Interactive Experiences
PolyScience

industrial design
ergonomic design
graphic user interface
models prototypes
tel: 847.724.8840
chicago
santa barbara
cesaroni.com

CESARONI DESIGN®
product design consultants

© May 2010 Cesaroni Design Associates, Inc.
Visualization Software
Luxology

made in modo® by J.O. Rust
The quarterly publication of the Industrial Designers Society of America (IDSA), Innovation provides in-depth coverage of design issues and long-term trends while communicating the value of design to business and society at large.
INTERACTIVE EXPERIENCES

22 Design Interaction: What’s Next? by Don Carr, IDSA, Guest Editor
24 Creating Effective Interactions: Integrating Industrial and User-Interface Designers by Rob Tannen, PhD, IDSA and Mathieu Turpault, IDSA
28 Wicked Problems: The Power of Interaction by Rob Englert, IDSA, Grant Meacham and Don Carr, IDSA
34 Devign Intervention: Explaining the Power of the Integrator by Rochelle Benavides
38 IxDA: Designing a Down-Up Organization by David Malouf, IDSA
41 The New York Sports and Convention Center: Urban Design Cues
46 Intimate Interaction: Modern Interface Design by William Lee, IDSA and Don Norman, IDSA
51 The Anatomy of Experience by Alexander Manu

FEATURES

14 Collaborating Between East & West: Design for the Majority by Ji Ping Chang
18 Indigenous Design: A Two-Week Vertical Studio Design Charette by Andy Loewy, IDSA
55 One Man’s Crusade: How a Spoon Revolutionized Design Protection in America by Cooper C. Woodring, FIDSA

IN EVERY ISSUE

4 From the Executive Editor by Alistair Hamilton, IDSA
6 Commentary by Bettina Martin
8 Book Review by Mark Dziersk, FIDSA
11 A Look Back by Carroll Gantz, FIDSA
59 Showcase: Design Concepts
64 This Is a Design Challenge by Budd Steinhilber, FIDSA

Cover photo: © iStockphoto

Innovation is the quarterly journal of the Industrial Designers Society of America (IDSA), the professional organization serving the needs of US industrial designers. Reproduction in whole or in part—in any form—without the written permission of the publisher is prohibited.
The opinions expressed in the bylined articles are those of the writers and not necessarily those of IDSA. IDSA reserves the right to decline any advertisement that is contrary to the mission, goals and guiding principles of the Society. The appearance of an ad does not constitute an endorsement by IDSA. All design and photo credits are listed as provided by the submitter.

Innovation is printed on recycled paper with soy-based inks. The use of IDSA and FIDSA after a name is a registered collective membership mark.

Innovation (ISSN No. 0731-2334 and USPS No. 0016-067) is published quarterly by the Industrial Designers Society of America (IDSA)/Innovation, 45195 Business Ct., Suite 250, Dulles, VA 20166. Periodical postage at Sterling, VA 20164 and at additional mailing offices.

For subscription inquiries, call 703.707.6000.

To subscribe, call 703.707.6000.

For more information about becoming a Patron and supporting IDSA’s communication and education outreach, please contact Beth Harrington at 703.707.6000 x104.

Annual Subscriptions

<table>
<thead>
<tr>
<th></th>
<th>General</th>
<th>Student</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within the US</td>
<td>$80</td>
<td>$40</td>
</tr>
<tr>
<td>Canada &amp; Mexico</td>
<td>$75</td>
<td>$50</td>
</tr>
<tr>
<td>International</td>
<td>$110</td>
<td>$65</td>
</tr>
</tbody>
</table>

Single Copies

<table>
<thead>
<tr>
<th></th>
<th>Fall/Yearbook</th>
<th>Spring</th>
<th>Summer</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within the US</td>
<td>$25</td>
<td>$25</td>
<td>$25</td>
<td>$17</td>
</tr>
<tr>
<td>Canada &amp; Mexico</td>
<td>$25</td>
<td>$25</td>
<td>$25</td>
<td>$17</td>
</tr>
<tr>
<td>International</td>
<td>$35</td>
<td>$35</td>
<td>$35</td>
<td>$28</td>
</tr>
</tbody>
</table>

For subscriptions, call 703.707.6000.

Back issues and bulk orders available upon request.
For the past several decades, research laboratories across the world have developed dramatic new ways of interaction using gestures and body movement. Most of these developments were discussed only at academic research conferences; although sometimes they are visible in science-fiction movies. *Minority Report* is one of the more spectacular demonstrations with its gestural interfaces and interactive shop advertisements that recognize people in the halls and pitch customized ads to them. These advances need not be relegated to science fiction: gestural controls and inexpensive smart sensors are here. Just look at the Nintendo Wii or the progress in cell phone interfaces.

Knobs and dials, switches and levers, labels and low quality displays: that’s the old way of designing controls and displays. The control of devices, usually called the human-machine interface (HMI), is about to undergo rapid change providing designers with great opportunities—whether it is tractors or oil-well controls, automobiles or wall ovens, industrial mixers or drink machines, MRI scanners or infusion pumps. Novel HMIs will enhance performance, reduce errors, and lower maintenance and training costs.

For the average consumer, the change was first apparent with smart touch-sensitive cell phones and other consumer electronic products. But now the change is moving to durable goods, a category that includes home appliances, commercial restaurant and medical equipment, manufacturing tools, and all commercial and military machines. In the past, the controls and displays on durable goods were thought of as necessary distractions, often interfering with the clean lines and function of the design. Today, they can be the centerpiece: attractive, colorful and defining. And they can provide dynamic movement to otherwise fixed mechanical structures.

Progress in product functionality has demanded improved user interfaces in cell phones and introduced us to new touchscreen technologies.
New touch-sensitive screens bring the costs of these systems to levels that can be cost competitive with mechanical switches. The action-oriented interaction we associate with modern smart phones and video games is now robust, reliable and inexpensive enough to change the world of industry and commerce. We can control product operation with a fingertip touch or flick gesture, or a two-point touch gesture such as a pinch and zoom with the thumb and index finger. These new approaches to the user interface can make jobs easier to do, reduce training time and reduce errors. At the same time, it makes jobs more enjoyable, increases productivity, lowers costs and decreases maintenance costs.

Sound too good to be true? Well, that’s what technology breakthroughs are about. In this case, the technology breakthrough is not about the innovation itself—the technologies have been around for decades. The breakthrough is what the technologies can now offer:

- Durable and robust mechanical constructions with progressive aesthetics
- High reliability, even in extreme environmental conditions
- The ability to include various display types, including large color screens, allowing graphical and textual controls that reduce confusion and that can be self-instructing
- The ease of tailored specification for the job.
- The ability to change the interface controls and displays rapidly and inexpensively without any other modification
- Affordability and cost effectiveness versus traditional HMI technologies

A special benefit of these new technologies is their ease of customization, tailored specifically for the needs of the manufacturer. One basic design platform can be readily adapted to particular needs. For instance, a restaurant can change the display daily—hourly, if need be—to match its menu changes. A central office can modify all the displays used across the world either by downloading a new structure over a secure encrypted Internet connection or by dispatching new memory cards that can be inserted into the devices. Any given location can rapidly decide which configuration best fits its needs. The changes can include new controls, new action items, new point-of-sale graphics, weekly or daily specials, or instructional videos. The language of the display can even be changed for each user. The potential is enormous.

Consumer appliances (white goods) are closely related to the world of consumer electronics, so we would expect these arenas to be the first to start moving into these new styles of interaction. Surprisingly, the first steps occurred elsewhere, such as the Coca-Cola Company’s Freestyle unit that allows customers to customize their own drinks. Just select the desired ingredients from the choices offered on the touchscreen display and a custom drink is delivered.

**Ready for Change**

Groundbreaking interaction design seldom happens in the world of durable goods. It’s not glorious—no industrial equipment star designers are highlighted in magazines, no salon shows are dedicated to commercial equipment. Innovative client/customer patrons may be hard to find. Equipment for the test and measurement industry and medicine has also tended to follow the tradition of slow rates of change. For instance, category-changing oscilloscopes have incorporated modern computer operating systems, but still use old-fashioned controls.

With medical equipment, functionality usually dominates. However, our experience with an increasing rate of medical error indicates that we need to pay more attention to the user experience including better and more human-centered displays and controls. Medical personnel face frequent interruptions, so the controls must be designed with this in mind. If a device can’t deliver drugs effectively, the patient suffers, sometimes in a way no one ever intends. For instance, infusion pumps are notoriously difficult for the medical staff, resulting in frequent errors and much frustration.

The same problems appear in much of the sophisticated equipment used in today’s hospitals. **Human error is invariably a design error, often caused by ambiguous, restricted design of the controls or displays.** With modern transparent touch-sensitive displays over a color LCD display, the controls can be easier to understand, self-instructing, error correcting, and better able to display the
state of the device and its operation for the physicians and nurses who must monitor the patient. Moreover, it is possible to put these displays and controls in fully sealed enclosures making the device easier to sanitize and keep clean.

For a chain of commercial restaurants, UICO was asked to redesign the controls of a drink dispenser, replacing the existing traditional membrane switch panel that had multiple poorly differentiated buttons for drink dispensing and maintenance tasks. We replaced it with a projected capacitive touchscreen that guides operators through use via a "what you need when you need it" HMI approach. That is, the panel provides several high-level choices, and whenever one is selected, the display and controls change to be appropriate to the selected activity. For maintenance, the screen serves as a simple tutorial, instructing the workers just how to perform each step and only moving on to the next screen when the current step has been completed.

The system was encased in a watertight enclosure that held a single board computer. The result was unheralded ease of use by semi-skilled labor in a fast-food setting. The sound and supportive self-instructing graphics clarified the maintenance tasks. Moreover, the language being displayed is easily changed to accommodate each worker. The result? Drink quality and throughput has been markedly improved.

A Gamut of Touchscreen Technologies
So how do we make great user experiences for folks wanting to cook a turkey, dispense medicines or effectively control factory machines? For the moment, we’ll call the most promising frontier of usability “intimate interaction.” It is achieved by combining relevant presentation layers with engaging input modes.

This trend is being clearly marked by the ubiquitous shift from basic interfacing using keypads or a mouse to the engaging touchscreen consisting of a high-resolution display with a sophisticated human-machine interface. The result is a new standard of engagement for how a product may be used.
## Touchscreen Technology Comparison

<table>
<thead>
<tr>
<th>Technology</th>
<th>Capacitive Systems</th>
<th>SAW</th>
<th>Infrared</th>
<th>Resistive</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input Method</strong></td>
<td>Capactive electric field thru material(s)</td>
<td>Capacitive electric field on material surface</td>
<td>Surface acoustic waves</td>
<td>Light interruption</td>
</tr>
<tr>
<td>Finger, gloved finger, conductive stylus.</td>
<td>Finger, conductive stylus.</td>
<td>Finger, gloved finger or soft tip stylus.</td>
<td>Finger, gloved finger or stylus pen.</td>
<td>Finger, gloved finger or stylus pen.</td>
</tr>
<tr>
<td><strong>Activation</strong></td>
<td>Activation sensitivity can be customizable. Activation pressure is consistent across substrate.</td>
<td>Activation sensitivity is non-customizable. Activation pressure is consistent across substrate.</td>
<td>High degree of false actuation due to zero pressure.</td>
<td>Activation sensitivity is non-customizable. Activation pressure is inconsistent across substrate &amp; over time.</td>
</tr>
<tr>
<td><strong>Durability/Longevity</strong></td>
<td>High. Solid-state technology protected thru thin or thick rigid substrates; highly shock/impact resistant.</td>
<td>Medium. Solid-state design through thin rigid substrates; medium level of shock and impact resistance.</td>
<td>Low. Highly susceptible to stress or wear in mechanical construction over time.</td>
<td>Low. Easily damaged by foreign objects &amp;/or harsh cleaners. Highly subject to wear under heavy use.</td>
</tr>
<tr>
<td><strong>Surface or Environmental Contaminants</strong></td>
<td>Best units immune to water, moisture and other contaminants or chemical cleaners; wide temperature range.</td>
<td>Does not work when wet or moist.</td>
<td>Adversely affected by moisture, surface contaminants and changes in temperature.</td>
<td>Potential for false actuation or dead zones from surface contaminants.</td>
</tr>
<tr>
<td><strong>Use with Gloves</strong></td>
<td>Yes (depending on type of system)</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Sensor Substrate Types</strong></td>
<td>Thicker glass. Some plastics possible with choices depending on use &amp; interactions.</td>
<td>Typically soda lime glass.</td>
<td>Glass only.</td>
<td>Any substrate.</td>
</tr>
<tr>
<td><strong>Gestures</strong></td>
<td>Limited</td>
<td>Yes</td>
<td>Low resolution due to spacing &amp; interpolation</td>
<td>Single touch; requires constant pressure.</td>
</tr>
<tr>
<td><strong>Multitouch</strong></td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Calibration</strong></td>
<td>None required.</td>
<td>Yes, required periodically.</td>
<td>Yes, required periodically.</td>
<td>None required.</td>
</tr>
<tr>
<td><strong>Surface Shape</strong></td>
<td>Flat or curved one direction only.</td>
<td>Flat only.</td>
<td>Flat only.</td>
<td>Flat only.</td>
</tr>
<tr>
<td><strong>Transmissivity Optics</strong></td>
<td>Very good &gt;92%</td>
<td>Very good &gt;92%</td>
<td>No distortion 100%</td>
<td>Distortion due to coatings &lt;82%</td>
</tr>
</tbody>
</table>

©2010 UICO, Inc.
Projected capacitive touchscreens often offer the best combination of functionality, reliability and durability. When implemented effectively, they make products sing and users take notice. The key is to design from the inside out—that is, architect the interaction and then choose and implement a technology that is supportive. And, as with the implementation of any innovative technology, find a partner who knows how to make this stuff really work and who you can work with and trust.

Thrilling Users
The new display and control technologies promise huge opportunities for the design profession. We are now free of the tyranny of fixed mechanical controls, which are ugly to look at, fixed in space and time, and unreliable. The new systems can be molded into a pleasurable experience for the eye and hand, offer increased flexibility for designers, and are dramatically easier for people to use because of their colorful images and room for explanatory text. At the same time, they can be less expensive and more reliable than the previous generation of mechanical and membrane switches.

The result will be great design for both consumers and durable goods with increased capabilities, ease of use and reliability. Customers and companies will seek products with richer experiences, and there will be a need for appropriate user interfaces and HMI sub-assemblies that represent the change to the new standard of intimate interaction.

For better product and user-interface designs seeking a touch system, projected capacitive technology is today’s flag bearer, in addition to a number of other emerging ways to interact with and manipulate products. As with any good design program, technology should be used as appropriate to deliver the desired end result. Keep in mind all users and stakeholders, strive for simplicity in any GUI undertaking, and seek durable and robust human-machine interface constructions such that users are thrilled.
Discover the desires and aspirations of your audience. **Understand the right problem to solve and the clear path forward.** See the future. Focus ideas. Inspire innovation. Deliver great experiences. Get Clarity. Get Lextant.

www.lextant.com