WebAnywhere: A Screen-Reader In The Cloud

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This NCTI’s Tech in the Works team provides usability and design implications for developing assistive technology for the cloud age. A commitment to open source standards and freeware as a fundamental principle of access is clearly on display with WebAnywhere. A “Google TechTalk” on the system is available on YouTube.

WebAnywhere Aims to “Do What it Says”
The purpose of the free-of-cost WebAnywhere screen-reader application is easy enough to grasp, as Jeff Bigham quickly outlines:

We originally developed WebAnywhere with the idea to make a system that would let a blind person use any computer that they happen to have access to, whether that’s the library computer, the computer in their school, the computer in a hotel business center, a friends’ laptop, etc. This was a problem that people without disabilities don’t have to worry about, right?

This ability to walk up and use a publically available or privately authorized computer in daily life is increasingly expected by users. Generally, operating systems, applications, and system configurations are consistent enough across platforms such that “Somebody without a disability can go up to them and probably get by in using them.” Yet, as Jeff points out, for many users who are blind, who have computing needs that are often greater than for the general population, this is still usually impossible. So Jeff and IBM’s Almaden Research Center asked,

What if assistive technology really did live in the ‘cloud’? Then you could have both the assistive technology and the user’s preferences follow the student
Continuing, Jeff points out, “As far as we know, all of the solutions that have come before us require you to install something or run an executable on the machine that you want to be accessible.” This is a major part of the access issue: extant software-based solutions have inherent problems including expense and the need to install some level of software on each computer to be used.

WebAnywhere functions like familiar screen-readers, employing many consistent conventions, but can be called up on the web – usually with a minimum of assistance – on any web-enabled system. Potentially, this solution may make multi-system computing as easy for the blind as for the rest of us. However, the technical challenges are far from insignificant, as Jeff explains regarding the current iteration:

What we had to do was solve a lot of really hard architecture-level computer science problems in making something as complicated as a screen-reader work inside of the web browser. We (the WebAnywhere application and its designers) don’t have access to things like local text to speech, which most applications can just use a built-in operating system support for. We do all of this kind of complicated stuff where we get the speech from a remote server and then send it back to the browser – where it’s then played locally.

Indeed, while there is a volume of encouraging anecdotal feedback that WebAnywhere is being used extensively, Jeff realistically indicates:

I think that we’re still at that point where we’re still developing it to the point where it’s so reliable that people would really count on it in their everyday lives. I think that most people are using it as kind of a back-up… if the computer they have doesn’t work yet (in any other way).

WebAnywhere Makes History Repeat Itself
Jeff frequently strikes an emphasis on the term “originally” as he discusses design intentions and the two-and-a-half year life span WebAnywhere has experienced so far. This is because a major portion of the usage reports coming in show that, “Multiple modalities can actually help with reading,” and that the system is being called up on
a regular basis in classrooms to provide support to a broad spectrum of students, especially those with learning disabilities and other reading challenges. This precisely tracks the transfer of resident software solutions like Kurzweil’s that were also initially focused on blind users, but which evolved into systems like Kurzweil 3000 for sighted users and broader purposes. To account for expanded use, the system is being continually modified and updated.

NCTI Tech in the Works Award Pushes Tech Transfer

WebAnywhere is still not promulgated explicitly as a general reading/learning system, and Jeff was just as surprised at this broad usage of the application as were his predecessors in the software world a generation earlier. He points out, “It didn’t, for instance, highlight what was being read as it went along. This “got us thinking ‘why?’, and also how we might better support that use case.” This spurred collaboration between the University of Rochester and IBM to push the solution and data gathering further:

As part of our NCTI award we pursued two main goals. One was to make it easier for people who were not blind but who were using it, for instance, to help reading, to use it for that purpose. It also allowed an investigation in schools to try to understand what are some of the actual reasons that people in schools might want to use something like WebAnywhere (in that setting).

Tackling the Problem of Continuity

Most developers are, naturally, interested in real adoption of technology and have an awareness of a range of variables that may hinder ongoing use. Jeff has taken the question a step further, using the term “continuity” to refer to consistent, continuous use across environments, contexts, and time. This concept encompasses nuances of the interaction between human and technological systems via a slightly shifted concept which includes components of transition as well as environmental variables. A simple example is that a student may have AT at school, but not at home – the beginning of many possible gaps that conspire to prevent use.

However, Jeff points to school-based participants in the study to sum up the issue with all of its greater complexities. One stated, “Every year you come in, and unless you have people who really make sure they pass that torch – and you have a good foundation for WHY they have that match [of student and AT] – you start at the beginning all over again.” Jeff explains,
It’s already hard to learn how to use much assistive technology – it’s complicated. On top of all that, students are expected to keep up with a classroom pace that is pretty aggressive. If they sit down and the computer doesn’t act like the computers they’ve already learned how to use, often times they’re more likely to just give up. If you throw that one more wrench in there where they also need to be able to adjust to changing AT preferences… I think that’s one of the reasons why we are seeing such dismal adoptions rates among people with disabilities and schools themselves.

Jeff sees successive generations of students leaving school “Without appropriate skills with the assistive technology that should let them have access to all the great information on the web: for education, employment, and even governmental services. This despite all the work done by organizations like NCTI, the Department of Ed, and state organizations – and even though funding for AT is becoming more available.” He sees the gaps not only in transition from grade to grade and, for example, from elementary to middle school, but even from lab to classroom within a single year’s educational experience.

While Jeff feels that attention to links within human systems is important, the punch line for him is that systems like WebAnywhere, which can be used across platforms and offer built-in transparency and continuity in the user interface, must be a major part of the solution. Incorporating the proliferation of small, mobile technology which is often developed without regard to universal design, he concludes,

You have a new platform on which all this existing code you have to support accessibility doesn’t actually run. If you could do that in the web – in the cloud – then maybe even these brand new devices for which no one thought about supporting with accessibility could I be accessible right out of the box. I think that’s a pretty powerful idea.

Success in Collaboration
A primary additional purpose of the study, then, was not just to expand the naturally emerging usability of WebAnywhere for additional populations, but specifically to examine how it could be modified – along with other technologies – to combat the predominant “discontinuity” Jeff observes in the present AT world.
Like so many collaborations reported on by NCTI, the success of the collaboration to develop – and further develop – WebAnywhere was rooted in a prior relationship between Jeff and personnel at IBM Almaden. Jeff had interned there, and worked on an application called "Trail Blazer" which ran essentially as a macro on the web, allowing blind users to effectively copy and replicate similar tasks on various websites – for instance running equivalent research inquiries on various library websites without having to re-enter information manually. The success of that project made it easy to follow up with the more complex web screen-reading challenge, and as Jeff reports,

We were now trying to make all of the other (reading related) pieces work, like now it does actually highlight what’s being read, it supports the mouse better as an input device, and so on. The people at IBM Almaden have dealt with a lot of these types of problems before, and were able to give us a lot of guidance as we went through solving these technical problems.

In addition, the team built in new levels of customization, feedback to the user, and a tutorial for the system. However, technical resources were not the only benefits of the connection with IBM, as Jeff elucidates,

We also worked with them to help prepare infrastructure for some studies that will allow us to record people’s interactions with Web Anywhere in realistic settings so that we can get a better sense of how they’re (users and teachers) using it. It’s providing more quantitative information about where it works and where it’s failing them. So in particular they have projects that approached this already, but needed to be adapted a bit to work with our setting with WebAnywhere.

Notably, collaboration also included school personnel and students via focus group research.

**Design Recommendations**

Although this collaboration has led to a re-vamped and more flexible product, perhaps the most momentous outcomes have been a set of carefully considered “design implications”. These include:
Easy Installation (or none at all): The team determined that matters surrounding installation, permissions, lack of portability, communications, and so on, are a primary barrier to technology continuity. They recommend absolute minimization of resident installations.

Easy Setup: The team believes the complexity of technology should be absorbed on the design end, with actual use being as obvious and fast as possible. Better feedback and cuing systems should be designed into systems for transparency.

Discoverability and Feedback: Jeff and his partners feel that clear usability cues should be offered not only explicitly to users, but to a range of people with various degrees of technological sophistication who will assist and work with them in various situations. Well designed technology that makes configuration and feature sets clear to all can help substantially in reducing confusion that leads to discontinuity of use.

Account for Culture: The team recommends maximum adaptability on the part of technology itself to withstand the vagaries of disparate organizational cultures, including policies on security and permissions. Users should not have to obtain special permissions for general use tasks.

Design Technology to Communicate and Grow with the User: Psychologist Donald Norman has written extensively about the need for technology to carry, crystallized within its design and presentation, a capacity for communicating images about itself with users. This includes fundamental messages about use and purpose, and Norman credits the failure of human/technology communications with a range of minor to extremely serious accidents and societal problems. In a similar vein, Jeff’s group feel technology must hold simplicity and clarity as top values:

> Often times with AT, it is more important to maintain simplicity than to pack in features. New or extended features should have the ability to be applied to the device once the user feels comfortable doing so. In other words, the device should grow with the user; the user shouldn’t be (forced) to grow into the device.