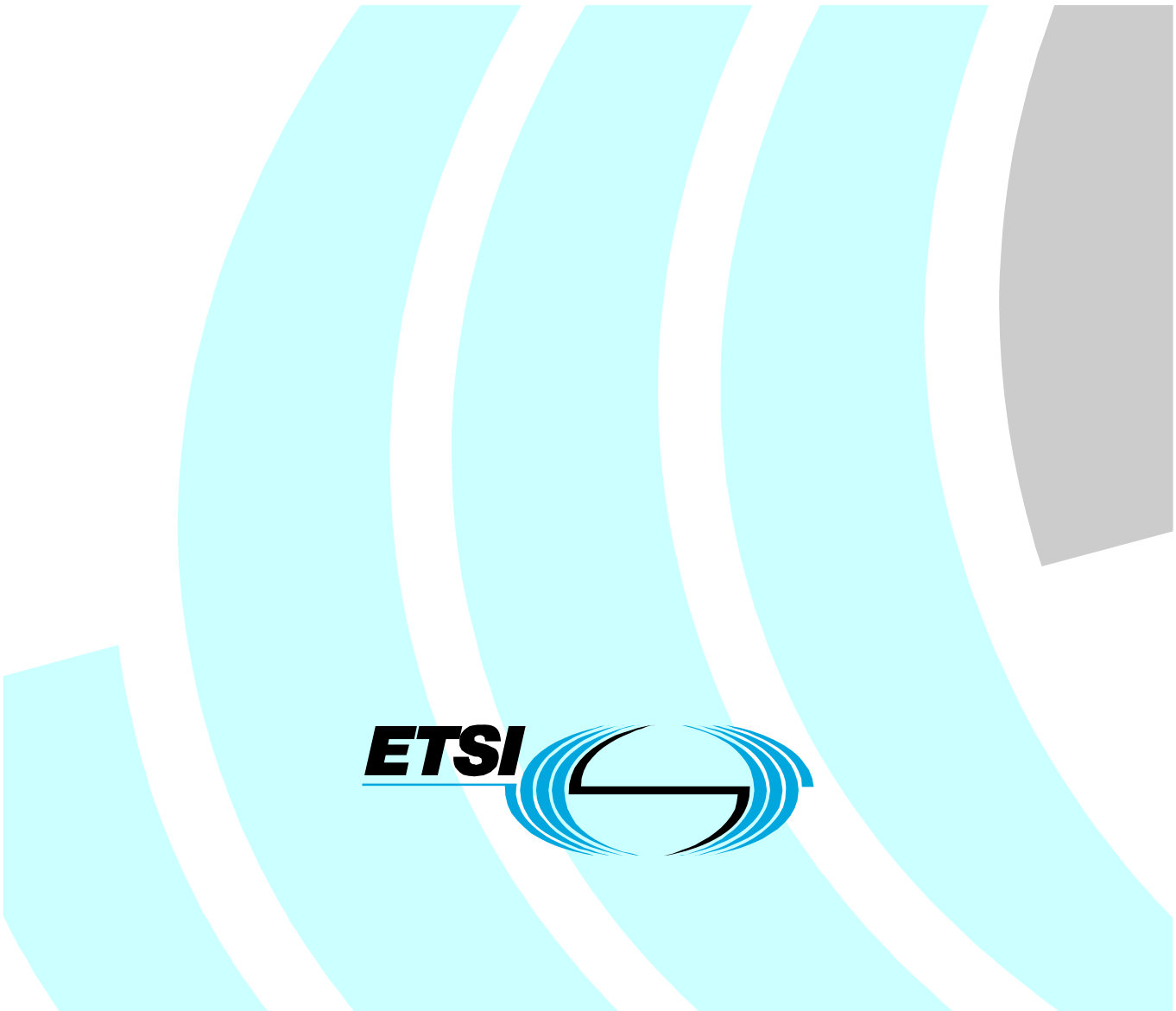
ETSI TR 102 535 V1.1.2 (2007-07)

Technical Report

Human Factors (HF);
Guidelines for real-time person-to-person communication services;
Future requirements



Reference
RTR/HF-00119

Keywords
HF, interaction, quality, QoS, VoIP, video, service

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Contents

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (http://webapp.etsi.org/IPR/home.asp).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI web server) which are, or may be, or may become, essential to the present document.

Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Human Factors (HF).

1 Scope

The present document is based on EG 202 534 [3] and a web-based guideline Access and Tutorial System (http://portal.etsi.org/stfs/STF_HomePages/STF284/STF284.asp). The main content of EG 202 534 [3] are guidelines for the real-time person-to-person communication services that provide text communication, audio communication, avatar communication, data communication, video communication and multimedia communication. Service topics include audio-video asynchrony, video resolution, video delay and packet loss for fixed and mobile networks. User topics include communication tasks (e.g. negotiation, joint problem solving and persuasion), usage outcomes (e.g. task efficiency, task effectiveness and user satisfaction) and special user groups (e.g. persons who are deaf, blind and elderly).

About 650 intended guideline users have been involved in the development work of EG 202 534 [3] and the associated web-based system. The present document describes the requirements for guidelines and the tutorial system that were identified. It considers three main areas of future work based on experiences from the project:

- Enhancement of the existing EG 202 534 [3] (e.g. through collection of test data on important topics).
- Enhancement of the web-based tutorial system.
- New service areas.

2 References

For the purposes of this Technical Report (TR), the following references apply:

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

[1] Hestnes, B., Brooks, P., Heiestad, S., Ulseth, T., Aaby., C. (2003): "Quality of Experience in real-time person-person communication - User based QoS expressed in technical network QoS terms", Proceedings of the 19th International Symposium on Human Factors in Telecommunication, Berlin, Germany, December 1-4 2003, pp. 3-10.

[2] ETSI TR 102 274: " Human Factors (HF); guidelines for real-time person-to-person communication services".

[3] ETSI EG 202 534: "Human Factors (HF); guidelines for real-time person-to-person communication services".

[4] Heim, J., Brooks, P., Følstad, A., Schliemann, T., Hestnes, B., Heiestad, S., et al. (2001). "Final Verification of Real-time Communication Requirements". Project IST-1999-11577 Eye-2-Eye: Fitness-for-Purpose of Person-Person Communication Technologies, EC Deliverable IST11577/SEF/DIS/DS/Pub/001/a1, October 2001.

[5] Brooks, P., Hestnes, B., Heiestad, S., Aaby, C. (2006):. "Communicating Quality of Experience data for the development of multimedia services". Proceedings of the 20th International Symposium on Human Factors in Telecommunication, Sophia Antipolis, France, March 21-23 2006, (available from http://www.hft.org/HFT06/HFT-06-programme.htm).

[6] Brooks P, Brundell P, Hamnes K, Heiestad S, Heim J, Hestnes B, Heydari B, O'Malley C, Schliemann T, Skjetne JH, Ulseth T (1999): "Final Report. ACTS Project AC314 Vis-à-Vis: Fitness-for-Purpose of Videotelephony in Face-to-Face Situations". CEC Deliverable A314/NSS/PB/DS/P/005/b1, June 1999.

[7] Brooks P, Schliemann T, Hestnes B, Frowein H, Aaby C, O'Malley C, (2003): "Final Report Project IST-1999-11577 Eye-2-Eye: Fitness-for-Purpose of Person-Person Communication Technologies". EC Deliverable IST11577/SEF/DIS/DS/Pub/008/b1, June 2003.

[8] Hamnes K, Brooks P, Brundell P, Heiestad S, Heim J, Hestnes B, Heydari B, O'Malley C, Schliemann T, Skjetne JH, Ulseth T. (1999): "Specifications of Fitness-for-Purpose. ACTS Project AC314 Vis-à-Vis: Fitness-for-Purpose of Videotelephony in Face-to-Face Situations". CEC Deliverable A314/Tel/MuM/DS/P/004/b1, June 1999.

[9] Hestnes B, Heiestad S, Ulseth T, Schliemann T, Brooks P, Følstad A, Frowein H, Aaby C, O'Malley C, Brundell P: "Fitness-for-Purpose guidelines for Person-Person Communication. Project IST-1999-11577 Eye-2-Eye: Fitness-for-Purpose of Person-Person Communication Technologies". EC Deliverable IST11577/TEL/RAD/DS/Pub/065/b1, March 2003.

[10] Hestnes B, Paint F, Geers R, Heiestad S, Fuglem I, Alapnes S, Bjelke P C. 3G service optimization. Fornebu, Telenor R&D (FoU rapport R38/2004).

[11] ETSI ETR 297: "Human Factors (HF); Human Factors in Videotelephony".

[12] ETSI ES 201 275: "Human Factors (HF); User control procedures in basic call, point-to-point connections, for Integrated Services Digital Network (ISDN) videotelephony".

[13] ETSI TS 300 375: "Human Factors (HF); Pictograms for point-to-point videotelephony".

[14] ETSI ETR 175: "Human Factors (HF); User procedures for multipoint videotelephony".

[15] ETSI EG 202 132: "Human Factors (HF); User Interfaces; guidelines for generic user interface elements for mobile terminals and services".

[16] ETSI EG 202 416: "Human Factors (HF); Guidelines for set-up procedures for mobile terminals and services".

[17] ETSI EG 202 417: "Human factors; User education guidelines for mobile terminals and services".

[18] ETSI EG 202 421: "Human Factors (HF); Multicultural and language aspects of multimedia communications".

[19] ETSI ETR 160: "Human Factors (HF); Human Factors aspects of mulitmedia telecommunications".

[20] ISO 9241-11 (1998): "Ergonomic requirements for office work with visual display terminals (VDTs) Part 11: Guidance on usability".

[21] ITU-T Recommendation E.860: "Framework of a service level agreement".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

almost live streaming: download and play service with the purpose of showing new information as a whole (e.g. last news)

NOTE: This is often associated with live streaming despite the use of FTP instead of RTSP. See also live streaming.

asynchrony: when audio and video information that leaves one communicating party at the same time is received by the other communicating party at different times. Typically the audio information arrives before the video information in an asynchronous situation

NOTE: It is calculated as audio delay subtracted from video delay (e.g. if audio delay is 50 ms and video delay is 200 ms, then asynchrony is 150 ms; if audio delay is 250 ms and video delay is 200 ms, then asynchrony is -50 ms).

audio communication: use of a service that transmits voice in real-time over a telecommunication network, such as ordinary telephony with a handset and loud-speaking audio conferencing

audio conferencing: telephone service that does not rely on amplification of the voice signal in very close proximity to the recipient's ear; i.e. loud-speaking audio communication

audio delay: time required for a audio signal generated at the talker's mouth to reach the listener's ear

audio protocol: set of rules defining the way audio information is represented in a network

audio telephony: "ordinary" telephone service using a handset as distinct from loud-speaking audio conferencing

avatar communication: use of a service that transmits voice signals in real-time over a telecommunication network in combination with a graphical (human) representation of the speaker

bandwidth: range of frequencies which can safely be conveyed in a communication channel

burst packet loss: loss of two or more packets in sequence

communication media: types of information with which humans communicate

NOTE: Examples are text, audio and moving image (graphics and video). This is consistent with the "Nature of information" component of the ETSI definition of a representation medium, which has various possible coded forms (ETR 160 [19], 1995).

communication service: service that is provided via a telecommunication network

NOTE: Examples are audio-telephony, email, videoconferencing, avatar-telephony, audio conferencing.

communication situation: combination of task, motive, content and user (group) characteristics

communicative behaviour: end-user behaviour while using a communication service, including turn taking, interruptions, verbal and non-verbal back-channels and gaze

conversational text: See real-time text.

data communication: use of a service that transmits personal computer-based information (e.g. presentation slides) in real-time over a telecommunication network in conjunction with the transmission of voice signals in real-time

duration: length of time of the communication task

dyadic communication: (distance) communication between two people

effectiveness: (ISO 9241 [20] definition) accuracy and completeness with which specified users can achieve specified goals in particular environments

efficiency: (ISO 9241 [20] definition) resources expended in relation to the accuracy and completeness of goals achieved

end-users: people who use a communication service for person-to-person communication

frame-rate: frequency by which a full video frame is updated, sometimes called video temporal resolution or image frequency

group: (distance) communication between three or more people

NOTE: Either in a point-to-point or a multi-point configuration.

interpersonal perception: extent to which the perception of the other person's attributes (how likeable, intelligent, friendly etc.) is positive or negative

lip synchrony: coincidence of lip movements with spoken sound, as is the case in face-to-face communication. Non-coincidence is a case of asynchrony

live streaming: the use of streaming protocol (e.g. RTSP) for continuous download and playing information

media effects: effect a particular communication medium has on an end-users task outcome, communicative behaviour, attitudes and beliefs

media/medium: See communication media/medium.

monitor size: number in inches of the diagonal of the image screen on a screen

multimedia communication: use of a service that transmits voice, video and data signals in real-time over a telecommunication network

multi-point: distance communication between three or more locations

network quality of service: degree of conformance of the service delivered to a user by a provider with an agreement between them

NOTE: From ITU-T Recommendation E.860 [21].

packet loss: loss of one packet that can be described using a certain statistical model

packet size: the maximum number of bits in a packet transmitted over a packet switching network as part of a message transferred from one user to another

point-to-point: distance communication between two locations

Quality of Experience: the performance of users when using what is presented by a communication service or application user interface

NOTE 1: It takes into account the individual Quality of Services and measures the acceptability of a service or application by including factors such as usability, utility, fidelity and level of support from the application or service provider (e.g. sales, delivery, error corrections).

NOTE 2: Quality of Experience is derived from users' usage of a service (see also Quality of Service).

EXAMPLE: A service provider may conclude that a particular communication service with a certain level of Quality of Service used for a particular communication situation offers users good or very good Quality of Experience as measured by user satisfaction, task efficiency and task effectiveness.

Quality of Service (QoS): Offered by the service provider it is a statement of the level of quality expected to be offered to the user/customer by the service provider

NOTE 1: The level of quality is expressed by values assigned to QoS parameters. These parameters are usually designed to be understandable to the user/customer. Each service would have its own set of QoS parameters.

NOTE 2: QoS is derived from technical aspects (see also Quality of Experience).

EXAMPLE: A service provider may state that the availability of basic telephony service is 99,9 % in a year with not more than a 15 minute break on any one occasion.

real-time text: service for transmitting alpha-numeric characters in real-time over a telecommunication network

remote inspection: videoconferencing used to show an object or environment rather than the person(s) talking

resolution: term denoting the degree of detail which can be created by a particular visual display system

satisfaction: comfort and acceptability of the work system to its users and other people affected by its use

NOTE: ISO 9241 [20] definition.

situation formality: relative amount of ceremonious or conventional communication versus casual or unconstrained communication

task: what users of communicative technology actually do in order to accomplish some *task goal*

NOTE: In experiments tasks may be described to the participants or they are embedded in scenarios as a part of a situation.

task outcome: extent to which task performance dependent on the medium

telephony: service for transmitting voice signals in real-time over a telecommunication network

text communication: use of a service that transmits alpha-numeric characters in real-time over a telecommunication network

NOTE: Also known as Real-time text and Conversational text.

urgency: extent to which a task is particularly urgent or under particular time pressure

usability: (ISO 9241 [20] definition) effectiveness, efficiency, and satisfaction with which specified users achieve specified goals in particular environments

user satisfaction: comfort and acceptability of the task performance to the service user. Operationalized as the extent to which the service is assessed to be a pleasant communication medium for the task

video communication: use of a service that transmits voice and video signals in real-time over a telecommunication network, i.e. use of videotelephony or videoconferencing

NOTE: For the current report the communication involves a loud-speaking audio system and not a handset.

videoconferencing: service for transmitting voice and video signals in real-time over a telecommunication network for group communication

NOTE: In the current report the audio system is considered loud-speaking and not with a handset or headset.

video delay: time between the input of the first pixel of a particular picture at the sending end encoder and the output of the pixel from the decoder at the receiving end

video protocol: set of rules defining the way video information is represented in a network

videotelephony: service for transmitting voice and video signals in real-time over a telecommunication network for dyadic communication

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AAC	Advanced Audio Coding
AMR	Adaptive Multi-Rate
CEO	Chief Executive Officer
CIF	Common Intermediate Format - a video format defined by ITU-T
CTO	Chief Technical Officer
EG	ETSI Guide
ETR	ETSI Technical Report
FPS	Frames per second
FTP	File Transfer Protocol
IP	Internet Protocol
IPR	Industrial Property Rights, Intellectual Property Rights
ISO	International Organization for Standardization
IST	Information Society Technologies
ITU	International Telecommunication Union
LAN	Local Area Network
MPEG	Moving Picture Experts Group
QCIF	Quarter CIF
QoE	Quality of Experience
QoS	Quality of Service
RTSP	Real-Time Streaming Protocol
SLA	Standard License Agreement
STF	Specialist Task Force
TR	Technical Report
URL	Uniform Resource Locator
VoWIP	Voice over Wireless IP

4 Real-time person-to-person communication services: Overview and issues

The current document addresses real-time communication services. The primary focus is on real-time person-to-person communication. Current and emerging real-time person-to-person communication services provide real-time text communication, audio communication, data communication, avatar communication, video communication and multimedia communication (figure 1).

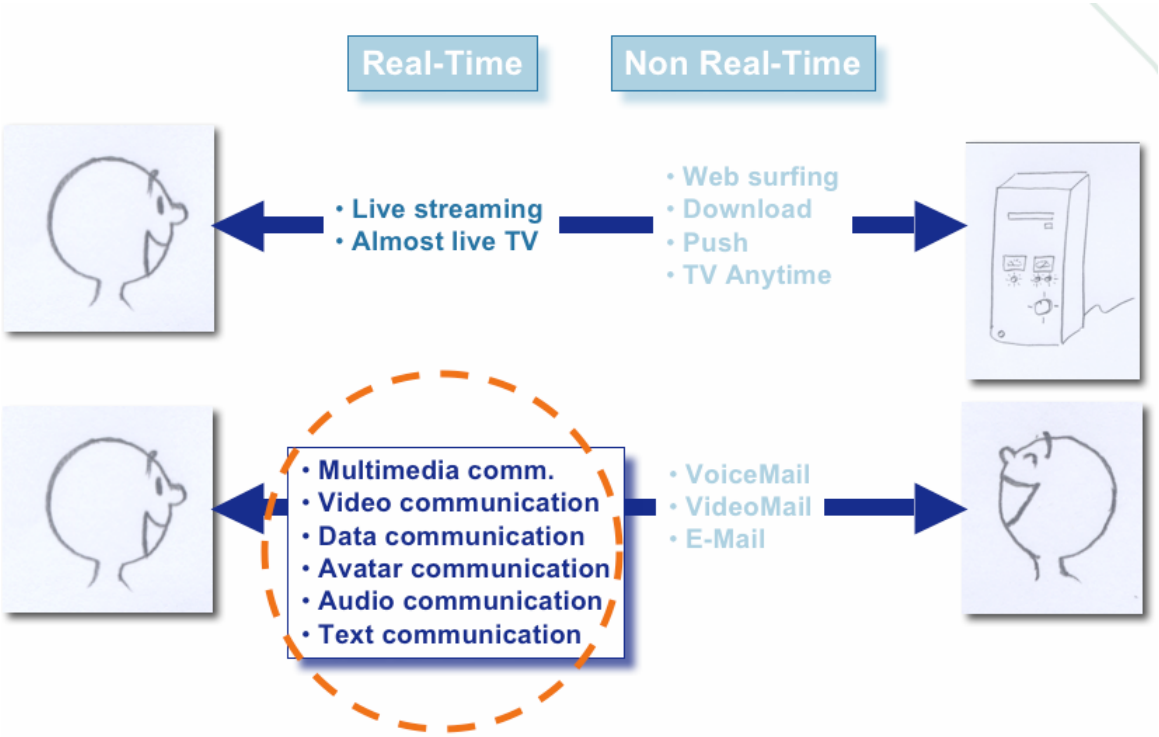


Figure 1: Communication services can be either for person-to-person or person-to-machine communication in either real-time or non-real-time. The primary focus of the current report is on real-time person-to-person communication

The successful introduction of real-time person-to-person communication services is complicated because they offer users the opportunity to interact using different media (text, audio, graphics, video and data). Different communication services may be more or less appropriate for different communication situations. Also different implementations of technical Quality of Service (QoS) parameters may influence the users' Quality of Experience (QoE). For example, in a packet switched network the QoS characteristics of bandwidth, packet size, delay, delay jitter, packet loss and burst packet loss may interfere with natural human communication [1]. Also, codec QoS characteristics such as video resolution, video frame-rate, monitor size and the media protocol chosen (i.e. G.7xx, AMR, AAC, H.26x, MPEGx) may have consequences for users that are difficult to predict.

Amid this complexity the developers of systems and services need to be able to make informed decisions.
TR 102 274 [2] identified the requirement to develop guidelines for network operators, equipment manufacturers and service providers that address:

- the configuration and quality of different communication services;
- the selection between different communication services;
- acceptability of different communication services;
- future applications.

The recommendations of TR 102 274 [2] have been addressed by EG 202 534 [3], which contains almost 200 guidelines concerning current communication services.

The current document builds on TR 102 274 [2] and EG 202 534 [3] to address the future requirements for guidelines.

The current clause introduces the vision and complexity of services that enable real-time human communication at distance, describes issues for the development of human-related technical guidelines and summarizes the requirements of potential guideline users.

4.1 A vision of user-centred real-time person-to-person communication services

An overall end-user requirement specification of a real-time person-to-person communication service has been developed through interviews and observations of end-users. This requirement specification can be summarized as a set of important properties together with typical user situations.

A real-time person-to-person communication service should have the following properties:

- **Heterogeneous** - equipment and services on different networks with different protocols should be able to communicate just as simply as mobile telephones and fixed telephones.
- **Multiparty** - not only two terminals should be able to communicate at the same time. To include three or more terminals should be possible with ease (e.g. similar to a video communication service provider setting up a multiparty conference when it has been booked in advance).
- **Everywhere:**
  - **Mobile network** - it should be possible to use a mobile terminal wherever the user wants or needs.
  - **IP network** - users of portable computers should be able to install a video communication client and traverse through firewalls and other security barriers from wherever they are on the IP-network.
- **Anytime** - support for spontaneous use. For example, users may start their calls between mobile telephones then discover that video should also be added and in addition that another person should join the call. This session should be possible without having to disconnect. Clearly, this spontaneous behaviour should be supported without having to book a call in advance.
- **Usable by all Europe's citizens** -advanced real-time person-to-person services are currently complicated to understand and the user interface is seldom easy to use. Setting up a conference is very difficult for most users, thereby deterring the uptake of potentially useful services.
- **Reliable** - a communication service failure can be expected to result in end-users perceiving reliability as a problem. Service failures can be due to technical problems, user interface problems or other reasons.

It could be argued that this is not a particularly new vision. Over approximately the last ten years most of these required properties reflect what end-users have wanted but have been unable to do. Whereas for a long time potential user situations have been recognized in the business domain, increasingly end-users have expectations for use of services in their every-day personal life. Figure 2 shows a typical business scenario whilst figures 3 and 4 illustrate non-professional uses.

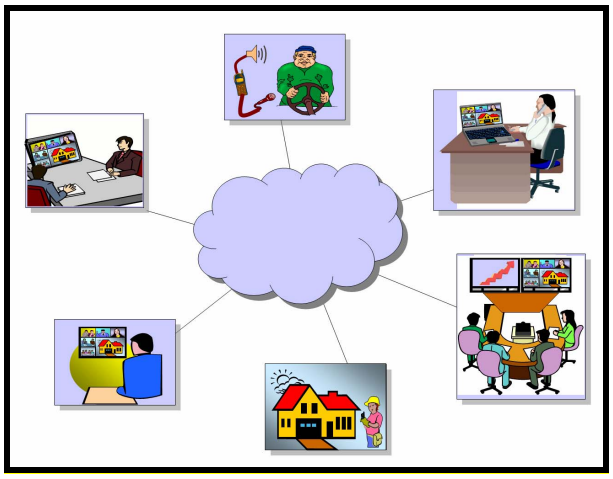


Figure 2: Board meeting decision support

A board meeting in which cases are argued and decisions are taken may involve an unplanned heterogeneous multiparty videoconference. Initially the participants are gathered at three sites:

1) A high quality video conferencing room.

2) An office with a PC-based high quality videoconference application.

3) A car with hands-free mobile telephone (audio only).

A meeting agenda item concerns buying a new office building. Only pictures have been seen, and some of the participants want a guided tour before they can decide. They call the building caretaker who has a 3G phone. In addition they call the architect who is using his desktop videophone to describe what the caretaker shows. Then one of the meeting participants asks the caretaker to walk to other places that he has not yet been shown.

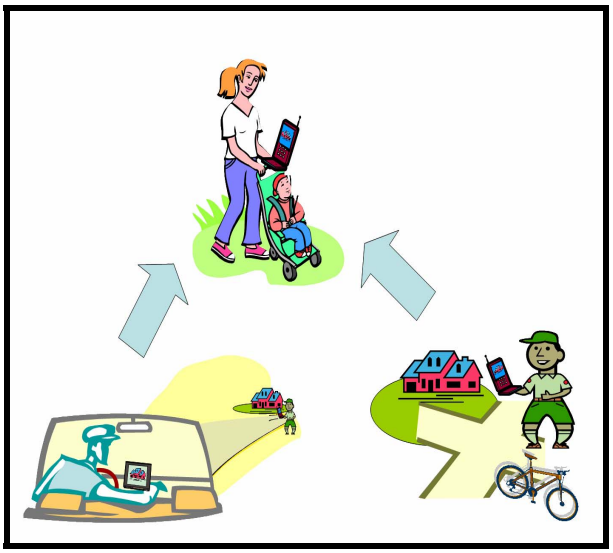


Figure 3: Lost child support

At 12 years of age Johnny loves to ride his bicycle and is getting more and more adventurous in his distance from home. Although he never forgets to go anywhere without his 3G phone, even if he thought to take a map he is not yet good at map reading. He becomes rather worried when he realizes it will soon be dark and he is a little lost. However, he is able to call his mother on her videophone. Johnny is reassured to see his mother and she is able to see a road sign to discover Johnny's location. Johnny is too far from the house for her to walk and she does not have a car. Besides, she is occupied with Johnny's baby sister. She therefore calls a friend who agrees to go and fetch Johnny and his bike. The friend is not so familiar with the many country lanes close to Johnny's home, so once he gets close he calls Johnny's mother. His car is equipped with a 3G handset that can be pointed to show the road in front. Therefore Johnny's mother can see her friend's location and give him the final directions that will find Johnny.

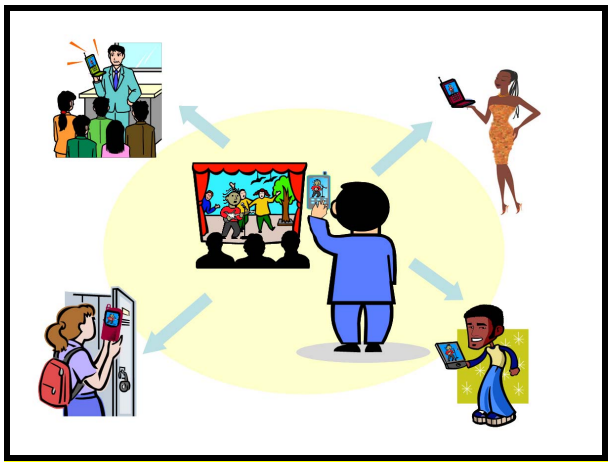


Figure 4: "Share this with me!"

Richard has been able to get tickets for the concert of a famous rock band. When arriving at the concert he has to call a friend to answer a question he received earlier that day. The friend asks where he is, and asks: 'May I see the view you have?' In fact Richard even decides to switch the audio telephony call into a multiparty video call where he shares the event with 4 of his friends.

4.2 The requirement for human-related technical guidelines

Achievement of the required properties of future real-time person-to-person communication services described in clause 4.1, shall enable a very large number of communication situations. This increases further the already complex choices for the design of the most appropriate technologies, media and services from an end-user perspective.

In addition to network and codec characteristics that may interfere with human communication [1] are the environmental characteristics such as lighting conditions, background patterns, colour and reflex, acoustics, audio echo degradation, background noise, viewing distance, camera position and camera parameters [4]. End-users' communications will include one-to-one and group communication involving potentially many geographical locations. The purpose of the communication may place different requirements on the media used and the quality of the media. For example, in video communication the visual image may be expected to offer clear information with which to infer qualities of another person (e.g. mood), more general information on social presence (e.g. "John just left the room") or precise information about an object (e.g. the signpost by the roadside) or environment (e.g. "that's a great view of the stage and singer from here!").

As well as requiring QoE data for the optimum design of a particular communication service, data is also required to aid the selection between candidate communication services (e.g. reasons for choosing between audio conferencing and video conferencing). Guidelines that address many of these topics can be derived from existing empirical results available in the literature. Where user-based results are not known, there is a requirement to obtain new data.

All system and service developers must deal with continually evolving technology and applications. This requires all persons to apply a certain amount of multidisciplinary knowledge, incorporating for example knowledge of technologies and knowledge of users. Therefore, information on related concepts should be available in order to help guideline users understand and apply the information on key topics. This implies the development of tutorial information that explains the key concepts to which the guidelines refer (considered further in clause 6).

The application of QoE data will be different between different guideline users. For example, it will depend on their particular role in the development of a system or service. It is possible that particular QoE data can be useful for different developers dealing with apparently different, though related, issues. It is also possible that particular QoE data can be used by the same person differently at different times, depending on a particular project at hand. The implication is that the development of guidelines from base knowledge of user behaviour should be topic related and allow for different abstractions to different guidelines. Base knowledge should be made accessible in a format that promotes abstraction to concise and applicable conclusions.

Although developers typically appreciate the need for user-based knowledge, their main reference points and decisions usually concern the technical QoS characteristics of a service. Therefore, whilst QoE embodies psychological measures of user behaviour it is should also be expressed in relation to technical QoS. Any guidelines should succeed where possible to combine both QoE and QoS measures to provide an expression of the usage outcome when performing a particular communication task with a particular communication service with known levels of QoS.

TR 102 274 [2] proposes an approach for extracting and combining QoE and QoS parameters from user test results where these data are known. The approach derives a database of detailed intermediate guidelines from which more concise guidelines can be abstracted. The intermediate guidelines are constructed based on the clause shown in figure 5.

Figure 5: Intermediate guideline format

In figure 5, the attributes 'communication situation', 'service prescription', 'technical parameters' and 'usage outcome' have sub-attributes and sometimes sub-sub-attributes in order to cover the problem space and to correspond to existing knowledge of media effects on communication behaviour. For example, the attribute 'Communication Situation' has the sub-attributes 'Task', 'Setting' and 'User'; and 'Task' is defined by sub-sub-attributes including 'Duration', 'Situation formality' and 'Urgency'. The 'Service prescription' contains the service used (e.g. audio conferencing, video conferencing) and the 'technical parameters' concern QoS measures such as network delay and packet loss.

With essential information collected and structured, guidelines can be abstracted and grouped to state the principal messages of relevance to the intended guideline users (figure 6).

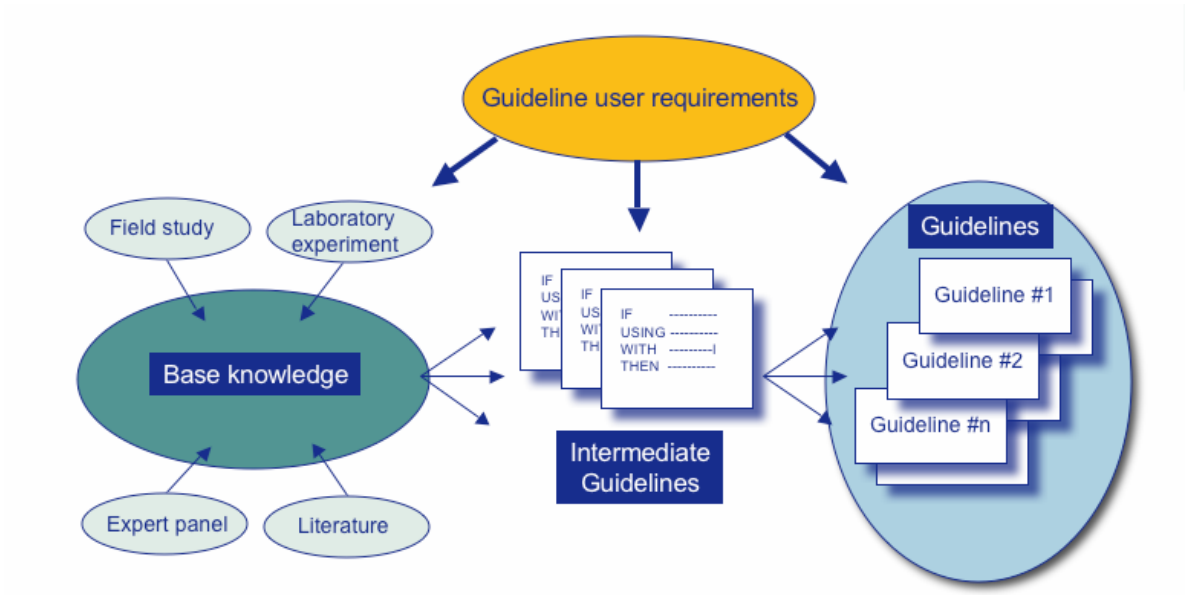


Figure 6: Guidelines are derived from base knowledge through a semi-formal process of intermediate guideline development and based on guideline user requirements

The 'usage outcome' attribute of an intermediate guideline could include many measures of user behaviour. For example, in the area of real-time person-to-person communication the traditional usability variables of (communication) effectiveness, efficiency and satisfaction can be supplemented with measures of interpersonal perception and social presence. Depending on the original user tests, all of these measures have the potential to consist of multiple variables. However, most users of QoE data are not human factors practitioners and instead come from technical and business backgrounds (considered further in clause 4.3). Therefore, meaningful summary statements of user behaviour are required that may differ from the original used in a user test, and an example scale for QoE [5] is shown in figure 7.

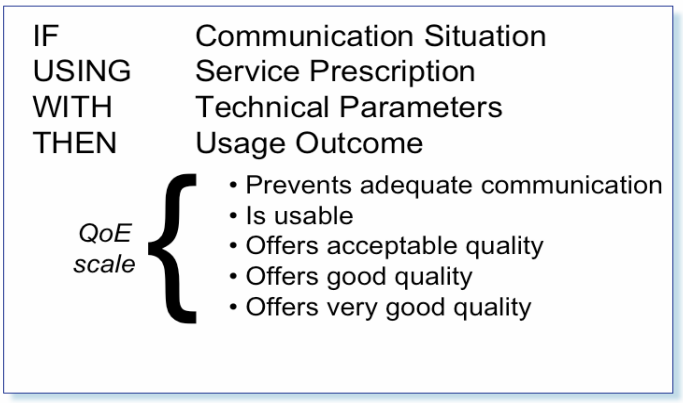


Figure 7: Example of a Usage Outcome scale for concise expression of QoE

In summary, providers of equipment and supporting services should understand the requirements placed on equipment and services by end-users. Guidelines are needed that bring user-centred research results into a common format for key persons in network operator, equipment manufacturer and service provider organizations. The guidelines should provide information on key topics of concern that will aid development choices and should be supported by tutorial information on key and related concepts. The guidelines should provide QoE data that can be used by persons with different professional perspectives and who are not human-factors specialists. Very importantly, the guidelines should link QoS and QoE variables.

4.3 The intended guideline users

It is possible to identify specific users of QoE data in network operator, equipment manufacturer and service provider organizations. These people have diverse roles as summarized in table 1 and include persons from more technical to more financial work areas, and from more design-oriented to management functions. Persons from all of these categories have contributed to the requirements description summarized in clause 4.2.

Table 1: Main work functions and strategic levels of users of QoE data
[levels conceptualized as Strategic (S), Tactical (T), Operational (O)]

Network operator	Equipment manufacturer	Service provider
Research president (S)	CEO (S)	CEO (S)
Product manager (S/T)	CTO (S)	Strategic service developer (S/T)
Marketing (S/T)	Research director (S)	Chief of sale (S/T)
Chief of sale (T/O)	Sales director (S/T)	Group service manager (S/T)
Sales person (O)	Sales person (O)	Marketing (S/T)
Strategic network planner (S/T)	Sales support (O)	Sales persons (O)
System integration (T)	Customer support (O)	Conference room architect (T)
Portfolio manager (S/T)	Technical research (T/O)	Multiparty conference hostess (O)
SLA responsible (T/O)	Human Factors research (S/T/O)	Customer support (O)
Project leader 3G network (T/O)	Development engineering (O)	Video conference hostess (O)
VoIP project leader (T/O)	System integrator (O)	Human factor specialist (S/T/O)
Technical research (T/O)	Audio codec engineer (O)	Technical research (T/O)
Human Factors research (S/T/O)	Video codec engineer (O)	Project leader, new services (S/T)
Network tester (O)	Network OSI level 3 engineer (O)	Technical development engineer (O)
Network engineer (O)	Network OSI level 2 engineer (O)	System engineer (O)

From a guideline user perspective there appear to be three main aims for the development of user-based technical guidelines:

- producing guidelines on the most relevant and important issues from a guideline user perspective;
- producing guidelines that are clear in their level of coverage and dependability;
- producing guidelines with short and powerful messages.

Intended users of guidelines were identified and case studies were conducted through interviews, workshops and surveys. The aim was to elicit requirements for guidelines and guideline topics. The process of identification involved finding the correct groups/organizations (e.g. network operator) and then the roles for guideline users (e.g. network planner). Then the actual persons who undertook these roles were identified and recruited.

Interviews, workshops and surveys have been performed with 649 persons representing 88 network operators, 134 equipment manufacturers, 168 service providers and 182 representing standards bodies. Table 2 summarizes the types and number of organizations involved and presents the division between European and non-European organizations.

Table 2: Summary of organizations providing requirements

Organization	Within-Europe	Outside-Europe	Number of participants
Network operator	28	4	88
Equipment manufacturer	20	6	134
Service provider	10	1	168
Standards body	8	0	182
Other	22	4	77
Total	**88**	**15**	**649**

The precise procedure performed within a particular organization varied primarily due to the time available to the participants. Typically the case studies started with a presentation and was followed by individual interviews, small-group interviews, workshops or self-completion questionnaire. Table 3 summarizes what the interviewees requested and had a need for in their work and why this was important to them.

Table 3: Typical information requirements derived from interviews and workshops with guideline users

Information needed	Rationale
What is the threshold for video quality in certain user situations?	Because it is difficult to detect if a quality is 'good enough'
Identify communication situations that give a high user QoE	Because this could identify new successful market areas
Identify user segments that will use a specific service	Because that could avoid product rejection
What is the threshold for end-to-end delay in different services?	Because if it is a threshold, then delay budget can be set up
Identify communication situations that is important for the end-user	Because then users will use it
What is the willingness to pay for a certain Quality?	Because then it is possible to develop a business model and decide if it should be pursued
General purpose communication situations	Because end-users want to use communication services for "every kind" of situation
With a certain bandwidth: What is the best division of resolution and movement?	Because it is not clear without having a user test
Thresholds for QoS parameters	Because a "better-than" parameter can be used to shape a communication service
Effects of audio-video asynchrony (audio immediate, video asynchrony)	Because end-users may have problems with long delay on audio, but current video communication systems provide synchronization as the only or main obvious option
End-user preferences and behaviour	Because this can be used for new products and introduction to new markets
Communication efficiency, user satisfaction and user preferences/choices	Because this can be used for new products and introduction to new markets
What is the cost-benefit of introducing a new service?	Information required by a content provider
What is the threshold quality for video in a mobile streaming service (mobile TV)?	Because the bandwidth is low, the batteries last less time if not tuned correctly

5 Assessment of existing guidelines

In response to the lack of existing guidelines that address the technical performance (QoS) of real-time person-to-person communication services and the effect on end-user behaviour (QoE), a programme of research has been in operation since 1998. It was initiated with the EC 4th Framework Programme project Vis-à-Vis [6]. This project had the objective to systematically collect QoE data (e.g. through laboratory experiments, field studies and expert panels) and to use this QoE data to derive industry-oriented guidelines. Much of the empirical work to collect QoE data and initial case-studies in network provider, equipment manufacturer and service provider organizations was conducted through the EC 5th Framework Programme project Eye-to-Eye [7]. This project provided the background knowledge for TR 102 274 [2]. The recommendations of TR 102 274 [2] have led to the production of EG 202 534 [3], that draws together the guidelines developed to date [22]; and [23] and extends the work with guidelines based on new data and additional research literature. EG 202 534 [3] consists of approximately 200 guidelines.

EG 202 534 [3] is primarily concerned with the phase of real-time conversation between two or more persons. Therefore the guidelines **do not include** design of the user interface or call set-up control. Guidelines on these areas are available elsewhere. ETR 297 [11] provides recommendations for videotelephony call control functions, video-related functions and audio-related functions. The report also provides recommendations on controls and indications, including feedback and display issues. ES 201 275 [12] provides user control procedures for basic call point-to-point videotelephony on Integrated Services Digital Networks (ISDN) and TS 300 375 [13] provides pictograms for point-to-point videotelephony functions. The user control procedures for point-to-multipoint connections for videotelephony have been considered in ETR 175 [14]. Special focus to user interface and call set-up control of mobile voice call and video call services is given in EG 202 132 [15].

Recommendations for enabling and improving the use of mobile terminals and services are dealt with in EG 202 416 [16] and EG 202 417 [17]. EG 202 416 [16] addresses issues related to the setup and configuration of mobile devices and services. EG 202 417 [17] provides guidance for design, content, format and user education. This includes the provision of user guides, addressing all modalities and media.

Other sources of guidelines include EG 202 421 [18]. The present document gives recommendations about how people can be offered a cultural variant of a service best matched to their individual preferences and abilities, even when their preferred cultural variant is not directly supported.

For the production of EG 202 534 [3] a database was developed that registers the requests for guideline topics from intended guideline users and in which these requests are translated, when possible, into guidelines. These database guidelines are categorized within four groups:

- Guidelines in EG 202 534 [3] - a total of **193** guidelines either requested by intended guideline users or considered important and that could be extracted from published test results.
- "Candidate guidelines" - a total of **75** guidelines requested by intended guideline users but for which no test results are known to exist to validate the guideline.
- Guidelines outside the domain of person-to-person communication - at least 10 topics for in related requested areas such as QoE and media quality for applications of person-machine communication.
- Guidelines not requested - a total of 89 guidelines developed from research findings but that were not considered important for intended guideline users.

EG 202 534 [3] therefore primarily documents guidelines that have requested and for which supporting research data exists. Further work would be required to finalize the "Candidate guidelines" and guidelines outside the domain of person-to-person communication.

Clauses 5.1 to 5.3 provide an overview of each of the first three main areas of guideline development introduced above. Also a general assessment of the scope and maturity of available material is provided.

5.1 Guidelines in EG 202 534 [3]

The guidelines are grouped in the following groups according to particular real-time person-to-person communication services:

- text;
- audio;
- data;
- avatar;
- video;
- multimedia.

There is also a separate clause containing guidelines for selecting between the communication services.

In addition, video communication is sub-divided into different types of service:

- "face-to-face" communication;
- remote inspection;
- multi-point and heterogeneous networks.

There are also clauses that address special user groups for real-time communication services. These are:

- blind and visually impaired people;
- deaf and hearing impaired people.

Within each group guidelines are clustered under topics. In total the 193 guidelines address 33 topics. A topic may have only one guideline or multiple guidelines.

Although EG 202 534 [3] contains guidelines on every requested service, not all the requested topics are covered. This is illustrated in table 4 in which three 3 different types of cells are highlighted:

- Cells crossed with a blue background - all of the areas requested have been addressed by guideline(S) in EG 202 534 [3].
- Cells crossed with a yellow background - no guidelines exist, but guidelines on certain areas are requested.
- Cells crossed with an orange background - guidelines exist, but not all areas requested are addressed by the guideline(s) in EG 202 534 [3].

Table 4: Guideline topics requested by potential guideline users

	SS	T	A	Av	D	V	F2F	RI	MPH	MM
Section number of EG 202 534 [3]	4.1	4.2	4.3	4.4	4.5	4.6	4.6.1	4.6.2	4.6.3	4.7
Reliability	x					x	x		x	
Cost-benefit						x	x	x		
Set-up time	x		x						x	
Media priority	x									
Multipoint communication	x									x
Duration	x	x								
Urgency			x			x	x			x
Asynchrony						x	x	x	x	x
Delay		x	x		x	x	x		x	
Packet loss			x			x	x	x		
Frame-rate					x	x		x		
Resolution					x	x	x	x	x	
Bit rate						x	x			
Media quality			x							
Media protocol			x			x	x			
Desktop, high quality						x	x			x
Screen size						x	x			
Appearance						x	x			x
Eye contact						x	x			x
Perception of other person(s)		x	x	x		x	x			x
Spatial speaker recognition		x								
Self view						x		x		
Window configuration						x			x	
Group conferencing						x	x			x
Human support						x	x			
Business communication	x		x	x						
Decision making										
Negotiation	x		x			x	x			
Joint problem solving	x		x			x	x	x		
Persuasion	x									
Object selection						x		x		
Showing surroundings						x		x		
Instruction			x			x	x		x	
Using a foreign language	x									
Elderly persons at home	x		x							
Blind persons						x		x		
Deaf persons	x	x	x			x	x			

Abbreviations:
SS Service selection V Video
T text F2F 'Face-to-Face'
A Audio RI Remote inspection
Av Avatar MPH Multi-point and heterogeneous
D Data MM Multimedia

The guidelines are clustered under topics, consisting of a:

- guideline number;
- main guideline statement;
- justification provided as an argument for the guideline.

As introduced in clause 4.2, each guideline is stated in a single sentence intended to be concise and easy to read. Each guideline is accompanied by at least one justification that provides an argument for the guideline that summarizes the test result on which that guideline is based (figure 8).

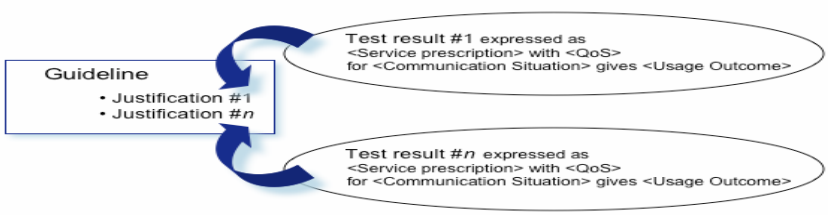


Figure 8: A guideline is a concise conclusion based on one or more test result

The 193 guidelines of EG 202 534 [3] are drawn from 268 justifications, of which 229 represent empirical test results whilst 39 are created from the judgement of expert panels.

The guidelines are considered initial due to the relative novelty of this area of work. While based on scientifically derived empirical data or expert opinion, the validity of some guidelines remains open for further study. For example, some of the user tests on which the guidelines are based should be replicated and extended to different user groups and task types. Whereas there may be cross-cultural issues concerned with real-time communication services, the available user test data is mainly restricted to samples within particular countries (e.g. the UK and Norway).

Most of the empirical tests involve condition comparisons that reveal where significant differences between independent variables exist and were not designed to identify precise thresholds. Also, most of the laboratory results that exist to date concern dyadic communication (i.e. between two people) that is point-to-point (i.e. between two locations). Some field data exists for group communication (i.e. between three or more people) that is point-to-point. There is currently little data available for multi-point communication (i.e. between three or more locations).

The case studies with intended guideline users were very positive about the structured approach to guideline derivation and the semi-formal format employed (summarized in clause 4.2 and described in full in TR 102 274 [2]). The intended guideline users report that the guidelines contain relevant, important and non-obvious information.

The main restriction is that guidelines have not be created for every requested topic. This is due to the unavailability of known user test data in these topic areas and is discussed further in clause 5.2. However, as can been seen in table 5 72 % of the topics requested have been addressed.

Table 5 provides a flavour of the guidelines available. The table presents the main seven guidelines according to ratings of guideline importance by an expert panel. The ratings of importance were based on the perceived value to intended guideline users based on the requests for guidelines obtained in the case studies. As can be seen from this table, the most interesting guidelines are judged to be within video communication. This probably reflects that most of the intended guideline users surveyed were working with advanced communication systems involving video communication or multimedia communication.

Table 5: The most requested guidelines in EG 202 534 [3]

Guideline Number	Communication group	Topic	Abbreviated guideline
4.1.2	Service selection	Reliability	Video communication set-up attempts that fail for 5-10 minutes usually result in users switching to audio communication
4.6.1.8	Video communication: 'Face-to-face'	Delay	500 ms delay may reduce user performance when used for problem solving
4.6.1.16	Video communication: 'Face-to-face'	Packet loss	Video communication with audio protocol G.722 and video protocol H.263 should offer better than 1 % packet loss on a fixed line to be perceived as good quality
4.6.1.27	Video communication: 'Face-to-face'	Screen size	QCIF works as well as CIF on a mobile screen
4.6.1.49	Video communication: 'Face-to-face'	Group video communication (continued)	Video communication rooms or equipment shared by occasional users is perceived as usable if human assistance arrives within 5 minutes when requested
4.6.2.2	Video communication: Remote inspection	Audio-video asynchrony	Remote inspection with 500 ms asynchrony offers good quality
4.6.2.4	Video communication: Remote inspection	Resolution	Remote inspection with CIF and 15 fps when used for moving the camera to show the environment offers good quality

5.2 Candidate guidelines: Requests for guidelines for which no base data currently exist

As indicated in table 6, there have been requests for guidelines that currently cannot be developed because no known supporting base data exist. Indeed, it is possible that future research may not support these guidelines, in which case the candidate guidelines should be modified or deleted.

From the candidate guidelines available, an expert panel has ranked them in terms of importance and table 7 shows those that were identified as most interesting.

Table 6: The most requested candidate guidelines

Guideline Number	Communication group	Topic	Abbreviated guideline
1010	Audio communication	Packet loss	Audio communication with media protocol G.723.1 and a packet loss of 1,5% is useable
1046	Data communication	Delay	Data communication with 800 ms delay when used for presentation material is usable
1083	Video communication	Asynchrony	Video communication with 100 ms audio-video asynchrony and 12 fps when used for general communication offers good quality
1108	Video communication	Negotiation	Video communication with 128 kbs and CIF when used for negotiation offers acceptable quality
1030	Video communication	Group communication	Video communication in a videoconference room with 4 or more persons at one site should offer ?? Quality, ?? Functionality, ?? Predictability to be acceptable
1022	Video communication	Set-up time	Video communication with a call-set up failure rate exceeding x % is not used
1003a	Video, Multi-point and heterogeneous	Delay	Multipoint video communication with continuous presence and a maximum delay of ?? when used for meetings is useable
1075	Video, Multi-point and heterogeneous	Continuous presence	Multipoint video communication with continuous presence with 1 000 ms delay when used for general meetings offers acceptable quality (compared to voice-switching with 500 ms delay)

5.3 Guidelines outside the domain of person-to-person communication

It is possible to identify media, technology and service developments that are outside the area of real-time person-to-person communication but which share similar QoS and QoE issues. This is particularly in the area of real-time person-to-machine communication.

For example, television viewing via a mobile streaming service poses similar issues for QoE in different usage situations and for different QoS parameters (resolution, frame rate, screen size, audio quality). For such a mobile streaming service the suggested audio and video quality for different types of viewing content are shown in table 7. As can be seen from the table, it is bit-rates, frame-rates, a division between audio and video on a fixed bit-rate and media protocols for a specific user situation. Such base knowledge could equally be disseminated via guidelines for industry.

In addition to date there is greater interest in the use of avatars for person-to-machine communication than for person-to-person communication. For example, as a VideoMail application an avatar could prompt users who do not have their own welcome video and show menus options. These avatars should have an audio quality that is easy to understand and a graphic resolution that is good enough for reading menu texts. The optimum quality levels for these uses it is not yet understood.

From the case studies performed the main areas for which related guidelines should be produced are small-screen use of: mobile TV, avatars (used in VideoMail) and music videos.

This implies that using the format described in TR 102 274 [2] and employed in EG 202 534 [3] should be modified to extend beyond the person-to-person communication context to the person-to-machine context. For example, new user situations should be included (e.g. watching mobile TV) and types of TV content (e.g. news, movie, humour, football). Also, the locations for the usage situation will continue to expand (e.g. home, train, bus, car, plane). New technical parameters would include streaming, almost live streaming download, push, codecs, and network technology.

Table 7: Audio and video quality on different mobile streaming content [10]

Content types	Encoding parameters/ Aggregated service types	Live Audio/ Video feed	Audio/Video on-demand	Download	Content Push
News	Avg. bandwidth	50 kbps	50 kbps	64 kbps	64 kbps
	Video frame rate	8-12	8-12	10-15	10-15
	Video bit rate	36 kbps	36 kbps	42 kbps	42 kbps
	Audio bit rate	8 kbps	8 kbps	12 kbps	12 kbps
	Format	.3GP H.263/ MPEG4, AMR	.3GP H.263/ MPEG4, AMR	.3GP H.263/ MPEG4, AMR	.3GP H.263/ MPEG4, AMR
Sports	Avg. bandwidth	50 kbps	50 kbps	64 kbps	64 kbps
	Video frame rate	5 -10	8 -12	8 -12	8 -12
	Video bit rate	42 kbps	42 kbps	50 kbps	50 kbps
	Audio bit rate	8 kbps	8 kbps	12 kbps	12 kbps
	Format	.3GP H.263/ MPEG4, AMR	.3GP H.263/ MPEG4, AMR	.3GP H.263/ MPEG4, AMR	.3GP H.263/ MPEG4, AMR
Music Clip	Avg. bandwidth	50 kbps	50 kbps	64 kbps	64 kbps
	Video frame rate	8-10	8-10	10-12	10-12
	Video bit rate	33 kbps	33 kbps	40 kbps	40 kbps
	Audio bit rate	16 kbps	16 kbps	32 kbps	32 kbps
	Format	.3GP H.263/ MPEG4, AAC	.3GP H.263/ MPEG4, AAC	.3GP H.263/ MPEG4, AAC	.3GP H.263/ MPEG4, AAC
Web cam	Avg. bandwidth	20 kbps	20 kbps	20 kbps	20 kbps
	Video frame rate	0-5	0-5	0-5	0-5
	Video bit rate	15 kbps	15 kbps	15 kbps	15 kbps
	Audio bit rate	0 kbps	0 kbps	0 kbps	0 kbps
	Format	.3GP H.263	.3GP H.263	.3GP H.263	.3GP H.263

6 Dissemination of guidelines within industry

It is not obvious that when a standardization work is completed it reaches all the persons for whom it was intended. To increase dissemination and therefore uptake of best practice the work should be:

- Visible as relevant - especially for the purposes of a person's work at that time, but also when information from an unexpected body that can have high utility and provide new knowledge because it gives a new perspective.
- Capable of giving an overview - often it can seem that there is too much relevant material in the public domain because it is time consuming to determine if a certain work is really important.
- Understandable - the terms and the language should be easy to understand as possible for the intended audience. It can be difficult to apply meaningful conclusions from a work that is formalized according to a particular discipline (e.g. engineering, human factors, standardization) rather in a more introductory way.

In an attempt to meet these requirements a web-based guideline Access and Tutorial System has been developed in addition to EG 202 534 [3]. In particular the web-based system can have the following key properties:

- The system can have hyperlink properties, so information can be identified and traversed in additional ways possible with a report.
- Tutorial support can be effectively provided and is necessary because:
  - The guidelines cover complex and continually evolving area (e.g. guideline users must deal with an increasingly wide technological area).
  - The area is multidisciplinary (the guidelines deliberately combine multidisciplinary knowledge, such as from more technical QoS to more psychological QoE perspectives).
- With internet access and terminal a web-based system can be available anytime and everywhere.

The web-based tutorial system is accessible at http://portal.etsi.org/stfs/STF_HomePages/STF284/STF284.asp.

6.1 Scope of the web-based system

The web-based system contains the guidelines of EG 202 534 [3] with additional navigation features plus tutorials on concepts and terminology contained within the guidelines (figure 9).

The home page of the web-based system is shown in figure 10. The main links on the home-page are:

- Find a guideline - access to the navigation engine.
- Take a tutorial - access to the tutoring engine.

Additional links into the system are:

- Search - an additional aid to navigation.
- Intended users - a statement of the main types of professions and organizations for whom the site has been developed.
- See overview - background information on the rationale for the site.
- About us - background information about the authors of the site.
- Contact us - a mechanism to send an email to authors of the site.
- Send us feedback - a mechanism providing a form-completion interface that encourages users to give feedback.

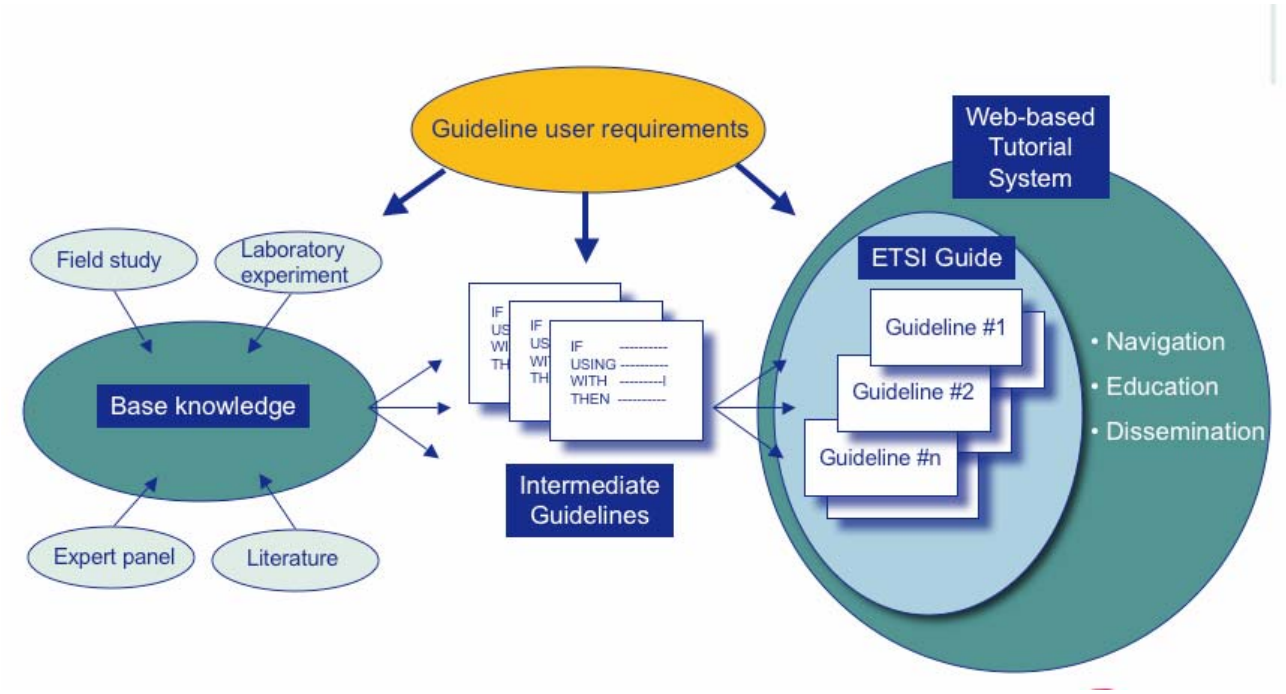


Figure 9: The web-based system contains the guidelines plus tutorial information

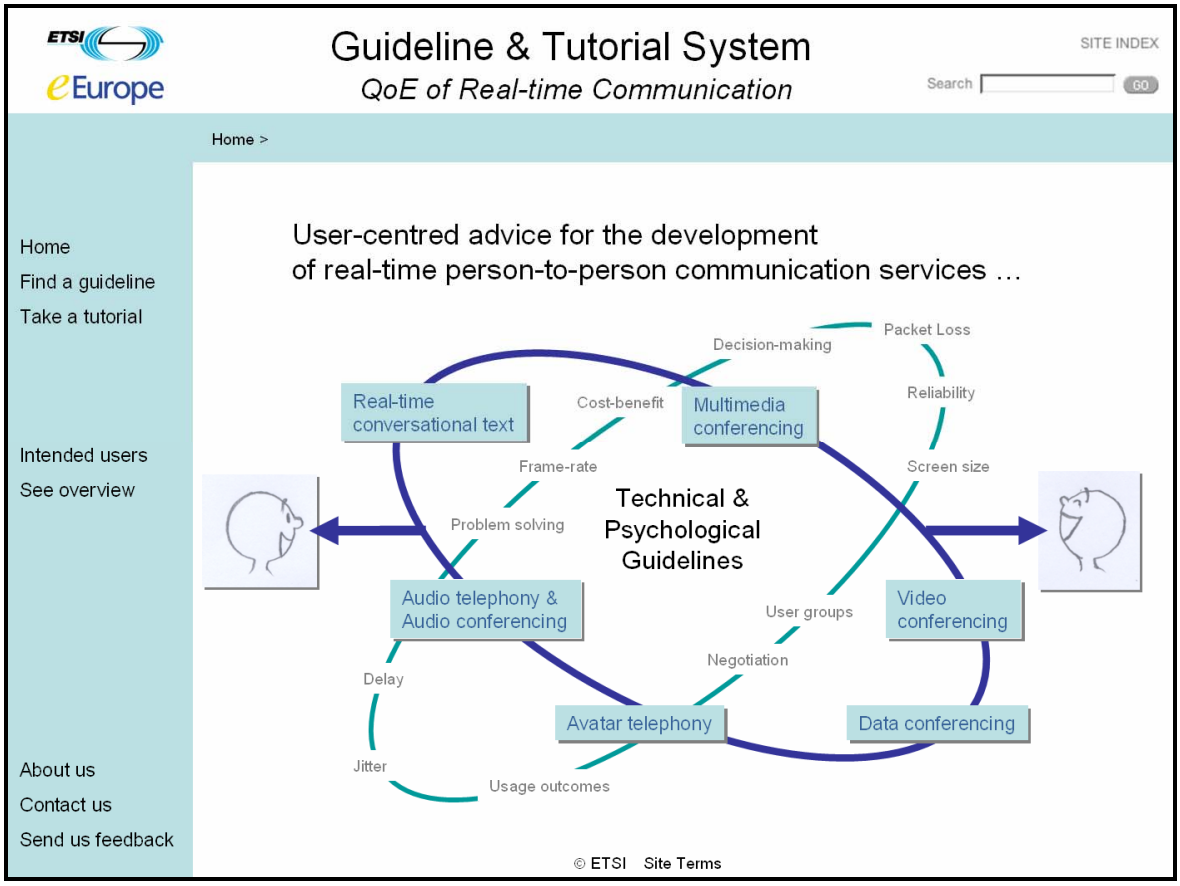


Figure 10: The web-based system home-page

6.2 Main functionality offered by the web-based system

The main functions of the web-based system are to promote:

- **Navigation** - to enhance traversing the information that is in EG 202 534 [3].
- **Education** - to tutor important aspects of EG 202 534 [3].
- **Dissemination** - to make the content available in an alternative way and also for other audiences, in order to maximize the spread of knowledge and good practice.

These guideline navigation, education and dissemination functions are treated in turn below.

6.2.1 Navigation

The aim of the navigational function is to assist guideline users to discover whether or not guidelines exist that cover the issue in which they are interested.

The navigation function offers three paths to reach a specific guidelines, via:

- Communication services.
- Guideline topics.
- User keyword *search*.

EXAMPLE: A network provider is considering to launch a new ADSL product for video calls. A Strategic network planner in this organization would like determine the number of subscriptions that are possible on the same sub-network. By using the "Find a guideline"' link it is possible to find guidelines about "Services" and then "Video communication" as a Service sub-set. Also, navigating through the Topic of "Technical parameters" will similarly lead to information on Packet loss.

If the need concerns one specific service, such as Audio communication, all other information is excluded. This is also the case when selecting a particular topic, such as "Purpose of communication". If the topic of "Purpose of communication" is chosen and then Negotiation, then all guidelines about negotiation within the services covered will be presented.

If neither of these paths provide relevant information for a particular guideline user it is possible that the general search engine could identify additional information. There could be a problem with terminology. For example, between use of the words Delay and Latency. Whilst navigating via Services and Topics enables a relatively simple but effective traverse through a relatively broad information space, the Search function is available as a final option to the user when necessary.

The navigation engine also enables guideline users to enter deeper into available data than is presented in EG 202 534 [3]. Due to the constraints of a mainly "linear" paper or electronic document, EG 202 534 [3] presents only single-sentence summary justifications for each guideline whereas detailed information on each justification is made available with the web-based system. These detailed justifications provide comprehensive information about the test result from which it is derived (e.g. types of users, experimental design, complete technical set-up, statistical results) and provides the reference to the literature from which it was derived.

6.2.2 Education

The aim of the education function is to assist guideline users to understand terms, expressions and concepts used in EG 202 534 [3]. The guidelines deliberately incorporate multidisciplinary data (e.g. linking QoE and QoS aspects is a key requirement introduced in clause 4.2). Guidelines users working in technical areas may understand Packet loss, whereas persons working in more marketing and financial areas may benefit from an explanation of this term. On the other hand, the more technically-oriented guideline users may benefit from explanations of the more user-centred concepts, such as a communication task based on Joint problem solving.

EXAMPLE: A Human factors specialist working at a service provider organization becomes responsible for considering user implications of packet loss. However, he does not understand the implications of packet loss sufficiently to immediately apply his knowledge of psychology. He chooses the lessons about packet loss and becomes informed about what causes errors on a digital line and that this is measured in Bit Error Rate. He also learns that when packets are transported over a digital line and a Bit Errors damages the packet this results in either the packet repairing itself (if it has enough information) or the packet being lost. The packet may contain audio or video information and therefore damage or loss will lead to the user perceiving some type of distortion.

The education function offers lessons within specific areas. These areas were identified from case studies of intended guideline users, as:

- Packet loss.
- Delay jitter.
- Lip-synchrony / asynchrony.
- Frame-rate / resolution.
- Reliability.
- Multi-point social presence.
- Heterogeneous transcoding.
- User communication modes.
- User task types.
- Influence of participant status.
- Configurations for blind persons.
- Configurations for deaf persons.
- Quality of Experience (QoE).

Each lesson has the same structure:

- A self-playing system of sub-lessons that in total cover the chosen area. Sub-lessons are:
  - Why can this be a problem for users?
  - What is it?
- Frequently asked questions.
- Links to relevant guidelines.
- References to relevant literature.

6.2.3 Dissemination

Dissemination is not a mechanism in the web-based system. Rather, the web-based system is used to enhance the dissemination process.

EXAMPLE: An equipment manufacturer developing 3G mobile terminals recognizes that it is necessary to know if the video quality of a new device is good enough. A Development engineer in this organization wonders if there could a Standard or published Guide to which she could refer and be able to state that the new product is quality assured for users. She uses a general internet search engine and discovers the current guidelines and, in particular, a guideline that states that CIF with 15 frames per second is good for remote inspection.

TR 102 274 [2] presents the need to support at least two styles of information acquisition by intended guideline users. These two styles are described as "Lean back and think" and "Lean forward and explore":

- "Lean back and think" guideline users can be supported by a human presenter who is very knowledgeable in the guideline origins and rationales and who is in turn supported by a slide-show presentation package (e.g. using Microsoft PowerPoint) that contains the key messages (figure 11).
- "Lean forward and explore" guideline users can be supported by a software implementation that allows exploration of details of guidelines (figure 12).

These two distinct working styles may be a requirement for the same individual at different stages of their work activity.

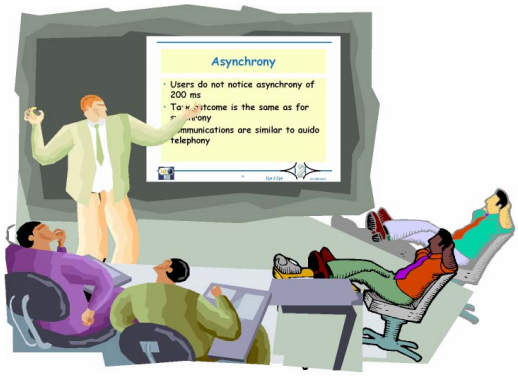


Figure 11: Guideline presentation package for "lean back and think" result users

Figure 12: Guideline presentation tool for "lean forward and explore" result users

The "Lean back and think" approach could be achieved within an organization if certain individuals (such as Human Factors specialists) become very knowledgeable about the guideline set.

The web-based system provides a tool for "Lean forward and explore" users. It should be:

- **Findable** by chance searching and by intentional users. The URL should be associated with the responsible Technical Body, the key authors and with the supporting Standardization document. For these reasons the web-site is located within the ETSI web-site and at the address of the responsible Specialist Task Force.
- **Accessible** when the guideline users require. An automatic feature of a website is that it is available anytime and anywhere with a terminal and internet connection.

6.3 Maintenance of the web-based system

As with most websites, there is an issue of maintenance of the web-based system. Furthermore, this particular site can expect to require updating due to a number of reasons:

- Existing guidelines should be modified or removed - for example, due to new research findings and changes in technologies, media and services.
- New guidelines should be added - as new research findings become available.
- Tutorial elements should be modified - for example, due to changes in technologies, media and services.
- New tutorials should be added - as new terminology, expressions and concepts appear.
- User interface should be modified - as experience from use reveals difficulties.
- Errors should be corrected - as usage reveals poor and no functioning elements.

Updating the web-based system could be primarily driven by the responsible Technical Body. In addition, it can be expected that users of the web-based system will provide requests for changes and additions. Indeed, this should be actively encouraged by the "Send us feedback" link on the homepage (described in clause 6.1).

7 Conclusions

The collection of guidelines for real-time person-to-person communication has been a continuous task since the EC 4th Framework Programme project Vis-à-Vis (1998-1999), with the collection of the requirements of intended guideline users in progress since the EC 5th Framework Programme project Eye-to-Eye (2000-2003). With the inclusion of the current work of an ETSI STF a total of 193 guidelines have been collected and 650 intended guideline user have been studied.

Experience from this research has shown a very high level of support for the aims, approach and results of the work. However, not all the guidelines that have been requested have been developed, due primarily to an absence of supporting data on which to base a conclusion. To address this requires further collection of user test data. Especially within areas as packet loss, Asynchrony and real-time person-to-machine communication for mobile usage there is still a lot of work to be done.

In general the developers of multimedia communication services recognize that not enough of their design and implementation decisions are based on data about end-users. Two main categories of information are identified that could enhance their work: information on topics that will aid development choices; and information on related concepts that will help understand and apply guidelines.

It is also possible to systematically derive concise guidelines from user test results that explicitly link QoS and QoE variables and, by doing so, respond to the various and changing information needs of network operators, equipment manufacturers and service providers.

It is difficult to meet all of the guideline user requirements with a "linear" paper or electronic document. In particular, there is a requirement for tutorial information that explains the key concepts to which the guidelines refer. Also, the ability to get more detailed justification of a guideline is required by some types of users. Therefore, a web-based guideline access and tutorial system is considered to be an important extension.

During this work on real-time person-to-person communication services aspects of real-time person-to-machine communication have been noted as strongly related and should be considered to be included in the future. The main areas are mobile streaming and download for TV watching and listening to music, particularly for guidelines on media quality. Another area is the use of person-machine avatars in VideoMail and VideoPortals. It can also be expected that person-to-person avatar communication shall move increasingly from the research laboratory to the market place and may find application areas and convergence with person-machine communication that currently cannot be predicted with certainty. As end-users are becoming more and more mobile, there may be several new candidates within new services and uses for 3G mobile, both in the person-to-person and person-to-machine areas. Therefore, there seems to be a convergence of certain user-centred and technical issues between these domains.

A widening of the scope for the guidelines, from pure real-time person-to-person communication to also aspects within the person-to-machine domain, will increase the demand to find the right borderline of inclusion for deciding which user-centred knowledge should be collected and expressed as guidelines.

8 Recommendations for further work

Two items for further work have been identified from the assessment of existing guidelines and the dissemination approach using a web-based system:

- Extension of EG 202 534 [3].
- Maintenance and enhancement of the web-based system.

Each area is therefore treated below.

8.1 Extension of EG 202 534 [3]

There are 75 candidate guidelines that have been developed but that were not included in EG 202 534 [3]. Some included guidelines are based on provisional research work (e.g. expert panel, restricted user sample) that should be validated by more user tests. Some guidelines were excluded either because there was not enough confidence in the guideline (e.g. no test data or expert opinion available) or because they were requested but were not relevant to a focus on real-time person-person communication. The new areas concern person-to-machine communication (e.g. media quality for mobile TV streaming, avatars used in VideoMail and VoWIP). An approach to developing a new Guide is:

- Revisit what has been done and what is requested as new guidelines given the state-of-the-art of technologies, media and services.
- Identify the set of guidelines that should be developed.
- Continue the contact with intended guideline users for requirements and feedback.
- Perform end-user studies to create the base data from which the guidelines can be developed.
- Revise EG 202 534 [3] as a new Guide.
- Revise the web-based system.

8.2 Maintenance and enhancement of the web-based system

It is recognized that there is little scope for maintaining a completed deliverable at the end of the period for which the responsible STF was contracted. This is also the case for EG 202 534 [3] and the web-based system. Due to possible errors or revisions in other parts of the ETSI website, the web-based system has a particular risk of presenting difficulties to users for reaching certain content. It could even becoming totally unreachable by people who could benefit from it. Future work should therefore at least maintain the web-based system. This could imply:

- Errors should be corrected - as usage reveals poor and no functioning elements.
- User interface should be enhanced - as experience from real use reveals difficulties.
- Existing guidelines should be modified or removed - for example, due to new research findings and changes in technologies, media and services.
- New guidelines should be added - as new research findings become available.
- Tutorial elements should be modified - for example, due to changes in technologies, media and services.
- New tutorials should be added - as new terminology, expressions and concepts appear.

History

Document history		
V1.1.1	November 2006	Publication
V1.1.2	July 2007	Publication