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Integrating User Interface and Industrial Design

THE **NEED** FOR A **HUMAN CENTERED APPROACH**

While some received the recent launch of the Apple iPad as the ultimate evidence of effective user interface/industrial design synthesis, it is more accurately taken as the exception that proves the rule. In recent years, we have seen the rapid proliferation of products with integrated digital user interfaces. Led by consumer electronics, and quickly cascading to appliances and commercial, medical and industrial applications, a new product without an integrated touch screen is behind the times. But Apple's level of hardware/software integration is so noteworthy because it is so rare.

Andy Polaine articulates the more common situation in a recent Core77 article [http://tinyurl.com/ye2az9h]:"Practically every device I own falls into one of two categories: Some have decent product design chops, but the interaction design feels like it was created by another department who never even bothered to chat with the design team around the water cooler. The others have interfaces that work well enough, but the device itself looks like the worst excesses of a teenage boy's doodles on the back of his schoolbook."

As product design consultants, we see the root causes of these failures: software development by engineers lacking interface design knowledge, industrial design and user-interface design handled by separate groups with minimal front-end planning, and an overall lack of focus on a cohesive user experience. Most importantly, there is a general lack of central design leadership responsible for the whole product experience.

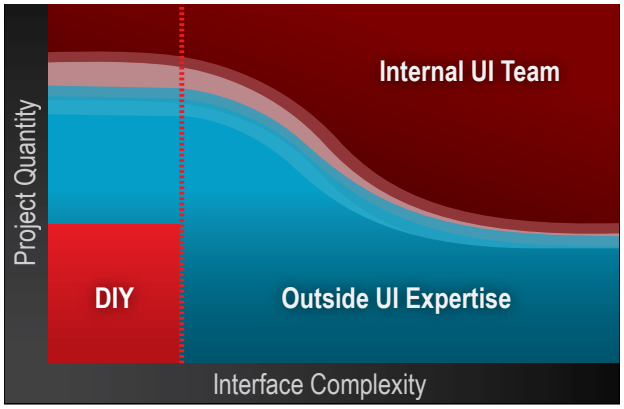
For industrial designers, the rise of the user interface is no surprise, but recognizing a change and capitalizing on the opportunities are two different things. **Industrial design departments, consulting firms and individual designers have adapted to the growth of user interface in a number of ways: avoiding it, embracing it and, in some cases, strategically shifting toward it.** The benefits of designing the user interface are both financial and functional: for consultants interface design services can command a higher rate than comparable stand-alone industrial design projects, and combined services deliver more usable and

cohesive products. For corporate design group leaders, the opportunity exists to further differentiate products by delivering more holistic product experiences.

Resourcing Integrated Design Projects

Two key factors that impact integrated user interface design projects are the quantity and complexity of the user-interface design. In the case of a small number of interface design projects of low complexity, a do-it-yourself approach by in-house industrial design teams will be sufficient. And their efforts will improve with experience, but only up to a point. If the interface design work becomes too complex, then industrial designers will simply not be able to execute it. Similarly, if the quantity of interface design work exceeds a threshold, even if it is basic work, then it will go beyond the bandwidth of the industrial design group. As a result, industrial design groups will typically choose to outsource user-interface design expertise. (Note that industrial designers who are primarily designing user interfaces are effectively no longer industrial designers for the purposes of this example.)

As industrial design departments find themselves facing a greater volume and/or complexity of interface design work, they may come a point when building their own internal teams is more efficient than relying on outsourcing.



The impact of user-interface project quantity and complexity on project resourcing.

Or, at a minimum, the design leadership within the organization could (or should) make a strong case that existing user-interface team members migrate from the software/engineering group to the design team. A number of forces shape the need for an internal user-interface design team: When there is a consistently high quantity of interface design work or a consistently low quantity of high-complexity user-interface design, a group will have sufficient workload to use in-house resources. There may still be a need for outsourcing user-interface specialists in certain cases; although for even higher complexity situations there may be a greater learning curve for outside resources.

At Bresslergroup, we initially approached user interface design in the 1980s and early 1990s as a natural outgrowth of industrial design, product graphics and human factors. This do-it-yourself method capitalized on the skills and experience that industrial designers already had and was generally effective for the low-complexity, low-resolution interfaces that were initially emerging within product design projects. But it quickly became apparent that the value of interface design depended on solutions that required multiple workflows and complex logic where information architecture expertise was required (but typically lacking in traditional industrial design training). As higher quality, visually richer displays became available, basic product graphics skills were clearly insufficient as well. Most importantly, without a consistent focus on user-interface design work, it is difficult for industrial designers to become efficient and knowledgeable in that area. (Anecdotally, we have seen many industrial designers make the transition to user interface design, but rarely the opposite.)

Recognizing this gap in our own capabilities and the potential to support this need for our clients, Bresslergroup developed in-house user-interface design capabilities. This initially began with hiring designers with a balanced skill set in terms of graphic design, information architecture and software usability. As our capabilities and demand grew, this spread into bringing in additional subspecialties including interactive prototyping and usability analysts to support a broader range of design needs.

The design of the Moviecle kiosk was driven by an integrated user-interface/industrial design process.

Integrated Design Processes

Developing an experienced interface design team allows product designers to deliver a truly integrated product design process, but it is important to determine the relative priorities of industrial design and interface design on a case-by-case basis. For many projects, an integrated industrial design/user-interface process may not be needed as when the associated interface design work is relatively minimal. A traditional industrial design-led process will likely be adequate for products that have low complexity interfaces (e.g., straightforward workflows and shallow, linear navigation)—for example, defining the interface on a typical kitchen toaster or coffee maker.

On the one hand, sticking with a familiar process is comfortable for industrial design teams, but there are caveats to this concession. By its nature, an industrial design-led process puts less emphasis on the available time, creativity and priority of the user interface. As a result, a "good enough" user interface is usually delivered, but opportunities for significant rethinking and improvements are often missed. The products are appealing and attractive, but their user interfaces often fail to leverage opportunities to improve user experiences.

Over time, the number of products with limited user-interface requirements is diminishing as display and computing continues to become less expensive to embed. With more sophisticated interface technologies comes, for better or worse, the ability and demand for more sophisticated interface designs and workflows.

On the other hand, a group might consider a user-interface-design-led process on projects where considerable interface-design thought is necessary and the industrial design needs are minimal—for example, software design projects on predefined hardware platforms (e.g., desktop computer). As a practical matter, projects that do involve the design of hardware and software require some up-front fundamental industrial design decisions to define the technical, functional and cost requirements of the interface hardware. Consequently, an integrated user-interface/industrial design process is the pragmatic alternative to the traditional industrial design-led process.

In an integrated process, both user-interface and industrial design issues are researched, designed and iterated in a synchronized—although not necessarily parallel—manner. **One of the biggest changes that industrial designers must deal with when shifting to an integrated process is the timing of creativity in visual form and style.** Typically, industrial design places an emphasis on generating a range of forms early in the project and then narrowing down and detailing the solution. In interface design, the process is almost flipped, where significant upfront time is spent on the details of the information architecture to determine the navigation, workflows and information content. Consequently, more time and effort is needed to determine the details of the user interface before associated industrial design steps can occur. This patience and effort is rewarded with better

allocation of functions between the user interface and the hardware, and greater consistency and control of the user experience. At the end, the right process delivers an integrated and cohesive design solution that supports what a brand and its products represent.

Creating, and adhering to, an integrated design process can be challenging. From a project management perspective, there are more "moving parts" to handle as both industrial and user-interface design activities are both co-occurring as well as influencing each other.

For both interface and industrial designers, a greater degree of patience and flexibility is required as critical issues must be examined early in the process. For example, functional allocation mapping—determining which features and information will be delivered via user interface or the industrial design—is a key benefit of integrated design but requires a thoughtful decision process.

While designing the Moviecle digital kiosk, for example, decisions were made about how to physically integrate a number of interactive displays within the unit and how the user experience would be delivered through a combination of physical and digital cues and interactions.

User research also requires adjustment in an integrated design process. In up-front generative research, observational data must be efficiently gathered on both physical and cognitive activities. In fact, this is a process of doing functional mapping in reverse—seeing what tasks are currently being performed by hardware interactions and others via software and then considering how those interactions might be improved by remixing the mappings.

While it is ideal to conduct integrated user-interface/industrial design concept or usability testing, this research demands a level of prototype integration that is typically beyond the traditional initial phases of the design process. This spurred leading organizations to develop quick and dirty user-interface prototypes for effective research. Industrial design prototyping and testing with physical mock-ups may be conducted in parallel or conjointly with early user-interface-design wireframes and concepts, delivering richer research data and retiring risk early. The findings from early research influence the design of successful looks-like and works-like prototypes later in the design process.

The Future of Industrial Designers in User Interface Design

While some may see the role of industrial designers diminishing as user-interface design continues to permeate product development, other concurrent trends actually emphasize industrial design skills in interface design. The rapid emergence of gestural and other "natural" user interfaces that utilize the physical dynamics of the human body will depend on a solid understanding of ergonomics and physical human factors. Many industrial designers have this expertise; most interaction designers do not.

From touch and multi-touch phones and computers to gestural interface gaming systems and radio transmitters embedded in everything from passports to pets, the connections between people and technology are becoming stronger, even as the medium for doing so becomes less visible and tangible. These technologies have opened a rich world to interaction designers, who have largely been constrained to an input vocabulary of buttons and pointers. Now, designers are gaining a complex and dynamic palette built around (and limited only by) the physical capabilities of the human body.

Creating effective physical-to-digital interactions is a unique challenge. With the great human diversity in physical capabilities due to age, gender, physical condition and motivation, a one-size-fits-all solution rarely exists. A human-centered approach involving the collaboration of interface and industrial designers with expertise in human factors and ergonomics is necessary. In other words, as people and technology become better integrated than ever before, industrial and interface designers will need to do likewise. ■