

The Many Faces of Interface

May 3, 2004

Kalev Leetaru

Mediated Interaction

- Software engineers often develop an application in isolation from the interfaces that present its functionality to the end user. As Susan Dray points out, however, to an end user, the interface *is* the application. The interface thus mediates the user's interaction with the application, accepting the user's inputs and presenting those to the application in terms of data structures and taking the data structures output by that application and presenting them in human-readable form. The development of an application and the design of its user interface are thus symbiotic processes and must occur in tandem in the successful application.
- The user interface of a software application is often thought of as simply the set of computer screens presented to the user during the course of operating the software. This narrow scope of evaluation constrains the designer to only considering the attributes of the interaction media (the computer), when in reality, it is the metaphors and processes which lie at the fundamental junction of human and computer.

Interaction as Fusion

- Nathan Shedroff presents user interface design as an instance of external fusion, involving Information Design, Interaction Design, and Sensorial Design, with the commonality of the three being Content. He terms this fusion Information Interaction Design. Shedroff briefly touches on the continuum between information and knowledge, and adds the additional layers of data beneath information and wisdom above knowledge. The disjuncture between information and knowledge is precisely the driving force behind the existence of user interfaces. At the lowest level, traditional software applications operate in terms of internal data structures, which require some form of interaction medium to allow the user to affect the data structures and to act on their contents. On a slightly higher level, automated learning and mining tools provide an interface to overwhelming volumes of information by refining that information into knowledge. For example, the web at large may be considered a vast collection of information, but if a user is looking for the subset of that collection referencing user interface topics, the resulting sub collection may be termed knowledge, since it represents a targeted refinement to answer a specific question. The knowledge of which resources constitute that sub collection may not be the ultimately desired knowledge, however, and further refinement may be successively applied. At the highest level, interfaces may be used as knowledge concentrators, transforming the modality of a set of knowledge into a more readily analyzed form. An example is visualization of information, such as the visualization of a storm simulation, where the output of the simulation is knowledge, the set of numbers representing the cell velocities. However, this knowledge is not in a form that can be readily absorbed and analyzed by a human, so the numbers are transformed into visual form, which concentrates the knowledge by a modality transformation, rather than by representation and synthesis of it.
- Several authors discuss the internal fusion of the design process itself, with Jesse Garrett illustrating it with the five overlapping layers of Strategy, Scope, Structure, Skeleton, and Surface. Significant detail is provided on the

implications this multilayer process has for the overall design workflow. One fundamental consideration is that the design process should be architected such that each layer is completed and applied before embarking upon the next, rather than completing all layers in parallel and then applying them at the end, which can result in considerable disharmony.

The Audience Metric

- A user interface acts as the conduit between two worlds: that of the human, and that of the machine. A conduit cannot be successfully designed in isolation from the two worlds it connects, and hence it is imperative to identify up front both the human audience and the information content being brought together through this interface. The information content is usually predetermined and often influences the prospectus human audience. A collection of articles about specific programming techniques to achieve certain interface elements has a very narrowly defined readership demographic of highly technical users. Such a specialized assemblage of users will often have a common background knowledge and a shared set of experiences and expectations for the content and the medium in which that content is expressed. This suggests that such a site may draw upon this common background to provide a certain experience. This experience will differ substantially for an alternate demographic without that shared knowledgebase, and the metaphors for accessing and interacting with the content will need to be changed to address the differing baseline.
- It is also important to always remember that the *audience* is defined by the amalgamation of the entire demographic, and hence the successful design must make assumptions based only on the global shared knowledge of the group. Subsets of users within the community that have additional shared knowledge must be addressed in sublevels of the interface, rather than at the top-level. A relatively recent trend, enabled by advances in content management and publication technologies, is the notion of individualized content presentation, known by the common terms *customization* and *personalization*. These capabilities present unique possibilities for content mediation, by allowing the mediating interface to dynamically adapt to the user, rather than having it statically defined at the start by a designer.

Organization as Interface

- With the rapid growth of information production and publication, we have quickly left the age of information scarcity and entered a world of information overload. New publishing technologies have made the production and dissemination of information breathtakingly easy, empowering the individual to reach a worldwide audience. To add to the tremendous influx of human-produced information, remarkable strides have been made in computer-based instrumentation, generating previously unfathomable amounts of data every second of the day. To be useful, all of this information must be processed into forms from which the desired knowledge may be extracted. One such process is organization, where a large collection of documents is grouped by similarity. However, organization is deeply subjective, heavily incorporating a person's background knowledge and

experiences into the classification scheme. This causes one person's organization scheme to often not immediately map into another person's intuition. Hence, organization itself is as an interface problem, providing a mediating layer between mountains of information and the desired knowledge, with the understanding that no single mapping is sufficient for all users.

Visual Impact

- The human visual facilities are among the most developed sensory inputs in the human body. Specifically, the visual system contains a large array of specialized processing centers that autonomously analyze perceived visual imagery and tag and extract various attributes. This results in a very high-level understanding of the visual world being presented to the brain. Hence, the transformation of textual and other forms of information into first-order visual representations significantly increases the resolution of the information transfer, allowing a much greater amount of information to be analyzed at once by a human and with greater recognition capabilities than in alternate forms. For example, humans can recognize patterns with much greater speed and accuracy than from large columns of numbers.
- The richness of the visual facilities suggests that the visual presentation of information conveys a certain amount of knowledge by itself. For example, by highlighting a section of text with elevated font size and coloration, an elevated level of importance is connoted to the reader. Luke Wroblewski presents color, texture, shape, direction, and size as additional properties that influence perception of content. The proper use of these attributes allows a publication to be arranged with a strict visual hierarchy, giving the interface control over the order in which a reader peruses the document.

Personality as Interface

- At its most basic level, an interface becomes the user experience and hence assumes responsibility for the way in which the user perceives the content it mediates. An interface must therefore implicitly carry its own personality. This personality shares in the background knowledge of the user and thus must be designed with a particular audience in mind. The personality of an interface comprises everything from the language used for the text (literary style or colloquial / vernacular), imagery (formal portraits or "casual" snapshots), color schemes (muted or vibrant), and other visual elements that connote a certain emotional response to the content being conveyed. This can significantly influence a reader's perception of the content and can help form a bond between the content and the consumer.
- The personality of an interface can also be expressed in emotional terms such as *sturdy*, *contemporary*, or *high-tech*. Take the example of the chair, a staple in human life for an eternity. Differing designs of a chair can offer the suggestion of a sturdy chair that can take any abuse given to it, or a contemporary feel, taking the person back to a particular time in history, or high-tech, conveying the idea of "space aged". Each of these emotional responses is evoked from the same fundamental object, the only difference is in the presentation.

Optimism

- It is worth mentioning an article by Steve Calde, which chastises the design community for an overwhelming focus on what makes for poor design, rather than concentrating on how to create good designs. This is an important lesson, as one must always remember to look for good alongside of the bad, in order to see what designs *work* and what we can learn from them.

The Familiar

- One very successful interface technique is to relate a particular interface element to something that is already familiar to the user. For example, computers present users with a virtual *desktop* covered with *folders* and *trashcans*. This mirrors the physical desk that office dwellers are accustomed to. What-you-see-is-what-you-get (WYSIWYG) editing for word and image processing presents an electronic authoring correlate to the paper and pencil direct-rendering format of the physical world. As yet another example, icons and menubars mirror the pictorial signs and text directories that have become an integral part of life. By relating new elements and actions to familiar aspects of a user's life, the learning curve can be drastically reduced.

The Human Factor

- It is always important to remember that *user interface design* goes hand-in-hand with *human factors research*. Designing a user interface solely by following a set of written usability guidelines is a dangerous path, as the unique aspects of each application often require subtle application-specific deviations in order to make an interface "work". Thus, *usability testing* should be an integral aspect of interface design, to ensure that human element is considered as it applies to a particular application, and not just as an average of human responses to applications in general.

Golden Simplicity

- More is not always better and when it comes to intuitiveness, this is especially the case. The more features and capabilities that are built into a product, the more complex the interface must necessarily be to accommodate those features. The trend in software production to base new software releases on the number of additional features, with the emphasis on new features over interface improvements. Thus, software becomes more and more complex to use, with limited screen real estate crammed tighter and tighter with additional buttons, menus, sliders, scrollbars, and other widgets. The few software products that place a primary emphasis on interface design, hiding new features with automation and intuitive designs, therefore stand out in the marketplace.

Interface as Initiator

- Stanford University's Persuasive Technology Lab defines *captology* as the union of computers and persuasion. The fundamental concept of machines influencing human behavior through their interface to human users underlies all of interface

- design. If only one single concept is to be taken away from a course on user interface design, it is that the interface serves as the mediator between the content and the consumer, assuming the sole representation of the content, and heavily influencing the consumer's perception of that content. Content is only as useful as the interface through which it is accessed, but that interface need not remain passive. Active interfaces, which react and evolve based on user actions, represent a paradigm shift in content mediation. The emphasis noted earlier on audience identification, personality, and organization becomes far less critical in the realm of active interfaces, as a single interface is capable of assuming multiple roles based on the user. Instead of a designer determining a target demographic and building a static interface with the shared common knowledge and experiences of that audience, the human designer is rendered obsolete. The interface itself becomes the designer, learning about its audience as they use it, and evolving its personality and organization autonomously to fit that audience. The natural extension of this technology is through autonomous personalization, where the interface tailors itself not to the "average" user, but to each individual user, retaining detailed profiles that allow it to use very specific background knowledge and experience for each user to enable fine-grained customizations.
- Interfaces have an incredible power to influence the consumer's perception of content. Passive interfaces do this through visual hierarchy, personality, and organization. Active interfaces, however, achieve their influence through an implicit and sometimes explicit dialogue with the user. Implicitly dialoguing interfaces comprise the bulk of active interfaces. These systems merely monitor a user from afar, "speaking" to the user through subtle (and sometimes not-so-subtle) alterations to the user interface, and then "listen" by watching how these changes affect the user's navigation paths through the interface. These systems operate on a variety of levels of complexity and capability, but in the end, all effect a significant impact on user experience by tailoring the interface to more closely match the user's expectations. These user-centric interfaces, which exist to better serve the user are in sharp contrast with the other side of active interfaces, those rare interfaces which step outside of the status quo and consider the user to be the servant. One particularly compelling example is the CAVE™ application Thing Growing. This virtual reality application features an interactive character that orders the human user to perform certain dancing tasks. The application very carefully monitors the user's performance and uses the user's reactions to follow a basic decision tree keyed on emotional response. This application's interface is extremely unusual in that it commands the human user to perform tasks on its behalf, and, in many cases, the human complies. This reversal of roles, in which the interface, which is traditionally thought of as human-serving, becomes the master and the human becomes the servant, is a most succinct demonstration of the power of interface.