



INVITED PAPER

Beyond Information Appliances : Serving Human Needs

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Understanding Human Needs

Technology harvests are best measured by their contributions to human capability. Suitable tools amplify our capacities for information handling, communication, and innovation. Now, as the numerous information appliances grow in function and shrink in size, new opportunities emerge for designers to truly serve human needs.

The range of those needs could include improved medical care, enhanced business communication, richer family relationships, and more fulfilling experiences. Successful information appliances are designed for simplicity, enabling users to carry out their tasks with minimal distraction and low frustration. A few scenarios give the flavor of usage of near-term products:

Portable medical **monitors** that track blood pressure, heart rate, or blood sugar will shrink from pocket-sized boxes to wearable jewels - you get to choose emerald or sapphire color to coordinate with your clothes. When your vital signs change dramatically, an **alert** is sent to your doctor. If your health requires immediate attention a request for help will get emergency services.

Palm-sized computers that require awkward data entry to record personal names and addresses will give way to future devices that will silently **gather** the email addresses of the hundreds of professionals at a conference who want to know more about your work and swiftly **spread** copies of your product announcement to those who click to request it.

Your next digital camera will enable friends or parents to **participate** in your personal travel by getting photos as you

take them. As they read or hear your trip commentaries, examine associated web sites for more information, and listen to the sounds of Disneyland they may learn more about you and **relate** better to your needs.

Instead of ruffling through tourist books, you will be able to point at and find explanations about Thomas Jefferson's home or **identify** the delicate yellow flower. By recording the location, you will be able to **capture** photos taken by visitors who were willing to **share** their photos of the same location ten years earlier or two winters after you visit. Your travel album will be enriched.

In thinking of new products I suggest that designers should expand their focus from the technology aspects (hard disk size, RAM capacity, networking speed) to include the desired tasks. The bold-faced words in these examples give some clues to what technology users can do:

monitor-alert
gather-spread
participate-relate
find-identify
capture-share

In each scenario the technology contributes to the users' experience, not only by supplying useful knowledge (information appliance), but often by providing communications (relationship appliance), enabling creativity (innovation appliance), and reaching out to many people (dissemination appliance). These descriptions of user needs are not complete, but still serve as a useful guide in thinking about new products. Entertainment, shopping or other tasks might be seen as additional task to add, or they might be

decomposed into these components. For example, shopping requires users to gather information, find a dealer, form a relationship, and create a deal.

Activities and Relationship Table

Inventing future information appliances is a great challenge. Rapid progress in expanding the range of products is likely to be made by those who consider how technology supports relationships, innovation, and dissemination. They will deal with more than bits, they will think in terms of messages, ideas, feelings, music, images, etc. This first axis for thinking about future products (information-relationship-innovation-dissemination) is the key idea in Leonardo's Laptop: Human Needs and the New Computing Technologies (Ben Shneiderman, MIT Press, 2002).

The second axis for thinking about future products is to break out from the concepts and language of 'personal computer' or 'personal data assistant'. Personal use will remain an important category, but there are striking opportunities for designers who consider user relationships with friends & family, colleagues & neighbors, and citizens & markets. As these four circles of relationships expand in size from personal to broader audiences, the human interactions decline in shared knowledge, common history, expectations of future contacts, level of empathy, and degree of trust.

Figure 1 uses these two axes to create an "Activities and Relationships Table." Key activities listed on horizontal axis, and different scales of relationships on the vertical axis. Example products that facilitate a particular activity for a particular type of relationship are listed in the cells. Empty cells may represent opportunities for innovative new products.

Sensitivity to these different activities and relationships will enable designers to build novel and successful products. Products that were designed for personal use, can be reconfigured for family use, business collaborations, or e-commerce and e-government. A natural route is to elaborate on the innovations of those who identified the vitality of chat, short messages, and buddy lists. Similarly, tomorrow's thriving entrepreneurs will be the ones who expand on the desire for social interaction by way of online auctions, health support communities, and networked gaming. Fresh design ideas are needed for million-person communities that can promote consensus seeking for political action. Similarly, bold visions are needed for technologies that support terror prevention, conflict resolution, and disaster relief.

Smaller, Cheaper, Faster, Better

Information appliances and similar small devices may also

contribute to the vital goal of bridging the digital divide, usually defined as the gap in levels of usage between wealthy (well educated) and poorer (poorly educated) users. Smaller, low-cost devices, that are easier to learn and support users in accomplishing specific tasks may enable a wider range of people to become participants in the information age. Such devices could also be more reliable under difficult conditions and more vigorously support universal usability principles than larger more complex desktop machines.

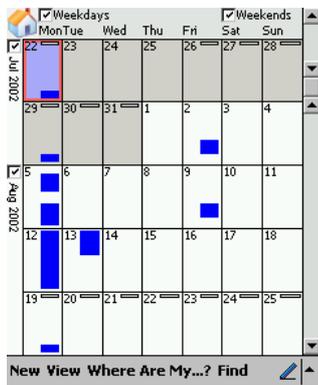
Advanced designs will also facilitate switching among multiple languages and permit users with different abilities/disabilities to succeed. These products will allow access by slow and fast network connections, work with small or large displays, and convert to voice output/input when desired. One example of advanced thinking to support diverse needs is the use of zooming user interfaces to enable users of small displays to gain an overview and then rapidly focus on their current needs. Bederson's DateLens reconfigures a calendar interface to allow quick checks on specific dates, immediate presentation of available meeting times, and feedback on conflicting appointments (Fig.2a-d). In addition to the pleasure of the smoothly animated displays on small machines, the same principles work for desktop or wall-sized displays.

Successful designers are astute at recognizing problems that people face and identifying ways in which technology products can support human aspirations. They understand that communication technologies, such as telegraphs and telephones, satisfy human needs for relationships. Similarly transportation technologies, such as cars and planes, also sustain relationships and enable travel and commerce. Life enriching experiences are supported by media technologies, such as MP3 players and television, which provide entertainment.

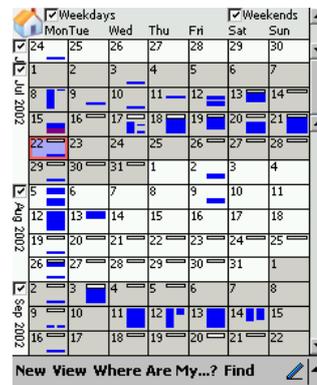
For those who seek to innovate, modern cameras, musical instruments, and graphical editors enable novices to perform at the level of yesterday's experts. Professionals also gain remarkable powers from advanced medical and scientific devices. Our aspirations as designers should begin by responding to market needs, but they should also encourage positive developments that engage diverse users and promote trusting relationships. Our goals should be to develop usable technologies that are universally acceptable and truly useful in serving human needs.

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|------------------------|--|-----------------------|---------------------------|---------------------------------|
| A | | | | |
| R | Collect Information | Relate Communications | Create Innovation | Donate Dissemination |
| T | | | | |
| Self | Personal digital assistant Printers | | Office productivity tools | |
| Family & Friends | | Mobile phone | | Family history, Photo-albums |
| Colleagues & Neighbors | | Email Lotus Notes | | Copiers |
| Citizens & Markets | News Programs Google | Ebay | | Offset printers |

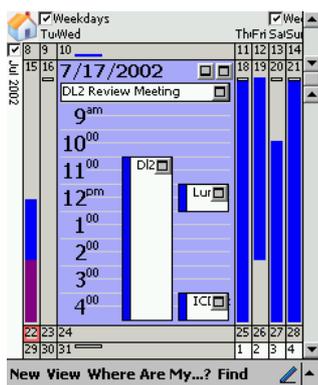
Fig.1 An Activities and Relationship Table partially filled in with some well-known products and services. The horizontal axis represents different types of productive activities, while the vertical axis represents different scales of personal relationships. Such tables can be helpful in understanding current markets and identifying new opportunities for innovative designs that address human needs.



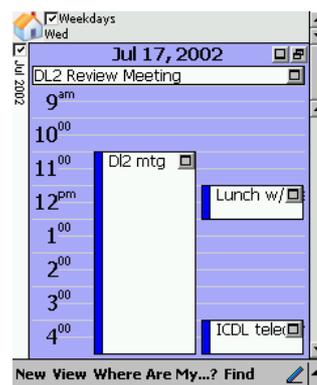
a) Default view of three months (although a full year is possible). Appointments are in blue, with all white all day events.



b) Smoothly zooming into a month view enables users to preserve their context and see patterns of appointments and free time over five weeks.



c) Tapping on a day makes that day grow bigger smoothly, and surrounding days smaller.



d) Pressing the "maximize" button expands the day further filling the screen.

Fig.2 DateLens user interface allows rapid exploration of calendars even on small displays (<http://www.cs.umd.edu/hcil/datelens/>). Smooth, animated zooming between views enables users to preserve context and retain their orientation.

