Universal Design: Is It Really About Design?

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Abstract
Universal design (UD) of information technology products [1] is usually portrayed as either an approach to design or a set of recommended and deprecated features. In either case, the focus of UD advocates has been on design per se. However, there is evidence that informational issues are the principal barriers to broader market success for UD. Consumers (and clinicians, caregivers, and third-party payers) are not sufficiently aware of the benefits of "UD products" or mobilized to shop for them.

Introduction
The accessibility utilities built into a common computer operating system are found to be used by less than 25% of the people who could benefit from them. Programs that distribute free TTYs to people who cannot otherwise use the telephone find that as many as 80% of the TTYs are returned. A company that marketed a talking Caller ID device to blind telephone customers found that less than 5% were interested.

What's going on here? Why do people appear to reject or ignore technologies that are known to be effective barrier busters, even when cost is not an object?

This paper will raise some of the overriding non-technological reasons that universal design is only a moderate success in the market. It is aimed at the audience of accessible technology experts and policy makers.

Universal Design, a Technique
Universal design has been defined as "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design" [2] by its inventor, Ron Mace. The concept first emerged in architecture, but has been expanded to apply to the entire designed environment, including computers, telephones, and information systems of all types. Note that the word "universal" is somewhat misleading, as no one claims to be able to design a single product that will serve the needs of every imaginable user. UD is often referred to as a direction, towards an expanding range of users.

Universal design has two basic design strategies. The first is to make the product's features easier to use. Theoretically, a feature can be made so easy to use that it imposes no burden whatsoever on the user, and it becomes difficult to identify anyone who could not use it. Such ease of use is approached, for example, by automatic door...
openers. Only mobile individuals need to access doors, and the act of mobility itself activates the door. However, a door is an essentially simple product. For the complex products in information technology, there are limits in usability, especially in the cognitive realm. Input devices may become easier to use, but understanding the necessary functioning of a word processor will probably always require high cognitive performance.

The other UD strategy is called redundancy, meaning that the product has more than one mode of interaction. A computer user may open a file by using:

- the mouse (or trackball or...)
- the keyboard via a shortcut key
- a speech recognition system

According to redundancy, more options mean more ways to succeed. So universally designed information products offer the user redundant input and output technologies, allowing each user to select and operate them in the most usable and convenient manner.

There are two potential limits to redundancy. The first is cost. Adding a feature usually has some cost, even if it is only in software; software testing costs can be significant. The second limit, an ironic one, is that redundancy increases user options, and therefore complicates the interface. If a computer only has a keyboard interface, input for those who can type is easy. If the user must actively select an input modality, some users may abandon the attempts. Such interface complications may essentially force a trade off between physical and cognitive limitations. In the words of Devo, "Freedom of choice; that’s what you’ve got. Freedom from choice; that’s what you want." Both of these limits, of course, can be addressed successfully, but never eliminated completely.

UNIVERSAL DESIGN, A TECHNICAL PHILOSOPHY

Universal design has been so actively accepted by the disability community because it parallels the community’s demand for full integration into society. It posits an alternative to clinical and segregated models of technological accommodation often experienced by users of assistive technology. The goal of universal design is to include as much accessibility as possible in mainstream products and services, rather than require users to acquire and use assistive technologies (AT). Thus an appliance with a large character display or a speech synthesis capability would meet the needs of many people with impaired vision, obviating the need for a special AT device, a portable electronic magnifier.

UD also expands the working concept of disability beyond the clinical definition, to include people without disabilities who are in "disabling" situations. People using strollers or hand trucks approaching a set of steps welcome a ramp just as wheelchair users do; closed captioning is probably used as much in loud sports bars as in the homes of people with hearing loss.

UD’s "normalization through design" is a response to AT’s medical orientation. Instead of "fixing" the person with a disability by equipping him/her with an accommodation that fits the way the world is currently designed, UD identifies the locus of disability as the unnecessarily inaccessible built environment. The origin of disability is not within the "broken" person, but at the point of intersection between the person and the built environment. That is, disability becomes the gap between what a person can perform and...
what the environment demands. The problem is "out there". In the light of UD, disability becomes not a tragedy but an ergonomic situation. All humans exist as points within a set of bell curves that indicate their differing abilities. All consumers are confronted by technologies that are usually or occasionally difficult or impossible to use. This is what we mean by "normalization" of disability. This strikes a responsive chord in the disability community because it universalizes the experience of disability. People without disabilities are reminded of their own vulnerability to bad design. This "shared victimhood" acts to dissolve the attitudinal barriers between people with and without disabilities.

UD makes sense for people with disabilities because it means that more of the products and environments they encounter will be accessible immediately, without the need for any special accommodations. In fact, UD can be seen as a response to a principal weakness of AT: the fact that due to high prices and scarce information, AT reaches only a small fraction of its intended users [5]. It was felt that UD offered an alternate path to accessibility [6]. UD was not intended to replace AT, but to provide more options. Together, AT and UD are supposed to provide a wide enough range of accessible solutions so that consumer sovereignty is established.

AT AND UD THROUGH THE EYES OF A CONSUMER

An elder with low vision (let's call him Karl) who can no longer read a newspaper (even with a magnifying glass) faces a dilemma. Let's examine this dilemma in detail. Karl has several choices (aside from abandoning the whole function of staying current with the news [7]):

- Have someone read him the newspaper
- Listen to news radio
- Listen to a radio reading service
- Use NFB's Newsline service
- Use AOLbyPhone or an equivalent "browse by phone" service
- Get a computer, screen reader or magnifier, and access newspaper stories online

All of these solutions work, in that they permit Karl to continue to get the news. From a technologically perspective, they are in "low to high tech" order. This set of options appears sufficiently broad to serve any individual. In fact, a technology enthusiast could use all of them, and probably get more information than by reading a newspaper! And that's fine for the technology enthusiasts who make up the bulk of accessible technology experts, disabled or not. But we must admit two caveats if we want to apply this scenario to the millions of people who encounter it each year. First, only a small percentage of people are enthusiastic users of new technology, who seek novelty as avidly as they seek functionality [8]. Second, everyone uses non-technological criteria to make decisions about technology products.

Let's look at those options again and evaluate them through Karl's eyes:

<table>
<thead>
<tr>
<th>Option</th>
<th>As Karl sees it</th>
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<tbody>
<tr>
<td>Have someone read him the newspaper</td>
<td>May be expensive, intrusive, or put me in a dependent</td>
</tr>
<tr>
<td>Listen to news radio</td>
<td></td>
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<tr>
<td>Listen to a radio reading service</td>
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<td></td>
</tr>
<tr>
<td>Get a computer, screen reader or magnifier, and access newspaper stories online</td>
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We see that each of the options has at least one possible disadvantage for Karl. It’s not that these disadvantages are insuperable, or even accurate. It’s that the typical elderly consumer may have no way to approach this decision from an option-rich perspective. Karl may cancel the newspaper subscription, listen to the radio a bit more, and ask a Sunday visitor to read a few stories from the paper.

The existing technologies are effective, they are suitable, and they are well supported. If many of the people who might be using them, don’t, it’s a fact that personal choices against technology should be presumed to be as valid as choices in favor.

There may be a lot of misfortune in that personal choice, however. Not all people with disabilities are self-actualized self-advocates. What if Karl is acting out a denial of disability by rejecting a product he sees as stigmatizing? What if he is depressed about losing his vision, and is too paralyzed by his depression to do anything about it? What if Karl’s children are forever bothering him with new gadgets, some of which have been nothing but nuisances? Is it condescending for accessible technology experts to examine these reasons for rejecting technologies that we think, with good reason, can make a significant improvement in Karl’s quality of life? What if we found that these kinds of effects were the primary cause of underutilization of accessible technology, both UD and AT?

As professionals, we would be bound to address the non-technological issues as comprehensively as we address the technological ones. There are certainly tools at hand to let us perform there.

The point is that preparing another technological option will not help this potential user. If tomorrow there were a new AT product that used a wireless Internet connection to prepare highly intelligible spoken renditions of exactly the kinds of stories this elder wanted to hear, there is no guarantee that anything would change in the scenario in front of us. The focus on technological innovation alone is bound to be a dead end, not adding substantial numbers of successful users of accessible technology.
AT and UD both benefit from a generalized uncritical belief in the benefits of technology, especially in highly industrialized countries. Technological utopianism often raises unreasonable expectations and prevented reasonable assessments of technology outcomes compared with other interventions. Technological interventions are automatically deemed superior, and can be improved only through the use of more, improved technologies.

TECHNOLOGICAL IDEALISM AND TOTEMISM

In the context of technological utopianism, tokens of accommodation are coin of the realm. Rather than measure the extent to which AT or UD actually improve the lives of large numbers of people with disabilities, policy makers and others have been willing to see a promising AT prototype or a single universally designed mass-market model as an indication that the problem is solved. This focus on technical innovation rather than massive grassroots implementation has discouraged efforts directed at solving information and service infrastructure problems. Although lack of information, professional training, and local support services have been repeatedly identified as key barriers to the rollout of accessible technology, these issues play poorly; they lack glamour. The Potemkin village aspect of the exhibit halls of the major accessibility conferences allows too many visitors — or roll away — reassured, relieved, and refreshed.

UNIVERSAL DESIGN’S NEEDLE IN THE MARKET’S HAYSTACK

The literature of assistive technology recounts the reasons for its underutilization. Chief among them are cost (and especially limited third-party funding); stigma; the need to participate in some form of clinical experience; and insufficient awareness, evaluation, and training (all resulting from weak local services infrastructures).

UD appears to eliminate most of these weaknesses. The cost of a well-designed product is not likely to be much higher than a comparable product in the same category. There is no stigma in using a mainstream product. Neither is there any need to be a patient at a clinic.

It is in the area of information and information services that UD appears to fail. How can this be? Is there a “weak local services infrastructure” for mainstream products? Hardly! Mainstream products announce their presence everywhere, in advertising, ubiquitous retail establishments, and by example through observing and communicating with other consumers. In a real sense, products are the ocean that people swim through. Karl and the rest of us live in an all-encompassing product ecosphere. So the problem cannot be lack of information about mainstream products.

It is instead the scarcity of targeted information about accessibility that perpetuates the problem of low adoption of universally designed products. Ironically, this informational problem arises not from a scarcity but rather from an overabundance of information. In the world of mainstream products, marketing hype is king. Each company strives to create a competitive advantage by trumpeting its newest breakthrough products and features. The public has been conditioned to compare products by counting features, so that the product with more features is automatically considered better. Packaging, advertising, and
the little training given to salespeople all emphasize high feature count, using complex and non-standard terms. Adequate information about accessibility and usability are drowned out.

An example comes from a study performed for the Access Board’s Market Monitoring Report. An audible low battery indicator provides blind cell phone users with important information. In fact, many cell phones have this feature. But the study found that typical wireless retail sales staff could not confirm its availability, and were not willing to open a new box and search the user’s manual.

How is a typical consumer expected to search for and evaluate all these components, assembling the combination that best suits her needs and preferences? With respect to accessibility, information may be missing or may be documented in such a way that only the most aware and energized consumer can find it and compare it with others.

To some extent the mass market, especially in information technology, is deliberately confusing to consumers. This is not just a skeptical view, it is a marketing verity, with a powerful motivator. In the absence of perfect information, consumers tend to rely on known entities. This is the value of a brand. When beset by “fear, uncertainty, and doubt,” consumers tend to huddle for safety beneath the branches of a familiar tree. Anyone who has shopped for a wireless service plan recently can confirm this point!

Whether intentional or not, accessibility information about mainstream products is not easy to find or easy to use. The concept of “information cost” is well studied in the management literature, because large enterprises are always confronted by the need to make important decisions in the face of overwhelming information and imperfect certainty. Organizations must identify reliable, relevant information sources, collect the right information and deliver it to the right people, and make a timely decision. When people with disabilities confront the market’s information glut, we are unreasonably expecting individual consumers to reproduce the expensive, complex information management functions found in large enterprises.

An additional irony proceeds from the fact that it is the profusion of mainstream products that gives universal design its power. Each product will probably not contain all the features needed by all people with disabilities. But the more products there are in a product category, the more likely there is at least one good match for each user. Thus UD succeeds not only within a given product, but within the rich ecosphere of the product category. This gives consumers two levels of choice: in the individual product, and in the market. That is, the universe of keyboards includes dozens of models, each of which presumably contains differences in key size, force requirements, audible feedback, etc. It’s true that the most commonly sold ones are quite similar, but there is a wide range of “offbeat” keyboards just outside the Radio Shack orbit. This accentuates the information management problem.

Mainstream companies are not as well motivated to serve their customers with disabilities as AT companies are. For example, one study showed that service calls to 5 out of 6 television manufacturers failed to result in accurate information about adjusting captions, while all closed caption decoder manufacturers (3 AT companies) answered the same question accurately [13].

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We would like to be able to count on mainstream manufacturers and retailers to take responsibility. Indeed, some have. But as the wireless retail and closed captioning studies revealed, weak motivations result in substandard service. Were it not for consumers’ demand for access to mass-market products, mass-market companies might have gone on forever ignoring people with disabilities. But that consumer demand was translated into laws and regulations intended to force mass-market companies to pay attention.

We may then think of somehow extending the AT services infrastructure so that it includes mainstream products as well. After all, the AT infrastructure is supposed to be motivated to serve the needs of people with disabilities regardless of the technology. It would certainly be possible to encourage AT information brokers to become aware of accessible mainstream products. In fact, significant steps have been taken in this direction. But we are still confronted by the lack of support for this infrastructure. Where is the outreach, evaluation, and training supposed to come from? In the AT world, vendors provide outreach, evaluation, and training; these services are subsidized by the price of AT products. We probably should not count on mainstream companies subsidizing such services. In fact, using mainstream products as part of an AT program raises troubling concerns. The few state telecommunications equipment distribution programs that give away modems or cordless phones must constantly guard against fraud.

CONCLUSION

The point of this paper has not been to raise insoluble problems, but to turn our attention away from technological issues to sociocultural ones. It is not enough to hail UD as a promising technological approach to the needs of people with disabilities. As Rudi Volti puts it, “in considering the influence that technology in general or any single technology has over human affairs, it is therefore necessary to consider not only the technology and its presumed ‘imperatives,’ but also the key human agents of the technology, the organizations in which they operate, and how these influence the course of technological change” (p. 257).

UD sees its users within the mass market, not in a disability niche. Ideologically at least, UD posits a more empowered person with a disability. Like any other consumer, the person with a disability participates in a mass market, seeking the best match between his/her abilities and needs, and the range of products and services that can serve those needs without demanding too high a level of human performance. However, although mainstream products are legion and ubiquitous, it is rarely clear whether a given class of products or a given model actually will meet a consumer’s specific need. Few people know enough about accessible technology to solve their own problems, or those of family members, employees, or clients. Beyond the truly tech-savvy leadership circle there is a real shortage of expertise at the service level. This scarcity is made worse by the fact that few people with disabilities know where to go to find an expert. Beyond this, there are many people with disabilities who do not recognize that they have an access problem, or believe that they can find a solution. Too many people unfortunately give up on the goal of integration due to pessimism and lack of awareness.

Accessible technology experts know that information technologies are at the heart of employment, education, and communication. We know that without access to these products and services, people with disabilities will not be able to participate in society.
Technological trends are exciting, because they offer more potential access than ever before through ease of use, redundancy, and customized interfaces, at lower cost and greater availability. We are right to become enthusiastic about their potential. However, for every promising new technology, there are concerns about how to reach the millions of disconnected users with disabilities (especially "unwired elders"), how to demonstrate the value of accessible technology as a liberating force for personal development and productivity, how to pay for technology products, and how to keep up with the accelerating pace of technological evolution.

If we can resolve the non-technological issues as well as we address the technological ones we can look forward to a Golden Age of Accessibility. If we continue to focus on technology alone and ignore its context we will serve few and disappoint many.

NOTES

1. This paper will not deal with universal design in architecture or environments. It will also not deal with UD adoption by industry, which suffers from similar non-technical barriers.


3. Of course, the implementation of many automatic doors leaves much to be desired, both in ease of use and accessibility.

4. "Assistive technology" is defined by the Technology-Related Assistance to Individuals with Disabilities Act of 1988 as "any item, piece of equipment, or system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities." It is usually taken to mean a product that is primarily designed "to increase, maintain, improve." That is, its intended market is people with disabilities. In contrast, UD's intended market is all people, regardless of disability.


6. For the purposes of this paper, the term "accessible" when applied to a product or service means "having those features that enable a person with a disability to use the product or service, whether by itself or in conjunction with assistive technology." Thus "accessible" refers to sustainably productive use by a person with a disability. An "accessible mainstream product" means a product not primarily intended to solve an accessibility barrier, but one which does so nevertheless. So "accessible technology" could be considered to be (roughly) the sum of accessible mainstream technologies and assistive technologies. Of course, the two categories are not so neatly delineated in practice.
7. In fact, abandoning a function may be the most common reaction to some functional limitations. This psychological phenomenon deserves much more attention in the context of "consumer behavior" and "adoption of innovations".

8. According to Everett Rogers' classic work on the adoption of new products, Diffusion of Innovations, only about 1% are "innovators" and about 13% "early adopters.


11. Two examples come to mind. The telecommunications relay service (TRS, or "deaf relay") is the subject of many experiments with speech technology, wireless communications, and IP telephony, but its most frequent users care more about relay operator language and typing skills. A steady stream of funding has been poured into robotics research for people with mobility impairments, but most of these people would prefer increased funding and improved training for personal attendant services.

12. However, often the model with the widest range of features is also the most expensive model; people with disabilities wind up paying more, both for the feature they need and for other deluxe features they cannot use.


14. Thus we have the somewhat amusing insistence by advocates that even though UD dramatically enhances mainstream revenue, mainstream companies must be forced by law to adopt it.

15. Prime among them is NIDRR's support of both the Information Technology Technical Assistance and Training Center (ITTATC), and the Disability and Business Technical Assistance Centers (DBTACs).