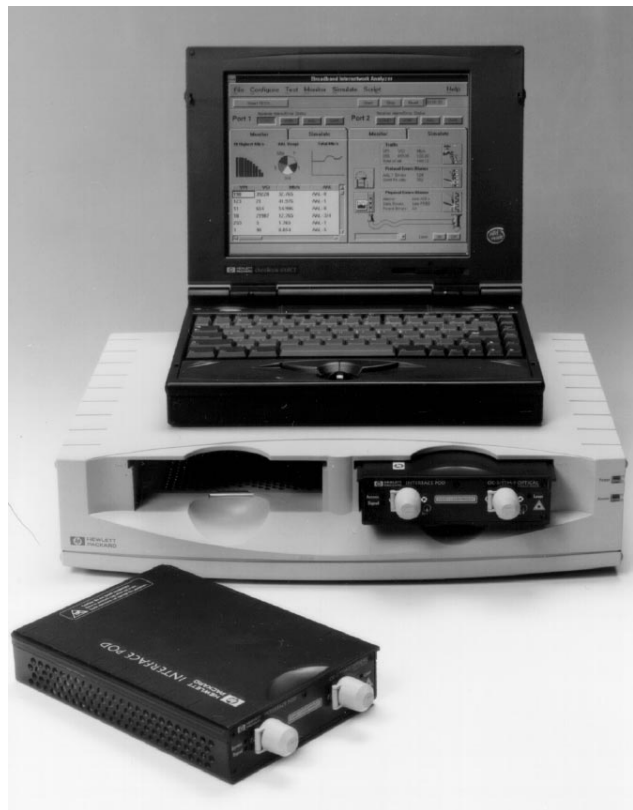


# Usable Usability

Usability engineering aims to improve a product's ease of use by focusing on user needs. "Usable usability" also considers the needs of the product developers.

by **Peter G. Tighe**

Misguided usability engineering effort is a waste. So how do you get maximum benefit from your investment in usability engineering? This article discusses some of the methods HP's Australian Telecom Operation (ATO) used while developing the new HP E5200A broadband service analyzer (Fig. 1). The service analyzer is designed for installers and maintainers of large telecommunications networks that employ BISDN (broadband ISDN) technology, such as the information superhighway networks.



**Fig. 1.** HP E5200A broadband service analyzer.

Traditionally, usability engineering aims to improve a product's ease of use by focusing on the users' needs, behavior, environment, skills, and so forth. "Usable usability" takes this one step further by also placing high focus on the needs of the product developers—in this case, the ATO staff.

The usability engineering motto, "Know your user," can be easily extended to include "Know your organization." This can be as simple as understanding that the development engineers frequently don't read paper reports, that they prefer to read e-mail, that they are professional but are always in the mood for a laugh, or that when they sarcastically criticize someone they are actually complementing that person. So the first step was to align usability efforts with ATO's business and staff needs. The remainder of this article explains some of the results.

## Understanding the User

One of the first and most essential steps quoted by almost every textbook in usability engineering is user analysis. Understand, live with, and love your users so much that you feel that you can predict their behavior.

We lived with the customers, we stood over their shoulders while they did their jobs, we asked questions when we could, we helped them do their jobs, we ate lunch with them, and we interviewed some of them intensely. We gathered information on what users looked like, on what they did, on what their environments were like, on what skills they had, on their education, on how they preferred to learn, on their tolerance limits, and on what they liked or disliked.

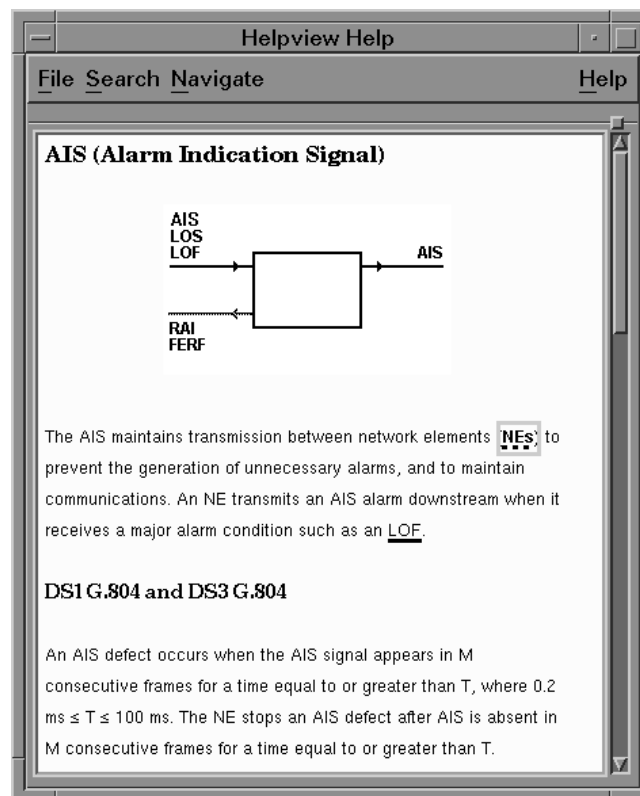
Being in Australia, we couldn't visit a customer in the U.S.A. whenever it suited us. We needed to condense all of our visits into one or two trips. The sheer quantity of quality information gathered created challenges, too. To meet these challenges, four techniques evolved and proved very successful:

- Onsite experts
- Meet-the-user e-mail
- User nicknames
- User artifacts.

**Onsite Experts.** We found that giving a customer access to a telecommunications engineer from ATO was a very effective way of gaining the customer's attention. It's a win-win situation. Both the customer and ATO engineers have the challenge of keeping up with the rapid changes in telecommunications technology. The ATO engineers get access to real-life situations in which ATO products are being used. The customer gets some free advice from the ATO engineer, has a chance to influence the direction of ATO products, and sometimes gets to see a prerelease product. Meanwhile, a usability engineer gathers the information required to make ATO's service analyzer easy to use.

**Meet-the-User E-Mail.** An example of meet-the-user e-mail is "Meet Billy B. Bob," one of the trip reports produced from our customer visits. An outsider might view this trip report as unprofessional or brash. Yet, to the ATO staff, it was essential, entertaining, memorable, informative reading.

Billy was not ATO's target user, but he works with and shares our equipment with our target users. The lessons ATO learned from Billy were explained explicitly in a summary trip report and presentation. For example, Billy only reads the manual for the exceptions to the rule. He actually expects to be able to use the service analyzer without training, relying on his industry knowledge. Billy also states he is new to BISDN technology and is very willing to learn. This affected ATO's documentation team, resulting in an online help system that not only explains how to use the service analyzer, but also allows users like Billy to probe (using hyperlinks) into details about BISDN technology (see Fig. 2).



**Fig. 2.** HP E5200A broadband service analyzer online help also teaches users about broadband ISDN technology.

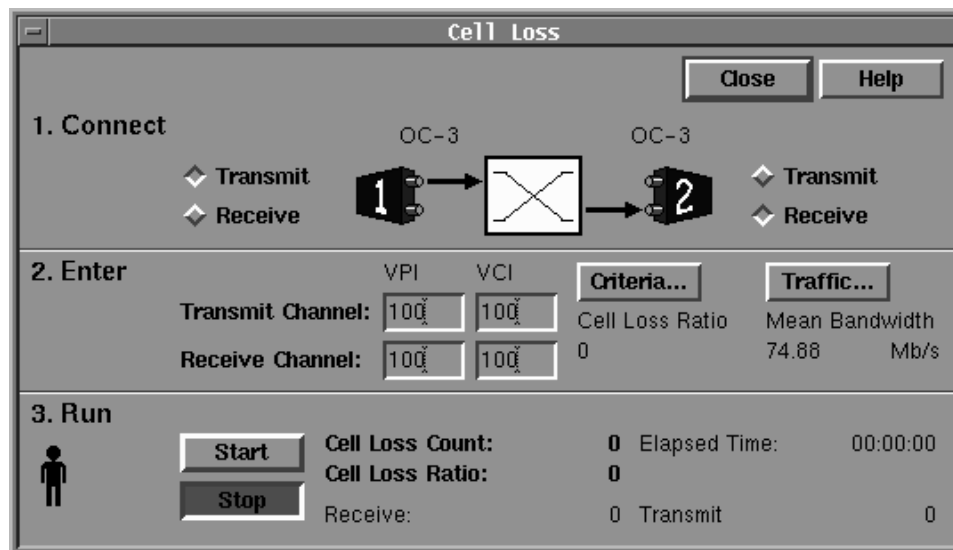
Another deliberate approach was to include very personal details about Billy in the meet-the-user e-mail. This was a very effective method of influencing product design decisions. The product developers became very conscious of the user, which made a big difference in their attitudes—they became more sensitive and understanding to users' needs, resulting in better design decisions.

**User Nicknames.** The results of the user analysis revealed that most of ATO's users fall into three distinct categories. Each category has different skills, education, working environments, aspirations, and day-to-day tasks. To characterize these types of users, ATO marketing invented "Telecom Tom," "Protocol Pete," and "Gigabit Guru." These names are now part of the vocabulary of every ATO staff member. The nicknames are referred to in situations ranging from manufacturing problems to design opportunities, from order processing requirements to marketing strategies, and from lunch-table discussions to high-level business plans.

The real success of the nicknames is not just that they summarize a user's characteristics swiftly and succinctly. They also summarize the use scenarios of ATO products, that is, they represent complete descriptions of the situations in which ATO products are used. Bruce Tognazzini<sup>1</sup> describes how important scenarios are to user analysis: "The scenarios were not dwelled upon during the design process, but were always in the background, ready to be referred to when pressing an argument or forming a new idea." This is much like what happened at ATO, thanks to the user nicknames. For example, people would say, "This is mainly used by Gigabit Guru, so in this case ease of doing is probably more important than ease of learning." "Yes, but might Telecom Tom need this information?"

For example, the most popular use scenario for Telecom Tom can be summarized by one particular users comment during a customer visit: "I don't want to understand the technology, like how cell loss is measured, I just want a button that says Test Cell Loss, and when I click it, it tells me if cell loss is good or bad."

The result was the cell loss SMARTtest, as shown in Fig. 3. Telecom Toms use at least five other network analyzers. They have to support high-profile companies, such as airlines and banks, with mission-critical network connections. Every problem is important and urgent. They also install and maintain at least five different types of network elements (switches, routers, bridges). They simply don't expect to remember technology details—they expect help from the technology itself, or from an expert in that technology. The cell loss SMARTtest is an example of how the service analyzer directly addresses this concern.



**Fig. 3.** The cell loss SMARTtest.

**User Artifacts.** Meet-the-user e-mail messages and user nicknames, although very efficient forms of communication, are both secondary to hearing it "from the horse's mouth." The reader must place a lot of trust in the storyteller. Here, videos, photos, documents, broken equipment, or even just a user's notepad can be extremely valuable.

## Usability Testing

As mentioned earlier, the purpose of user profiling is to understand, live with, and love your users so much that you feel that you can predict their behavior. Unfortunately, no matter how well you know your users, you can never fully predict their behavior. This is why usability testing is so important. Says Donald Norman,<sup>2</sup> "... even the best-trained and best-motivated designers can go wrong when they listen to their instincts instead of testing their ideas on actual users."

For those not familiar with usability testing, it's a very formal process of observing users attempt to learn and operate a product in real situations. A good reference for more information is Rubin.<sup>3</sup>

Usability testing can be tackled in a number of ways. For example, there are expensive ways such as using laboratories with one-way mirrors and complex data recording equipment. Or there are cheap ways such as visiting a customer with a prototype computer and a portable video camera.

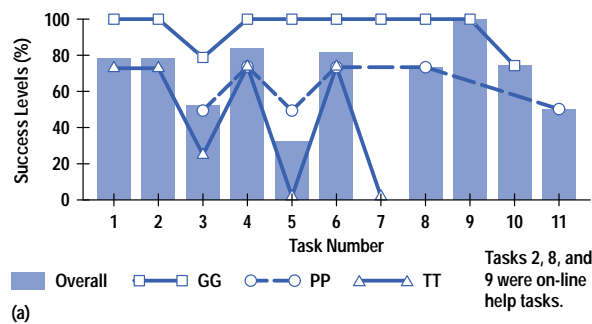
Fortunately for ATO, the cheaper option was the most suitable. ATO's customers are very busy. It was much easier to get a block of a customer's time if ATO engineers traveled to the customer's site. This gave HP a chance to see the users in their real environments and to meet other users in the organization.

One of the disadvantages of this cheap form of usability testing is that it is more difficult to control. Many external factors can intimidate the user and corrupt the test. For HP, this proved to be a minor problem. Low-skill users showed intense concentration while trying to grasp BISDN technology, and soon lost signs of intimidation. High-skill users loved the chance to show off what they knew and talked about the technology. Regularly they would stay after the usability testing and drive very motivating discussions about the technology and how ATO could benefit from it.

Usability testing was a very motivating and creative experience for everyone involved. The sales force was completely motivated after seeing ATO staff listen to and watch the user. They could also see the excitement the customer showed.

## User "Hot Spots"

User hot spots is a technique that focuses on minimizing the development team's information burden. No matter how much information was gathered from a usability test, we always reduced it to approximately five of the most important items (see Fig. 4). Anyone who has ever done a usability test will realize how difficult this can be—so much information is gathered in one test.



### Mental Model Clash

- Previous experience with BSTS and other analyzers is affecting ease of use
- Users did not expect autoconfigure and an automatic link summary
- Wanted to override with a manual configure anyway
- Solve: Bootup and hot swap messaging
- Loopback expected inside configure.



### "What does Commission Mean?"

- Commission confused with configure.
- "Equipment" and "Service" grouping not understood.
- Solve: Put tests on front panel "Cell Loss & Cell Delay," remove test grouping for release 1, more effectively, communicate "predefined" tests as being a separate environment.



### Labeling and Messaging

- Monitor windows and simulate windows confused.
- Not enough feedback when errors/traffic is simulated
- Four alarm buttons still visible when simulate tab is active.

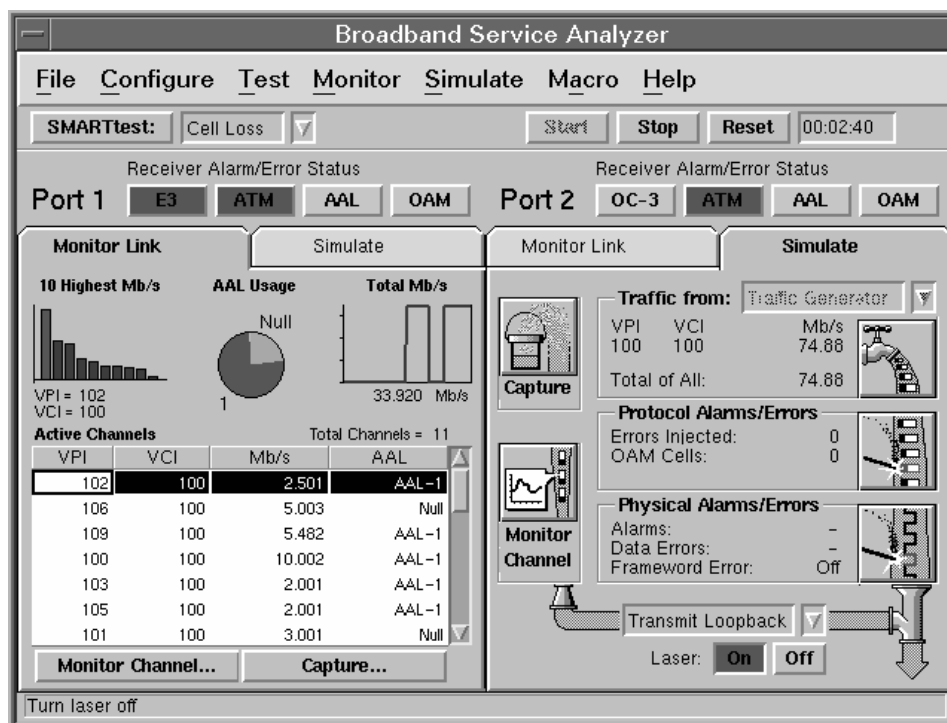
**Fig. 4. Usability test reports.** These condensed weeks of data gathering into approximately five basic critical issues, called user hot spots.

## Testing Enhances Creativity and Motivation

Putting it simply, de Bono<sup>4</sup> explains why usability testing actually enhanced ATO's creativity. "Having to be correct at every step makes creativity virtually impossible." Knowing there would be second chances, ATO engineers were able to risk all sorts of new design ideas. They exploited this opportunity to do some creative thinking. The de Bono technique called "Six Hats Thinking" was used.<sup>5</sup> When "wearing" the green (creative) hat, we used the "Provocation" and "Random Word" techniques to help generate alternative, unorthodox ideas. De Bono<sup>5</sup> describes a provocation as crazy idea that is designed

to take people out of their normal perceptual patterns. It challenges assumptions and impressions that everybody seems to take for granted.

For example, one provocation ATO engineering used was: “What if the user could do the most frequent task without having to press a single button?” After overcoming the apparent absurdity of this idea, the engineers soon realized that it was going to be possible. From this, the link monitor was created (see Fig. 5).



**Fig. 5.** The link monitor tells the user what's happening on the network without any button clicks.

The link monitor is a new concept in network analyzer design. Without any button clicks, it performs the most frequent task—discovering what's happening on the network. This task is intuitively basic and not immediately obvious. Ask any group of network troubleshooters what they do, and only a few will mention this task. The rest will assume they already know what's happening on their network. It's similar to typing using a word processor. Imagine if you had to select Edit/Type from the pull-down menu every time you wanted to start typing.

The second new idea in the link monitor can be compared to tools such as automatic spell-checking and grammar checking in a word processor. For example, as you type “hte” it changes it to “the.” Similarly, the link monitor tells its users of network problems without their having to click any buttons. So when do users click buttons? Only when they want more details.

## Task-Based Design

A rule of thumb for usability engineering is, “Design for your user's tasks.” The HP E5200A broadband service analyzer project was no exception. The online help describes realistic tasks to users. The user interface is structured to follow a typical user's task flow (see Fig. 6).

The end result seems quite simple, but it's a challenge that ATO worked hard to achieve. Why? Telecommunications technology is full of structured detail about network protocols and standards. It's very easy to get involved in these technology details and lose focus on the user's task. ATO avoided these complications by using the user nicknames (mentioned earlier) and regularly repeating the question, “What's the user trying to do with this information?”

## Rapid Prototyping

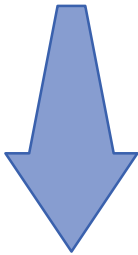
Rapid prototyping proved to be an ideal strategy for this project. ATO chose Microsoft® Visual BASIC as the prototyping tool. Visual BASIC was not suitable for ATO's application development environment. Its major advantages were the speed and flexibility with which screens and screen behavior could be prototyped. These advantages suited ATO's dynamic and creative attitude to GUI prototyping. In fact, it gave ATO much more freedom than expected:

- Initially, the prototype was way ahead of the user interface specification. It actually replaced the need for a GUI specification in the early stages of product definition.

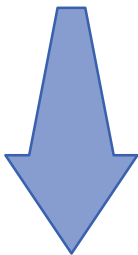
1. What's happening on my network/network element?



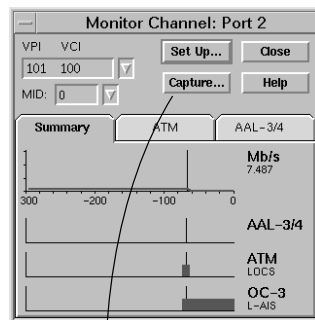
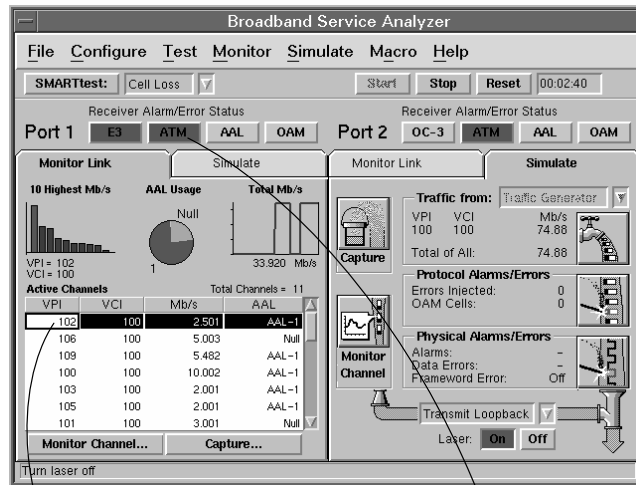
2. I think the problem may be here, let's take a closer look.



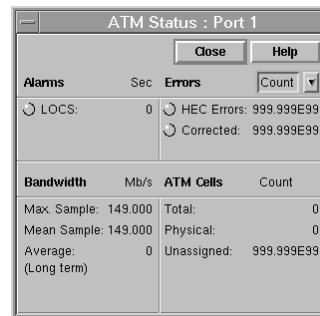
3. I think I've found it, let's see if that really is the problem.



4. I've fixed it—let's make sure everything is OK now.

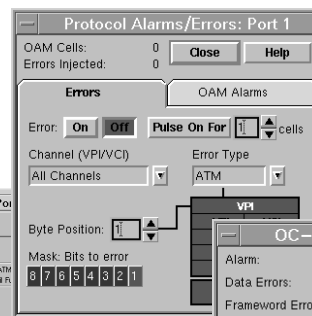
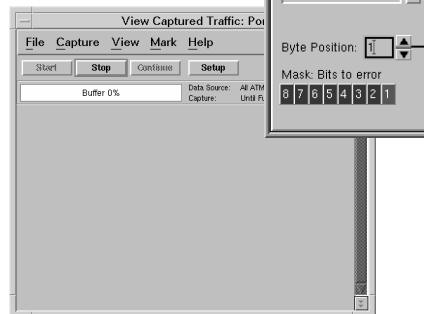


Channel monitored in real time.

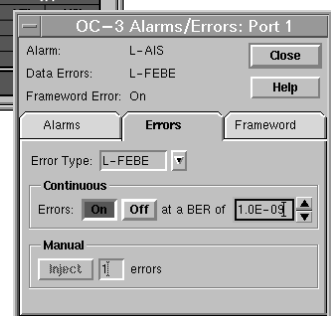


Alarms monitored in real time.

ASCII, hex, or binary representations of network traffic.



Simulate network behavior such as artificial load, alarms, and errors.



**Fig. 6.** A user's typical troubleshooting tasks, and how the user interface makes these tasks easy. The more detailed and less frequent the task, the deeper the user delves into the user interface.

- The prototype was used as a selling tool. Sales force and customers were able to see and interact with a prototype product long before it was even on our price list.
- Early in the project, everyone felt they were talking about the same thing.
- Early prototyping eliminated major product changes from the middle to the end of the project. The “It’s too hard” excuse or the “programmer’s attachment to work” did not hinder conceptual design.

## Conclusion

This article has conveyed some ways of maximizing the benefit from an investment in usability engineering. The staff at ATO believe some of this work was breakthrough and an inspiration for other usability projects. But remember, most of the methods described in this article came from first analyzing the organization’s needs. These methods may not apply to other organizations, especially if they have different needs and a different culture from ATO.

There is one factor that is important to secure before trying to apply these methods in other organizations—that is, management’s support to experiment with how usability engineering is applied. This support is all a motivated team needs to succeed with usability engineering.

## Acknowledgments

Most of the best practices described in this article have been successful because of the advice and direction given by the intelligent product and media group at Hewlett-Packard Corporate Engineering, Palo Alto, California.

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