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HUMAN FACTORS

INTERACTIVE SERVICES
DESIGN GUIDELINES

ITU-T Recommendation F.902

(Previously “CCITT Recommendation”)

FOREWORD

The ITU-T (Telecommunication Standardization Sector) is a permanent organ of the International Telecommunication Union (ITU). The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1 (Helsinki, March 1-12, 1993).

ITU-T Recommendation F.902 was prepared by ITU-T Study Group 1 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 21st February 1995.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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SUMMARY

This Recommendation provides guidance for the design of basic procedures for the use of interactive telecommunications services using DTMF input and voice response. These services are accessible from any DTMF telephone, or from pulse-dialling telephones with the use of an adjunct DTMF dialling device.

Recommendation F.902

INTERACTIVE SERVICES DESIGN GUIDELINES

(Geneva, 1994)

1 Summary

This Recommendation provides guidance for the design of basic procedures for the use of interactive telecommunication services using DTMF input and voice response. These services are accessible from any DTMF telephone, or from pulse-dialling telephones with the use of an adjunct DTMF dialling device. Consequently, the user's control of the service must be accomplished solely by the use of the 12 buttons of the DTMF dial (0-9, plus * and #). Recorded spoken messages or tones, called "prompts", are used to provide choices, guidance and feedback to users, and to ask for input of data such as telephone numbers, account numbers, time of day, etc. Choices are usually provided in the form of spoken "menus" that indicate which response (DTMF button) is associated with each available choice.

If these guidelines are carefully observed and good human factors design practices are followed, users should find such services easy to use, enhancing user satisfaction with them.

2 Scope

Interactive voice response equipment makes possible a variety of interactive services, in which users may control the operation of the service through the use of a DTMF telephone. These include transaction services, voice messaging, information retrieval and various supplementary services. This Recommendation is intended to provide general guidelines for the design of such services to ensure that they will be easy to use for customers and to provide some degree of consistency across services. It is intended to cover all such services in which the control by the customer is exercised through the 12 keys of a DTMF telephone set (the digits 0-9 plus * and #), and which provide prompting messages and responses in the form of recorded or synthesized speech. It does not include similar services controlled by voice commands interpreted either by human operators or by automatic speech recognition equipment.

3 References

The following Recommendations and other references contain provisions which, through reference in this text, constitue provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision: all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- CCITT Recommendation E.183 (1989), *Guiding Principles for Telephone Announcements*.
- ISO/IEC JTC 1/SC 18 N 4420 Revised Text of ISO/IEC 13714, *Information Technology – Document Processing and Related Communication – User Interface to Telephone-based Services: Voice Messaging Applications*. Proposed draft International Standard, 15 November 1993. Source: ISO/IEC JTC 1/SC 18/WG 9.

4 Definitions

For the purposes of this Recommendation, the following definitions apply:

4.1 **adaptive guidance:** User-tailored prompting, feedback or help messages that differ depending on the specific context in which they are presented.

4.2 **code**: String of digits (0-9 plus * and #) to be dialled to access a service.

4.3 **command**: A request by the user for the system to perform some function. It is invoked by entering a code (see above).

4.4 **default dialog**: System action that occurs in the absence of specific user request for a different dialog.

4.5 **delimiter**: Symbol (* or #) used to logically separate parts of an entry.

4.6 **dial-ahead**: The ability to enter DTMF input before the system has requested it. It is commonly used for rapid entry of data or a series of menu choices. In dial-ahead, a user enters a key-press or key-presses in advance of the associated prompt(s) and the output of these further prompt(s) associated with the input key-press(es) is suppressed.

NOTE – This term may also be referred to as a key-ahead, or type-ahead. The term dial-ahead is used in this Recommendation.

4.7 **dial-through**: The interruptions of the system output with DTMF input acted on just as if it had been entered at the end of the system output.

NOTE – This term may also be referred to as key-through or cut-through. The term dial-through is used in this Recommendation.

4.8 **dialling device**: DTMF device acoustically coupled to a telephone set.

4.9 **DTMF**: Dual tone multi-frequency encoding of key-press input. The definition of the encoding employed may be found in CCITT Vol. VI, Recommendation Q.23.

4.10 **DTMF device**: A device through which a user can generate (or, in the case of the equipment such as digital telephones, duplicate the effect of) the DTMF tones associated with the keys 0-9, * and #. This device is typically a DTMF-telephone but may also be a tone generator, a digital telephone used to invoke DTMF signals from a telephone switch, or a digital telephone.

4.11 **feedback**: Information supplied by the system to indicate that the user actions have had their intended effects, or have had unintended effect. Typically, feedback consists of a new prompt or message indicating that an action has had its intended effect, but feedback also includes error indications and tones.

4.12 **going off-hook**: Picking up the receiver or equivalent action to activate a telephone set.

4.13 **help**: Information provided, either automatically or upon request, to inform users of their available prompted and unprompted choices, and of their current place in the system.

4.14 **main menu**: The first menu encountered in the dialog when accessing a service.

4.15 **menu**: The presentation to the user of a list of possible actions. A menu typically consists of a set of prompts each describing an available function and the user action necessary to invoke that function.

4.16 **people with special needs**: Categories of users (e.g. elderly, children, disabled, travellers) who have special requirements in order to access a telephone terminal.

4.17 **prompt**: Auditory system output providing instructions or guidance to the users. Prompts consist of recorded or synthesized voice and/or tones.

4.18 **teller machine**: Automatic cash dispenser.

4.19 **time out**:

1) An interval of no user input that causes the system to change state.

2) The state change resulting from such an interval.

For example, a time-out during numeric input may be interpreted as end-of-string and cause the system to change from numeric input state to command state or some appropriate action state.

4.20 **user interface**: Software and hardware components through which a user can interact with a system.

4.21 **user-tailored menus**: Menus which are flexible so as to meet the different needs of the users.

5 Abbreviations

For the purpose of this Recommendation, the following abbreviations are used:

CCITT	International Telephone and Telegraph Consultative Committee
DTMF	Dual Tone Multi-Frequency
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
ITU-T	International Telecommunication Union - Telecommunication Standardization

6 Guidelines

6.1 Procedures

6.1.1 The benefit-to-cost ratio of the user access procedures should be optimized. In particular, for common and frequent procedures, entering long unstructured strings of digits should be avoided (e.g. by means of default values, logical codes, user-tailored menus, dialling devices), or such strings should at least be partitioned into logical chunks.

6.1.2 User procedures should be easy to learn. The design should facilitate the cognitive transfer of a user experience with similar services. The users should be able to generalize their experience from parts of the system to other parts of the system.

6.1.3 The design should not violate user expectations (e.g. the user procedures for using credit cards with telephones and teller machines should be similar).

6.1.4 The user interface should be adequate to the complexity of the service and the capabilities of the user. The user interface designer should consider the differing needs of frequent, sophisticated users and infrequent or new users. The cognitive load of the access procedures should be transferred from the user to the terminal or network by the use of suitable technology, as it becomes available.

Example:

The user should be allowed to invoke the service by name (Automatic Speech Recognition) or to pick it up from a menu displayed on a screen (screenphones).

6.1.5 User procedures should be flexible to accommodate individual preferences. For example, if users tend to enter the means of payment both before and after going off-hook, both orders of operation should be allowed.

6.1.6 Similar commands should be used to access similar functions (e.g. the same delimiter should be used to indicate the end of input).

6.1.7 When stating options in a menu, always present the choice first, then the action to achieve it (e.g. “To send a message, press 1 now”).

6.1.8 The speed of the interactive dialogue should not create anxiety in the user (e.g. if the user is entering a string of digits and keying stops in mid-entry, then wait at minimum 3 and at maximum 8 seconds before timing out).

6.1.9 Where universal (i.e. context-independent) commands, such as accessing help or returning to the main menu, are available, they should be preceded by the * key to preserve the remaining keys for context-dependent use. For example *4 might be used for “help”, *7 for “return to main menu”. Where they are widely available, the letters on the telephone keypad can be used to help users remember universal commands. For example, *H could be used to access “help”.

6.2 Opening message

6.2.1 Upon accessing a service a user should be presented with a welcome message identifying the service and making it clear the service is an automated one (e.g. "Welcome to the Universal Personal Telecommunications automated service").

6.2.2 It would also be advisable to verify the user is calling from a DTMF device.

6.3 Prompts

6.3.1 The user should be helped through the procedures by means of voice prompts. In the case of prolonged user inactivity a message or a default dialogue should be provided.

6.3.2 Prompts should be kept short, in order to avoid exceeding the capacity of the users' short-term memory (e.g. only four, or at the most five, choices should be presented on a single menu; choices should be numbered sequentially in ascending order and presented in decreasing order of frequency of use or grouped by logical functions). In the case of long menus, human memory load should be minimized by allowing users to hear the menu choices repeated. This may be provided either automatically or as a result of a user request.

6.3.3 Universal commands (e.g. "return to main menu", "delete", etc.) that are always available should not be described in each menu, but should be described in help messages or through user documentation.

6.3.4 When listening to prompts, user should be allowed to dial-through and dial-ahead, i.e. to interrupt and by-pass them. This permits experienced users to speed the use of the service and minimize frustration.

6.3.5 The use of tones as prompts should be limited to avoid confusing users. Tones may best be used for error feedback or for indicating when to speak to record a message.

6.3.6 When the service is used typically by frequent users, it may need only brief prompts, but when the service is used mainly by infrequent users, it may need longer, more detailed prompting messages.

6.4 Error handling

6.4.1 The system should be error tolerant and, possibly, prevent errors (e.g. through the use of context-sensitive error messages, re-prompting or adaptive guidance).

6.4.2 User-friendly error recovery procedures should be available. For example, upon entering invalid information, a user should be given a chance to re-try. Besides, if an error was made in the middle of a long procedure, the user should be asked to repeat just the last step, not to start the entire procedure from the beginning. Uninterruptible error messages may be needed to help users who make use of dial-ahead.

6.4.3 The users should be allowed to cancel data entry or actions that a user cannot recover from.

6.4.4 In the case of important, irreversible or critical actions, the user should always be asked for confirmation (e.g. "Your calls will be sent to NNNNNN. To confirm, press 1 now; to re-enter, press 2").

6.4.5 Help should be available at any time.

6.4.6 Help, in the form of repeated prompts, should be provided after a few seconds (depending on the context) of inactivity of the user.

6.5 Feedback

6.5.1 Immediate feedback should be provided after each user action to give the user the information that the system has accepted the input. This can take any of several forms, including interruption of the prompt in the case of dial-through. In general, system output indicating that user input was successful will be indicated by beginning the next prompt, menu, or announcement.

6.5.2 Feedback redundancy across different media (auditory, visual), if available, is helpful to the general public and may support people with special needs.

6.5.3 Verbal announcements should normally be used in preference to tones, as verbal announcements can convey more explicit information and are typical of traditional telephony. There may be exceptions, when the tones are very familiar and can speed use of the service.

6.5.4 In the sequential steps of a user procedure distinctive feedback should be provided. Using the same feedback message repeatedly should be avoided, as it does not help the users to check their progress through the procedure.

6.5.5 If the delay between user action and system response is longer than a few seconds (the exact amount depends on the particular situation), then the user should receive a wait message.

6.6 Preparation of messages

6.6.1 All messages in a service should be recorded by the same speaker. Professional speakers should be used. Voices should be agreeable and assertive.

6.6.2 Better understanding is achieved by using straightforward, positive sentences. However, negative sentences are helpful to discourage the user from doing certain actions (e.g. "To make another call *do not hang up*, but dial ##33").

6.6.3 Messages should not contain technical expressions.

6.6.4 The same terminology should be used throughout the service and supportive documentation.

6.6.5 Conversational pleasantries used in interpersonal conversation should be minimized, as they lead to dialogue inefficiency.

6.6.6 Messages should be provided in the language(s) preferred by the majority of users, but requirements for international visitors should also be taken into account.

6.7 Usability testing

6.7.1 A service should be tested for usability before being offered to the public. The testing should be conducted by selecting a sample of representative users, and asking them to access and use the service with no instructions about how to use it beyond the instructions that will be available to real users.

6.7.2 Usability targets should be set before testing (e.g. 95% of users should be able to complete correctly a specific feature of the service being tested within one minute after picking up the receiver).

8 Bibliography

SCHUMACHER (R.M.) Jr.: Phone-based interfaces: research and guidelines, *Proc. HFS*, 36th Annual Meeting, p. 1051, 1992.