Integration and Communication: Teaching the Key Elements to Successful Product Interface Design

Vicki Haberman
Georgia Institute of Technology

Introduction

The role of the user along with the goals of products and systems, as a whole, are evolving as products transition from simple analog devices to complex digital devices. Defining the user becomes central to defining the operation of a device and is integral to the design process. The domain of product interface design emerges from the need to properly integrate the aesthetic, functional, and dynamic elements of a product and to ensure a device's usability. The user interface is defined as how an individual communicates with a device and how that device, in turn, communicates with the individual. It involves the precise interaction, "not only as what is being done, but also as how it is being done." (Dourish, 2001) Beyond simple communication, a successful product interface defines the user's role in the interplay and, unbeknownst to the user, properly outlines the device's operation. To a designer, the vital role user interfaces play in these new digital devices brings about challenges in both communication and integration.

Communication is best defined in context. The design of digital devices establishes two distinct meanings, communication *in* the design process and communication *of* the interface design. Likewise, integration in respect to product interface design is defined by two applications: the *integration* of interface design into the product development process and the *integration* of hardware and software elements in relation to the user experience.

Communication Defined

Product interface design requires new methods of communication in the design process. With interface design and technology, professionals beyond design and engineering are drawn into the product-development cycle. The need arises to have concepts and ideas conveyed in a language understood by every discipline. From the industrial designer's perspective, the typical product concept development phase starts with pen, paper, and the sketching of ideas before moving into three-dimensional prototyping. This approach falls short as products become more dynamic with different states to define and communicate to other team members. Additional methods for communication are needed to give life to the user interface elements in both the initial concept and prototyping phases. As with traditional industrial design, a distinct skill set exists for the interface development stages. Unfortunately, these non-traditional design skills are often overlooked and often prove difficult to individuals accustomed to primarily sketching and creating physical models to communicate their design solutions.

Effective communication of the interface design is actually covert communication. While this seems like a paradox— by nature good communication should be explicit— when examined from the standpoint of the end product user, the contradiction is explained. "The communication between designer and user takes place against a backdrop of commonly held social understandings." (Dourish, 2001) A designer creates a successfully communicated interface when the product has a clearly defined human-device relationship. The user feels in control of their environment and clearly understands his/her possible courses of action. The device itself communicates its use and methods of operation, without instructions, which would be considered explicit communication of the interface design. (Norman, 1998) The concept of communication of the interface design is further explained by the fact that comprehensive communication in the design process leads to the communication of the interface design, all of which are enhanced by proper integration.

Integration Defined

As technology develops, there is a consistent seam between the hardware and software elements of a product. The goal is to create stronger connections between the two, making the seam recede and the two elements connect more directly. This integration of hardware and software results in an enhanced user experience. (Dourish, 2001) If the hardware and software elements of a product are appropriately unified, the communication between a human and the device is clear. When interface design development and communication skills are not properly integrated into product development, an increase in the seam and in the disconnect between the physical and technological aspects of a device results. The user interface, once thought of mostly as an add-on to a device, needs to become an integral part. (Baumann, 2001) Without a holistic approach to the design process, including the introduction of non-traditional design communication skills, the advance of technology and introduction of digital devices is overshadowed by poor user experiences.

Implementation

Implementing the nontraditional design communication skills and integrating them into the product-development cycle allows the designer(s) to end with a product that integrates the aesthetic and functional elements creating a dynamic and successfully communicated interface. Therefore, a complete understanding of these nontraditional design communication skills is critical to developing products that create a positive user experience. By using the foundations of communication and integration the nontraditional design communication skills are effectively taught in a five-step process:

1. Understand the need for the skills or "tools."
2. Provide a "toolbox" from which to select an appropriate "tool."
3. Establish the method(s) for deciding the "tool(s)" to use.
4. Implement the "tool(s)" to create a "communication."
5. Integrate the "communication" into the design and design process.

Understanding the need for the nontraditional design communication skills or "tools" is created by placing interface design problems into the student's curriculum, giving them first-hand experience. This can be accomplished by dissecting an existing interface and getting students to discuss their observations, including difficulties and problems they encounter. A seemingly simple interface can turn out to be enlightening. The example of a house key, representing the interface between a human and entry into a dwelling, is excellent. The house key is handheld. It interacts with the door, interfaces with other keys, and must be fit into a tight space. As students begin to explore the scenario, they become aware of interface issues and naturally move into thinking of solutions. With a little coaching, they begin to verbalize different scenarios and discuss different steps one could take to enter a house. Realizing they need a better way to communicate their methods than just talking about them as a class, an awareness of the need for additional tools is created.

With the need established, the next step is to provide a toolbox. Writing and drawing skills are the starting point. While industrial design students are well trained in visual communication, they often lack the honed skills of written communication. This skill is extremely important to the development of interfaces and to communicating ideas, especially to those outside the design field. A quick review of writing skills can be obtained from William Strunk's *The Elements of Style*. By combining writing and drawing, students can create usage scenarios, information flow diagrams, and storyboards.

Usage scenarios are an exercise in writing skills and are a great method for strengthening this skill and pushing a design student to use words to describe his/her ideas. Usage scenarios describe an interface including: the available operations and/or functions of a product, the precise method of how the functions work, and the exact procedure for operating the various functions. Scenarios can depict the rationale a user would take for choosing one path of operation over another, thus describing characteristics and decision patterns of the user. (Dix, 1998) It is important to keep scenarios short and to the point limiting excess words and unnecessary descriptions.

Industrial designers are hands-on individuals and enjoy being immersed in the creation process. With this in mind, information flow diagrams can be best developed using string, pushpins, and multicolored Post-it notes. Thoughts are organized by labeling potential states of the device, potential interactive elements on the device, and any aspect that needs to be controlled. Each is written on a different color of Post-it and like elements pinned next to each other on a board. Using the string to link elements together, potential relationships are explored. A digital camera comes in handy to capture different stages of the thought process as the notes and string are moved around. In the end, if needed, the information flow diagram can be translated onto a computer.

For product interface design, storyboards illustrate different states of a device and highlight cause-effect relationships between dynamic product parts. Combining a series of images with short text descriptions creates a clear understanding of the human-device relationship. The key to producing successful storyboards is to clearly represent the dynamic portions of the product by illustrating the components that involve user interaction in enough detail to give

a clear understand of the sequence of changes. Multiple storyboards can be presented to demonstrate different aspects of a product. When combined, they give the whole picture of the device.

While it is not necessary to use all of the nontraditional design skills to explore interface solutions, the key is to ensure the communication of concepts. In a presentation, an evaluator is able to examine competing ideas demonstrated though the scenarios, information flow diagrams, and storyboards and use these to compare and contrast the ideas. It is helpful for students to create a series of communication pieces that relate. For example, when storyboards show competing concepts, like features should be visually represented for comparison. By developing various means of communication for presentation, valid feedback about the interface can be received from fellow students, faculty, and potential users. This feedback, when integrated into the form development process, gives new insight as to how the form and aesthetic should be modified to best create a cohesive human-device relationship and positive user experience. Following the initial review cycle, concepts are further refined using the same communication tools and once again viewed with the progress of 3-D development. When the final direction(s) is chosen, interactive prototypes bring it to the next level and ensure that all aspects of the interface are thought about and developed.

Complex interfaces have multiple options at any given time. Based on this information alone, linear, or single decision/direction, mechanisms for interactively prototyping an interface are inadequate. Nonlinear, time-based media including, Macromedia Director and Macromedia Flash, if used correctly, adequately represent Weblike, or nonlinear, possibilities of an interface. Rather than attempting to teach students the full operation of these programs, it is best to develop an understanding for their basics and potential applications rather than the techniques for operating them to their fullest extent. When the basics of a non-linear, time based media are taught along side the concept-development communication skills, students are ready to delve into interactive prototype creation following concept generation and refinement. Through more advanced computer programming, nonlinear, time based media provides a means for mimicking all varieties of interface elements. Online help menus and forums as well as book resources are good pointers to push students in the direction of taking the basics one step further. This step gives students the ability to clearly represent a product interface using a 2-D prototyping environment. Placing a completed non-linear, time based media piece with at 3-D prototype gives peers, faculty, and potential users the ability to review the aesthetic and dynamic aspects of a concept together and help merge these two areas to create a coherent project.

Conclusion

Mastering nontraditional design communication skills and integration techniques is important to the design and development of digital devices. Using a foundation of writing and drawing skills, interactive communication tools are taught to help students organize thoughts and create well-designed interfaces that enhance the overall user experience. These tools are implemented to create a body of work that is easier to evaluate in the development

process by both designers and nondesigners. Peers, faculty, and potential users understand the communication pieces and provide insightful feedback. When merged into the product development process, interface design feedback provides impetus for modifications to the product form to ensure the integration of the aesthetic, functional, and dynamic properties of a product. When "paper" development methods are fully explored, nonlinear, time-based media continue the process and allow for the exploration of an interface's complexities. Integrating interface prototyping into the design process allows students to fully explore their interface design solutions and how they best fit with the 3-D form. The result of this exercise in communication and integration is a design with a powerful user experience.

References

Baumann, Konrad, and Bruce Thomas. 2001. *User Interface Design for Electronic Appliances.* London: Taylor and Frances.

Dix, Alan J., et al.1998. *Human-Computer Interaction*, 2nd ed. London: Prentice-Hall.

Dourish, Paul. 2001. *Where the Action Is: The Foundations of Embodied Interaction*. Cambridge: MIT Press.

Norman, Donald A. 1998. *The Invisible Computer*. Cambridge: MIT Press.