

The Role of Metaphor in Interaction Design

Dan Saffer

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**The School of Design
Carnegie Mellon University**

Submitted by _____
Daniel Saffer

Approved by _____
Shelley Evenson, Advisor
Associate Professor, School of Design

“Logic is a very elegant tool,” he [Gregory Bateson] said, “And we’ve got a lot of mileage out of it for two thousand years or so. The trouble is, you know, when you apply it to crabs and porpoises, and butterflies and habit formation” — his voice trailed off, and he added after a pause, looking out over the ocean — “you know, to all those pretty things” — and now, looking straight at me — “logic won’t quite do...because that whole fabric of living things is not put together by logic. You see when you get circular trains of causation, as you always do in the living world, the use of logic will make you walk into paradoxes.”

He stopped again, and at that moment I suddenly had an insight, making a connection to something I had been interested in for a long time. I got very excited and said with a provocative smile: “Heraclitus knew that! ... And so did Lao Tzu.”

“Yes, indeed; and so do the trees over there. Logic won’t do for them.”

“So what do they use instead?”

“Metaphor.”

“Metaphor?”

“Yes, metaphor. That’s how the whole fabric of mental interconnections holds together. Metaphor is right at the bottom of being alive.”

from *Uncommon Wisdom: Conversations with Remarkable People* by Fritjof Capra

Part I: What is Metaphor?

“Everything one says about God is a metaphor.”

—Paul Tillich

Introduction

The role of metaphor in interaction design has oft been maligned and usually misunderstood. Metaphor has been called “not only unhelpful, but harmful” (Cooper, 1995) in design, and is typically thought of as being limiting, scaling poorly, and leading to faulty thinking about how products work.

However, properly used, metaphor can be a powerful tool for designers, in both the process of designing and within the products themselves. Metaphor can help redefine design problems and help solve them. It can be used as a research tool, to understand new subject areas, or as means to generate new ideas about familiar subjects. It can help sell a product, both to internal stakeholders and teammates as well as to consumers. Metaphors can provide cues to users how to understand products: to orient and personify. In short, interaction designers can use metaphor to change behavior.

It is not hyperbole to suggest that without metaphor, interaction design today would be severely limited, especially in the digital realm. After all, no one addresses his computer without some metaphoric mediation; we do not speak machine language. Metaphor provides us with the means to understand our complex digital devices.

As the levels of complexity are layered one atop the other in order to produce the high-level behaviors that are the actions we recognize while interacting with the computer, the possibility of talking or thinking literally about the computer’s behavior vanishes. We deal with this complexity and this plasticity by speaking metaphorically about the computer (Hutchins, 1989).

In this paper, I will explore how designers can use metaphor in their work: first in the process of interaction design and secondly within interactive products. I’ll begin by giving a brief overview of metaphor: some historical views and current thinking on metaphor, then examine some of the criticism leveled at metaphor in design.

The definition of interaction design I’ll use throughout this paper refers to the art of facilitating or instigating interactions between humans (or their agents), mediated by products. To a lesser degree, interaction design

can also signify interactions between humans and reactive or responsive products. By interactions, I mainly mean communication, either one-on-one (a telephone call), one-to-many (blogs), or many-to-many (the stock market). The products an interaction designer creates can be digital or analog, physical or incorporeal or some combination thereof.

Throughout this paper I'll use the term "metaphor" to mean a linguistic, visual, or auditory construct in which one thing (the referrer or source) refers to another (the subject or target). Later in this paper, I will discuss with greater detail how a metaphor works and how it is constructed. But simply put, a metaphor is "a device for seeing something in terms of something else. It brings out the thisness of that or the thatness of a this" (Burke, 1945).

I will also use the writing convention that linguists and theorists have used when speaking of specific metaphors, which is to write them as such: SUBJECT IS REFERRER. For example, WORKSPACE IS DESKTOP to designate the metaphor of a workspace as a desktop.

Traditional Views of Metaphor

Up until the late 1970s and the 1980s, metaphor was considered by most linguists and scholars to be an abnormal part of speech, a poetic flourish that was merely decorative language.

The word "metaphor" was defined as a novel or poetic linguistic expression where one or more words for a concept are used outside of their normal conversation meaning to express a similar concept (Lakoff, 1993).

Metaphors were seen as "deviant" and needed to be explained in terms of "normal" language usage (Ortony, 1993). Indeed, metaphors were generally seen as novelties, to be used for specific rhetorical purposes. Metaphor, it was thought, got in the way of conventional language and the "literal" world, which could be comprehended fully without metaphor. Linguists such as John R. Seale felt that metaphors could only be understood by starting with the literal meaning, then comparing it to the figurative meaning, creating a literal-figurative split that later linguists would rebuke.

A few did expand on metaphor's role, however. Aristotle, while agreeing that metaphor is novel in usage, also viewed metaphor as a teaching tool. In order to understand a metaphor, he argued, the hearer has to find something common between the metaphor and its subject. Metaphor doesn't just refer to something, but also describes some aspect of it. When a speaker

uses a metaphor, hearers learn a different characteristic of the subject through the metaphor. It is from metaphor, Aristotle says, that “we can best get hold of something fresh.” (Rhetoric, III.10, 1410b14f).

Another expansion on the traditional line of thinking was from Kenneth Burke. Burke, in *Permanence and Change* (1935) and “The Four Master Tropes” (1945), noted correctly that metaphor is about perception, about how we view things. “To consider A from the point of view of B is, of course, to use B as a perspective upon A” (1945). To change the metaphor is to change how we perceive its subject. As I will show later in the paper, this by itself is a powerful tool for designers.

Burke even goes further, employing an idea that would later be taken up by linguists and cognitive psychologists: that we establish the character of something by approaching it (via metaphor) through a variety of perspectives (1945). That is, we best understand a thing by conceptually comparing it to other things.

The Current View of Metaphor

In the late 1970s, linguists such as George Lakoff, Mark Johnson, and Michael Reddy began to realize that metaphor was not only extremely common, but also related to thought and action. Indeed, they claimed that “our conceptual system...is fundamentally metaphoric in nature” (Lakoff and Johnson, 1980). Furthermore, metaphor isn’t particularly about language at all, but rather about thought “in the way that we conceptualize one domain in terms of the other” (Lakoff, 1993). Rather than being novel, metaphors are extremely common, with thousands of domains being “mapped” to other domains. (Note that it is nearly impossible to talk about metaphor—or any other abstract concept—without employing a metaphor.)

It was Reddy in his essay “The Conduit Article” (1979) who first demonstrated by linguistic analysis that ordinary English is mainly metaphorical and that we use metaphor to conceptualize the world. We use metaphor to reason with and thus base our actions on. A word, image, or sound used metaphorically is likely drawing upon a complex web of associations that reflect how we think and feel about a concept.

Take for example the metaphor AFFECTION IS WARMTH. “She gave me a warm welcome,” “It took me a while to warm up to the subject,” and “He’s an old flame” are all examples of this metaphor in use in daily life. And indeed, this metaphor also has an opposite: DISLIKE IS COLD, as in “She gave me the cold shoulder.” Taken together, these two simple examples begin to

show the conceptual web of meanings that underlie not only our language, but how we think about these subjects.

Abstract concepts such as time, space, states, changes, causation, and actions (all of which relate to interaction design) are all metaphorical in nature. We tend to think of time as “moving forward” and we “put the past behind us.” We see change and motion linked in CHANGE IS MOTION: “He returned to what he was doing.” “She fell into a depression.” “He went bald.” Or take FORM IS MOTION: “The road bends.” And on and on. These aren’t novel, poetic conceits; these are ordinary examples of how people talk and, more importantly, how we as humans think. Metaphor is tightly woven into our conceptual framework.

Metaphors help us to conceive and understand abstract concepts like time, usually by making reference to more concrete objects (e.g. TIME IS MONEY). Lakoff and Johnson theorized that this is mainly because we have bodies that have or perceive physical experiences and that are oriented in space (1980). In the traditional view of metaphor, scientific “facts” could be described using “literal” language; no metaphor was needed. This position is now completely reversed, with metaphors providing not only a means of describing known phenomenon, but also to theorize about undiscovered phenomenon as well (Boyd, 1990).

The idea of “cross-domain mapping” is central to the current view of metaphor. The way we understand new things is to conceive of them in terms of things we already know. Metaphors become natural models that allow us to take familiar, concrete objects and experiences and re-cast them onto unknown or abstract concepts or things, giving them structure and meaning (Erickson, 1991).

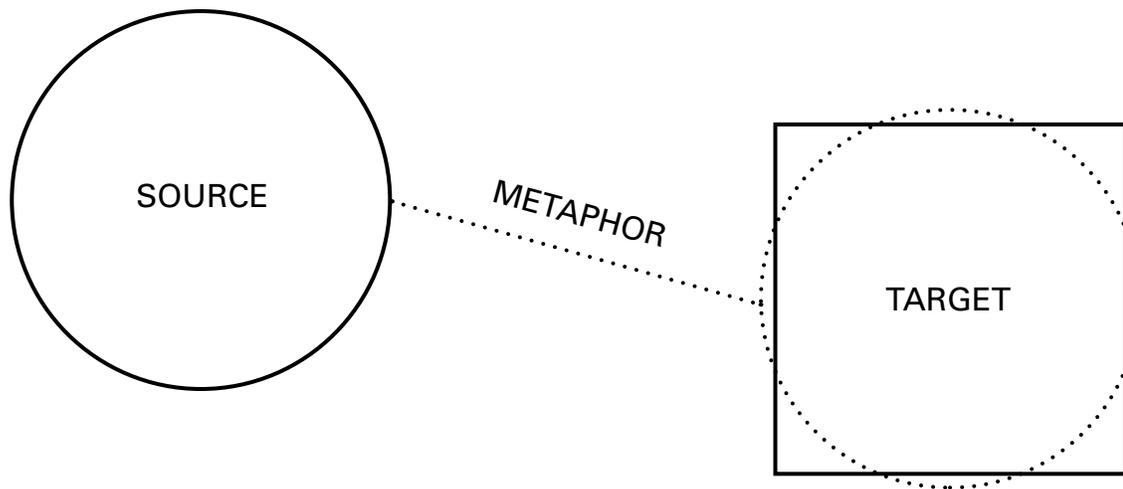


Figure 1. A model of cross-domain mapping, after Wulff, Evenson and Rheinfrank, 1990.

We use metaphors in a variety of conceptual ways. We use them to orient (e.g. *HAVING CONTROL OR FORCE IS UP*, as in “She is on top of the situation”); to create “artificial” boundaries or containers in order to examine or reason about a particular thing (e.g. *VISUAL FIELDS ARE CONTAINERS*, as in “There’s nothing in sight”); and to personify non-human entities in terms of human emotions, motivations, characteristics, and activities (e.g. *THE COMPUTER IS A PERSON*, as in “The computer won’t let me send email”) (Lakoff and Johnson, 1980). As this last example demonstrates, much of the ways in which we speak of digital devices is in terms of metaphor, even if we don’t recognize it as such.

The use of metaphor in interaction design is hardly without controversy, however, with most of the criticisms leveled at using metaphors within products and thinking of metaphor in the traditional way. As will be detailed later in this paper, metaphor has and can be used effectively within products. But metaphor’s use to interaction designers isn’t only limited to that. Before products are even conceived, designers can use metaphor during the design process.

Part II: Metaphor in the Design Process

“It is not the role of metaphor to draw our sight to what is there, but to draw our vision toward what is not there and, indeed, cannot be anywhere. Metaphor is horizontal, reminding us that it is one’s vision that is limited, and not what one is viewing.” – James Carse

Metaphor is typically an unconscious part of our daily existence. But it can also be used in a deliberate manner, as a tool for designers during the design process. From the initial problem definition through the delivery, metaphor is increasingly becoming a technique for the creation or reinvention of products and services.

Redefining “Problems”

There’s an old joke among software developers. When something works in an unexpected, but strangely effective way, the developers often kid, “Oh, that’s not a bug. That’s a feature.” And thus a problem gets redefined in other, more positive terms. While this is usually only a joke, designers can use the same technique of using a metaphor to redefine a problem when tackling design problems. Indeed, there’s an old joke among designers: “It’s not a problem. It’s an opportunity.”

Before a designer typically gets involved in a project, a business usually encounters or discovers a problem or a perceived problem. A current product isn’t selling or working well. A competitor has launched a better product. A new market has opened up and products need to be invented for that market. This “problem” becomes the basis for involving a designer.

There is a tendency to think that problems are fixed, that they spring from natural, social, or economic forces in forms that can be known, discussed, and eventually solved. Businesses then engage designers to find the best solution to fit the constraints of this given problem space (Simon, 1969).

The problem is that problems are not fixed. They are human constructs, created as responses to complex and troubling situations (Schön 1979). They are created by a process that Donald Schön calls naming and framing.

Things are selected for attention and named in such a way as to fit the frame constructed for the situation. Together the two processes construct a problem out of the vague and

indeterminate reality that John Dewey (1938) called the “problematic situation.” ... They select for attention few salient features and relations from what would otherwise be an overwhelmingly complex reality (1979).

Naming and framing often happen via metaphor. Schön uses the example of an urban housing project. The housing project was seen as a “blight on the community” and as “a disease that must be cured.” Once these metaphors were in place, the “solution” seemed obvious: blights should be removed and diseases should be cured (1979).

A designer who understands metaphor can, however, change not only the naming and framing, but also the solutions those might imply. Like the developers joke, changing the underlying metaphor of the “problematic situation” can change not only current feelings about the situation, but also the outcome of the situation. A product that is “a total disaster” seemingly requires much more work than one that is “flawed,” even though the amount of work may in fact be the same.

Problematic situations viewed from another perspective can reveal solutions or other opportunities. In the case of the housing project, thinking of it as “a folk community,” although vaguely condescending, still allowed for different outcomes other than simply removing the “blight” when addressing the situation.

For example, consider a troubled ecommerce site that is not doing an effective job selling products. Traditionally, ecommerce sites are thought of as a point of purchase: WEBSITE IS STORE and the problems are viewed as problems of sales (the checkout process isn’t useable, for example). But solutions to the problems of the site may spring from viewing the site differently: WEBSITE IS A DISPLAY or WEBSITE IS AN INFORMATION CENTER or even such leaps as WEBSITE IS A PLAYGROUND.

Metaphor as a Research Tool

One of the challenges of being a designer is the difficulty of working in unfamiliar subject areas. Designers are often thrust into domains where they have little to no background knowledge. Traditionally, the way to overcome this is to utilize the help of a subject area expert. But this too can be problematic, as the expert might have too much knowledge and things that seem obvious to him or her are not as apparent to the designer.

An alternate method is to use a metaphor to explore the subject matter. Since metaphor is naturally used to map unfamiliar domains, it

is reasonable to claim that it can be harnessed and used directly toward any phenomenon in need of greater explication (Shank and Gleber, 2002). Designers can take a familiar domain and manually utilize its characteristics to find similarities and differences between it and the unfamiliar domain.

This was done effectively by a design team at the University of Sussex. As detailed in “Making Tea: Iterative Design Through Analogy” (2004), the design team was tasked with developing a digital lab book system for use by university chemists. None of the designers, however, knew anything about chemistry or how chemists work, so they employed a metaphor, TEA IS CHEMISTRY, in order to research chemistry and how chemists work. The designers had the chemists prepare tea as though it was a chemistry experiment and thus were able to begin to understand chemistry through its differences and similarities to tea.

Metaphor as Inspiration

It has been theorized that new ideas are almost always due to the juxtaposition or recombination of ideas (Koestler, 1964). Designers can consciously create juxtapositions through the use of metaphor as a brainstorming technique. Indeed, this is probably the easiest and one of the most fruitful way for designers to embrace metaphor use.

All metaphors are, in a sense, juxtapositions in that two different things are put together to form a construct that highlights (and hides) different characteristics of each. Finding any inherent metaphors in the problem space is therefore probably a useful activity. Thomas Erickson recommends designers focus on identified user problems, then look for real-world events, objects, and institutions that embody some of the characteristics that users find difficult to understand (1989).

But almost any metaphor, even an arbitrary one, can trigger new ways of thinking about a product or new solutions to a design problem. Indeed, sometimes arbitrary juxtaposition can be the best method of brainstorming:

The human mind cannot tolerate a meaning vacuum. If we compare some X to Y, then we strive mightily to understand that comparison. Sometimes the comparison is simple and transparent. When we compare, say, a smile to a flower, then it is easy to abduce that the smile is pretty and pleasant, much as a flower is pretty and pleasant. When we make such simple abductions, then we are staying well within our current

range of preconceptions about the meaning of things in the world. When our metaphors are arbitrary, however, then we are no longer in “safe” preconceptual territory. There is no easy and apparent solution to the metaphor “puzzle.” Also, even though we know that the comparison is arbitrary, we still feel the tug of our desire to render the comparison as meaningful. Therefore, we have no choice but to leave our familiar preconceptions and engage in meaning exploration (Shank and Gleber, 2002).

As is detailed in the book *Dealers of Lightning: Xerox PARC and the Dawn of the Computer Age*, the whole notion of what a computer is and is capable of doing slowly but radically changed once the designers and engineers at Xerox PARC began to think of computers not as calculators or a tools for programmers, but instead as communication devices (Hiltzik, 1999).

Metaphor as a Communication Device

Once design ideas have been generated, an important step in the design process is selling those ideas to those who will ultimately fund and implement the design. Designers can use the metaphor(s) that have been generated as a communication tool to convey concepts to the other members of the project team. Saying, for example, CELLULAR PHONE IS A RADIO can convey more about what the device or feature will do than a drawn-out conversation about listening to audio files ever would.

Once there is buy-in on these metaphors, they can act as a connection between disparate team members. Shared metaphors can help define social groups and their boundaries, creating a team identity and enhancing communication between team members on a project. Having a shared metaphor helps to maintain a common understanding of a project and makes it easier to negotiate compromises as the pressures of users, customers, technology, schedules, budget, and organizational pressures increase throughout a project (Stubblefield, 1998).

Metaphor during Product Development

It’s not an exaggeration to say that the process of creating products, especially digital products, is riddled with metaphor. Indeed, the term “computer” originally referred to a human being who calculated; only later was it made into a metaphor: MACHINE IS A COMPUTER. The programming “languages”

we “speak” to computers are all highly metaphoric: hard drives (metaphoric themselves) are “written to,” images are “loaded,” “files” are “saved” or “moved” to “folders,” and so on, almost endlessly. “Mice” “move” a “cursor” across a “screen.” Code is “tested” to find “bugs.” Nearly everything one says about a computer is metaphoric.

And lest designers think that metaphors are limited to engineers and programmers, we use “brushes” to make “strokes” on the “page” which is a “landscape” view. We “crop” images, add more “lead” to lines and change the “face” of type. We make type “bold” and have items “bleed” off the edge of a page. And so on.

Other complex products besides computers are also developed and built using metaphor to describe, understand, build, and communicate about their components. Electrical systems with their “positive” and “negative” wires, “batteries,” battery “life” etc. are metaphoric. Telecommunications likewise has its metaphors—“placing” a call, call “waiting,” etc.—as do consumer electronics, and medical devices. Even non-tangible products such as workflows and services have them embedded: designers and business people speak of service “delivery” and customer “touchpoints.”

Design Process is a Metaphor Itself

It stands to reason that, as an abstract entity itself, the design process would become a focus for metaphors to help create boundaries, as well as to comprehend and to reason about. In “Use of Narrative in Interactive Design” (2004), the authors demonstrate this by applying a metaphor to the design process (THE DESIGN PROCESS IS A STORY). By doing so, designers can not only revitalize their creative processes, but also create more holistic products as well.

As we’ve seen, metaphor is used through the design process, both consciously and unconsciously, and can even be a means of reshaping the design process itself. But metaphor is also extensively used throughout interactive products, in a variety of ways. It is to this usage that we now turn our attention.

Part III: Metaphor in Products

“You don’t see something until you have the right metaphor to let you perceive it.” – Robert Shaw

Much of the criticism of metaphor in design focuses on the use of metaphor within products. Unquestionably, companies have fostered onto users all sorts of misbegotten metaphors, stuffing existing functionality into uncomfortable and awkward metaphors. Yet, when used properly, they can be a powerful tool for conceptualizing, orienting, and personifying products.

Metaphor as a Conceptual Framework

Designers can take metaphors and use them as the driving force in projects. Unlike, say, Microsoft’s BOB, in which a metaphor (COMPUTER IS A HOUSE) was crudely placed on top of existing functionality (a wall calendar became a calendar application, etc.), new interactions or styles of interactions are being explored via metaphoric techniques. Metaphors are at the heart of these projects.

An example of this is a project done through HP Labs called “Friction in Scheduling and Coordinating Lives in Families” (2004). The designers used the metaphor FRICTION IS A CONNECTOR to drive their design.

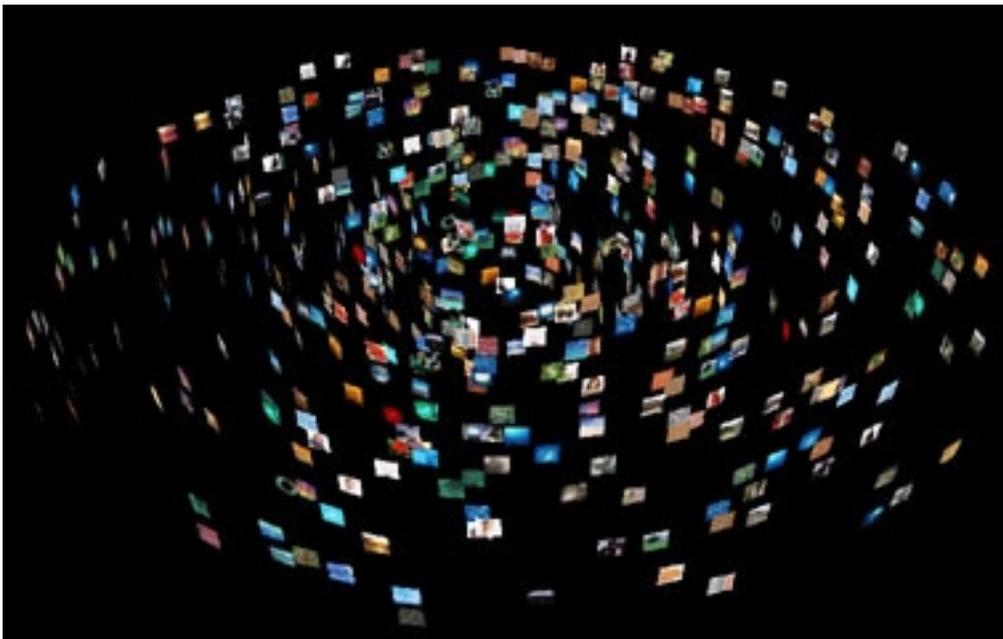
Previous use of metaphors in design have focused on object metaphors guiding the shape of products and their associated actions...In our approach, we take not an object, but a property (“friction”) as metaphorical, and explore the similarities between the unfamiliar situation (lifestyles) and familiar areas of technology (mechanical friction). Used as a conceptualization device, such metaphors serve to suggest questions and generate miniature “research programs” (Hoefnagels, Geelhoed, Stappers, et al., 2004).

The designers used the characteristics of friction (mutual dependence, desirability in engineering, counter-force) and applied it to their scheduling devices, creating, for example, a wristwatch that embodies these characteristics:

When they are not together, the family members can interact concurrently with a shared appointment through rotating the rim on their watch...force feedback indicates the difficulty in adjusting the

appointment. Through distributed haptic interaction, the family members literally feel one another... This enables them to express emotions about the change, for example to resist, “counter-rotate,” when being disgruntled about the change in appointment. Friction again becomes tangible (2004).

Information visualization systems are ripe for more metaphoric use. Ryukyu ALIVE (2003) uses the metaphor INFORMATION SPACE IS A GALAXY as a means of organizing, displaying, and allowing the user to interact with the contents of the Okinawa Digital Archives called “Wonder Okinawa.” Ryukyu ALIVE contains many “stars” representing individual web pages of Wonder Okinawa and a gravity field that emulates the gravity of the Milky Way. If a user visits a web page, the corresponding icon will jump towards the outermost rim of the galaxy. The gravity field pulls unvisited pages towards the center of the galaxy, where they will eventually vanish. Changes in the galaxy show the overall usage status of Wonder Okinawa.



Picture 1. Okinawa Prefectural Government's Ryukyu ALIVE, 2003.

“Artifacts of the Presence Area” (<http://web.media.mit.edu/~fviegas/ICA/>) (2003) is another application that is built based on a metaphor: DATA IS GEOLOGY. Installed in Boston's Institute of Contemporary Art (ICA), the application recorded visitors, their movements, and the ambient noise of the space to create a record of a three-month time period (January-April 2003). “In trying to convey a sense of historical buildup over time, it made sense to

look at natural examples of accretion for inspiration. The geological layers in sedimentary rocks and their function as record keepers provided us with such an example” (Viegas, Perry, Howe, and Donath, 2004).



Picture 2. A sample from MIT's Media Labs' "Artifacts of the Presence Era," 2003.

The designers created the piece so that museum visitors were able to move through layers of the history like “archaeologists,” turning a simple dial to move chronologically through the data, “excavating” the traces left by previous visitors (2004).

Defining Spaces and Structure via Container Metaphors

Things are difficult to understand without edges, without boundaries. Metaphor has been used to define spaces and boundaries in places where there really are none (Lakoff and Johnson, 1980), even within mediums. The digital world (itself a metaphor), due to its sprawling and intangible nature, has been particularly ripe for this sort of metaphoric usage, often in clusters of related metaphors. A GROUP OF DATA IS A FILE and A GROUP OF FILES IS A FOLDER, for example.

The internet has spawned many of these container metaphors: INTERNET IS AN OCEAN (e.g. “I’m surfing the web”), INTERNET IS A LIBRARY (“I’m browsing that site”), COLLECTION OF HTML DOCUMENTS IS A PLACE

(a web “site”), HTML DOCUMENT IS A BOOK (“web page”) and of course INTERNET IS A WEB.

Without these structuring metaphors, users would quickly become disoriented and confused. Designers need to be aware of these structures or create them if none are available. The desktop metaphor would be a very abstract concept if the operating system didn’t resemble an actual desktop. In other words, products need forms and designers must either find them or invent them. Metaphor is one powerful way of doing this.

Using Metaphor to Orient

Related to the creation of metaphoric boundaries is the ability to move through space and even time via metaphor. Once a space is defined, there typically needs to be some method of figuring out where one is in that space and how to move about if necessary. Web pages “link” together and use “bread crumbs” to show how a user can move “back” or “up” in the site’s hierarchy. 3D applications use metaphors drawn from flying to navigate: yaw, pitch, and roll.

For people in Western cultures who read left-to-right, the metaphors LEFT IS BACKWARD and RIGHT IS FORWARD are often used in products, as witnessed by the left-pointing “back button” on browsers to return to the previous web site or on the buttons of music players to move forward or backward in the music tracks. (Curiously, some cellular phone manufacturers like Nokia break this metaphor.)

This sort of orientation via metaphor is crucial for users to be able to explore the product space and discover the features and functionality therein. If users cannot orient themselves with a product, the product is essentially useless.

Operational Metaphors

Actions can also be metaphors, substituting for other operations. Opening a flip-top cell phone answers the phone the same as pressing the answer button. Dragging a file to the trash can is the same as deleting the file by pressing the delete key. Modifier keys (Control-C/Command-C for Cut) are metaphors for actions typically done via pull-down menus.

As digital products move beyond computers and devices, we can expect to see many more of these operational metaphors. One can imagine pantomiming turning a key to unlock a door equipped with a digital lock, for example.

Using Metaphor to Personify Products

Metaphors can endow machines and inanimate objects with human characteristics, making them more approachable and usable. These types of metaphors “allow us to make sense of phenomena in the world in human terms—terms we can understand on the basis of our own motivations, goals, actions, and characteristics” (Lakoff and Johnson, 1980).

Within products, this can be done in a very literal way, by having a humanoid agent (Microsoft’s Clippy) or robot (such as Carnegie Mellon’s robot receptionist) address users directly (PRODUCT IS A PERSON), or, more subtly, by employing individual characteristics of humans. Most applications, for instance, have “dialog” boxes in which the application behaves like a human being would and asks user direct questions when a problem is encountered (HUMAN-COMPUTER INTERACTION AS CONVERSATION).

Metaphor can also be used to portray complex, non-human activities as simpler, human ones via personification. Computers don’t “write” data to disk. Telephones don’t “make” or “place” phone calls. MP3 players don’t “pause” music. But because we can use a metaphor to personify these actions, we can better understand what our products are doing.

Using Metaphor to Introduce New Concepts

Since one of metaphor’s main applications is to use the familiar to explore the unfamiliar, one of the main (and the most overused) reasons to use metaphors is their power to introduce new concepts to users. At its best, this can cause fantastic cognitive leaps, like the ones made at the appearance of the desktop UI and the internet browser. At its worst, it can trap users into a metaphor that obscures more than it illuminates, that causes anger and frustration, and that in some cases can cause injury or death.

Obviously, this is the area of metaphor use that is the most fraught with peril, for metaphor both reveals and hides. Some characteristics of both the metaphor’s subject and the target are highlighted while others are hidden. This can cause significant problems of comprehension when the target doesn’t act like its subject (or visa versa), either in having more capabilities or in having less.

But, as we’ve seen, this is how we as humans frequently, naturally, and unconsciously use metaphor: as a means of cross-domain mapping. If designers do not provide metaphors for beginning users, then users will bring their own metaphors to bear on the new domain, and these

metaphors may or may not be adequate or appropriate. To not provide metaphors seems to be an abdication of the designer's responsibility.

The perils of using metaphors are discussed in depth in the next section, as are guidelines for appropriate use of metaphor.

Part IV: Using Metaphor Appropriately

“Life is described in one of four ways: a journey, a battle, a pilgrimage, or a race. Select your own metaphor, but the necessity of finishing is all the same.” – from *The War Cry*

Metaphor is a powerful tool for designers, both in the design process and within products themselves. It is also a dangerous tool, one that if used improperly can have serious consequences. But one shouldn't throw out a tool simply because it is dangerous; the tool should just be used with care. Indeed, care and wisdom must be brought to bear when employing metaphor in interaction design. But this is not by any means a universally held opinion; there has been much criticism of using metaphor in design at all.

Criticism of Metaphor in Interaction Design

Much of the criticism that has been leveled against the use of metaphor in interaction design is related to the traditional view of metaphor and is focused mainly on the use of metaphor within digital products. Some have gone as far to say that using metaphors is a “trap” that leads to broken interfaces and cognitive strain on users (Hutchinson, 1997).

Alan Cooper has been one of the most vocal opponents of using metaphor in interaction design.

Searching for that guiding metaphor is like searching for the correct steam engine to power your airplane, or searching for a good dinosaur on which to ride to work... I think basing a user interface design on a metaphor is not only unhelpful but can often be quite harmful. The idea that good user interface design is based on metaphors is one of the most insidious of the many myths that permeate the software community (Cooper, 1995).

The criticism of metaphor in interaction design can be broken down into five areas: 1) The physicality of the object that is being compared to cannot be matched by the more abstract subject. This leads to people using the abstract object incorrectly because they assume it can do things that the physical object can. You cannot, for instance, clear your virtual desktop with one swipe as you could with your analog one. Metaphors are misleading and allow for false affordances (Mohnkern, 1997). 2) The abstract object has more properties than the more concrete object does and, by using a metaphor,

users of the abstract object will be unaware of the properties that aren't reflected in the concrete object. A digital file folder, for example, can do many more things (e.g. replicate itself, be in multiple places at once, etc.) than can its analog. 3) Metaphors do not scale well. Although current features of a system might all work under one umbrella metaphor, new features might not fit and have to be twisted or warped to fit the existing metaphor. 4) Metaphors degrade over time. They become stale ("dead") and lose meaning and power. THE COMPUTER WORKSPACE IS A DESKTOP metaphor has been around for over twenty years as of this writing. Does anyone still consciously think of the computer as a physical desktop any longer? 5) Metaphors are overused as a design tool. While they might help beginners understand a system, they soon hinder more advanced users (Cooper, 1995).

These criticisms are fair. Because of the systematic nature of metaphor, using it to comprehend one thing in terms of the other will hide or obscure other aspects of the concept. By focusing on one element of a concept, we may not see other elements of the concept that are inconsistent with that metaphor (Lakoff and Johnson, 1980). No one could deny that metaphor has sometimes been overused in products. Microsoft's BOB, which used the metaphor COMPUTER IS A HOUSE, is an excellent example of metaphor gone amok. Each part of the operating system had to be squeezed into this metaphor. Calendars on walls launched calendar applications. A rolodex sitting on a side table held addresses. And on and on.



Picture 3. Microsoft's BOB, 1995.

Why Use Metaphor?

As I've shown, the use of metaphor, especially within products, can be a great help or a terrible hindrance. To use a metaphor, metaphors are nuclear power in interaction design: strong and effective, but can also blow up in your face and cause many long-term consequences. So why risk using it?

The first reason is that we as humans can't help it. As Reddy and Lakoff and Johnson (among others) showed, metaphors are part of our cognitive processing. We use them to make sense of the world; thus we use them to make sense of the things in our world and in the products we use and create. Even if it was possible to make a product without using metaphor, users would bring their own metaphors to bear on it. This is how we understand things: by comparing them to other things.

Some (Cooper, Monkern) would argue that it is best to let users generate their own metaphors for products. While assuredly this will happen anyway, especially with expert users, novice users may pick an even worse metaphor than the designer, who presumably knows the product (at least initially) better than the users. To leave it up to the users is to abdicate design responsibility.

The second reason is that there are a limited number of ways to change perspective. Of Burke's Four Master Tropes (metaphor, synecdoche, metonymy, and irony), metaphor has thus far proved to hold the most power and flexibility for interaction designers. It can be applied to many different parts of the process and in all different types of products. Because of its deep place in our language and thought, metaphor is also the most readily available and thus the most "natural" to use in a variety of situations.

Lastly is that metaphor's power to transform is too powerful a tool to ignore. If all invention comes from the juxtaposition of two unlike objects, then metaphor is at the heart of invention. And since invention (and reinvention) is at the heart of Design as well, it stands to reason that metaphor itself is at the center of Design as well.

A Tool to Change Behavior

The goal of interaction design isn't simply to optimize machine behavior; ultimately it is to influence or change the behavior (hopefully for the better) of the product's users. Whether this is providing them with relevant information at the most relevant time so that they can make informed decisions, making their work tasks easier, or even just entertaining them, the

goal is the same, and the metaphoric choices a designer makes can directly influence this behavior, for good or ill. With the exception of use during brainstorming, designers need to be careful of the metaphoric choices they make.

How a user responds to a product, and thus to the environment in which the product lives in, can be highly influenced by the underlying metaphor. Inappropriate or unfamiliar metaphors can cause errors, anger, frustration, or disappointment. *BANKING IS A GAME* could be a foolish and dangerous metaphor to utilize for an automatic teller machine. Using *MEDICAL DEVICE IS A GUN* is likely a wrong metaphoric choice, leading to scared patients and callous health care personnel. *DVD PLAYER IS MAGIC* will probably lead to some misunderstandings about how the device works. These are broad, comedic examples, but there are subtler ones as well, with far-reaching implications. *WORKSPACE IS A DESKTOP* metaphor has shaped how computers have been used (primarily as an office tool). Indeed, it could be argued that the desktop metaphor has hindered the development of ubiquitous computing as much as some hardware factors. The desktop metaphor also likely hindered non-knowledge workers from adopting computers as well. As John Brock succinctly put it, “If you don’t have a desktop, then the desktop metaphor doesn’t connect” (1996).

Alternately, an appropriate metaphor can take a challenging or unwelcoming situation and make it less so. The adoption of computers skyrocketed after the desktop metaphor replaced the previous metaphor (*COMPUTER IS A PROGRAMMING ENVIRONMENT*). TiVo and other Digital Video Recorders (DVRs) (and arguably their predecessor VCRs) have rapidly changed the way their users watch and manipulate television by changing the metaphor of television from *TELEVISION IS A STREAM* to *TELEVISION IS COMMODITY*, which in turn has changed the behavior of both the television networks (in how they schedule shows) and television advertisers (in how they advertise products). Similarly, DSL was a failed technology until the phone companies changed the metaphor from *DSL IS A SERVICE* (which had to be installed by trained technicians) to *DSL IS A PRODUCT* and started selling it as such, complete with do-it-yourself kits. Once DSL became a “thing,” its adoption soared to millions of users.

Guidelines for Metaphor Usage

As we've seen, metaphor is a powerful but potentially dangerous tool for designers. So how can designers use it appropriately? Some guidelines are below:

- **Metaphors are cultural.** Different cultures have different conceptual frameworks, especially about abstract ideas like time. Be conscious of differences when picking metaphors that span multiple cultures. And not only are metaphors culturally-specific, they can also be limited to specific audiences within that culture. If you don't have a desktop, the desktop metaphor could be meaningless to you.
- **Metaphors are contextual.** Be aware of the context in which the metaphor is being used. What can work in one medium or domain may not do so elsewhere. Unless you are deliberately juxtaposing for effect, metaphors within a product should fit the context in which they will be used. The subject matter of most projects will likely be rich with its own metaphors. Finding and utilizing them can make powerful connections between the product and its context of use.
- **Fit the metaphor to the functionality, not the other way around.** Metaphor should be a tool to help users comprehend unfamiliar content or functionality. So when using a metaphor within a product, start with the new, unfamiliar (to users) material you have and make that the subject of the metaphor, not the referrer. Awkward situations are more likely to happen when functionality is shoehorned into a metaphor. In the best case, metaphors should support concepts, not be supported by concepts or be the concept.
- **Use metaphor to uncover otherwise hidden aspects of the material.** While *BANKING IS A GAME* might be an inappropriate metaphor when used inside a product, it could be a powerful metaphor to use during concept development to show what banking is not. And even perhaps is.
- **Discard process metaphors when necessary.** Metaphors that have been used in brainstorming or during the design process can grow constrained or simply be inappropriate for users. In some cases, it is

better to have no metaphor at all than an inappropriate one.

- **Don't let your metaphor ruin key features.** Designers need to realize that all metaphors can obscure as much as they illuminate and they should choose their metaphors so as to not obscure or distort key features. Microsoft's recycling bin in Windows OS is cute, but is less clear than a trash can or a dumpster would be.
- **Choose metaphors that are appropriately scalable.** The desktop metaphor has lasted as long as it has because it scales very well. Many varied tasks fit well into its framework. Likewise, the folder metaphor. Other metaphoric choices (an envelope instead of a folder, say) may not have scaled so well. (On the other hand, using the metaphor of a workbench instead of a desktop might have supported many activities—not just working with paper.)
- **Let your metaphors degrade and die.** Once an appropriate metaphor is understood, it becomes nearly unconscious (“dead”), only to become apparent again with effort. Although this has been criticized, this is a good thing, as intermediate and advanced users should not have to bother overmuch with the metaphor and deal more directly with the underlying material. It is only inappropriate metaphors that continue to hinder more experienced users. This is, in fact, a good test for whether or not a metaphor is appropriate.

Epilogue: The End of the Desktop Metaphor?

The desktop metaphor has been commercially available now for over 20 years and has affected computers for good and ill ever since. Every year, it seems, someone predicts the end of the desktop, and yet it continues to hang on. And there's a good reason for that: it's powerful, moderately flexible, and allows for a variety of applications to be incorporated into it.

As our devices get smaller and more ubiquitous, however, the desktop metaphor seems too unwieldy to move to handheld devices, mobile phones, and environments. Our metaphors must not only fit their functionality, but also their environment as well. It's as absurd to contemplate having a cell phone interface on a computer with a large monitor as it is in the opposite direction.

So then what will replace the desktop metaphor? As we've seen, it's

impossible to comprehend the abstract and complex digital devices we have directly. Thus, what will replace the desktop metaphor will be...another metaphor. Perhaps it will be a cityscape or a room or something less concrete. Whatever it is, it will hopefully cause us to make another cognitive leap, like the desktop metaphor originally did, and show us new possibilities and a different future.

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