

Using Technology to Achieve Ease of Use

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The user interface is a critical determiner of the success of AT&T's products and services. Customers demand interfaces that are attractive, entertaining, and easy to use. New technologies promise significant improvements in the interfaces between people and systems. However, care is needed to ensure that these technologies produce results that are in fact easy to use. The articles in this issue describe ways to achieve high quality user interfaces in AT&T products and services. These include a user-centered approach to design and development, the use of standard interfaces to provide a common look and feel across products, and the use of software tools that promote good design principles.

Introduction

New technologies are changing how people interact with products and services. Both evolving and new technologies are expanding and enhancing the user's interface to products and services, making them easier to access and use. Indeed, many of the new technologies currently reshaping information services and communications are aimed primarily at improving the interface between people and systems.

A user's interface includes the user's actions or input, the system's response to the user, and the dialog or interaction between the user and the system.

A number of new technologies are affecting user interfaces:

- Speech recognition, character recognition, and pen and touch techniques enhance the users' access to a system, providing more natural and flexible ways to enter information. These include speaking numbers and commands, entering data freehand, or touching screen icons to make a selection.
- High-resolution graphics and window systems, hypertext, text-to-speech conversion, video, and multimedia displays present large amounts of information in easy-to-understand formats. Mixing text, images, and graphics can make documentation more attractive and effective.
- Natural language understanding,

applications of artificial intelligence and expert systems, and object-oriented interfaces expand the dialog between the user and a system, giving users increased control of the sequence of operations in an application.

Applying these and other interface capabilities effectively is important for AT&T, because the user interface is a major factor in determining a customer's impression of AT&T's products and services. It is becoming clear that customers care about both usability and the quality of the user interface. Good user interfaces are a necessary foundation for success in the market, especially in areas like consumer electronics, information services, and personal computing. Customers not only expect, they demand, interfaces that are attractive, even entertaining, and easy to use. Products perceived to be easy to use—and companies that have a reputation for producing them—have a significant advantage over those that are not.

Though the use of new technologies may enable improved ease of use, they alone cannot guarantee it. Indeed, new technologies, unless they are carefully applied, can even degrade the user interface. The proliferation of articles in the press on the complexity of user interfaces suggests that this problem has become widely recognized. Applying a new technology to increase the power of the

user interface—without being careful to keep it simple and easy to use—often leads to products that are too complicated for users to operate, and features that remain unused.

An Example: The Telephone User Interface

The history of the user interface to basic telephony—how people make phone calls—illustrates how usability can be affected by changes in the technology of the interface.

Often cited as a good example of ease of use, the telephone user interface has historically been simple, natural, and direct. Years ago, the caller talked to an operator who established the connection. Then a new technology, the rotary dial, made it possible to replace the operator by letting users themselves dial the calls. Although less personal and “intelligent” than the operator, the user interface, a rotating dial powered by a user’s finger, proved simple and easy to use. Once learned, a stable and ubiquitous numbering plan and dialing procedure allowed users to easily place calls anywhere. The introduction 25 years ago of dual-tone multi-frequency signaling, better known to customers as touchtone dialing, made dialing even faster and easier. The customer only had to press a button to register a digit, and didn’t have to wait for the rotary dial to reset between each digit selection.

In recent years, touchtone dialing and voice response systems have enhanced the power of the telephone user interface, enabling services to be developed for voice messaging, telemarketing, and accessing information. Unfortunately, these developments often have led to complex interactions between the user and the service, and to confusing rules for entering choices or selections via touchtone. These developments sometimes turn a simple, usable system into one that is often complex and frustrating. Even the familiar numbering plan that assigns area codes to distinct geographical areas will soon change, adding even more complexity to the simple act of dialing a number.

Nevertheless, the telephone user interface will continue to change rapidly. For instance, videotelephony is expected to become widespread. Personal communicators will feature graphical displays and pen and touch input to dialing. Speech recognition interfaces promise to make dialing and other telephone transactions easier and more natural. Eventually, speech recognition and natural

language understanding may bring us full circle, to an interface that is as natural and as easy to use as talking to an operator.

A similar story could be told about the user interface to almost every class of product or service: graphical interfaces for network management and operations systems; speech recognition, graphical displays and pen input for enhanced telephony and transaction terminals; multimedia interfaces for conferencing; and “groupware” hardware and software interfaces that permit interactive, real-time, computer-supported cooperative work. In each example, new technologies give the user greater power, but more work is needed to ensure that the product or service is easier to use and more attractive than what it is replacing.

In other words, we are at a point where the possibilities of new user interface technologies are exciting. Care is needed in applying them, however, to ensure that the results are truly an improvement.

Approaches to Designing for Usability

The papers in this issue of the *AT&T Technical Journal* illustrate several approaches that can help to ensure a good user interface:

- A *user-centered* approach throughout the design and development process ensures that the definition and realization of a product or service are guided by information about user needs, and by extensive feedback about how well the design satisfies those needs. Though this approach should be applied to almost all aspects of a project, it is particularly important for designing and developing the user interface. An important feature of this approach is *rapid prototyping* to produce versions of the interface that can be evaluated, by both users and experts, to provide continuing feedback on the design.
- *User interface standards* provide users a consistent look and feel to products and services, permitting developers to create a distinctive corporate “signature.” Standards-based consistency promotes easier use by offering a single interface model to learn that can then be applied to access many different products and services. One reason the traditional telephone is easy to use is that it is based on a de facto interface standard. Standards also contribute to ease of use by capitalizing on the design expertise of many people, and the experience of multiple projects, thereby

promoting the reuse of interface designs that have proved successful. They also serve to speed and simplify development.

- *Software tools* can improve user interfaces by promoting good design principles. Sometimes, the tools also can give user interface designers more direct control over the implementation of the interface.

Overview of This Issue

The papers in this issue of the *AT&T Technical Journal* reflect the breadth and scope of work to ensure that new technologies are easy to use:

- Cunningham, Blewett, and Anderson's paper on graphical interfaces for network operations and management shows how graphical user interface (GUI) technology improves the usability of management systems. It also illustrates the importance of standards and software tools in creating easy-to-use systems. They show how the flexibility and power of tools, like the `xtext` language, can make iterative design refinement possible even in large and complex systems.
- Henneman and Rubini describe how a user-centered approach to design increases the usability of NCR transaction terminals. They also present the use of new input/output technologies—such as graphics, voice recognition, and pen and touch input—and discuss how to decide when to use which technology.
- Speech recognition and other aspects of voice processing will change the user interface to telephony and network-based services, and is becoming increasingly important to AT&T. Wattenbarger's paper reviews some of the important human factors issues involved in designing interfaces using speech recognition, and illustrates how seemingly small decisions about the interface design can have a significant impact on the service's usability.
- Millen's review of pen and touch interface technologies, and Blanchard, Angiolillo, and Israelski's discussion of how to design interfaces for videotelephony, deal with two other ways the telephone interface is

being enhanced. Both present instances in which these new input and display capabilities promise to improve the user interface—but also raise important new issues of their own.

- Benimoff and Burns discuss some of the challenges to designing user interfaces for multimedia systems. They also illustrate the idea of employing concrete usability goals to help guide development.
- Documentation is a crucial part of the overall user interface to many products. Online documentation is changing how documentation is written and delivered. Baldasare reviews some AT&T work on electronic documentation and the usability issues associated with it.
- Finally, Opaluch and Tsao describe specific processes and approaches to designing and developing interfaces that help ensure that the resulting products and services are easy to use. Their rules and procedures can help any organization improve the quality and usability of its products.

As a leader in establishing human factors as a part of the R&D environment, AT&T has a long tradition of taking usability seriously, and of producing products and services that are recognized for their ease of use. As a leader in communications and technology, AT&T needs to ensure that new technologies are applied in a way that continues to produce interfaces that are distinctive, attractive, and easy to use. The papers in this issue illustrate how this can be done.

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