything at all," Humphrys said. "If we test on-site, though, the community will be so enthralled about having an American bring them a hunk of metal to set up and test that the data will be skewed. Almost all cultures are such that no one wants to report bad news. They think, 'You're nice enough to do this for us, so thanks.' But then it sits in a corner and rusts."

It's also difficult to make a test run of the equipment using the exact type of grain villagers grow. CTI food scientists have found work-arounds for most foods. They test equipment bound for Africa with a type of sorghum found in the southern United States that closely matches African sorghum. They import small amounts of other grains especially for test runs.

But sometimes, you can't get around it; you have to test a product in the field to know whether it's even worth making. That was the case for Camille George and her engineering students at the University of St. Thomas in St. Paul.

George found a serendipitous route to CTI. She sat next to George Ewing at a political lunch. While chatting, he told her his organization needed a heat transfer specialist to study a problem on food drying. George is an assistant professor at St. Thomas; her specializations include heat transfer, fluid dynamics, and thermodynamics. She jumped right in and volunteered her students to boot.

**Breadfruit and Pepper**

The students were charged with figuring out how to best dry breadfruit, a vegetable with a squash-like consistency that grows abundantly on some Caribbean islands, including Haiti, which imports most of its food.

Although readily available, breadfruit isn't used much as food in Haiti because of one major drawback: The melon-size fruit rots within a day of harvesting. But not if it's dried. Dried breadfruit can be ground into flour and sold to help revitalize small villages economically, and to feed schoolchildren across the island country.

George and her students were designing a simple, easy-to-erect dryer that takes advantage of the sun and the greenhouse effect to dehydrate vegetables. The dryers had to be easy to set up in a remote area. People with no experience with food-processing machines would be expected to run them.

It was easy enough for the students to build their simple system on campus and gather information on drying time, the moisture content of the air, the height of the sun, and everything else they found relevant.

But the students couldn't experiment with the design for a drying system they'd come up with. They had no access to breadfruit. They didn't know much about weather conditions in the device's design—nor new home. And local conditions in Haiti are very different from those in St. Paul.

"If local temperatures are too high, you get case hardening where the top gets hard, so water in the middle can't get out," George said.

Would the dryer work in Haiti? Or would the vegetables simply harden, then rot. And would villagers use such a device?

"Everyone realized right away that the problem is too difficult to do theoretically," George said. "We needed to do testing. We didn't know enough about solar drying or about breadfruit to do this theoretically."

George and her students planned a trip to Haiti to test the dryer, but political upheaval in the island nation forced a last-minute change of plans. The group detoured to the Caribbean island of St. Vincent, where weather conditions mimic those of Haiti.

The students built a dryer in St. Vincent and took measurements. Their data showed that the device didn't maximize drying in the local climate. Foods dried faster in the direct sun with continued airflow. And there's always a light breeze over the island.

"If you don't care about the sun bleaching the breadfruit, you didn't need the dryer at all," George said.

So the project didn't turn out as expected. One comfort is that the discovery was made before the devices were spread over the island of Haiti, where they would have served little purpose. However, as Humphrys will tell you, CTI's projects make for an exercise in creative engineering.

The students' efforts, as it turned out, weren't in vain after all. The technology didn't suit its intended use, but some women of St. Vincent found a moneymaking and surprising way to put the dryers to work.

They found that red pepper flakes dry to a uniform color in the special frames. They now sell those seeds to Italian restaurants in the United States. It's a robust market that buys only flakes dried to just the right color, which George's simple technology provides.

You can't always tell how things will turn out. If you're dealing with a market far different from your own, you may have to go into the field to test something where it will be used. According to Humphrys, that's how motivated engineers can make the cross-cultural exchanges happen. ■