

Working group on access to mobile telephony for handicapped persons

**REPORT ON ACCESS TO MOBILE
TELEPHONY FOR HANDICAPPED PERSONS**

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1 – Scope of study

In October 2002 the French telecommunications regulator, ART, launched an initiative to assess accessibility of mobile telephony for sight-impaired and hearing-impaired handicapped persons, and to pursue concrete, practical actions on improving accessibility.

Representative GSM equipment manufacturers on the French market, and France's three mobile telephony operators, met to discuss the subject. The meeting revealed that equipment manufacturers were sensitive to this issue but had only taken limited measures, chiefly addressing hearing-impaired people. Operators already provided bills in Braille or large characters, and were working with specialist associations on adapting their websites for easier use by the sight-impaired. These measures illustrated efforts that had already been taken on access for handicapped people, making a good start that deserved following up. Members of the meeting were therefore asked to put forward solutions to four main difficulties: reading and writing SMS texts; caller ID recognition, easy navigation through GSM phone menus; and access to GPS-based pedestrian navigation systems. Concrete proposals from equipment manufacturers and operators were requested by the end of January 2003. This issue appeared on the agenda for meetings of the ART Radiocommunications Consultative Commission (CCR) in December 2002 and March 2003, during which all members supported and encouraged the initiative, and all concerned confirmed their intention to take measures.

In April 2003, a launch meeting called by the ART chairman decided to set up a working group that would draw up a comprehensive report on all current measures, along with proposals and implementation schedule for concrete actions. This report would be submitted to a CCR meeting during the second half of 2003. The ART chairman asked Mr Philippe Balin (CCR telecom expert with specialist know-how on technical adaptations for the sight-impaired) to coordinate the group's work. Group members responded enthusiastically to the challenge and came up with a number of proposals for the coming months.

The group was broken down into two subgroups, one formed from equipment manufacturers that had taken up the ART invitation, and the other from France's three GSM operators. These two subgroups would address the following points:

Equipment manufacturers group

1. Sales literature on mobile phones, in electronic form for issue by e-mail
2. User documentation and instructions in electronic form, available on request by sight-impaired customers
3. Caller number or name identification for callers listed in phone's internal directory, by integrated speech synthesis
4. Caller identification for callers listed in phone's internal directory, by vocal tag during ringing
5. Beep indicating entry into and exit from coverage area
6. Beep indicating low battery charge
7. Read capabilities for mobile phone screen display at any time
8. Easy call transfer enable/disable for sight-impaired person
9. Outgoing SMS: voice-driven text entry, reading and editing functions
10. Incoming SMS: voice-driven reading and deletion functions (or download to PC of SMS texts stored on mobile phone)
11. Easy deletion for SMS texts in in-box
12. Menu scroll stops on top and bottom items
13. Return to menu at start of tree branch rather than last item accessed
14. Download to PC for internal mobile phone directory using PC software adapted for the sight-impaired
15. Pedestrian navigation system for sight-impaired people integrated in mobile phone

Operators group

1. Sales literature on mobile telephony packages, in electronic form for issue by e-mail on request
2. User documentation in electronic form, available on request by sight-impaired customers
3. Bills e-mailed in electronic form for sight-impaired subscribers
4. Customer correspondence by e-mail for sight-impaired subscribers
5. Mobile phone instructions available by e-mail on request
6. Frequently called numbers directory with free access for sight-impaired subscribers
7. Free lookup of last ten calls not in answering machine, with date, time and caller number
8. Special selection of mobile phones with designed-in functionality for the sight-impaired, with special labelling in sales literature.
9. Call transfer enable-disable capability
10. Outgoing SMS: text entry, reading and editing functions by voice or on web
11. Incoming SMS: text reading and deletion functions by voice or on web
12. Current subscription consumption details accessible by voice or on web

Both subgroups considered all items relevant, though the lists are not comprehensive.

2 – General situation

2.1 – Population concerned

Handicapped people (all handicaps included) account for over 10% of the population. This figure does not include elderly people who are not handicapped physically but who may be effectively handicapped with regard to use of new technologies like the mobile phone. Handicapped people do not form a homogeneous population. Diversity goes well beyond the different types of handicap, and this also applies within specific categories; individual capacities depend on cultural and social background, and on the way the handicap is regarded and tackled. Moreover, except for extreme instances (like blindness and deafness), handicaps are difficult to define. Sight-impaired and hearing-impaired people, for example, might not identify their difficulties immediately. Then we mustn't forget that handicapped people are consumers like everyone else, and equally influenced by fashion. In each category of handicap, we find the same diversities as across the population as a whole. Blind people, for example, might well wish to have mobile phones similar to those of their friends, and may reject a specially adapted device for aesthetic reasons. It is nevertheless clear that much work will be needed to make mobile phones accessible to handicapped persons. Since today's mobile telephony market is more than sufficiently mature, it is clearly time to get down to concrete, practical action. Though the handicapped population is numerous, it does not in itself constitute a sufficiently large market to motivate operators and equipment manufacturers on priority development. But each time an adaptation is performed to make life easier for handicapped people, it brings spin-off benefits for everyone. For example, menu customization to individual needs will be useful to the population at large.

Blind and hearing-impaired people undoubtedly form the population group that experiences the most difficulty in using mobile phones. This population group includes some 1.2 to 1.5 million people, and includes 10% of blind people. Around 40% know Braille and 30% of blind people have Braille or speech-synthesis PC support. The mobile phone is an important tool that makes a major contribution to independence for sight-impaired people. Imagine how useful it is for a blind person, faced with incomprehensible pushbuttons at the building entrance, to just call up and ask his correspondent to open the door! But this population is not prepared to pay more than anyone else for the privilege of having the same functions. Take the example of SMS: it is tempting to assume that emphasis should be given to voice functions rather than offering access to written messages, but everyone is aware of the important differences between written and spoken expression. Sight-impaired people definitely form the handicapped segment most easily integrated in normal life, provided access to the same facilities is available.

We should also bear in mind that new technologies, and over-preformatted usage of technologies, generate something very similar to handicap among a significant proportion of the population at large, through the phenomenon of technological “illiteracy”. Progress on access to mobile telephony for handicapped persons stimulates ergonomic advances of definite benefit to a much broader population of people who may be reticent to the adoption of what they perceive as technologically challenging products.

2.2 – Legislation on access to mobile telephony for handicapped persons

2.2.1 – Situation in Europe

A European Council resolution dated 15 July 2003 (2003/C 175/01)¹ on the promotion of employment and social integration of handicapped persons invites member states to pursue efforts on easier access for handicapped persons to life-long education and training, with special consideration to unhindered access to new information and communication technologies for learning, professional training and employment. Member states are also invited to lift the obstacles hindering participation of handicapped persons in social life, and working life, and prevent the emergence of new obstacles, by promoting the “designed for all” principle. The resolution does not go into details on the use of mobile telephony, but it does set out general principles on the use of new information and communication technologies. The specific issue of access to telephony services is studied by a working group (INCOM, for “Inclusive Communications”) set up by CoCOM (Communications Committee), which should be reporting by the end of 2003 on access to electronic communications for handicapped persons. A preliminary draft of the group’s preliminary report has been issued already.

The working group examined the following points:

- Access to national emergency numbers
- Access to telephone services for hearing-impaired and speech-impaired persons
- Access to digital television and related services
- Access to public phone booths
- Ease of use of electronic communications for hearing-impaired and speech-impaired persons
- Technical utilities capable of providing equivalent services to handicapped persons
- Use of Ermes frequency bands for accessibility services
- Improved information provision for handicapped persons

Mobile telephony issues are covered by several of these points.

Mobile telephony raises a number of problems with regard to access to national emergency numbers. Use of SMS / MMS is not always compatible with access to emergency services. One INCOM recommendation might therefore concern development of gateways managing text telephony. Another problem concerns caller location, and another working group recommendation to equipment manufacturers might concern inclusion of technical features for improved caller location capabilities. Regarding techniques for providing equivalent services to handicapped persons, the group chiefly examined accessibility of broadband and mobile communication, setting out the following focuses for work on access to mobile communication:

- Identification of best practice. An example of good practice is the initiative by Vodafone, Nokia, the Madrid Telecommunications University and the Spanish Deaf Association, on development of portable text telephones (TTYs) for issue to members of the hearing-impaired community. This service has also been proved economically viable.
- Identification of levels of service for handicapped persons, to equivalence and quality criteria.

¹ Resolution accessible on website: http://europa.eu.int/eur-lex/fr/dat/2003/c_175/c_17520030724fr00010002.pdf

- Proposals for legislation inspired by successful experience and good practice.
- Encouragement for equipment manufacturers to develop more accessible terminals and cooperate with operators on improvements to existing services.
- Recommendations to standardization organizations on inclusion of accessibility clauses, especially for third-generation mobile sets.

2.2.2 – Situation in USA

Americans with Disabilities Act (1990)

The Americans with Disabilities Act (ADA), signed on 26 July 1990 by President George H.W. Bush, is fairly wide-reaching legislation that seeks to make US society more accessible to handicapped people. The legislation is broken down into five “titles”:

- Work
- Public services (such as transport)
- Public housing
- Telecommunications
- Miscellaneous

Title 4 requires telecommunication companies offering public telephony services to provide telephone relays for individuals using text telephones (TTYs) or similar devices for hearing-impaired people. The Telecommunications Relay Services (TRS) programme was set up to meet the requirements of ADA title 4, but seems to concern fixed rather than mobile telephony.

Telecommunications Act (1996)

More recently, the Telecommunications Act was signed on 8 February 1996, with the aim of promoting availability of telecommunication equipment and services for persons experiencing difficulties in accessing such services, including handicapped persons. Two sections (255 and 713) make specific mention of handicapped persons. Section 255 requires equipment manufacturers and telecommunication service providers to ensure that equipment and services are designed and developed for accessibility and usability by handicapped persons. Section 713 requires that video services are accessible to persons with hearing, sight and speech impediments.

Interagency Working Group on Assistive Technology Mobility Devices (2003)

On 12 February 2003, the White House published a memorandum setting up an interagency working group on mobility devices for assisting handicapped persons (Interagency Working Group on Assistive Technology Mobility Devices). The aim is to provide handicapped persons with technological resources enabling them to seize training and employment opportunities. However, mobile telephony is not explicitly mentioned as a technological resource contributing to improved integration of handicapped persons in US society.

3 – Summary of work carried out by group

3.1 – Equipment manufacturers subgroup

The subgroup met regularly, studying all the specified points to examine possible solutions. Marked commitment was observed from the suppliers Alcatel, Motorola, Nokia and Sagem, all of which were eager to have tests performed on their mobile phone models best adapted to use by sight-impaired persons. Models from Alcatel (OT535), Motorola (T720i, 9210i & 3510i), Nokia (3650) and Sagem (myX6) were tested and a copy of the test report issued to each supplier. These reports are not included in our final report for obvious reasons of confidentiality. The tests yielded the following general recommendations:

1. Documentation: All equipment manufacturers offer clients instructions in the form of a PDF file on their websites. These files can be read by sight-impaired people using Braille or voice synthesis

facilities, and can be printed automatically on Braille paper or in large characters. However, certain precautions must be taken if sight-impaired people are to be self-reliant in using this documentation to get the most out their mobile phones. For example, keys on the phone are often referred to using graphic icons, which are not legible to the systems used by sight-impaired people. To get round this problem, keys should also be referred to by name, with the documentation including a description of the keypad, plus details on the location of each key.

Another problem is that write-protected .pdf files can be incompatible with Braille and speech-synthesis readers, since the system returns a file protection violation error. Then some parts of the .pdf file (such as scanned documents and screen shots) may prove illegible in Braille or speech synthesis systems.

Of course, since not all sight-impaired persons are equipped with Braille or speech synthesis systems for PC, printed documentation in Braille or large characters would be useful, as would instructions in audio form for blind people who don't read Braille. Equipment manufacturers should therefore provide files in a format that supports automatic production of documentation in these media variants.

2. Keypad: The keypad should be pleasant to the touch, and intuitive for use by touch alone. Keys should be clearly differentiated. Horizontal key alignment will make the keypad easier to use by touch alone. The "5" key must be located by a Braille dot. When keys perform several different functions, this can make it impossible to enter certain characters (like the "+" sign required for international dialling) by touch alone. Often, the character list will scroll as the key is pressed; if this is the case, there should be an audible beep when the character changes. Optional connection for a standard keyboard (AZERTY or QWERTY) is greatly appreciated, especially for sending SMS texts and entering directory data.
3. Menu: Menu use is the main difficulty facing sight-impaired people when using a mobile phone. Touch-based navigation is possible if the user knows the menu structure by heart, but will prove difficult or impossible if the following precautions are not taken:
 - a. Menus are easier to use if the scrolling stops at the start and end of the list. One of the menus could therefore include a special "Accessibility" option, one of the functions of which would be to disable scroll stops for vertical and horizontal menus. Alternatively, there could be a special tone to mark the start and end of menu lists.
 - b. Lists can be very long, and include functions that sight-impaired people are unlikely to use on their own. Menu customization capabilities will therefore be appreciated, enabling sight-impaired people to set personal menu lists that include useful functions only.
 - c. Context-sensitive menu: With a context-sensitive menu, the user is never sure which item will be highlighted by default when the menu is accessed. The software may show the last function used, meaning that a sight-impaired person would have to remember the last-used function. And lists may include different numbers of functions in different contexts, which makes touch-based navigation a hazardous matter; for example, the third item in a list will vary if the list contains a variable number of items. Context-sensitive menus should therefore be avoided for sight-impaired persons. Again, one of the menus could include a special "Accessibility" option, one of the functions of which would be to disable contextual menus.

As new mobile phones offer more and more sophisticated multimedia functions, this capability could be harnessed to assign prerecorded voice tags to each menu item, thus informing sight-impaired users of the current screen text.

4. Directory: Sight-impaired people have little difficulty entering directory data, but may have difficulty retrieving the correct entry if, for example, the only lookup method is to enter the first letter of the correspondent's name then scroll through a list. Lookup using the first few letters would get round this difficulty. And if the mobile phone features multiple directories, they should always be displayed in the same order, rather than last-used first. It should be possible to enter directory data from a PC, using software supplied with the mobile phone; this would enable sight-impaired persons with Braille or speech-synthesis PC support to enter data rapidly, and check the content.

As new mobile phones, even entry-level models, offer more and more sophisticated multimedia functions, this capability could be harnessed to assign prerecorded voice tags to each directory entry (a

little like the graphic icons often found today), thus informing sight-impaired users of the currently selected correspondent.

5. **Outgoing SMS:** If dictionary-based assisted text entry is offered, classic ABC should be the default mode.
6. **Incoming SMS:** Sight-impaired people will obviously be unable to read SMS texts on their phones if the device does not offer speech synthesis capabilities. The PC software supplied with the phone should enable SMS transfer onto PC, for reading with speech synthesis or Braille support.
7. **Network coverage indication:** Sight-impaired people must be given information on network cover and reception quality, with, for example, a beep signalling entry into and departure from coverage areas. The menu could include an additional item on audible indication of network reception quality; when selected, the phone would emit as many beeps as there are bars on the reception quality gauge.
8. **Battery charge indication:** Sight-impaired people must be given information on battery charge level, with warning when recharge is necessary. The device could emit a beep signalling low battery charge. And the menu could include an additional item on audible indication of battery charge level; when selected, the phone would emit as many beeps as there are bars on the battery charge gauge.
9. **Speech recognition:** Speech recognition could be used as a workaround for directory access difficulties, especially if there are no voice tags for directory entries. But is it not an essential requirement if multimedia capabilities are used to assign voice tags that identify the current directory entry audibly.
10. **PIN code:** Because mobile phones can take a certain time to initialize before requesting the PIN code, a beep could be emitted to prompt PIN entry for sight-impaired people. And coded beeps could signal correct or incorrect PIN entry.
11. **Caller ID:** Voice tags can be used for identifying callers listed in the directory. Personalized ring tones make an acceptable alternative if tones can be assigned to individual directory entries rather than to whole sub-directories.
12. **PC software:** The PC software supplied with the mobile phone should be compatible with the support systems used by sight-impaired persons. Because these systems use the asynchronous COM interface, the phone software should not interfere with the PC COM ports. Infrared interfaces are difficult to use for sight-impaired persons. So mobile phones should connect to the PC via a USB port. Cable connection at the phone end should be simple, and not require the phone to be opened.
13. **Speech synthesis:** Speech synthesis should be responsive and easy to understand. Ideally, speech synthesis should stop automatically once the call is through, i.e. as soon the correspondent picks the phone up. Mobile phones offering integrated speech synthesis need substantial memory capacity, to avoid memory overload liable to impede other functions and programmes from running while speech synthesis is operative.
14. **Additional functions:** Functions such as alarm clock, reminders, call transfer, and incoming and outgoing SMS / MMS deletion should be useable by sight-impaired people.

Notes

Equipment manufacturers wish to see harmonization or standardization on the development of solutions for access by handicapped people. Joint standards and open operating systems will make it easier to develop durable special applications addressing access for handicapped people in different categories. Technologies implemented in recent mobile phones appear to offer sufficient inherent capabilities to support all our recommendations, even on entry-level products (except for speech synthesis and related functions like SMS reading, only supported on top-end models).

All equipment manufacturers are ready to adapt, or have already adapted, forthcoming mobile phone models to accommodate most of our recommendations. However, because of fierce competition among mobile phone vendors, and the attendant exclusive emphasis on mass market, these improvements have not been given sufficient priority to date. Powerful mobile phones with large memory capacities open the way to integrated speech synthesis. This will definitely prove the best solution eventually, but owing to the cost of speech-synthesis telephones, and the still mediocre quality of present-day speech synthesis systems,

adaptations such as those mentioned in our recommendations are considered as providing sufficient functionality for sight-impaired persons today, without the need for speech synthesis.

Pedestrian navigation systems (using GPS or other methods) in mobile phones are not yet a market reality, but developments along these lines would be a major step forward in self-reliance for sight-impaired persons, for whom printed town plans are useless. Accessibility for sight-impaired persons to this sort of system should be major priority throughout development work, to ensure all necessary functionality is designed-in from the outset.

3.2 – Operators subgroup

The operators subgroup met regularly, studying all the specified points to examine possible solutions. All three operators worked diligently on their assigned tasks, reporting to ART in September 2003. A number of concrete actions were proposed, some with implementation schedules. For obvious reasons of confidentiality, specific contributions will not be detailed in this report. But the three operators definitely do intend to offer concrete solution to handicapped customers in the near future.

All three operators wished to conduct joint action through AFOM (French mobile operators association), issuing a charter specifying the operators' commitment to adapting their services to handicapped persons, and drawing up a list of criteria for different types of handicap, to determine whether a mobile phone is adapted for use for handicapped persons in different categories. In addition, consideration would be given to a labeling system informing consumers on suitability.

Given the findings of the equipment manufacturers' working group, operators are advised to give priority attention to issues unresolved by the above-listed adaptations to mobile phones. If, for example, we consider a two-year wait likely before quality speech synthesis becomes a viable proposition for entry-level mobile phones, work should address provision of an acceptable interim solution. And this can only be achieved through joint effort of equipment manufacturers and operators.

Operators should therefore address the following issues:

- Vocal reading for SMS and MMS text
- Inexpensive voice-driven methods for real-time queries of voice, SMS and MMS consumption
- Voice querying for numbers of last ten answered calls and last ten unanswered calls not in answering machine.
- Bills, contracts, customer correspondence, sales offers and service instructions in Braille, large characters and electronic format, at customer request.

Funding for recommended adaptations could be supported by operators' development of innovative new pay services addressing handicapped persons.

3.3 – Other handicaps

Owing to lack of time, the group did not study other handicaps in as great a depth as sight-impairment, which is probably the most complex scenario regarding mobile telephony access. However, equipment manufacturers and operators are equally attentive to the needs of people suffering other forms of handicap. Solutions under study include measures such as the following:

- Solutions for deaf people emphasize written messages and light indicators.
- For hearing-impaired people, equipment manufacturers propose solutions including amplification and light indicators, and are working on compatibility of mobile phones with hearing aids, to avoid interference. Some operators propose routing voice calls through signal processing systems to improve intelligibility.
- For sight-impaired people, equipment manufacturers propose large-character displays and adjustment of contrast and colors. And correspondent identification could be facilitated by displaying a photo of the person concerned.

- For reduced-mobility persons, equipment manufacturers propose joystick-type accessories.

An additional study should be conducted to determine precise recommendations for other handicaps. Work should also bring benefits in enhanced access to mobile telephony for the elderly.

4 – Reporter’s proposals for actions

In view of the findings set out in this report, the reporter proposes that the CCR adopt the following action plan, intended to further prompt implementation of concrete improvements:

1. This report should be issued to ministries concerned by telecommunications development and handicapped people.
2. This report should be made public and issued to handicap associations.
3. ART should monitor actions under way with equipment manufacturers and mobile telephony operators, and extend the initiative to cover other handicaps.
4. Regulations should include a requirement to offer services accessible to handicapped persons, applicable from 1 January 2005.
5. Mobile telephony operators and equipment manufacturers should undertake to offer UMTS mobile phones and associated services accessible to handicapped persons within two years of initial service startup.
6. AGEFIPH² should include an adapted mobile phone as an integral part of an adapted workstation.
7. For handicapped persons not recognized by COTOREP³, or not in employment, telephone operators’ packs should include the telephone set best adapted to the handicap in question, at no extra charge. In exchange, it would be acceptable for the operator to require a long-term subscription commitment.
8. Equipment manufacturers, operators and software publishers concerned should set up a working group on development of a pedestrian navigation system integrated in a GSM mobile phone for use by blind and sight-impaired persons.

² National association managing funds for employment of handicapped persons

³ Technical commissions on employment guidance