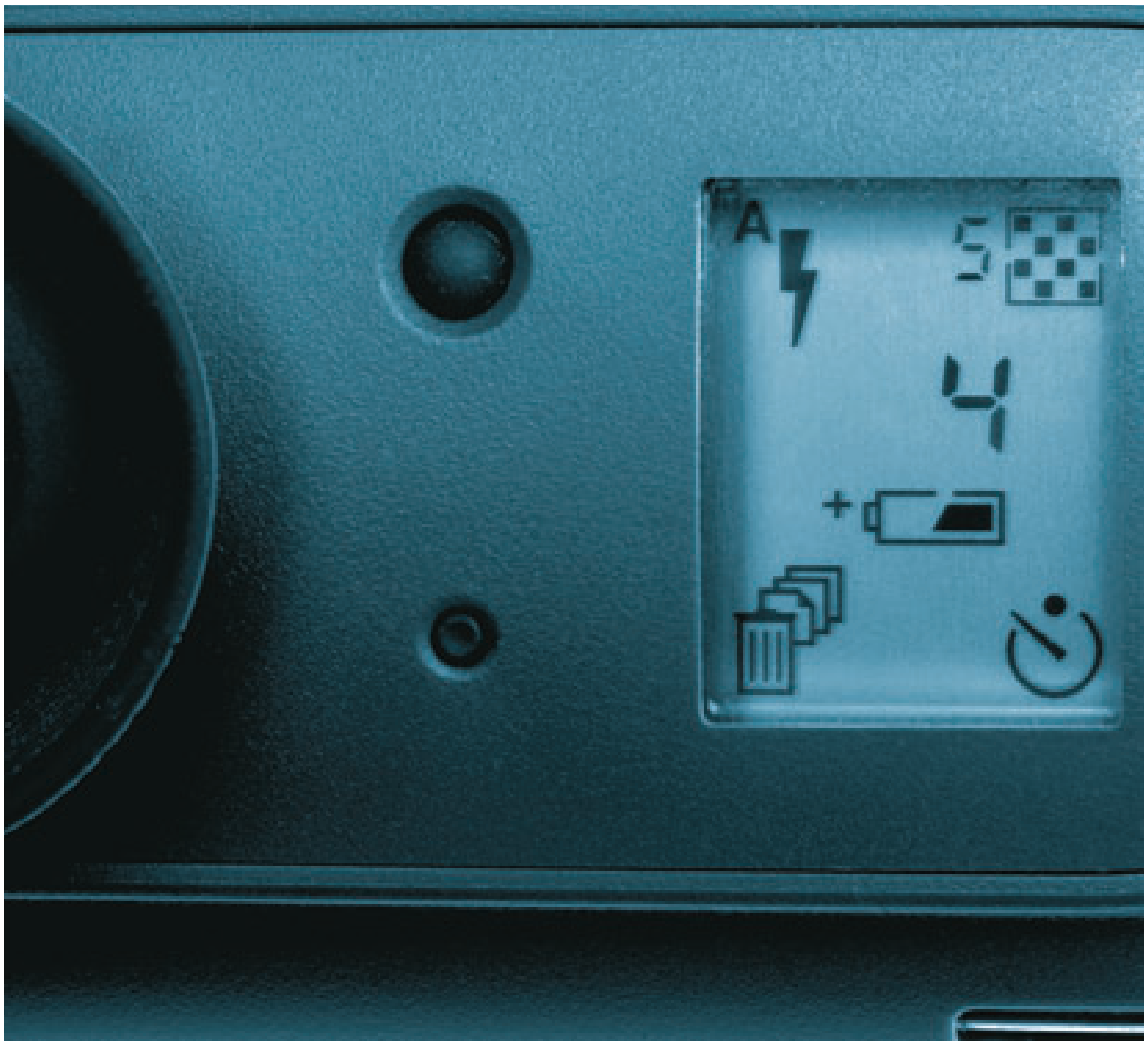
Speaking the language of the machine

Internationally experienced designer Amanda Mander and product development expert Richard Mander take us into the world of interaction design, where people and devices commune.



Interaction design — the art of designing how a user will interact with a product — has been applied to a broad range of electronic products, from software applications to mobile phones to airline ticket machines. Basically, anywhere a human has to interact with a machine or computer, interaction design has (we hope) been applied.

In some industries interaction design has reached a high level of maturity — for instance, in aircraft cockpit controls/displays and air traffic control systems. With these types of interfaces, however, users typically get a great deal of operator training. For many interaction designers, it is very rewarding to work on interfaces for "the rest of us" who need to interact with devices without the help of specialist training. The holy grail for many interaction designers is to make a product "walk-up usable" —so that most people can use the device for the first time without having to refer to a manual. One would expect, for instance, to be able to use a fire extinguisher or flashlight without training. But shouldn't we also be able to easily check in at an airport touch-screen kiosk, find our way around our local hospital's website, or set our video recorder to record tonight's episode of our favorite TV show?

Within New Zealand there is a lot of interest in increasing the proportion of GDP coming from information and communications technology (ICT) exports, from around 3 percent currently to more than 10 percent, and a concurrent interest in raising the quality and enhancing the differentiation of products for international competition through design. But while New Zealand has experienced industrial and visual designers, it does not have many with the training or experience needed to do world-class interaction design. Also, New Zealand companies do not necessarily understand the extent of investment in interaction design by their competitors in foreign markets. Follow-on efforts by industry, education, and government are working to address this skill shortage by developing a tertiary curriculum and encouraging companies to invest in design-led product development.

In the meantime, we'd like to draw a diagram, as it were, of interaction design and its applications; to describe the process and bring some insight through our own experiences working to develop human-to-machine interfaces.

A TEAM SPORT

Interaction design is really a higher level term for work done by an interdisciplinary team, which ideally includes the following people, who each bring a unique set of skills to the interaction design process:

- **Interaction designer:** Develops the details of the interaction, how the user will move from screen to screen, what will be displayed on each screen, and what controls and widgets will be used to control the device. In website design this is often called "information architecture."
- **Usability engineer:** Conducts customer research, usability tests of prototypes, and validation tests of design concepts.
- **Visual designer:** Develops concepts and then final art for all visual elements both on-screen and for any icons or labels on the exterior of the product.
- **Prototype engineer:** Builds prototypes to test the design ideas. These can include software and electronic components. Often there are both software and electrical engineers in this role.
- **Industrial designer:** Develops the physical design of the product and ensures the design can be manufactured.

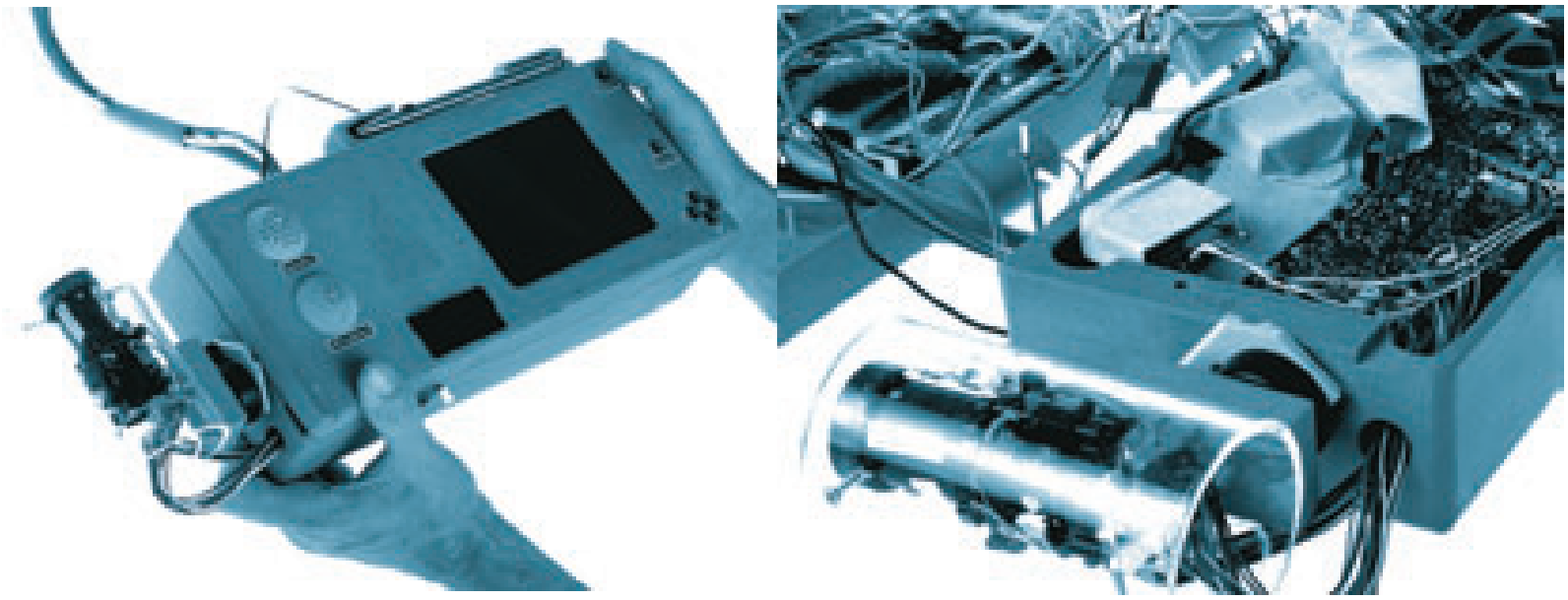
Together this team will work through a user-centered design process to specify the user interface for the product. This will include all the elements of the product the user touches and sees in order to make the product work. In many consumer electronics companies this can extend to the "out-of-box experience," meaning the packaging and manuals, and the screens of the company's website where users might go to get pre-sales information about the product or seek support when they have problems getting the product to work.

USABILITY'S VALUE

In the United States (Microsoft, Google, Palm, Apple), Europe (Nokia, Phillips), and Japan (Sony), many large companies understand and invest in teams with this mix of skills. Often the team will act as a central service to multiple product groups. However, smaller companies tend to outsource all or some elements of the team to specialist consulting companies. Another approach is to hire employees who

With the first consumer digital cameras, designers had to consider the huge interactive changes implicit in the shift from film cameras.

The last iteration in the process, the working camera prototype let the designers trial the interaction design with real users.



are "T" people — with depth in one discipline and general knowledge in one or two others.

Some manufacturers question the value of this emphasis on design and ease of use. But once they have experienced the benefits, most companies find it easy to justify the investment. The pay-off comes in three ways:

- The products are better specified from the start. This pays off in terms of more accurate product development schedules, since engineers know exactly what the product needs to look and feel like.
- They require fewer support calls and incur fewer returns.
- They can command a premium price, as they typically provide more value.

We often find the investment in design is more than covered simply in terms of the reduced number of support calls experienced with products that are easier to use.

In the United States, large retailers such as Circuit City and Best Buy actually test products to determine whether they are easy to use; products that don't meet their standards will not be carried, as these retailers know they will get large numbers of the products returned by disappointed and confused customers. In some cases manufacturers find the "usability bar" of U.S. retailers to be higher than their own.

THE DIGITAL CAMERA EXPERIENCE

Enough theory — now we'll show interaction design in action, using our experiences with digital cameras for several companies.

Our first design encounter with digital cameras was as part of a research project at Apple Computer in the early 1990's. At this time Apple was investigating several new product directions — interactive television, personal digital assistants, phones, audio recorders and digital cameras. As part of a team working on some of the first digital cameras to target a mass consumer market, we were faced with an interesting problem, the answers to which now seem obvious: What would it mean for users if the pictures they took were digital, rather than film?

CENTRAL QUESTIONS

In the user-centered design process, there are two key questions that need to be answered. Firstly, who is the user? In order to ground our designs in reality we need to identify the potential users of our products and base our design around meeting their unmet needs.

In the case of digital cameras, the marketing group had identified several potential markets:

- Consumers: Mums and dads, young adults
- Education: Teachers and students
- Real estate: Real estate agents, photographers and house buyers

The second question: What is the job the product needs to do for this user? Here we are trying to understand what the user would do with the product. For each type of user we needed to understand why they would use a camera — what purpose would the picture serve?

Our first step was to learn about the technology behind digital photography— to understand the implications of the digital platform. For instance, with a digital camera, how would you:

- Review a picture after you had taken it?
- Manage all the pictures on your camera?
- Get your pictures from the camera to your computer?
- Manage and organize the pictures in your computer?
- Print your pictures?

We were also tasked with finding other features that could be added to a camera based on digital technology. For instance, would users be interested in annotating their pictures with sound and text?

For edification, we undertook a series of design research exercises:

- Several families were given disposable film cameras and asked to use them over a weekend. We then collected the cameras, had the film processed, and interviewed the users as they looked at the pictures for the first time.
- We took families out on a day at an aquarium and observed them from a distance as they took pictures.
- We had people show us their photo albums and talk about how they managed their pictures.
- We visited schools and saw how teachers and students used photographs.
- We followed a real estate photographer around for a day and interviewed house hunters, realtors, and house inspectors to see how they used photographs. We followed a news photographer to see how he took photos and how the pictures ended up in the day's newspaper.
- We also interviewed some well-known photographers to get ideas about how to take better photographs.

DESIGN CHALLENGES

From all of this research we learned a great deal about how photographs are taken and used, as well as any problems and unmet needs with film cameras. We worked with the engineers to see how we might address some of these issues, and prioritized features for the first rendition. The first camera developed was Apple's QuickTake 100, designed to be a simplified version of what a digital camera could ultimately do.

One interesting design challenge with the QuickTake was communicating the concept of digital

memory capacity. Many solutions were proposed and tested with users. The one that was implemented tied a number displayed on the camera's LCD screen representing the pictures remaining (i.e., memory left) to the resolution button, which toggles between high and low resolution modes. In this way, as the user takes pictures, they see the memory draining at different rates, depending on the resolution setting.

Originally the QuickTake had a tree structure menu for picture settings, but given the target users, this was too complex. Instead, the design team exposed each of the controls in the settings window and provided a dedicated button for toggling through the different setting parameters.

Another big leap from the QuickTake was the Digita operating system, created by Apple spin-off Flashpoint Technologies. The Digita system could do everything: panoramic photos, slide shows, sound annotation, zoom and picture categorizing. The challenge was to design an interface that was scalable (meaning it could be used by first-time users, and more experienced users could access advanced features) and skin-able (meaning that different camera manufacturers could use the same interface with their own branding). The design developed coped with this need for flexibility by using "soft" buttons below the LCD screen that changed function depending on what the user was doing at any given time.

Finally, probably the biggest contribution to photography from the digital world has been the ability to view pictures immediately. At first we thought people would be happy just to use the LCD to compose their pictures and then review them, but while watching people use one of our prototypes, we found that people felt lost without the conventional viewfinder; moreover, photo subjects were confused without the visible button and the shutter sound indicating a picture had been taken. Part of the design solution was to have the camera generate a shutter-like sound when the picture was taken.

ITERATIVE DESIGN

In all our camera work, an iterative process was used: Initial concepts were storyboarded, prototyped and then tested. Initially paper prototypes were tested to validate the concept framework. The last iterations had full features implemented on working electronic prototypes, which may not have been the same size or appearance as the final product, but allowed us to try out the interaction design with real users.

The ability to gain constant feedback during the development process was critical to creating cameras that gave users a positive experience. Being able to tightly define feature sets and base them on research into the unmet needs of users enabled us to avoid costly last minute changes and unexpected design problems.

THE SUCCESSFUL PRODUCT

Research by the Product Development Management Association (see www.pdma.org) has looked at the differences between companies who fail and succeed at bringing new products to market. The PDMA has identified three factors common to companies that produced "winning" products:

- Customer need — successful products meet a clearly identified consumer requirement. In the eyes of the customer the product provides unique benefits and value for money.
- Market orientation — the company operates with a market orientation; product decisions are supported by well executed market research.
- Technical fit — there is a good fit between the product and the company's technical competence and development expertise.

All of these factors are key components of a good interactive design process. New Zealand has a rich history of innovation and there is no shortage of new ideas. What is needed is for New Zealand companies to make the investment in design and for more designers to work together on interaction design.

Amanda Mander is founder of Zanzara Ltd (www.zanzara.com), now based in Christchurch. Richard Mander is the new CEO for Humanware Group.

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The electronic picture display was a big boon of digital cameras — but users still needed the simple functionality of the standard viewfinder.