the changing profession

Reading Interface

JOHANNA DRUCKER

INTERFACE, WE THINK, IS THE SCREEN, THE DISPLAY, THE PORTAL INTO THE ONLINE WORLD OR COMPUTER. THE GUI (GRAPHICAL USER INTERface), with its menu bars and navigational buttons, is so familiar that we tend to overlook the "gooeyness" of it—the mutable, mediating activity—and take interface for a thing, static, stable, and fixed. Or we take it as a representation of computational processes, a convenient translation of what is "really going on" inside. Neither could be further from actuality.

The GUI is a specialized subset of interface broadly considered. The mediating structures of interface signify by their graphical organization (they do not just display information "transferred" to us by reading). Our task is to understand how they organize our relation to complex systems (rather than how they represent them) and, maybe more important but less tangible, to understand how an interface works as a boundary space (though it masquerades as a reified image or menu of options). As the double entendre of my title suggests, we face the challenge of reading interface as an object and of understanding it as a space that constitutes reading as an activity.

We can begin reading a GUI by paying attention to its perceptible features. We can look at the graphical, compositional, and navigational conventions and attempt to understand their rhetorical value. But we can also look at the historical developments of interface across the specialized fields of design, engineering, human-computer interaction, and cognitive studies to tease out the assumptions on which these developments were based.

Broadly construed, interface is ubiquitous. The techno-human mediations of control panels, dashboards, toaster ovens, home-entertainment units, plumbing fixtures, and card catalogs linked to shelving systems are all instances of interface. We rarely "read" these interfaces as "texts" outside cultural studies class exercises, though students in design environments are generally asked to create a working model for remediating common tasks as formal instructions coded into a plan of menus or buttons. The more tangible features

JOHANNA DRUCKER is the inaugural Breslauer Professor of Bibliographical Studies in the Department of Information Studies at the University of California, Los Angeles. Her latest titles include *SpecLab: Digital Aesthetics and Speculative Computing* (U of Chicago P, 2009), *Graphic Design History: A Critical Guide* (Pearson, 2008; 2nd ed., 2012), and *Digital_Humanities*, a collaborative work written with Jeffrey Schnapp, Todd Presner, Peter Lunenfeld, and Anne Burdick (MIT P, 2012). She recently completed a book titled *Graphesis: Visual Knowledge Production in Information Graphics and Interface* (Harvard UP, forthcoming).

© 2013 JOHANNA DRUCKER
PMLA 128.1 (2013), published by the Modern Language Association of America

https://doi.org/10.1632/pmla.2013.128.1.213 Published online by Cambridge University Press

of an analog interface (often the skin over an electronic operating system) remind us that the GUI's roots are physical, tactile, and haptic, providing a useful segue to the discussion of the history of approaches to its design.

Punch cards were an interface based on the straightforward assumption that a mechanical device could perform methodical, formalized, step-by-step processes, thus enacting the instructions that constitute algorithms. Their long history dates back to eighteenth-century Jacquard looms and early calculating devices. But when brought into play for computational programming, they superseded an even more cumbersome interface: switches and circuits that "set" a program through tedious patterns of steps that translated binary instructions from a large panel of toggles into a language that the machine could read. In the late 1940s, the beginning of the era of stored programs and the transformative work of John von Neumann, switches were already seen as an advance over plugging and unplugging circuits. Mainframe iconography retains a Dr. Who appeal as a special effect for science fiction spoofs or retro set design, but the holy grail was a WYSIWYG (what you see is what you get) graphical interface.

Flight simulators were the first prototypes for immersive interface design, created to enhance performance, lower risk, and optimize the deployment of personnel in missions, whether military or commercial. These cockpit hybrids of the virtual and the physical created a spatial expression of the complex relation of probabilistic behavior to an environment of cues designed to engineer performance in a human being. Visual feedback, as well as physical sensation, was crucial. The symbolic model of a world structured around tasks is a perfect demonstration of the "interface theory of perception" developed later by the cognitive studies scholar Donald Hoffman.

Other scenes of origin include Douglas Engelbart's now clumsy-looking, handmade wooden mouse and his insight that any digital information could be displayed on a screen (gleaned from his experience with radar), the head sets and gloves of the University of Washington Human Interface Technology Lab's virtual-reality experiments, and Ivan Sutherland's Sketchpad and his crude 1970 head-mounted display. Two overlooked but useful detours, the Sensorama bicycle, designed by Morton Heilig in 1962 (*Father*), and the 1960s experiments of the light-and-media artist Myron Krueger ("Myron W. Krueger"), promoted the notion of the body as the ultimate user interface. These were explicitly embodied experiences, augmented later by Jaron Lanier and others who assumed that the entire sensorium had to be tricked into a "satisficing" illusion in the virtual space (*Web Resources*).[1] But the force of the symbolic trumps this requirement. Our ability to identify with the screen space overwhelms any need to literalize analogies with "real" space. We speak of "going to" an online site as if it were a place rather than a refreshed screen in a browser on our desktop. The doomed interface Microsoft Bob, from 1995, with its kitschy replica of an office, was a quintessential demonstration of how literal representation is less effective than abstraction.

In the 1960s and 1970s, only the command-line interface was available. It had a steep learning curve and assumed specialized knowledge—the ability to grasp the complexities of an operating system and interact through instructions encoded in the lines of text on the screen ("Command-Line Interface"). This had limited market appeal, and in the 1970s researchers at Xerox PARC developed programming and interface prototypes now integrated into our daily screens (Hiltzik). Among them was Alan Kay, who drew on the cognitive theories of Jean Piaget and Jerome Bruner to create a graphical language of icons and actions grounded in constructivist approaches to learning and narrative models of the world. Kay, the

https://doi.org/10.1632/pmla.2013.128.1.213 Published online by Cambridge University Press

programmer Dan Ingalls, and the graphic designer Norman Cox are responsible for developing the first generation of the GUI as we know it through their early WIMP (windows, icons, menus, pointer) model. At the end of that decade, Steve Jobs hired Kay to help design the Lisa and Macintosh computers for Apple, launched in 1983 and 1984 (Booth).

Thus, by the mid-1980s the first generation of mass-market devices with windows or desktop metaphors became available. Computer users divided into those who wanted to look through the display and those who wanted to look at it. The windows and desktop metaphors have equaled in suggestive potency the old poetic images of mirror and lamp, with their tropes of reflection and illumination (Abrams). But as graphical icons became linked to more sophisticated, object-oriented programming, they no longer just looked like objects; they could also mimic the behavior of the things they resembled.[2] A file folder might not open on-screen the way it does in the hand, but an analogy supported the functional interaction. Expectations for user-friendly engagement escalated. Object-oriented programming gave screen icons the properties of the analog elements they seemed to represent. The intellectual, theoretical, and computational leaps involved are stunning. We now take them for granted, but in an abstracted world whose abstraction we no longer see. The assumption was correct: metaphors could enable behavior by analogy.

In the 1990s Ben Shneiderman and his lab at the University of Maryland created guidelines for effective interface design. Building on the protocols of file transfer, Web addresses, and markup languages, Shneiderman's "Eight Golden Rules" took into account the kinds of metrics provided by psychology experiments—how many things one can keep in short-term memory, what cues carry over from one screen to the next, what levels of scale, search results, and detail are comprehensible. They are commonsense guidelines, forged from much hard work, such as "Permit easy reversal of actions" and "Offer informative feedback" for every "operator action." Shneiderman's lab originated many features of interactive sites—like sliders, data-entry forms, and other effective, consumer-oriented Web front-end display mechanisms that assumed users must be gratified in their relation to the machine through clicks, sounds, and so on if they were going to want to search, shop, and gather information in an interface.

"Task optimization" became the watchword among the interface community, in the 1990s particularly, as networked environments came online. Influenced by Jakob Nielson's work on Web usability, the task of interface design was conceived as mediating between a complex information structure (e.g., data, metadata, display protocols, processing and storage elements) and the user's behaviors and needs. A milestone published in 2000, Jesse James Garrett's much-cited graph exposed the tension between information organization and task support in the design of interface. What you see is never what is "going on" computationally, nor is it a view into the file structures.

A popular example of current professional attitudes toward interface design, Steve Krug's witty but pointed *Don't Make Me Think* is the New Age equivalent of Beatrice Warde's embrace of the crystal goblet, the idea that the best typography is invisible. Krug assumes that a successful interface disappears, so easy to use it is transparent, naturalized, and perceived as simply "what is" on the screen. Part of his analysis uses evidence produced through eye-tracking experiments and other clinical trials to confirm what all users know—we read selectively, driven as often by whim and mood as by tasks and goals. Structuring an interface, like writing a book, only launches a probabilistic missive in the direction of a user or reader, whose interpretation produces a reading that is necessarily an act of "deformance."[3]

https://doi.org/10.1632/pmla.2013.128.1.213 Published online by Cambridge University Press

User-centered approaches, such as those embodied in Krug's whimsical handbook, are now standard. But guidelines for effective engineering stand in the same relation to interface theory as the analysis of plumbing fixtures does to the history of personal-hygiene training and its effects on the development of the psyche. Our constitution as subjects is integral to use; we are in constant formation in relation to interface.

With this history and its practical as well as theoretical considerations in view, we can think beyond representational models and their long-standing hold on the critical imagination. We have to understand interface as a constitutive boundary space, not just a place of mechanistic negotiation and exchange among elements. Interface is often defined as an encounter between systems. But that encounter need not be understood mechanistically. It could be understood ecologically, as a border zone between cultural systems, with all the complexity and emergent relations that suggests. This notion does not follow intuitively from reading graphical and formal structures. Sociologists, engineers, and cognitive scientists of many stripes use the term *interface*. They describe it according to the tenets of their disciplines, but always in a relational paradigm. The way the relational activity is construed has implications for how interface is read, especially if we are to shed the notion of an interface as a thing.

In a 2009 paper outlining his interface theory of perception, Hoffman argued that the schemes by which animal species organize their relations with the world have little or nothing to do with representing it in any "veridical" way and everything to do with making icon models. In other words, we adapt to the environment through an interface, an abstraction, a set of icons that do not represent what is real but support "sufficing" behaviors. The mental models are made up of organizing elements that support the activities sufficient for survival. We don't need a picture of the world to get by, any more than we need to know the "real" processing activity in a computer to send an e-mail message. A vivid example of Hoffman's principles in interface design is "real time" refresh—a result of processing that is above the threshold of our cognitive perception of the machine. Nothing about it is real; the processing simply conforms to our perceptual model of real time as immediate—a kind of clock rate of our organism's capacities. Eyes, brains, capacities also mutate; we adapt, altered by interface.

The GUI is a mediating scrim, a boundary space in which we interact with an abstraction of computation, not a window through which information passes like fast food at a drive-through. We manipulate hidden circuits, chips, and processors by using icons that serve as metaphors once removed, logical analogues to behaviors whose cues we can follow by inference. I know that if I see a file folder on-screen I can place something in it. That folder is a behavioral cue, not a representation either poetic or literal. Icons do not show the processes that make them functional. We don't see the computer, any more than we rely on a picture of the world. We work with abstractions built on top of the computer's capacities. The screen metaphors we have come to rely on have no analogy to the affordances engineered into the operating system. And they bear only a faint relation to the objects in the physical world that they mimic. The file folders, pages, and documents that we access digitally allow what the renowned designer Donald Norman initially referred to in 1993 as "experiential or reactive cognition." We can work, follow cues, "react to a rich set of information" as presented by the screen environment (qtd. in Lynch).

Our familiarity with the metaphors blinds us to their nonrepresentational status and to their primary function as cues for actions. Neither the file folders nor the other objects in the screen space are things; they are icons that represent behaviors and actions we

https://doi.org/10.1632/pmla.2013.128.1.213 Published online by Cambridge University Press

want to perform (or kinds of files we want to access), and they interpellate a user through disciplinary and scopic regimes. In the constitutive exchange, the effect is not merely efficient tasking but also cognitive adaptation and change. Interface is a space of individual and collective subject formation. Our notions of privacy, property, identity, and even individual voice and self are modified constantly in the exchange, bound to the cognitive modeling *of* experience *through* experience. As a reading interface, the GUI is a microcosm of constitutive modeling.

To return to the more apparently tractable part of our task, we can read the GUI by adopting many of the critical approaches we inherit from semiotics, gestalt psychology, critical cultural and visual studies, and bibliography, among other fields. In one well-wrought study, Mads Soegaard conducts a point-by-point analysis of the GUI using gestalt principles. Proximity relations, continuity, resemblance—all can be brought to bear on the rhetorical semantics of graphical organization, because they construct meaning rather than simply present it. Textual and literary readers are sometimes disinclined to consider the graphical dimensions of texts. But just as the language of a work constrains its semantic field (however wild the interpretations provoked), so the graphical codes give initial rhetorical structure to the presentation of a work in any visually perceptible format.

The features of the codex book came into being to enable various reading practices, as the medievalist Malcolm Parkes makes evident. In the same way, the structures of the standard interface have organized around other reading practices. Taking a lesson from bibliographic studies, we can read an interface as a paratextual apparatus. Like tables of contents, indexes, marginalia, and commentary, an interface performs rhetorically, presenting an argument as if it were a statement of fact, but engages us by presenting options. Go here, follow this, click, point, play, listen, search—all commands that are motivated by behaviors constrained by features and structures.

Describing structures of information, Geoffrey Bowker and Susan Star took apart the ideological and political underpinnings of data sets and classification systems, subjecting the elements of interface to a Foucauldian critique. Power relations and disciplinary techniques order our relation to use, and we are never more clearly subjects of regimes of scopic control than in our interactions with what Simon Penny once termed the "interpassivity" of the screen environment, usually mischaracterized as interactive.

The new-media critics Brenda Laurel (*Computers* and *Art*), Gretchen Bender and Timothy Druckrey, Margaret Morse, and Henry Jenkins and David Thorburn offered useful conceptual frames for exposing the media-specific theatricality and psychodramatic identification of viewers absorbed into the flow of online and other digital environments. Their work, complemented by that of the sociologists attentive to computer-mediated communication and comparative media studies (e.g., Thurlow, Lengel, and Tomic), has developed useful discussions of power, control, democracy, identity, and the transformation of nearly every aspect of contemporary life.

In the design community, Aaron Marcus and a team working with Jakob Nielson produced a pioneering study of cultural mores, social codes, and information structures and provided early and still-valid principles for looking at the unexamined cultural assumptions built into interface design. The group assessed the context-dependent associations of fundamental graphical principles such as hierarchy, symmetry, and spatial organization (Ackerman).

A more extensive curriculum for reading interface as the screen space involves forays into the history of graphic design (the rhetoric of style and composition), visual forms (iconography), visualization techniques

https://doi.org/10.1632/pmla.2013.128.1.213 Published online by Cambridge University Press

(remediation of digital files), information graphics (techniques of display production), multimedia editing (crosscutting, framing, sequencing, etc.), film and other visual and audio technologies, and media theory. The cognitive load for processing media with multiple temporal modalities, distinct spatial coordinates and systems, or demands for embodied engagement goes beyond any explanation that can be provided by comparisons with film or video. Interface is more complex in the challenges it presents to what can be referred to as "frame jumping"—shifting cognitive reference frames—than film ever was. The early days of describing the "language of new media" as if we were just in an advanced state of avant-garde film work set critical studies back, until the structural and cognitive differences of new media were explored in more-extensive arguments. These stressed that when we are engaged in the mental task of reading, viewing, hand-eye coordination, bodily discipline, and audio and video play in a structured (and thus semiotically encoded) environment, we are not watching something unfold. As we make a text, we are produced by it as its subject. This observation does not depend on digital technology. But the means of engagement do enact differences of degree—and perhaps of illusion and identification.

The immersive experiences of virtual worlds and simulacral interface are less taxing than the screen space of, say, the *New York Times* online, because their apparent seamlessness organizes our experience around a navigational narrative that integrates us into it. In such an environment, actor-network theory breaks down, since it is premised on assumptions of discrete autonomy, distinctions of actor from network, that are at odds with the integrative codependencies of interface experience. The boundary is not between one thing and another; it is the space in which the experiential construction of an in-betweenness that is inclusive, both human and computational, comes into being.

Coming to the end of this overview of interface design as a subtext for reading, we might think about how digital humanities change the game. We can extract an argument from the organization and labeling of tabs, menus, and other navigational features. A new online archive of Vincent van Gogh's letters won kudos from a perceptive critic who argued that its interface was grounded in a bibliographic model (i.e., addressee, chronology, place of origin) distinct from the labeled-bucket approach to which so many repositories default (maps, pictures, documents [*Vincent van Gogh*; Ciula]). The task of designing an interface is probably the best exercise in reading one can provide. Organize a music collection—by artist? by date? by performance? by title? by tasks of browsing, searching, playing? The multifaceted, polymorphous interface has yet to fully emerge, as does the formative environment for argument making as a way to express engagement with that boundary space. New, advanced research agendas driven by a desire to expose interpretation rather than display its results may separate the critical from the engineering practice of digital humanities by revealing interpretative practices instead of by producing representations.

In addition to dissecting the reading *of* interface, we must create theoretical frameworks for discussing reading *as* interface. Creating such frameworks means returning to the notion of interface as a boundary space. As interface changes in the era of distributed and ubiquitous computing, the screen surface—that apparent image—may go away. The ambient triggers and smart environments offering commercial and cultural opportunities for the integration of stored and programmed information into daily life will increasingly make the world we navigate into an interface. The augmented-reality purveyors offer screen-enhanced viewing of the world around us, a kind of inversion of Plato's cave, in which a mediating scrim stands between us and everything we view in a panoptic projection.

https://doi.org/10.1632/pmla.2013.128.1.213 Published online by Cambridge University Press

More and more, this integration of cultural constructions into the built and experienced environment (as well as whatever we delimit as the natural one) will argue for the need to address the systems ecology of interface and our mutating adaptations. That the mediating sites, instruments, protocols, and devices are systemic and that the critical understanding of their operation requires recognition of their and our emergent codependence are the real lessons on which reading interface depends. Interface, increasingly, will be the experience of being in the world. Distinctions between first- and second-order representations—those symbolic orders of language and image or their simulacral presence—will cease to matter when we realize that we live in a material and symbolic domain of actualized encounters, the boundary spaces of interface relations, through which we imagine our lives into being and give knowledge its forms of expression. At that point, interface will be construed not as representational but as performative and constitutive, and the need for ways of reading that constituting scrim and its naturalized models of what we take for the world will be ever more urgent.

Notes

1. The term *satisficing* comes from Hoffman.

2. The objects in object-oriented programming are data and their behaviors, not on-screen objects such as icons, but the principle that data are linked to behaviors, tasks, or functions in the programming environment underpins interface design. The change from list-based to object-oriented programs altered attitudes toward programming and, though developed before GUI interfaces, was central to their implementation ("Object-Oriented Programming").

[3] *Deformance* is taken from McGann.

Works Cited

Abrams, Meyer Howard. *The Mirror and the Lamp: Romantic Theory and the Critical Tradition*. New York: Oxford UP, 1953. Print.

Ackerman, Samuel K. *Dimensions of Culture and Global Web User-Interface Design*. Emeryville: Marcus, 2001. PDF file.

Bender, Gretchen, and Timothy Druckrey, eds. *Culture on the Brink*. Seattle: Bay, 1994. Print.

Ben Shneiderman. U of Maryland, n.d. Web. 16 Nov. 2012.

Booth, Charlotte. *Alan Kay and the Graphical User Interface*. N.p.: n.p., n.d. PDF file.

Bowker, Geoffrey, and Susan Star. *Sorting Things Out*. Cambridge: MIT P, 1999. Print.

Ciula, Arianna. "The New Edition of the Letters of Vincent Van Gogh on the Web." *Digital Humanities Quarterly* 4.2 (2010): n. pag. Web. 16 Nov. 2012.

"Command-Line Interface." *Wikipedia: The Free Encyclopedia*. Wikimedia Foundation, 11 Nov. 2012. Web. 16 Nov. 2012.

Engelbart, Douglas C. "Augmenting Human Intellect: A Conceptual Framework." *Augmenting Human Intellect: A Conceptual Framework*. Doug Engelbart Inst., Oct. 1962. Web. 16 Nov. 2012.

The Father of Virtual Reality: Morton L. Heilig (1926–1997). N.p., n.d. Web. 16 Nov. 2012.

Garrett, Jesse James. "The Elements of the User Experience." *JJG.net*. N.p., 2004. Web. 16 Nov. 2012.

Hiltzik, Michael. *Dealers of Lightning: Xerox PARC and the Dawn of the Computer Age*. New York: Harper, 1999. Print.

Hoffman, Donald D. *The Interface Theory of Perception: Natural Selection Drives True Perception to Swift Extinction*. N.p.: n.p., 2009. PDF file.

Jenkins, Henry, and David Thorburn, eds. *Democracy and New Media*. Cambridge: MIT P, 2003. Print.

Krug, Steve. *Don't Make Me Think*. Indianapolis: New Riders, 2005. Print.

Laurel, Brenda, ed. *The Art of Human-Computer Interface Design*. Reading: Addison, 1990. Print.

———. *Computers as Theatre*. Reading: Addison, 1991. Print.

Lynch, Patrick J. "Visual Design for the User Interface Part 1: Design Fundamentals." *Journal of Biocommunications* 21.1 (1994): 22–30. *Yale Center for Advanced Instructional Media*. Web. 27 Dec. 2012.

McGann, Jerome J. *Radiant Textuality*. New York: Palgrave, 2001. Print.

"Microsoft Bob." *Wikipedia: The Free Encyclopedia*. Wikimedia Foundation, 16 Nov. 2012. Web. 16 Nov. 2012.

Morse, Margaret. *Virtualities*. Bloomington: Indiana UP, 1998. Print.

"Myron W. Krueger." *Wikipedia: The Free Encyclopedia*. Wikimedia Foundation, 10 May 2012. Web. 16 Nov. 2012.

Nielson, Jakob. *Designing Web Usability*. Indianapolis: New Rider, 2000. Print.

Norman, Donald. *User Centered System Design*. Hillsdale: Erlbaum, 1986. Print.

https://doi.org/10.1632/pmla.2013.128.1.213 Published online by Cambridge University Press

"Object-Oriented Programming." *Wikipedia: The Free Encyclopedia*. Wikimedia Foundation, 12 Nov. 2012. Web. 16 Nov. 2012.

Parkes, M. B. "The Influence of the Concepts of Ordinatio and Compilatio on the Development of the Book." *Scribes, Scripts, and Readers*. London: Hambledon, 1991. Print.

Penny, Simon. "Consumer Culture and the Technological Imperative: The Artist in Dataspace." *Digital Culture Readings*. Dept. of Studio Art, U of California, Irvine, 2006. Web. 2 Nov. 2012.

Shneiderman, Ben. "Shneiderman's 'Eight Golden Rules of Interface Design.'" *Josh Tenenberg's Homepage*. N.p., n.d. Web. 2 Nov. 2012.

Soegaard, Mads. "Gestalt Principles of Form Perception." *Interaction Design Foundation*. Interaction Design Foundation, n.d. Web. 13 Nov. 2012.

Sutherland, Ivan Edward. "Sketchpad: A Man-Machine Graphical Communication System." *Technical Report Number 574*. U of Cambridge Computer Laboratory, Sept. 2003. Web. 16 Nov. 2012.

Thurlow, Crispin, Laura Lengel, and Alice Tomic, eds. *Computer Mediated Communication: Social Interaction and the Internet*. London: Sage, 2004. Print.

Vincent van Gogh: The Letters. Van Gogh Museum; Huygens Inst., June 2012. Web. 16 Nov. 2012.

Warde, Beatrice. "The Crystal Goblet; or, Printing Should Be Invisible." *The Crystal Goblet: Sixteen Essays on Typography*. Selected and ed. Henry Jacob. Cleveland: World, 1956. 11–17. Print.

Web Resources Related to Jaron Lanier. N.p., n.d. Web. 16 Nov. 2012.

https://doi.org/10.1632/pmla.2013.128.1.213 Published online by Cambridge University Press