Who Cares About Our Conceptual System?

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ABSTRACT
We explain why at this stage of the development of ubiquitous computing it is important to examine our relationship to information in general. This leads to an examination of our society's conceptual system. By examining the role that metaphor plays, we see how ubiquitous computing can have a large social impact on our system of meaning. We then explore the consequences and opportunities that this might have.

Keywords
Social factors, ubiquitous computing, ambient display, metaphor

INTRODUCTION
Ubiquitous computing technologies are moving out of labs and into our world, and their impact is becoming increasingly prevalent. The social influence of these technologies is a subject of ongoing study. Although the effects are new and constantly coming to light, we have many ways of attempting to better understand them. In this case, we will take a bottom-up approach and look at the foundations on which ubiquitous computing rests. Although a field like linguistics may seem an unlikely choice, all of our understanding of the world around us, and how we communicate that understanding to one another, rests on language. As we augment our world we must first try and comprehend our relationship to it.

THE INFORMATION ALL AROUND
As technology becomes more ubiquitous, computation moves more and more "off the desktop" and into our everyday world. Lars Hallnäs et al. describe a scenario in which "information is everywhere [and] we just have to define a display in order to read it" [1]. In some ways, this is already the case. Our world is teaming with channels of information, but the difficulty lies in accessing and interpreting these myriad channels. Currently, most of the devices that are available for tapping into these streams of information still very much resemble desktop computers. Cell phones, PDAs, information kiosks, etc. are high on cognitive load, requiring most, if not all, of the user's attention. Additionally, these devices tend to be designed as a means of accessing many different types of information, and thus, are somewhat generalized. Generality is not inherently bad. It is, however, only one way of tackling the design problem that arises from dealing with numerous different types of information. What if we step away from the design process and take a look at our relationship with all of the information that saturates our lives?

OUR CONCEPTIONS
The study of people's relationship to and understanding of information is well established and examined under the umbrellas of many disciplines: philosophy, linguistics, etc. In *Metaphors We Live By* Lakoff and Johnson analyze our conceptual system and they describe it as "fundamentally metaphorical in nature". In other words, "we comprehend one aspect of a concept in terms of another" [2]. For our purposes, this means that the ways in which we understand the many different kinds of information are interdependent. Therefore, the technologies which we develop to handle the many streams of information should not be designed completely independently of each other. But how much of an effect would ignoring our metaphorically-based conceptual system really have on our lives? Arguably a large one, but let us examine the consequences in more detail.

AMBIENT DISPLAYS: DISTILLED METAPHOR
Of the many possible social ramifications that ubiquitous computing poses, affecting our conceptual system is not necessarily the first one that jumps to mind. However, there are deep and complex consequences that arise from such a thing.

Let us start by considering an example. Ambient displays are devices that provide a peripheral channel of lo-fi information into the user's environment. Typically these devices are low on cognitive load and also often function as artistic pieces. Because the presentation of the information in these devices is relatively simplified, it is easier to observe the effects of our conceptual system at work. Simple and basic concepts are often utilized and whether or not we as designers realize it, metaphor becomes a prominent component of our understanding of the display. When a piece of information (e.g. the current temperature or the state of a particular subway line) is represented by an abstraction (e.g. a color or up/down), all of the metaphorical "baggage" which we associate with those concepts is now coupled with the information on display.

When using metaphor in language or thought "we typically conceptualize the nonphysical in terms of the physical"

according to Lakoff and Johnson [2]. Ambient displays are a reflection of this convention and have emerged as an important piece of ubiquitous computing.

Clearly then, technology is a product of our society, and it does not arise wholly independently of it. We the designers are members of society and all of our designs are consequently influenced. Metaphors, which our conceptual system are based on, are not only "grounded in our physical and cultural experience; they also influence our experience and actions" [2]. So, as technology manifests itself in our everyday lives, it also influences our system of meaning on a basic level. The relationship between technology and society is cyclical and must be viewed as such or we risk affecting our conceptual system without even knowing it.

DESIGNING FOR INFORMATION

So what should we do? The first step is to keep in mind the effects that our designs can have. Concepts are defined, at least in part, by interactional properties [2]. As we go about exploring what affordances an object has, be it something found in nature or a newly designed technological artifact, we may define, or redefine, part of our conceptual system. As technology permeates our world, changes to our conceptual system begin to occur at a more accelerated pace, and this rate will only increase with time if Moore's law continues to hold. So it is wise to make sure that all of our designs give proper consideration to the metaphors which shape our lives. If we don't there are at least two possible outcomes.

Rejection

Technology which does not conform at least partially to our understanding of the world will probably be met with rejection. That is not to say that cutting edge designs will not be accepted. Obviously that is not the case. However, we must realize that successful designs which "push the limits" still recognize those limits. They use our system of meaning as a springboard rather than abandoning it altogether and designing from scratch. Lakoff and Johnson state that a "concept is stable because we continue to function successfully in terms of it" [2]. By extension, a technology is adopted if the concepts which it is built upon are stable, allowing us to function productively with that technology.

When the Apple iPod first entered the market in 2001 it was somewhat alien. Rob Malda (a.k.a. CmdrTaco) of Slashdot fame even wrote of the iPod, "No wireless. Less space than a nomad. Lame" [3]. Yet, the iPod has become an embodiment of the concept of digital music and that comment has since become an inside joke. The iPod is incredibly simple and elegant, a reflection in many ways of how society was beginning to envision and regard the "technology of the future". In films, we tend to see high-tech devices as being exceedingly minimal and stylish, and the iPod, along with many Apple products, is designed to fit into and extend that area of our conceptual system. It works because we can relate to it on a fundamental level. Likewise, technologies which just don't "feel right" end up falling by the wayside.

Accidental Influence

There is another possible problem that can arise from designing without regard to the already established system of meaning. If we don't understand where our designs our coming from, or why they are finding acceptance, we could end up designing the rug out from under ourselves without even knowing it. If we accidentally augment the conceptual system of society without even realizing it, we make it more difficult to create successful designs in the future. It is important to have a clear understanding of the concepts we are working with and building upon, otherwise we cannot really call our designs our own, rather, they are just happy accidents. As designers putting technology out into the world, it is our responsibility to pay attention to the powerful impact that these devices can have.

GOING FURTHER OR GETTING OUT OF HAND

One very important thing to keep in mind is that "all experience is cultural through and through, that we experience our "world" in such a way that our culture is already present in the very experience itself" [2]. This means that we must pay attention when designing cross-cultural technologies. Because our systems of metaphor are not completely universal, deployment of technologies to different parts of the world is not trivial. Even among subcultures of the same country there are differences to be found. When we identify these differences, the design process becomes less mysterious and hopefully more successful.

Tackling some of the social problems that can arise in the domain of ubiquitous computing can be reduced to understanding these inter-cultural differences. For instance, it is more easy to make technologies accessible to minority groups if their conceptual systems are understood and accounted for.

By examining the conceptual systems of various groups, we can find the areas where they overlap and focus our design efforts there. In order to have truly ubiquitous computing designers must go further and see beyond their culture while remembering that their designs are contributing to the ongoing development of our systems of meaning. Without understanding where our ideas come from it is more difficult to gracefully extend them. It will become increasingly complicated to do this on a global scale if we don't begin to consider how very important our conceptual system is right now.

CONCLUSIONS AND FUTURE WORK

Technology shapes our lives, but it is very much a response to the information we are trying to manage. The more intelligent and applicable the response, the more

successful the technology becomes. This applicability can be considered in terms of how well the technology harmonizes with or pays deference to the society's conceptual system. Reworking a metaphor is not wrong, it is a form of progress, but ignoring it altogether is a mistake which can have unintentional consequences.

Consideration for our society's system of meaning will be a key component of the design process of an ambient display which we are currently in the process of creating at UC Irvine. We look forward to seeing what benefits can be achieved when considering all of the metaphors which we often take for granted during the design process and hope that the end result will be all the more usable and integrated into the lives of the people who will be utilizing it.

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