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11th International Symposium on Human Factors in Telecommunications

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Dear [REDACTED]

We are pleased to inform you that the Technical Program Committee has accepted your paper entitled :

A CONSUMER EVALUATION OF THE TOUCHPHONE CONCEPT

for inclusion in the poster session in the 11th Symposium.

The poster session is presently being used by a number of scientific and technical societies. A specific time on the order of 1 1/2 hours during the symposium would be set aside for this session. Each author at the poster session would have a display board to post graphs, photos or other visual aids. All poster session papers would occur simultaneously, with the audience moving between boards. Authors for the poster session are asked at least to submit a 500 word abstract for the Proceedings by 30 April, 1985. A full manuscript of 2000 to 4000 words will also be welcomed if you wish.

2 pages

The proceedings will be phototypeset and complete instructions to type your abstract are enclosed. Please send us your original typing as camera-ready form.

On behalf of the Technical Program Committee,

Yours faithfully,

Francis KRETZ

P.S.: please combine in one paper this one and the one entitled "A new generation of Telecommunication terminals" (coauthored with C. Baumiller, L. Bloedon, S. Cohen - Sfetca).

The 11th Symposium is sponsored by the CCETT and the CNET

A New Generation of Telecommunications Terminals

Abstract

This paper will describe a new generation of telecommunications terminals designed and developed by Bell-Northern Research for Northern Telecom Limited, which embodies the principles of a soft machine in its purest form - with neither mechanical keys nor typed commands.

An increase in functionality for satisfying communication needs has typically meant an increase in the complexity of terminal interfaces with either an unmanageable number of keys or an involved programming language, leading to confusion and poor usage of the communication services. The terminal should have a small footprint, show status, not be intimidating, allow easy expansion of services, and be multi-lingual. What is needed is a terminal that provides direct access to the services through an interface that allows easy understanding, learning and control. The solution is a terminal with an interface that adapts to the selected service desired by the user - a soft machine.

The embodiment of this soft machine in a telecommunications terminal is TouchPhone. TouchPhone is an intelligent terminal offering voice communications capabilities, voice and text messaging, and personal administration services, such as directories, calendars, etc. It uses a touch-display interface, a PBX interface module, a microcomputer and software module, a audio feedback module, a handsfree module, a handset, a data communications module, all encased in a "box" as embodiment of a new generation telephone.

The design and development of this new terminal has involved the interworking of multiple disciplines including industrial, graphics, hardware ergonomics, software ergonomics, acoustic, audio, electro-mechanical, electronic and software design.

The first prototype was built in the Behavioural Laboratory; this led to informal evaluations, which led to formal testing of the performance of a dialpad on the touch-display, user acceptance of the touch-display for a featured telephone, the viability and user interface to personal administration services, etc. This iterative process of design and testing and re-design and re-testing resulted in the product that best satisfies user needs and market requirements.

The accompanying papers deal with specific areas of behavioural design and development: the consumer research that evaluated the user acceptance of the interface; hardware and software ergonomic experiments; the audio and acoustic experiments; and the industrial and graphic design.

TOUCHPHONE: The evolution and verification of a new generation of telecommunication terminals

Bell Northern Research Ltd.
Ottawa, Canada

One of the impacts of new technology on telecommunications manifests itself in the multitude of features and telephony services available today to users. Traditionally, user access to this multitude of services has been provided through adding more and more service/feature keys to the telephone set. Often, this approach resulted in forbidding arrays of keys, which led to confusion and frustration on the part of users, especially as most of the features are dynamic, and the corresponding keys are active only at very specific points in the man-machine dialogue. At the other extreme, attempts at providing traditional telephony access through a command language interface (a la computer) have met with user resistance.

One solution to this problem of providing easy access to a large number of services is to offer for selection only those keys that are valid (active) at any given time, or that are immediately relevant to the task being performed. In addition, confusion can be further minimized by providing context-dependent feature and service descriptions (prompts) and help instructions.

The first telecommunication product implementation of this solution is the Meridian M3000 TouchPhone designed by BNR and manufactured by Northern Telecom Ltd. Initially offered as a premium digital telset for the SL-1 PBX, the M3000 TouchPhone uses an internal microprocessor, RAM and ROM memory, and an LCD touch-sensitive display to provide only context-sensitive keys and prompts, which guide the user naturally through the logical sequence of features. The use of full text and graphics permits the design of visually intuitive and easy to use screens. Additional congeniality is provided through judicious use of audio and visual feedback.

This kind of context-sensitive interface is ideally suited to command selection man-machine dialogues - as in telephony. There are approximately 180 keys (including a full query keyboard), but less than 12 are generally offered for selection at any one time. Some personal services like alphanumeric directories, call logging, calculator, reminder, and dial-by-name are also provided.

Several ergonomic studies were carried out to determine ways to overcome the limitations imposed by the specific interface technology utilized, especially the lack of tactile feedback. Special care was taken in the selection of the touch-sensitive display module, as well as in the design of the audio feedback signals to provide an ergonomically robust interface.

In essence, the TouchPhone is uniquely characterized by the deep integration of functionality and user interface, with both elements fused to a degree unequaled before. This allows users to master the use of the TouchPhone without requiring heavy procedural training prior to utilization. A "discovery learning" process is sufficient, and, to a large extent, recommendable.

The user interface driven architecture of the M3000 set permits the addition of new features without requiring H/W and/or plastics re-design, and without forcing the user to change his/her cognitive model of the set, or to learn a new command vocabulary. Therefore, new services can be introduced without making the set obsolete. Common hardware and consistent user interfaces can be used for a family of products because differences in the underlying system (signalling mechanism, PBX or CO exchange architecture, etc.) can be masked by appropriate S/W in the set itself. In addition, the architecture allows sufficient flexibility (memory, processing power and touch-display area margins) for the user to dynamically allocate services to satisfy his/her changing needs. Also, the set is truly "international": it can be multi-lingual, with language changes achieved simply by software mods.

The TouchPhone concept emerged in the lab more than 3 years ago in an attempt to increase telephone set functionality by adding softkeys in the "classical" manner: correlation of mechanical keys with a 2 line display above. The natural step was to combine the two elements into a touch-sensitive-display sandwich. An experimental telephone was built and used to sell the concept on the basis of its functionality, flexibility and ease of service access despite the obvious cost penalties. A second experimental set, with an improved interface (larger display) and ergonomics (touch technology), was built to test the functionality and the user interface pertaining to a large number of PBX communication and personal computation services. Several test set-ups were designed and used for specific ergonomic experiments, before the development of the M3000 product.

An important part of the process of implementing an innovative product like the TouchPhone was the concept validation through consumer testing. A study was conducted in Canada with 175 respondents at all organizational levels, from a wide range of businesses. Respondents were given the opportunity to use one of the experimental models to acquaint themselves with the totally new interface modality.

The consumer research validated the design hypotheses and confirmed the value of the set on the basis of perceived functionality increase through better user interface. The set has broad appeal across several organizational levels as a high quality product, innovative and distinctive.

In essence, the M3000 TouchPhone represents the first of a new generation of telephony terminals, which will be highly valued by the users for its appeal, ease of mastering, and the "transparency" in which service access is provided.