REACH112

REsponding to All Citizens Needing Help

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STATEMENT OF ORIGINALITY

This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.

Total Conversation & 112 for all

TABLE OF CONTENT

TABLE OF CONTENT

1 Executive summary

Total Conversation is an extension of the voice telephony concept by adding the video and real-time text media, still maintaining the bearing ambition of standardized implementation to accomplish an opportunity of global interoperability between implementations of different manufacturers and service providers.

The extended conversational service concept is intended to suit a wide range of situations in conversational settings over distance, and especially situations that appear when one or both communicating parties has a communication related disability causing a need to communicate in other modalities than speech, or complementing speech with other modalities.

The REACH112 project established a model for implementation of conversational services focusing on Total Conversation access to emergency services as well as person-to-person communication in modalities that suit persons with varying capabilities and preferences. Relay services, providing translation between modalities in communication form also important parts of the services. The project aimed at contributing to making the 112 number accessible for all across Europe, encouraging replication as well as ensuring interoperability and assessing cost effectiveness and user acceptance.

Even if the concept has general applicability to improve communication for all, the project focused on serving deaf, hard-of-hearing and deafblind persons.

This deliverable is a report summarizing and analyzing the previous deliverables and outcomes of the project; it is a public report which can be used generally by a wide range of readers.

It is based on the work of all work packages and aims at putting REACH112 into the general perspective of sustainability of Total Conversation in the European socio-political context.

The implementation environment for the services is modern broadband networks using state-of-the art technologies.

Reference is sometimes made to other public deliverables of the project, where data and details supporting the conclusion of this reports can be found.

2 Introduction

Voice telephony is a very successful concept for distance communication because of its global interoperability based on strict standardization of interfaces between various implementations of the concept.

At the same time voice telephony is not usable for a large population of people with disabilities who need other or complementing modalities of communication. Total Conversation is created with the goal to extend the usability of voice telephony but maintaining the global interoperability ambition by strict application of standards.

Total Conversation is an extension of the voice telephony concept by adding the video and real-time text media. By maintaining the bearing ambition of standardized implementation, an opportunity of global interoperability between implementations of different manufacturers and service providers is achieved.

The extended conversational service concept is intended to suit a wide range of situations in conversational settings over distance, and especially situations that appear when one or both communicating parties has a communication related disability causing a need to communicate in other modalities than speech, or complementing speech with other modalities.

The REACH112 project established a model for implementation of conversational services focusing on Total Conversation access to emergency services as well as person-to-person communication in modalities that suit persons with varying capabilities and preferences. Relay services, providing translation between modalities in communication form also important parts of the services. The project aimed at contributing to making the 112 number accessible for all across Europe, encouraging replication as well as ensuring interoperability and assessing cost effectiveness and user acceptance.

As a response on observations of fragmented communication services with low functionality and inferior support of emergency calls for people with communications related disabilities, REACH112 has been set up as a pilot project in five countries: France, The Netherlands, Spain, Sweden and the UK. Its primary aim was to implement interacting telecommunications infrastructure across these countries using the same standard of Total Conversation (TC) – allowing video, real-time text and voice simultaneously in the call for emergency service access as well as everyday communication. REACH112 has three components:

1. Deployment of infrastructure and user terminals to allow person to person calling in Total Conversation to reach other users and terminals in each country.
2. Implementation of and/or integration with relay services which support Total Conversation functionality in order that disabled users can get support for

conversion of communication modality when contacting and being contacted by the community at large.

3. Installation of Total Conversation in emergency service centres and cooperation with such centres in regard to accepting Total Conversation-enabled calls to 112.

3 Objectives

The project main objectives as identified in the contract with the European Commission are listed in the following:

OB1 Validate the technical and operational deployment of Total Conversation and Real-Time Text services for person to person communication with the possibility to call between different users, terminal types and service implementations in different countries

This objective aimed at validating the deployment and usability of Total Conversation. Scenarios included communication in sign language, real-time text for typing a conversation and voice for spoken conversation. The components of this are:

- Users are provided with terminals and call each other. ('terminals' here includes fixed line devices, mobile devices and software installed in computers)
- Users are provided with terminals of different makes, in different countries, and are customers of different providers and call from country to country and use all media provided the Total Conversation standard has been implemented.
- Users are alerted to incoming calls even if they have a sensory disability.
- Users of text-only services have calls in text with users of Total Conversation.
- Where differences in implementation of the standard occur, these are negotiated and communication verified
- The organisations setting up the services are expected to continue to deploy the service.
- There is provision for technical and operational support to the users.

OB2 Validate technical and operational deployment of Total Conversation and Real-Time text in calls via Relay services for text and sign language

This objective represented the bridge between the disabled users and the community at large. Relay operators using Total Conversation should be able to mediate communication between the disabled user and the able-bodied, hearing user. In this case the endpoint for the hearing user may be a voice telephone and not a Total Conversation-enabled device.

The project therefore aimed at ensuring that calls can be made to and from the users of the relay services and that business plans for sustainability of the relay services are established.

OB3 Validate technical operational and ICT-organisational deployment of Total Conversation and Real-Time text access to 112 emergency services with and without Relay service support

This objective dealt with access to 112 emergency services. Scenarios including relay services and scenarios based on direct connection were investigated. The project had to:

- show that the emergency services can receive the calls in an operational environment and will demonstrate that this facility can continue beyond REACH112
- Ensure that Total Conversation users obtain a similar priority as other emergency service callers.
- Aim at creating a system to enable the emergency services receives appropriate and sufficient detail on the call.
- Verify that calls-back to the users are possible and that they can be handled with the same media and conversational modes as the initial emergency call.

OB4 Validate efficiency, usability and user satisfaction for Total Conversation and Real-Time text for person-to-person and Emergency calls

This objective concerned the user response to the facilities created by REACH112 and the effectiveness of support to these users. REACH112 had to:

- Verify the model for the supply of services and support to an agreed number of users.
- Verify that the users in 5 pilot sites find the services to be of value to them, and to explore the capacity to pay a subscription for a continued service.
- Verify that the services can meet established service standards for reliability and response latency for each service component.

OB5 Validate sustainability and replicability of Total Conversation and Real-Time text services for person-to-person and emergency calls

This objective related to the business plan and sustainability model and its presentation in a form which can be implemented elsewhere in the EU. REACH112 had to:

- Verify that there are providers prepared to deploy terminals, real-time text services and Total Conversation services.
- Verify that there are providers prepared to deploy relay services and that funding for these services are arranged or about to be arranged.
- Verify that emergency service organisations are prepared to include the services in the continuing emergency service provision.
- Determine whether there is political preparedness to arrange financing of the centralised services as a complement to user subscription
- Ensure that there is an understanding among the service providers that interoperability is essential, so that any plans for modifications in service provision is accompanied with plans for interoperability tests, and standardisation proposals whenever applicable.

OB6 Investigate and validate methods for distributing emergency alerts to groups of users

This objective concerned the possibility to provide emergency information to the users by reversing the process described in the above objectives i.e. to send messages from PSAPs.

From the service point of view, the project defined an internal list of golden goals ("Ten Commandments"), reported below:

1. All shall be able to call all. All users of each REACH112 pilot SHALL be able to call all other users of all REACH112 pilots.

2. Call by SIP address and number. Calling users of other REACH112 pilots MUST be made possible by using phone numbers (through public or private ENUM lookup) and SHOULD be possible by using sip address on the form user@domain.

3. Use common media. It SHALL be possible to use the media that are in common between two terminals in a call.

4. Total conversation or subset including Real-Time Text. In calls between REACH112 pilots, it SHALL be possible to use the protocols and media of Total Conversation as specified in IETF RFC 5194 or a subset thereof including Real Time Text.

5. Call destination and include relay service. In pilots including relay services, calling SHALL be possible by providing the number or address of the call destination, and get an appropriate relay service invoked in the call. This SHALL be possible both for voice users and relay service users.

6. Call 112 for all. All users SHALL have the opportunity to call 112 and be served by the emergency service in the media and modes that suit the users, and are supported by the communication service provider including Real-Time Text. External relay services MAY be invoked to meet this need.

7. Call back from Emergency Services. The 112 emergency services SHALL have a possibility to call back to the calling user and use the same set of media, modes and relay services as in the original call.

8. Provide Location in emergency calls. Pilots are STRONGLY ENCOURAGED to provide location in emergency calls according to draft-ietf-ecrit-phonebcp.

9. Record emergency calls. Pilots MUST follow national requirements for recording of emergency call information and media.

10. Use CAP for data transmission on emergency cases.
Pilots are RECOMMENDED to implement data transmission between PSAPs according to CAP for conveying information of emergency cases.

REACH112 Ten Commandments

The overall result of the project were targeted in being the implementation and evaluation of a pilot service offering Total Conversation with Real Time text as an extended and accessible telephony service for people who use voice, sign language, text and other visual expressions in person to person communication.

The Total Conversation service had to be validated for access to emergency services (making the 112 number accessible for all across the pilot sites). Services had to be replicable in other settings and other countries. However, the key targets were interoperability and assessment of cost effectiveness and user acceptance of the provided services.

Impact was planned to be measured quantitatively and qualitatively. The quantitative measurement was enabled by collecting data on traffic related to particular purposes, by examining the uptake of users and groups within each pilot site, by the demonstrated training of relay operators and call takers, and by the numbers of call to emergency services which are recorded. The qualitative measurement was enabled by user responses to direct questioning, through spontaneous reactions on the websites dealing with the project, and by group-task-related trialling, examining progress in community interaction.

Impact was also planned to be measured by the interaction with statutory telephony services, legacy systems and other Internet–based communication systems. By using published standard, the work of REACH112 would be integrated with and invite cooperation of other major players in networking and communication. Targets for use had been set in the work plan. The ultimate goal was a transnational Total Conversation telephony system which offers access to all.

4 Project organization and activities

REACH112 is a joint undertaking by 22 organisations across Europe, each of them contributing with their expertise, skills, aspirations and needs to achieving the project objectives defined in the previous section.

The project was part of the Competitiveness and Innovation Framework Program CIP, and it's Policy Support Program PSP, aiming at support to deployment of services of potential importance of policy reasons.

The list of project partners is reported in the following table:

Partner no.	Partner name	Partner short name	Country	Month enter	Month exit
1	IES Solutions	IES	Italy	1	36
2	Omnitor	Omnitor	Sweden	1	36
3	University of Bristol - Centre for Deaf Studies	UB-CDS	UK	1	36
4	AuPix	AuPix	UK	1	36
5	Royal National Institute for Deaf People	RNID	UK	1	36
6	Avon Fire and Rescue Service	AFR	UK	1	36
7	Avon and Somerset Police Authority	ASP	UK	1	36
8	National Police Authority	KLPD	Netherlands	1	36
9	4C Telecom	4CT	Netherlands	1	36
10	AnnieS	AnnieS	Netherlands	1	36
11	Grenoble Hospital	CHU	France	1	36
12	Ivès	Ivès	France	1	36
13	France Telecom	FT	France	1	36
14	WebSourd	WEBS	France	1	36
15	Siemens	SIS	Spain	1	12
16	Vodafone	VF	Spain	1	12
17	Sertel	Ser	Spain	1	36
18	Nokia	Nokia	Finland	1	36
19	European Emergency Number Association	EENA	Belgium	1	36
20	e-Isotis	e-Isotis	Greece	1	9
21	SOS Alarm	SOS	Sweden	1	36
22	Agencia Galega de Emerxencias	AXEGA	Spain	1	36
23	ATOS	ATOS	Spain	13	36

In REACH112, the work has progressed along two converging directions:

1. The identification of a Total Conversation system (i) interoperable across different Regions, (ii) independent from vendors and providers, (iii) ready to be integrated by Emergency Services in day-by-day operations and (iv) responding to the needs of the Deaf and Hard-of-Hearing in they every day's life.

2. The adaptation of services already existing in 5 Regions across Europe that became a 12-month pilot of the REACH112 Total Conversation system.

Descending by the results of these two main lines of work, two fundamental tasks were carried out:

- Assessment of the impact of project on the society and the intended user (Deaf, Hard-of-Hearing, Hearing people, Emergency Services, the Society as a whole)

- Identifications of the conditions for the sustainability of Total Conversation services; this includes the relevance of legal frameworks, technical standards and business conditions.

The project was organised in different Work Packages and tasks, each of them focusing on parts of the described direction of work.

Users & Services (WP2)

This work package aimed at determining and specifying the Current Service Status in Europe, the User experience and aspirations, the legal requirements and a description of the situation at Emergency Services. The conclusions of the activity are reported in the public deliverable D2.1 "Current status and availability of Total Conversation systems, aspirations of users; Legal requirements and structures of emergency services in each Participant country".

Total Conversation Platform (WP3)

This work package had to goal of specifying and providing the Total Conversation Platform for development and pilot in each participant country. The conclusions of this work package are reported in the public deliverable D3.2 "Final Specification of the functioning Total Conversation Platform", where functionalities, components and standards to be adopted are documented.

Total Conversation Service specifications; Person to Person trials (WP4)

This activity targeted the specification of devices and connectivity needs for users, along with the execution of trials of person-to-person calls; additionally, trans-national interoperability was trialed. The conclusions of this work package are reported in the

public deliverable D4.2 "Report on Person-to-person trials", however important conclusions were reported in deliverable, D4.1 "Description of users, their characteristics and their position in terms of marketing", whose conclusion have an important role in defining the user base for Total Conversation services.

Emergency Services' Trials and adaptations (WP5)

This activity aimed at installing the Total Conversation Clients in PSAPs (Public Safety Answering Points, where emergency calls are taken and managed) and Relay Services. I was also focused on specifying devices and connectivity needs for operators of PSAPs and on carrying out initial trials with users and relay services. The conclusions of this work package are reported in the public deliverable D5.1 "Report on Emergency Services' trials", however important conclusions were reported in a deliverable, D5.2 "Pilot Phase Specification", whose conclusion had a strong relevance for identifying the conditions for the next generation of 112 services compatible with the Total conversation principles.

Service Deployment and Pilots (WP6)

During 12 months towards the end of the project, service operation has been running making it possible for the users to call each other and the emergency services in ways accessible for persons with disabilities. The performance was monitored, and the activities reported in two reports: In D6.1 ("Pilot report 1") after 6 months, and in D6.2 ("Pilot report 2") after 12 months. An extra deliverable was also linked to this work package, reporting on European and national best practices in the area of accessible communications services with special focus on relay services. It is called D6.0 "Overview of best practices in accessible communication services".

Monitoring, Evaluation and Reporting (WP7)

In WP7, experience and statistics were collected from the pilot period. Specific focus groups and other activities were also organized to collect views of users and other stakeholders. Analysis of this data was made and documented in D7.1 "Report on performance of all elements in the value chain".

Dissemination, Exploitation and Business Plan for Sustainability (WP8)

Dissemination activities were collected under WP8, together with production of exploitation and business plan. Dissemination was planned so that it would have effect for further deployment and use of both the personal communication functions and the emergency service side of the REACH112 services. The plan for continued dissemination is reported in D8.3 "Plan for dissemination of foreground".

The actions for creation of the exploitation and business plan looked at possible ways to make the deployed services sustainable, and reported different approaches for different countries.

Also the web site www.reach112.eu and the final workshop belonged to the tasks of this work package.

Finally, this document, the final report was done as a summary and conclusion of the project in D8.5 "Final report on REACH112".

5 History

The communication standards to be used in the project were prescribed already in the CIP project program that REACH112 is a response to. A series of activities with involvement of the eInclusion unit of the European Commission had resulted in a collection of standards recommended for deployment of Total Conversation in fixed or mobile broadband networks.

The concept can lead its roots to the Wisdom project, years 2000-2003, verifying its usability in 3G mobile settings.

The INCOM group supporting the regulative group COCOM with accessibility advice, indicated in its first report COCOM 04-008 that communication for deaf, hard-of-hearing, speech disabled and deafblind persons had severely fragmented and inferior communication opportunities both for daily communication and for emergency service access.

The remedy was foreseen to be trans-European deployment of communication services interfacing using the standard protocols that now have been used as the base for Total Conversation in the services deployed in REACH112.

The same conclusion was provided by the eWGD subgroup of the terminal regulatory group TCAM in 2007, with more details and more discussions of alternative solutions.

The standards for IP based Total Conversation were also picked up and recommended by the European ICT Manufacturers organization DigitalEurope in the white paper: "EICTA recommendations on Total Conversation – from Vision to Implementation" in 2007.

The standards referenced in these European initiatives had been picked up in national procurements of communication aids by Swedish Institute of Assistive Technology SIAT, making it possible to procure interoperable Total Conversation communication aids and services to people with disabilities in order to fulfill national and European goals for affordable access to communication with equal functionality as what is available to the population at large.

The existing Swedish deployment and emerging implementations in other countries made it possible to refer to existing solutions of interest for Europe-wide deployment to be supported through the Competitiveness and Innovation Framework Program and Policy Support Program (CIP PSP).

6 The technical base

The technical base and architecture for the services implemented in REACH112 is best described in deliverable D3.2 ("Platform specification"). The pilots are interconnected through the Internet, using specified state of the art standards for interoperability. These main standards for this purpose are:

IETF RFC 3261 Session Initiation Protocol (SIP) for call control
IETF RFC 6116 ENUM for finding SIP addresses from numbers
ITU-T H.264 video codec with IETF RFC 3984 RTP packetization
ITU-T H.263 video codec with IETF RFC 4629 RTP packetization

ITU-T T.140 real-time text codec with IETF RFC 4103 RTP packetization
ITU-T G.711 audio codec with IETF RFC 3551 RTP packetization

These standards are the same as once recommended by INCOM, TCAM eWGD and DigitalEurope and procured in Sweden, and form a good base for trans-European interoperability. The details of usage are described in Deliverable D3.2.

Each pilot had its own technology service providers. Within one service provider's network, it is possible to use other standards for the same purpose. However, there are benefits in using the same standards for creating a common market for Total Conversation system components. In the REACH112 project, all pilots except the Dutch pilot used the same standards internally.

When the project started, there were no published standard for how to access the Public Service Answering Points (PSAP) in the emergency services in the multimedia Internet environment. But there were mature drafts that got published as standards later during the project. The umbrella for these standards is IETF RFC 6443 Framework for Emergency Calling Using Internet Multimedia pointing at the required technical standards. The same standards for call control and media communication are specified in this standard, so the project could implement the same standards in the connection to the emergency services as for the interoperability communication.

Same with relay services, they are connected with the same communication protocols.

In this way, the REACH112 concept forms a consistent framework for interoperability and growth. New service providers can join by using the same protocols for interoperability, and decide for themselves if the same are used internally or if there is any reason to use other protocols internally.

The picture below shows how two REACH112 service providers fit in to the architecture.

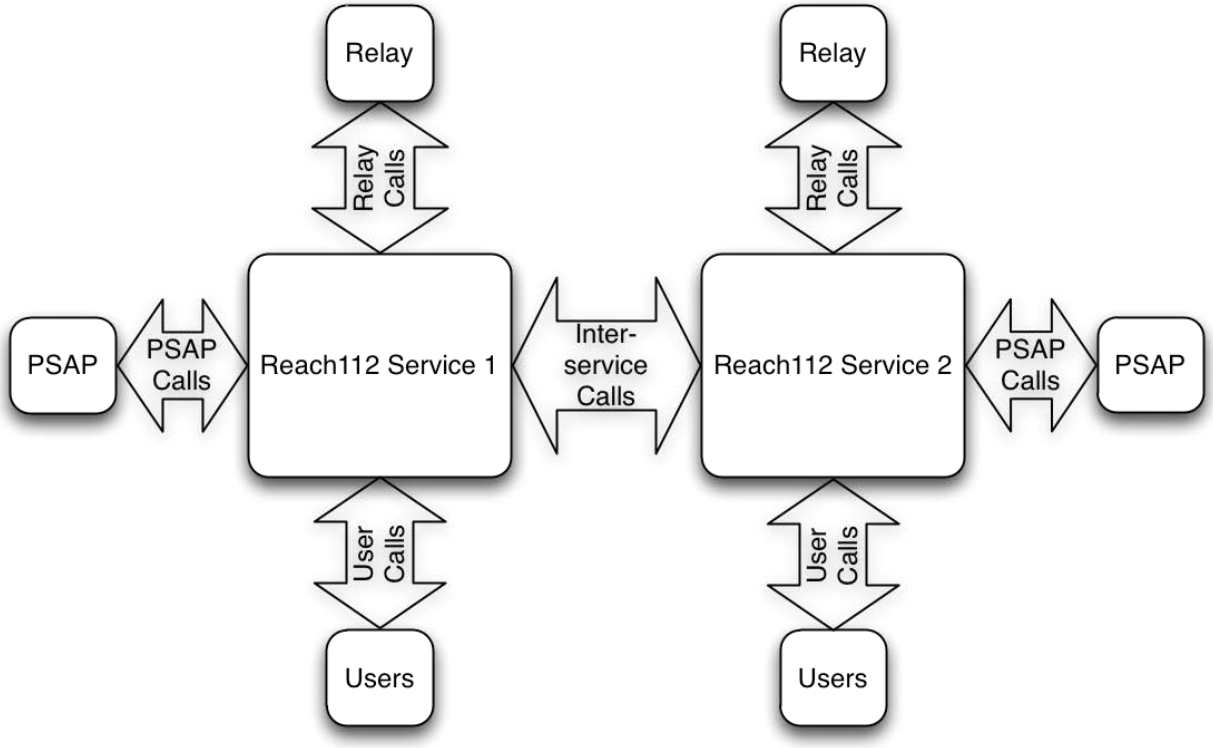

Figure: Two REACH112 Services Using Only Standard Total Conversation Interfaces

7 Project outcomes evaluation and assessment

7.1 Overview on REACH112 results

The work of the project has been guided by the contracted description of work. The six agreed objectives described in section 2 are summarised in Table 1.

Table 1 - Planned Objectives for REACH112

Objective	*The piloted solution should address the following aspects:*	*Societal/ technological issue*	*Expected Impacts*	*Means to sustain impact/ dissemination/ use plan*
OBJ1 Validate the technical and operational deployability of Total Conversation and Real-Time Text services	Deployment / validation of the service setup of Total Conversation	Creation of user base to allow person to person calling	Improved quality of life, ease in workplace.	Show to mainstream user to create interest. Exploitation plan WP8
OBJ2 Validate technical and operational deployability of Total Conversation in calls via Relay services	Create or validate existing relay services for Total Conversation terminals	Relay services integrate users in society	Open access to satisfy equality goals.	Governmental support of relay services; models for commercial sponsorship
OBJ3 Validate deployability of access to 112 emergency services	Total Conversation technology link to Emergency Services systems. Technical and operational adjustments.	Vital Premier service aspiration for marginalised community	Change in access to emergency	Governmental support
OBJ4 Validate efficiency, usability and user satisfaction of Total Conversation for person-to-person and Emergency calls.	Validate Total conversation and emergency services in pilot trials and evaluate user experience.	Major telecoms change to be assessed by community	Raised expectations and evidence of satisfaction; likely requirement for sustainability	User perception of value to lead to paid for service
OBJ5 Validate sustainability and replicability	Validate sustainability of the deployment across the EU of interoperable total conversation emergency services accessible to all.	Need to change governmental perceptions and to use existing funding mechanisms	Raised awareness of need; commitment from public services to support	Use of existing public and commercial support to ensure continuation
OBJ6 Validate accessible methods for distributing emergency alerts to groups of users.	Validate an accessible Emergency Alert system by sign language and text to a selected group.	Multi-cast emergency notification usually delivered through television; alternatives to be explored for Total Conversation	One solution of alerting trialled.	Suggested developments for other countries.

The status of these objectives is as follows

Obj1: **Validate the technical and operational deployment of Total Conversation and Real-Time Text services for person to person communication**

This has been achieved and the 'blueprint' for service development is set out in Deliverable D3.2 "Platform Specification"; user engagement with the service is detailed in D6.2 "Second report on pilots" and also in D7.1 "Report on all elements in the value chain"

Obj2: Validate technical and operational deployment of Total Conversation and Real-Time text in calls via Relay services for text and sign language

This has been achieved in all pilots. See Deliverables D4.2 "Report on P2P trials" and D 6.2 "Second report on pilots".

Obj3: **Validate technical operational and ICT-organisational deployment of Total Conversation and Real-Time text access to 112 emergency services with and without Relay service support**

This has been achieved in all pilots although only for the duration of the pilot. After the pilot, in Sweden it fell back to an available text access to emergency service 24/7 and sign relay access during limited hours and without priority. In France and the UK, the service was tested and detailed plans formed for a universal service. In the UK this is already available through text. In the Netherlands, emergency service access was possible directly through text during the project. A significant number of emergency service calls were reported (probably proportionate to the numbers of users and the time scale of the pilot). However, the major lesson learned here was of the complexity of the emergency service operation and the difficulty in creating innovation when resilience is seen to be at stake.

Obj4: **Validate efficiency, usability and user satisfaction for Total Conversation and Real-Time text for person-to-person and Emergency calls**

User aspirations were measured by qualitative data collection in Sweden, France and the UK. Not surprisingly, the overwhelming response was of the appropriateness and timeliness of the initiative. Questions and complaints mostly centred on the uncertain future of the service, particularly the connection to emergency services.

Obj5: **Validate sustainability and replicability of Total Conversation and Real-Time text services for person-to-person and emergency calls**

Despite energetic promotion in each pilot, only few of the services created specifically for REACH112 continue in operation immediately at the end of the project. In Sweden, all person to person services continue to function; already existing relay services continue to function for all aspects but only a limited hours' service for the sign relay service. Direct text access continues for total conversation users. In the UK, all created person to person services continue to run; there is a continuing 24 hour text relay service which encompasses contact with emergency services; funding is sought for the sign language relay service. In the Netherlands, current development for further Total Conversation access to the emergency service has been suspended. Relay services for video and text will be implemented and emergency access will most probably provided through the relay service. In France, the emergency service aspect of REACH112 has been overtaken by a government programme which runs to a different timescale, although the achievement of REACH112 included demonstrated call taking by Deaf staff as well as relay operation. The P2P Total Conversation service continues. In Spain, the text relay component continues to function as does the person to person text service although in both cases with very low volume.

Exploitation and confirmed sustainability of accessible emergency services and 24/7 available total conversation relay services remains an issue in all pilots.

Obj6: **Investigate and validate methods for distributing emergency alerts to groups of users**

Although a sign language fire service safety campaign was demonstrated at the start of the project, this was a website demonstration and does not generate the immediacy of emergency announcements. Total Conversation as a technology is not designed for one to many (thousands) communication. Instead the actions in the ETSI standard area called EU-Alert and in EU projects, such as Alert4All were briefly reviewed and found to be feasible environments for accessible alerts.

7.2 Factors considered for the project assessment

The impact assessment has been organised around some outcome factors considered as relevant for a project like REACH112. These are the areas of impact targeted by the five pilots and assessed in WP7 (re. deliverable D7.1).

Table 2 - IMPACT: **Individual and Family**
Outcome Areas and Sample Outcome Statements

Outcome Area	Sample Outcome Statements
Changes in attitudes, e.g. perceptions and beliefs	* realisation of "reach" – when others are not physically present * Improved sense of security as other people can be reached through Total Conversation * confidence in interacting with hearing/mainstream through relay service
Changes in knowledge	* understanding of Internet, telecommunications
Changes in awareness	* improved empathy with others because of immediacy of contact
Changes in skills	* new protocols for interaction in text, video and voice
Changes in behaviour	* more daily contact with others; more contact with society
Changes in health care provision	* easier consultation * creation of micro-health support networks, so better prevention and post-operative care
Changes in family stability	* better contacts with family members through Total Conversation – directly for disabled users
Changes in financial status	* no grounds for rejection of employability * no grounds for redundancy on account of increasing hearing loss

Some of these aspects are shared as the impact moves outward from the point of application; however there are also group and agency specific impacts.

Table 3 - IMPACT: **Population Level**
Outcome Areas and Sample Outcome Statements

Outcome Area	Sample Outcome Statements
Changes in health care provision	* easier network creation for interaction on health issues * access through relay services to health care – Doctor, dentist, pharmacist
Changes in education	* use of relay services in mainstream education facilities – increases choice and flexibility; increases involvement in non-curricular activities
Changes in social conditions	* contactable by mainstream groups, commercial agencies, allows social integration and lifestyle improvement
Changes in economic conditions	* cooperative actions on employment – supporting entrepreneurship * use of relay connects individuals and groups to mainstream
Changes in safety	* establishes position in a community, offers a means to get help and to provide help to others * 112 access
Changes in own community involvement	*easier to set up Deaf, Hard of hearing groups, promote cultural events

As well as outcomes measured at the individual and group level, there are higher level outcomes which we can examine in REACH112, through our Theory of Change.

Table 4 - INFLUENCE:
Outcome Areas and Sample Outcome Statements

Broad Outcome Areas	Sample Outcome Statements
Changes in visibility of issue	* dissemination leads to local media coverage and engagement with the development * continuing media promotion – establishment in public information services
Changes in community norms	* mainstream community accepts equivalence through Total Conversation use
Changes in partnerships	* Partners increase formal interagency agreements and/or other collaborative protocols.
Change in public will	* support for Total Conversation endpoints; publicly accessible endpoints in public sites
Change in political will	* incorporation of Total Conversation into public service – council sites, equipping of care workers
Change in policies	* designation of Total Conversation as valid enabling service to disabled users; corresponding funding
Specific policy changes	* legalization of Total Conversation, of relay service, of 112 access; training
Change in regulations	* incorporation of Total Conversation in regulatory framework – operator training
Changes in service practice(s)	* Total Conversation reception in public agencies * staffs that directly interact with Total Conversation service consumers increase their knowledge of the cultural backgrounds and experiences of their consumer populations. * service providers increase their linguistic competence. * service providers change the hours of service delivery to better match the availability of consumers.
Change in business practice(s)	* Total Conversation access possible to local business: support to relay service from business to support contact: * employers mandate Total Conversation functionality in workplace

The above factors are all expected direct outcomes, but as REACH112 gathers momentum it begins to provide leverage, an effect beyond its immediate application.

Table 7 - *LEVERAGE:*
Outcome Areas for REACH112 and Sample Outcome Statements

Outcome Areas	Sample Outcome Statements
Changes in public funds	* Public funds redistributed toward REACH112 priorities * New funding methods (pooled, matched, blended) increase monetary resources to support access in REACH112 * Public funding practices (mechanisms, formulae) change to adapt to a different landscape created by REACH112
Changes in philanthropy	* on agenda for charitable giving
Changes in resource planning	* areas, equipment identified with Total Conversation activity
Changes in private investment	* investment in endpoint development, software, networks
Changes in business models	* new business plans to allow for Total Conversation

7.3 REACH112 system assessment

The conclusions reported in this section are discussed in details and substantiated by figures and data in deliverables D4.2 Test Plan for Intra Service and Results, D5.1 Report on Emergency Services Trials, D6.1 "Pilot first report", D6.2 "Pilot second report" and D7.1 "Report on performance of all elements in the value chain".

7.3.1 Verification of functioning services

A factor to include when establishing a Total Conversation service is that its performance for a wide set of use cases must be verified. Users have right to expect that many of the use cases they can imagine are working properly, and that different user terminals used in the service can be used interchangeably in calls.

In order to verify the functionality, a set of test cases and test procedures were defined and documented in D4.2 "Test Plan for Intra Service and Results". The tests were performed in the pilots and results reported in order to assess preparedness for service operation.

The tests described in the document are intended to be intra-service tests implying tests between user terminals and services in each service provider's network.

The tests include factors that are experienced as important for the usability of the Total Conversation or Real-Time text services, including call setup, media performance, user-to-user calling, legacy terminal interoperability, relay service calling and emergency calls.

The tests are intended to be valuable to repeat for each terminal type introduced. The interoperability of terminals and between terminal and platform can then be verified-

The tests in the user to user tests included in this document can be used also for interservice tests between user terminals in different Total conversation platforms.

Inter-service tests between service providers are however described in REACH112 D3.2 Platform Specification, chapter 9.

The use of these test specifications showed that they were important instruments for establishing and maintaining good operational status of the services. Various failures occurred in initial tests that were analyzed and adjusted. Follow-up testing could verify that the problems were gone.

It is recommended that these test procedures are established and maintained for operational services, and that the results are stored by the service providers for reference and comparison if new problems appear.

7.3.2 Enabled use cases

Initially in the project, a large number of use cases were identified and documented in deliverable D 3.1 "Initial Platform Specification". The use cases were grouped according to what kind of terminals and other service components were to be involved and what media and modalities were to be used.

The list of use cases was a base for development of all routing and service connection scenarios.

In order to keep complexity feasible, some use cases were regarded to be too complex and little asked for or not contributing to the objectives of the project. These were marked not applicable in the list of use cases. The resulting master list of use cases shows a rich variation of possible use cases for a REACH112 service.

All the relevant use cases were tested in the various countries and gave a good insight in the handling of different situation that could occur in an emergency.

The list of these relevant use cases and information on which pilot they were tested and monitored in are documented in Deliverable D5.1 Report on Emergency Services Trials, chapter 5.

7.3.3 Traffic data

The figures collected in WP6 and the consequent analysis carried out in WP7 shows an active network of users in each pilot. The data show that the significant targets in the Description of Work Appendix 7 have been reached.

In summary, we can see major progress in the period of the pilot

- Nearly 7,500 registered end users
- over 970,000 Total Conversation calls
- over 124,000 relay calls were made
- that is, more than 100,000 hearing people were impacted as well as Deaf and hard of hearing people

Significant progress was made in access to emergency – in training, in awareness, in protocols – over 70 real calls processed

Hearing people were engaged in the implementation, through the relay service than deaf or hard of hearing people. The multiplier effect is significant. When this statistic is offered to the hearing community, it is often brushed aside as a project effect and not a change in behaviour. Of course, that is the point, REACH112 has connected Deaf and hard of hearing people to society without having to change the behaviour of the majority in any major way. From a Deaf person's point of view this is a huge step

towards inclusion for which there is little resistance from the society. The difficulty comes when there are costs to be assigned to this and at that point, a balancing has to be made which provides to the majority gains in efficiency.

The target of course in the end, is to allow all of society access to Total Conversation and at that point the traffic analysis will absorb the use by Deaf people and the likelihood is that those visible costs at present will be part of the enagement of society as a whole. At that point we can believe that the project has acheived its major breakthrough.

7.3.4 Findings from user trials

Since Total Conversation is meant to be a life-changing service development for users, it was considered appropriate to collect data on its effectiveness from a user's perspective.

There were three component trial designs and there were then several suggested trial areas relating to the user, endpoint and type of connection:

- person to person
- person to relay service
- person to emergency service

These are trials of Total Conversation – these are not duplicates of existing textphone services, although the French data provides an extended analysis of text relay usage with modern terminals and functionality. Triallists were Deaf, hard-of-hearing or deafened individuals. As indicated above, the UK data is based on these structured planned studies, the French component derives from planned "experiments" the responses to which were then analysed from a qualitative perspective while the Swedish analysis is post hoc examination of the calls and support provided to users.

The implementation of Total Conversation brings challenges to the users and to the support staff. Users have to learn a new way of communicating and have to understand physically how to use the equipment or software. Not surprisingly, then, the data collected in the UK in May 2011 and July 2011 at the start of the pilot shows many problems for the users and also some problems with the implementation. A great deal was learned from this and new versions of software and a greater degree of intervention from field workers (workshops, clinics and home visits) created a much more confident user group by the time of the second trial in April 2012. At this point most of the earlier issues had been solved and user satisfaction was very high. Users maintained that communication was easy and reliable; relay agents maintained that they could easily follow the signing of the Deaf caller. Typically ratings of success, video quality, ease of understanding were in the high 80% and 90%.

Reports of internal unstructured trials by Action on Hearing Loss (AoHL) were less positive (although there was no second stage follow up later in the pilot which would have allowed the analysis of change in the use). Some of the issues appear to be because of the need for more training and limited support (something also reported extensively in the French pilot). There appeared also to be problems with the broadband services used and this has also been indicated in the Swedish pilot. The sampled users were staff of AoHL and their daily communication pattern was already established – making the user terminal "myFriend" used in UK an addition. Most were users of the text component of myFriend. Their comments (discussed in greater detail in Chapter 11 of D7.1) reflect the need to understand a different system from web-based products.

French user trials built from simulations to designated-time emergency service calls (i.e. two two-hour slots per week for sign relay but later expanded with 24 hour access to text relay). Appendix 5 of D7.1 provides a description of the arrangements of the French set of trials which led to the finalised framework for relay services and emergency call taking. Appendix 6 of D7.1 provides an analysis of some of the data generated by these trials. The analysis examines the requirements for relay work in terms of visual presence and reflects upon the need in regard to emergency call taking. A second study deals with text protocols and the specific cultural approach of Deaf people in presenting their own description of the emergency. The purpose in these trials was to create the framework for the implementation of REACH112 relay and emergency services. In doing so, the work identifies many of the problems to tackle.

It was reported that many of these sorts of early difficulties had been overcome in the Swedish situation, where Total Conversation is widely used since around 2001 and the primary new aspect which their analysis examined was the possibility to call 112 with assistance of a relay agent.

In both Sweden and the UK, there are in some cases issues in regard to corporate networks where SIP traffic may be blocked and installation of software such as that for Total Conversation is not allowed. Solutions are relatively easy to set up but there are cost implications. More forceful accessibility requirements and the proliferation of mainstream multimedia communication are factors that can alleviate this situation.

User reactions and ratings were positive throughout but especially as the full service was available. Users particularly liked the ease of use of relay (which was new to all of them in the UK and to some extent in France – i.e. some users were already registered in an existing relay facility). The primary issue for most has been that the service might stop if there is no funding available and this question of sustainability of a demonstrably successful pilot is very prominent in the reported user reactions.

These aspects of user aspirations feedback are dealt with in greater detail in Chapters 10 and 11.

The main thrust of the user trials was that problems had been overcome and there was a functioning and effective Total Conversation service which had adapted to the changes in technologies i.e. adapted to tablets and Smartphones.

7.4 Ethics

This section reports some of the findings and recommendations of D6.0 "Code of practice", that represent the contribution of REACH112 to the understanding of the Ethical aspects of implementing Total Conversation with Relay Services. Moreover, it aimed at shedding some light to the implications of Emergency Calls placed via Total Conversation with Emergency Service Call-takers challenged by new technologies and new situations.

For this purpose, it is important to understand the whole chain of use of the Total Conversation service. In essence this is a complete overlay of the existing voice telecommunications; in fact, this may be a complete replacement for the PSTN system. Users engage with the Total Conversation network in order to interact with other Total Conversation Users, to talk to mainstream users of voice telephones and also to make contact with emergency services (or other public/commercial services e.g. banks, employment agencies and so on). Features such as leaving and retrieving messages that are handled in the voice telephone system exist also in Total Conversation Services but are handled in all three media.

To the extent that these agencies or operations impact on the users' rights and conditions of service, we will comment where appropriate.

7.4.1 Differences in Practice

As well as the simple model of user engagement and person to relay service interaction, there are other services which are in place and may impact on the code of practice, such as the use of ENUM - a system to offer "real" telephone numbers.

In the USA, users can make calls when entering their 10 digit standard telephone number. They can also chose a number of options before placing their calls i.e. having a male or female interpreter or the use of speech or sign. This is helped by the interoperability between the difference Sign Relay Service providers which allows more efficient use of interpreters; this is something that could prove more complicated in a European setting where each national group has its own sign language. This variety in sign languages makes the numbers of qualified interpreters for each language seem alarmingly low compared to the United States.

Provisions of standard personal telephone numbers or E.164 numbers are part of the platform specification for REACH 112 (see Deliverable D3.2) and will, at some point, become a standard part of the user registration across Europe.

ETSI (the standards body for the European Telecommunications industry) claimed in the standard and report on Harmonized Relay Services that calling a person or agency, emergency or otherwise through a relay service, without a real telephone

number may create, in certain implementations of the service, a time delay and inconvenience for the user as the operator may need to ask for the number and may need to make a further connection. Using ENUM and Total Conversation, users can dial the voice phone user's number and the call is automatically connected with both the relay agent and the destination. The end users need also themselves to have a real telephone number in order to receive calls which automatically invoke the relay agent.

In the UK users who wish to receive calls from hearing people can request an E.164-number at an additional cost.

There are other enhancements to the service which may affect the Codes of Practice in different countries and in different ways. Where this is apparent we will discuss in more detail.

7.4.2 Previous or Already Published Codes of Practice

There are many service documents available and many laws which apply to the service provision in regard to telecoms. Relevant aspects of these are set out in Deliverable D4.0"Ethical Guidance" (section 3.4 and Appendices A to G). These should be re-visited in the context of this document.

Guidance for REACH112 can be obtained from a study of these statutory documents for each of the pilot countries. Often these are technical and not user-facing. An analysis of these has been provided in D4.0 "Ethical Guidance" and all partners have subscribed to the actions which are set out there.

7.4.3 Telecommunications Codes in existence

Each telecommunications service operator and each communication provider is guided by and often bound by, regulation. In the UK this is set within Governmental regulation by OfCom. These regulations determine the nature and delivery of the service and also set out the means by which consumers can influence or complain about the service delivery.

There are also agencies engaged in this activity at the European level. For example, the European Telecommunications Standards Institute (ETSI) is recognised as a European Standards Organisation and among other tasks, creates the technical base for regulation on request from European authorities. The regulation is created by the European Parliament and the European Commission and often documented in European Directives, implemented by the member states. The kernel documents are the directives for electronic communication

In the United States the Government body responsible for relay services is regulated by the Federal Communications Commission (FCC). This mandates much of the interaction protocol and service provision.

7.4.4 Other Relay Services

The Australian Communications and Media Authority regulates all telecom relay provision in Australia under the National Relay Service (NRS). Although their telecom relay service is well established they do not yet have provision of a video relay service.

Similar guidance exists in Sweden for the text relay service, for the sign relay service and for the speech relay service.

In Spain, there is detail on the Government Relay Service (including text, speech relay and recently video relay).

New services are planned or developing in other countries such as Switzerland.

7.4.5 Codes of practice in practice

Although these international documents exist, it has not been confirmed that all partners utilised these in creating their own pilot services, although we can expect the same level of protection to consumers in the pilots as in mainstream telecommunications provision.

In the USA, there have been concerns about not only unlawful users but also relay agents exploiting certain loopholes leading the FCC to litigate and then to reinforce their laws and regulations to prevent fraud (FCC 11-184 2011). Currently funding of relay services in the USA is in a state of flux and there has been a significant reduction in the number of relay services and correspondingly a fall in the number of relay calls made.

7.4.6 Existing Codes for Relay Services

Relay services are typically available to users of different modalities of communication. It should however, be recognised that in the implementation of Total Conversation, relay services may not be required to bridge this gap – if all connected parties are using Total Conversation – e.g. in the case of elderly hearing people who need only visual support in order to have a conversation at a distance.

There are a number of relay services aimed at different groups in society ranging from text relay; speech to speech; Captioned Telephony to Sign Relay. Each service must adhere to each country's regulations on telecom relay services (TRS) and will operate

on an often similar but independent basis. The services offered in the REACH 112 project may vary according to the pilots' objectives and the different services they have offered.

In the USA, TRS, under the FCC, in operation since the early 2000's, offers a variety of relay services. They offer services such as captioned telephony and speech to speech relay which were only tested as part of the REACH 112 project, but not implemented. However all varieties of relay which have been used in the USA can be implemented within the Total Conversation set of standards.

'Relay' services are a typical societal response to inclusion and usually imply the setting up of a new facility and a new group of professionals whose task is to act as the link. These services make it possible for users with disabilities to interact with those people who do not have access to a Total Conversation endpoint. The relay services translate between different modalities of communication used by different parties in the call, thereby approaching equality in regard to outcomes[1]. This common view sees relay services for 'disabled' people as helping services, and interpreting and translation services for spoken language users as enabling services. The difference is significant in terms of the expression of rights and ultimately in terms of the sources of funding.

Relay services are usually staffed by human operators performing the required utterance translation (across languages and across modalities) in order to achieve the objective of negotiated exchange between the parties.

There is a standard for service description and operations of relay services, published by ETSI i.e. ETSI ES 202 975 Harmonized relay services. It describes many of the aspects that were tackled in REACH112 in terms suitable for procurement and operation of such services.

An accompanying report explains the situation in Europe regarding relay services in 2009, and other related material i.e. ETSI TR 102 974 Telecommunications Relay Services.

Other source materials that are useful to bear in mind are the codes of practice for:

- The FCC Structure and Practices of the Video Relay Service Program; Telecommunications Relay Services and Speech-to-Speech Services for Individuals with Hearing and Speech Disabilities. (FCC 11-184, 2011).
- Videophone Telecommunication Accessibility in Federal Government: Technology and Policy Analysis.

[1] It should be noted, as it impacts the discussion throughout, that relay agents are not machine translators – they are not meant to find an exact meaning match to what a person has said. Their role is to facilitate the interaction and as a result there may be times when they deviate from exact wording of one or other utterance.

- The FCC Telecommunications Relay Services and Speech-to-Speech Services for Individuals with Hearing and Speech Disabilities (FCC 11-184, 2011)
- The Australian Telecommunications (Consumer Protection and Service Standards) Act 1999 (ACMA).

These codes offer insight into other countries services and regulations and are useful in terms of information. The REACH 112 project is a European implementation independent from many of their regulations. REACH112 uses Total Conversation whereas of these codes only the one from ETSI applies directly to Total Conversation.

Swedish and UK codes of practice and procurement requirements were to a large degree used as base for the documents from ETSI. Therefore the ETSI document can sufficiently represent the code of practice for the general sign, text and speech relay services in Sweden.

7.4.7 Problems and Fraud

Codes are designed to standardise and to assure funders and users alike. Sadly, however, the story for relay services has not always been a happy one. Countries such as the United States have a long experience of fraud and abuse of the system both by users and by interpreters. Safeguards and strict procedures have been set in place to prevent this. It is likely therefore, that in future codes of practice will be reviewed to close loopholes and to ensure appropriate professional service delivery in Europe.

It should become clear from the text above, that the creation of a Total Conversation service is not simply a matter of creating a clever website, signing up some users and allowing them to talk to each other at a distance. The reality is that a new and parallel telecoms infrastructure has to be created and a service provided which matches the users' capacities for engagement. We see that resources needs to be expended in the telecoms infrastructure, the relay service setup and production, the support and management of the human interaction with the service, and in connection and integration in the emergency services.

The discussion of the business planning necessary to achieve this and the economies of scale which can be achieved if the Total Conversation service is provided to all and not just to people with special needs, has been reviewed during the project, but needs to be revisited.

In this section, we have tried to set out the considerations necessary to meet the needs of end users, of corporate/public users, of relay agents and relay providers. Inevitably as these are all human interfaces, they are complex and variable. The

technical needs of the service are set out in Deliverable D3.2 "Platform Specification" but alongside those details sit a range of responsibilities and legal requirements.

Not surprisingly, the conclusion is that the implementation of a Total Conversation service requires large scale thinking and probably European and national governmental intervention in order to ensure that the service will be truly open to all.

7.5 Social assessment

7.5.1 Cost benefit analysis

In order to evaluate the cost utility of REACH112 and to offer a judgement of value for money, we need to examine costs and benefit measures. The cost side comes from the expenditure recorded by each partner. Assessing the benefits is less easy as the benefit is harder to quantify. For example: determining the improvement in quality of daily life as a result of feeling more secure because of using the Total Conversation client.

However, we can go some way towards determining the benefits by asking people i.e. by interviews with participants in REACH112 and then comparing these responses to the responses of people who did not take part in the REACH112 pilot. We have done this in two Total Conversation pilots (UK and Sweden) and two non-pilot countries (Finland and Ireland).

As part of that we need to establish the comparability of the participants. We should be aware that this comparison has to be qualified by the relatively small number of people sampled in order to determine benefits – ideally this number should have been over 50 (instead of only 10 in each location). The small sample sizes do prevent any concrete conclusions on the positive effects of the programme as a whole; in purely statistical terms, we cannot conclude that there was a positive impact, but we can draw suggestive inference from the data.

We then examine the effects of REACH112 in the pilot areas compared with the outcomes in the non-pilot areas. Finally we consider the financial costs of that provision and try to construct measures of the cost utility by comparing effects with the cost outlay.

If we assume we are considering the activities which occur in WP6 as the primary focus for expenditure and we make an adjustment for the administrative and non-implementation costs and activities, then Table 7.1 shows the estimated spending amounts for REACH112 and the partners involved in the delivery. We need also to make adjustment for the period of this focus – i.e. the pilot which is only 12 months of the 15 months allocated to the work package.

Table 5 - Estimated cost on pilot provision based on human resource (May 2011-April 2012)

	Sweden		UK				
Person-Months per task REACH112	OMNITOR	SOS	CDS	AUPIX	RNID	AFR	ASP
WP6: Service Deployment - Pilot	14	16	18	15	8	18	18
Adjusted Total in euros	76384	91674	103133	69312	15590	28810	27367

In each pilot, there are fixed costs and variable costs. The fixed costs are set up and maintenance costs that are necessary expenditures for Total Conversation implementation and would have to be spent regardless of the number of users who registered. The variable costs are the additional outlay when another person registers for the service. In the absence of precise details regarding the fixed and variable elements of expenditure, the calculations used here necessarily divide the total outlay between the number of registered users to give the average total cost per individual. Consequently, this per person cost of each pilot represents their share of the variable costs and their share of the fixed costs – thus it should not be interpreted as the additional cost of providing the service for one more user. The additional cost of providing the programme for one more user will be considerably lower as there are only the additional variable costs to be born – the fixed costs have already been incurred at the outset.

Moreover, in each case, the number of users who benefit from a Total Conversation service is not precisely measured. For example, it is difficult to quantify the number of hearing users who have engaged with the programme through the relay service. The reality is that the number of hearing people who participated in the programme as parties in calls was 12 times higher than the number of Deaf people they interacted with. Their benefits are difficult to measure and we did not interview any of those people. However, we do need to make an estimate of their participation and as a result we have used an estimate based on the relative proportion of relay minutes compared to total minutes and we have weighted the number of relay calls (i.e. hearing people reached) by this proportion to give an estimate of the number of hearing people who benefit. These are added to the numbers of registered users in order to give an estimate of the number of beneficiaries.

Thus the total costs are divided by the estimated number of people benefitting from the programme.

Table 7.2 and Table 7.3 show the monthly estimate on this. The costs are the full costs – i.e. not just the 50% of the EC contribution.

Table 6 - Monthly estimate cost per beneficiary UK (euros)

Monthly	2011								2012			
UK	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
cost per month	20351	20351	20351	20351	20351	20351	20351	20351	20351	20351	20351	20351
registered users	692	787	898	1013	1085	1198	1286	1339	1416	1516	1581	1643
relay calls	538	610	1072	626	758	509	1344	1079	1356	1994	1983	1545
%relay/total	0.25	0.23	0.38	0.24	0.28	0.18	0.38	0.35	0.33	0.40	0.43	0.32
Estimates of hearing	132	139	407	149	209	92	517	380	447	806	850	494
per beneficiary cost euros	25	22	16	18	16	16	11	12	11	9	8	10

We can see that this shows a gradual reduction in cost as the number of beneficiaries increases. It is important to note also that the UK figures include the cost of maintaining the infrastructure, recruiting, training and supporting the users (field work), managing the relay service 9-5pm (i.e. recruiting relay agents, training, and paying them on an hourly basis) as well as training and supporting the emergency service staff. This is as close to total estimate we can have of the cost of managing the whole service (in the absence of the precise cost claim).

Table 7 - Monthly estimate cost per beneficiary Sweden (euros)

Monthly	2011								2012			
Sweden	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
cost per month	14005	14005	14005	14005	14005	14005	14005	14005	14005	14005	14005	14005
registered users	2486	2519	2558	2613	2647	2801	2906	2914	2905	2925	2922	2923
relay calls	4562	4437	4018	4688	3516	4890	3943	4178	3604	3339	3848	5278
%relay/total	0.11	0.10	0.10	0.10	0.09	0.14	0.08	0.11	0.09	0.09	0.11	0.13
est.-hearing	490	434	396	488	325	669	335	460	330	285	425	677
per beneficiary cost euros	5	5	5	5	5	4	4	4	4	4	4	4

Figures for Sweden include all of the above except for the daily cost of relay which comes from Central Government. However, the calculation does include the cost of setting up and maintaining an out of hours service for emergency calls for 11 months. Costs in Sweden look lower partly because of larger call volumes and numbers of users and partly because of the reduced cost of the relay service.

Although the costs now seem very low, the points to remember are that the start-up and initial maintenance costs are higher and that whether a particular programme is viewed as "value for money" requires some form of value judgement.

7.6 Impact assessment

The assessment of the impact of the projects along the factors listed in section 0 was carried out in WP7 (re. deliverable D7.1).

The following tables summarise the outcomes; more details are available in D7.1

***Table 8 - IMPACT:* Individual and Family**
Outcome Areas and Sample Outcome Statements

Outcome Area	Sample Outcome Statements	Partner reports
Changes in attitudes, e.g. perceptions and beliefs	* realisation of "reach" – when others are not physically present * Improved sense of security as other people can be reached through Total Conversation * confidence in interacting with hearing/mainstream through relay service	All agree this impact has been achieved. The use of the Total Conversation system has increased and user's confidence has improved greatly.
Changes in knowledge	* understanding of Internet, telecommunications	In Sweden, Spain and the Netherlands, this was said to have occurred; bit France and UK believed that it may occur as a result of the project
Changes in awareness	* improved empathy with others because of immediacy of contact	Sweden believed this to have happened, UK & Spain said it may occur.
Changes in skills	* new protocols for interaction in text, video and voice	Sweden and Netherlands reported positively on this; both France and UK said it was on-going.
Changes in behaviour	* more daily contact with others; more contact with society	Sweden and Netherlands agree this has happened; UK and France point to individual differences in progress.
Changes in health care provision	* easier consultation * creation of micro-health support networks, so better prevention and post-operative care	Sweden sees this as having been achieved, France partially achieved and UK, Spain said it may occur.
Changes in family stability	* better contacts with family members through Total Conversation – directly for disabled users	Sweden, Netherlands and France believed this to be happening although still on-going in France. UK, Spain considered it a likely outcome.
Changes in financial status	* no grounds for rejection of employability * no grounds for redundancy on account of increasing hearing loss	This was thought to apply for all although it was pointed out that no specific evidence existed. It was thought it might enhance the use of anti-discrimination employment laws.

Some of these aspects are shared as the impact moves outward from the point of application; however there are also group and agency specific impacts.

Table 9 - ***IMPACT:*** **Population Level**
Outcome Areas and Sample Outcome Statements

Outcome Area	Sample Outcome Statements	Partner Reports
Changes in health care provision	* easier network creation for interaction on health issues * access through relay services to health care – Doctor, dentist, pharmacist	Only Sweden felt that the first point would be achieved. The French response mentioned the possibility of incorrect information being exchanged. However, all agreed that the second was achieved or would be achieved in the project.
Changes in education	* use of relay services in mainstream education facilities – increases choice and flexibility; increases involvement in non-curricular activities	Both Sweden and the UK felt that this was achievable although there was a question about the availability of appropriate endpoints in schools.
Changes in social conditions	* contactable by mainstream groups, commercial agencies, allows social integration and lifestyle improvement	In Sweden and the UK this was achieved. The situation in the Netherlands seemed to be that hearing calling Deaf people through relay was disallowed by the service provider.
Changes in economic conditions	* cooperative actions on employment – supporting entrepreneurship * use of relay connects individuals and groups to mainstream	This was happening in Sweden and France and was expected to be an outcome in the UK. The second point was agreed for Sweden and France.
Changes in safety	* establishes position in a community, offers a means to get help and to provide help to others * 112 access	All pilots considered this to be a direct outcome and the ultimate goal of the project was to provide 112 access.
Changes in own community involvement	*easier to set up Deaf, Hard of hearing groups, promote cultural events	Only Sweden thought that this was an outcome of the project.

As well as outcomes measured at the individual and group level, there are higher level outcomes which we can examine in REACH112, through our Theory of Change.

Table 10 - INFLUENCE:
Outcome Areas and Sample Outcome Statements

Broad Outcome Areas	Sample Outcome Statements	Partner Reports
Changes in visibility of issue	* dissemination leads to local media coverage and engagement with the development * continuing media promotion – establishment in public information services	Only the UK thought that this had not yet been achieved. Sweden and the Netherlands considered that this second point had been achieved.
Changes in community norms	* mainstream community accepts equivalence through Total Conversation use	Both France and UK felt there was more work to be done on this before acceptance was reached. Sweden and the Netherlands felt that this had already occurred.
Changes in partnerships	* Partners increase formal interagency agreements and/or other collaborative protocols.	Sweden and the Netherlands felt there had been this increase but neither France nor UK agreed for their pilot.
Change in public will	* support for Total Conversation endpoints; publicly accessible endpoints in public sites	In Sweden there are installations of public Total Conversation endpoints. This seems to be the case also in the Netherlands although not explained. Neither UK nor France suggests this. However, in all cases because of the rise of smartphone applications, the need for fixed terminals has declined. In the UK REACH112 has supplied endpoints to public locations but these are not yet considered as a standard provision and they are set up to support relay only (VRI).
Change in political will	* incorporation of Total Conversation into public service – council sites, equipping of care workers	As above, all partners reported this as beginning to happen.
Change in policies	* designation of Total Conversation as valid enabling service to disabled users; corresponding funding	No policy change had yet been detected in the UK although Swedish public bodies were able to procure Total Conversation endpoints and services. France and the Netherlands felt this

Broad Outcome Areas	Sample Outcome Statements	Partner Reports
		was also possible.
Specific policy changes	* legalization of Total Conversation, of relay service, of 112 access; training	Neither in France nor in the UK was there a change of policy in a legal sense. Both Sweden and the Netherlands said that this had occurred. In the UK there was increasing provision for relay. Spain said relay was legalized
Change in regulations	* incorporation of Total Conversation in regulatory framework – operator training	Similarly, Sweden and the Netherlands said that Total Conversation had become part of the regulatory framework – not yet in France or the UK. Spain thought it was going to be an outcome.
Changes in service practice(s)	* Total Conversation reception in public agencies * staffs that directly interact with Total Conversation service consumers increase their knowledge of the cultural backgrounds and experiences of their consumer populations. * service providers increase their linguistic competence. * service providers change the hours of service delivery to better match the availability of consumers.	The Swedish partner felt that these changes in service practice had been achieved and that "Mainstream users are getting more and more familiar with relay calls (they know how to handle those calls and to speak normal "direct" to the user)." This progress was not claimed in the other pilots.
Change in business practice(s)	* Total Conversation access possible to local business: support to relay service from business to support contact: * employers mandate Total Conversation functionality in workplace	Both Sweden and the Netherlands indicated that there had been this change in business practices with mandatory Total Conversation functionality in the workplace.

The above factors are all expected direct outcomes, but as REACH112 gathers momentum it begins to provide leverage, an effect beyond its immediate application.

Table 11 - *LEVERAGE:*
Outcome Areas for REACH112 and Sample Outcome Statements

Outcome Areas	Sample Outcome Statements	Partner Reports
Changes in public funds	* Public funds redistributed toward REACH112 priorities * New funding methods (pooled, matched, blended) increase monetary resources to support access in REACH112 * Public funding practices (mechanisms, formulae) change to adapt to a different landscape created by REACH112	As before, Sweden indicates that all these points in this section are achieved. The other partners did not report these advances to the same degree (Spain, the Netherlands) or not at all (France, UK).
Changes in philanthropy	* on agenda for charitable giving	In Sweden and Spain.
Changes in resource planning	* areas, equipment identified with Total Conversation activity	In Sweden and possibly in Spain.
Changes in private investment	* investment in endpoint development, software, networks	In Sweden, Spain and the Netherlands.
Changes in business models	* new business plans to allow for Total Conversation	Progress in Spain, Sweden and the Netherlands

7.7 Standards

Based on D6.2 "Second Pilot Report", this section lists standards used fully or partially in the REACH112 project for Total Conversation user communication and emergency service access. Following standards is an important mean to achieve interoperability and good functionality.

7.7.1 Overviews, articles, regulations, policy statements

Document	Full name	Explanation	Use in REACH112
COCOM 04-08	INCOM Report	Report on eAccessibility to EU regulatory group COCOM The initial report about the bad situation in Europe for emergency service access and personal communication for people with disabilities.	Requirements for accessible communication implemented in REACH112 Total Conversation.
EENA Accessible 112	EENA Operations Document 112 Accessibility for People with Disabilities		Chapter 7 Total Conversation partially implemented

Table 12 - Overviews, articles, regulations, policy statements

7.7.2 Standards and specifications

EENA specifications

Standard	Full Name of Standard	Explanation	Type	Use in REACH112
EENA NG112 LTD	EENA NG112 Long Term Definition.	IP based access to emergency services in Europe	Technical broad interface specification	Implementation in line with this specification, but not covering all aspects.

Table 13 - EENA specifications

IETF accessibility specific documents

Standard	Full Name of Standard	Explanation	Type	Use in REACH112
IETF RFC 4103	RTP Payload for Text Conversation.	RTP Payload for T.140 text conversation. MIME Registered as "text/t140", used in H.323 and SIP and 3GPP	Transport	Implemented
IETF RFC 5194	Framework of requirements for real-time text conversation using SIP	Requirements and implementation guidelines for real-time text in the SIP environment	Requirements	Implemented

Table 14 – IETF accessibility specific documents

IETF General documents of specific interest for accessibility

Specification	*Title*	*Explanation*	*Type*	*Use in REACH112*
IETF RFC 3261	Session Initiation Protocol	The base for VoIP, IP Multimedia and Total Conversation in IP environment	Call control	Implemented
IETF RFC 4566	Session Description Protocol	Contains "text" as an allowable media type in multimedia calls.	Call control	Implemented
IETF RFC 2198	Redundancy for RTP payloads	Used in RFC4103 for reliability of text traffic	Transport	Implemented
IETF RFC 4733	Definition of events for telephony tones	Text transport in RFC 4103 mentioned	Transport	Implemented
IETF RFC 4504	SIP Telephony Device Requirements and Configuration	Text requirements included, referring to RFC 4103	Device requirements	Partially implemented
IETF RFC 5012	Requirements for Emergency Context Resolution with Internet Technologies	Requirements for emergency services in IP, including real time text, referencing RFC 4103.	Service requirements	Partially implemented, mainly media requirements.
draft-ietf-ecrit-phonebcp (approved but not yet published)	Best Current Practices for Communications Services in support of Emergency Calling	Refers to real-time text for emergency calls. Refers to RFC 4103	Service and terminal requirements	Media chapter implemented. Partially the location information provision.
IETF RFC 3984	RTP Payload format for H.264 video	Standard for packetization of video coding.	Technical coding	Implemented
IETF RFC 4629	RTP Payload format for ITU-T REC. H.263 video	Standard for packetization of video coding.	Technical coding	Implemented
IETF RFC 6442	Location Conveyance for the Session Initiation Protocol	Standard for placement of location information in the call establishment information	Technical	Implemented in one user terminal and one PSAP. Not used because the terminal did not get popular and network issues blocks location info.
IETF RFC 6443	Framework for Emergency Calling in Internet Multimedia	Structure for emergency services in IP. Refers to RFC 4103 for text	Service requirements	The media chapter implemented and partially the location information provision

Table 15 - IETF General documents of specific interest for accessibility

ITU Accessibility specific documents

Document	*Title*	*Explanation*	*Type*	*Use in REACH112*
ITU-T Rec. V.18	Operational and Interworking Requirements for DCE:s Operating in the Text Telephone Mode	Includes automatic interworking with most legacy text telephones.	Modem transport	Relevant national annexes are implemented for legacy text communication
ITU-T Rec. F.703	Multimedia conversational services	Defines Text Telephony and Total Conversation services	Service description	Fulfilled requirements
ITU-T Rec. T.140	Protocol for multimedia application text conversation.	Text conversation protocol for multimedia application. With amendment 1 (2000).	Presentation level	Implemented
ITU-T Rec.T.140 - Addendum	Marking of missing characters	Replacement for characters missing after transmission	Presentation	Implemented
ITU-T H Series Supplement 1	Video Quality for sign language and lip reading	Quality characteristics of video transmission of importance for sign language and lip-reading use.	Requirement	Fulfilled requirements
ITU-T FSTP.TACL	Technical paper: Accessibility checklist	General accessibility checklist for standardizers.	Guideline	Valid checklist
ITU-T F.790	Telecommunications Accessibility Guidelines for Older Persons and Persons with Disabilities	General accessibility guidelines	Guideline	Valid guidelines

Table 16 - ITU Accessibility specific documents

ITU general documents of accessibility interest

Standard	*Full Name of Standard*	*Explanation*	*Type*	*Use in REACH112*
ITU-T Rec. F.700	Framework Recommendation for multimedia services, Annex A.3.	Multimedia Framework, including real time text	Service description	Fulfilled requirements
ITU-T Rec.H.324	Terminal for low bit-rate multimedia communication	Addition of data channel for T.140 text	Multimedia system	Used in French pilot for some video calls.
ITU-T H.263	Low bitrate video codec	Good compression video coding standard	Media coding	Implemented
ITU-T H.264	Advanced Video Coding	High compression video coding standard	Media Coding	Implemented
ITU-T G.711	Audio coding		Media Coding	Implemented
ITU-T G.722	Wide band audio coding		Media Coding	Implemented

Table 17 - ITU general documents of accessibility interest

ETSI and 3GPP Accessibility specific documents

Standard	Full Name	Explanation	Type	Use in REACH112
ETSI EG 202 320	Duplex Universal Speech and Text Communication	Guide for text as a mainstream call component	Requirements and implementation framework	Implemented the SIP and PSTN parts
ETSI ES 202 975	Harmonized Relay Services	Service description for relay services	Service definition	Used the sign relay part
ETSI TR 103 170	Total Conversation access to emergency services	Specifies how total conversation shall be used in emergency calls	Technical report, close to specification	Partly

Table 18 - ETSI and 3GPP Accessibility specific documents

OASIS document

Standard	Full Name	Explanation	Type	Use in REACH112
OASIS CAP 1.2	Common Alerting Protocol		Coding of emergency information	Tested in French pilot

Table 19 - OASIS document

7.7.3 Used/missing standards in the REACH112 components

There is work underway in ETSI EMTEL group for standardisation of Total Conversation access to emergency services. It has also involved groups in 3GPP for specification on how to include relay services automatically in calls. The first part of the work in ETSI EMTEL is published. It is the technical report TR 103 170 Total Conversation Access to Emergency Services. It provides both requirements, a bit of background, and technical indications on functions and solutions to use. It can be used as a base for implementation, even if next planned output from REACH112 in the ETSI EMTEL standardisation is intended to be a more strict technical specification.

It is not possible to time the work in standards groups with the timing of projects. Therefore, TS 101 470 Total Conversation Access to Emergency Services is planned to be completed during the first half of 2013, and is still an output from REACH112. There is clear benefit of performing this kind of specification work in the wider context of the ETSI EMTEL standardization group with the wider experience and established authorization this group represents.

When the project started, many of the standards for IP based emergency service access were still at a draft stage. And the prerequisite for the project, being an ICT project has the requirement to do only minimal development, but focus on deploying existing implementations. Therefore many of the standards for IP based emergency services are recently approved and were not implemented or only partially implemented. The implementation has been to the degree needed for pilot production.

Still missing implementation is for example the TLS secure SIP connection from IETF RFC 6443 for emergency service access.

7.7.4 Integration with PSAP systems

This table gives a view over the degree of integration in the emergency service operational system of the accessible calls.

System	Comment
CAP	Standard for data conveyance about emergency cases. France implements this standard partially although the message conveyance is not yet used.
Call taking	Spain has the most integration as RTT is integrated with call takers workstations. In France the call handling / information capture system of the PSAPs has essentially been recreated separately for the Total Conversation system. Sweden has partial integration of a voice part of the call.
Queuing	Only The Netherlands pilot has a total integration with the queuing system of the PSAP. In Sweden, a voice call is taken alongside the Total Conversation part and so the calls are seen in the queue and the PSAPs Queue shows the handling agent as unavailable for other calls. In larger call centres it would be necessary to have a single ACD that handles all calls including both Total Conversation calls and voice calls. In many cases voice calls are not SIP based presently so using a SIP ACD is a major change to implement.
Media capture	In general, media capture (as well as other data capture) is implemented, but not integrated with the PSAP's existing systems. There are some innovative systems, using virtual ACDs so there are possibilities for solving some of these issues.

Table 20 – Integration with PSAP systems

7.7.5 Standards Compliance

Table 16 shows some of the standards compliance situation in the project. The compliance is sufficient for international interoperability of Total Conversation calls, for peer-to-peer calls, for relay assisted calls and for emergency service calls. See section 3.6.1 for a more comprehensive overview over applicable standards.

Standard	Compliance
RFC 3261 SIP call control	All pilots
RFC 4103	Real-time text. All Pilots
H.264/263	Video codec used in all pilots using video
G.711	Audio codec used in all pilots using voice
ENUM	Problems in Spain. Numbers registration has a cost which makes light use account expensive hence UK and some others do not reserve 'real' numbers for all users.
RFC 6442 Location information	Sweden implements but with difficulty in firewall traversal and support for multi-part SIP bodies
ITU-T V.18	Textphone standard. Nationally used annexes are implemented, except in France, where legacy text telephony does not exist.
OASIS CAP	Emergency case messages. Only implemented in France.

Table 21 – Standard compliance

7.7.6 Key Performance Indicators

The consortium has defined Key Performance Indicators to be used with regards to emergency calls in REACH112. It should be noted that currently no EU performance indicators are in place for 112 calls thus the creation of such indicators was challenging. The process of establishing performance indicators in REACH112 had to consider cultural, geographical, organization and legal requirements in each of the 5 pilots before agreeing on list of KPIs.

Item	Indicator	Comment for REACH112
%, calls answered (picked-up) within 15 seconds (stage 1 PSAP)	min. 80%	
% calls answered (picked-up) within 30 seconds (stage 1 PSAP)	min. 99%	
%, calls answered (picked-up) within 15 seconds (relay service, where available)	min. 80%	
% calls answered (picked-up) within 30 seconds (relay service, where available)	min. 99%	
Average conversation time with Total Conversation vs. voice 112 calls in %	max. 200%	E.g. if average conversation for voice 112 calls is 3 minutes, REACH112 conversation should be maximum 6 minutes (200%)
Average conversation time with Total Conversation vs. SMS 112 calls (where available) in %	max. 70%	Only for Sweden (vs. SOS Alarm 112 SMS service), France (vs. 114 SMS Service), UK (vs. 999/112 SMS Service managed by BT) - e.g. if average conversation for SMS is 10 min, REACH112 conversation should be max. 7 minutes (70%)
% of calls recorded with all media	min. 99,9%	
% of calls for which caller-location could not be determined (automatically or during the conversation)	max. 3%	

Table 22 – Key Performance Indicators

7.8 Reaults and discussions with stakeholders

In REACH112, case studies were originally expected to describe how the individuals who have come in contact with Total Conversation reacted to its use. Case studies are meant to describe the challenges faced as well as the successes and to offer a process view of the initiative. Typically we would expect to see a timeline showing movement towards a goal and a discussion of the factors which impede or support the progress. In the event most of the cases supplied were narrower in focus concerning individuals or incidents and offering mostly positive outcomes and praise for the services which were being developed.

Samples of the cases are provided in Appendix 8 of D7.1 and can be subjected to further analysis.

However, the report so far has a huge amount of rich content, designed to supplement and support the quantitative reporting of traffic and objectives. We will not therefore at this stage provide another chapter of quotations and comment. Rather what follows is a short reflection on the cases and their significance to the exploitation of Total Conversation.

7.8.1 Starting Off

It should be relatively clear by this stage that there is an enormous demand from the Deaf community to provide a solution for distance communication. The fact that the technology has advanced to allow mobile devices to communicate in video brings the whole development tantalisingly close. However, the Deaf community in many countries have already discovered opportunities with video applications which are freely available on the Internet and in many cases are already using them.

This creates two difficulties – the first is that the users are already creating their own micro-networks and are interacting with them with greater or lesser degrees of satisfaction. Beginning a new programme has to be able to displace the existing pattern of interaction.

The second is that by part solving this communication issue with incomplete tools and non-services, the Deaf community takes away the responsibility from the hearing community to offer and to support a solution which has a "design for all" label.

We see this tension most clearly in the cases supplied by Action on Hearing Loss where the members of staff have already part solved their communication issues and a new entrant – i.e. Total Conversation is not necessarily embraced fully.

7.8.2 Hard of hearing

One aspect which REACH112 has found difficult is how to implement Total Conversation for hard of hearing users. On the one hand, the commitment is to any combination of video, voice and text but the reality has tended to be a focus on either video or text. The case notes from Action on Hearing Loss, highlight the difficulties faced by hard of hearing users, trying to determine the advantage of being able to see the other person in the call.

It may seem obvious that being able to see and read the emotions on the other person's face is an advantage, yet with highly literate people, the use of text has become the most important aspect of communication. The cases presented seem to indicate a reluctance to alter behaviour and a common response is to displace the focus of the Total Conversation product to the more likely group of sign language users.

There are many reasons why REACH112 needs to examine very carefully the needs of this group. While the pilots in Spain and the Netherlands focused solely on text, various circumstances prevented the analysis of these counterbalancing cases.

Since hard of hearing people form a much larger group and would be the stronger case for change in central government funding then it is essential to examine in more detail the experiences of this group when visual communication is offered.

7.8.3 Person to Person

There is no doubt that there was great success for the Total Conversation concept among Deaf people. They have campaigned for a long time to have their needs met and the cases offered show clearly that the impact can be enormous. Cases tell of the liberation felt by the discovery of distance communication and interestingly also show us how service provision and contact with support professionals can be achieved.

The cases also indicate as have the focus groups and other feedback particularly in France and the UK, that the awareness of the value of Total Conversation does not by itself translate into action on the part of potential users. It requires a good deal of support and instruction, workshops and clinics, peer support and ultimately requires critical mass in producing a sustainable call network. The comments that 'I tried to call people but no one answered' and that 'I never receive any calls or people do not call back' are common in the mass of feedback data. This is partly social in that the community of users have not yet developed etiquette in regard to call behaviour and partly technical in that end points are often not connected to the network – mainly because the user switches them off. The advent of Smartphone applications could make an enormous difference to this situation.

7.8.4 Person to Relay

What is most welcome in all the accounts is the possibility to have an on-demand relay service. It is this component more than any which leads to the comments of feeling equal. Cases indicate that being able to manage problems, make arrangements and have a readily available interface to society as a whole is perhaps the single most important factor in enabling the Deaf community. In pilots, this has typically been set up as a sign language relay service as in many places there is already 24/7 text relay. The value of this service is set out very clearly.

The possibility however, to have this combined with speech and text is also very important. Cases also refer to the use of text for particular purposes and in one case, the user makes connection and announces that she does not use sign language and demands lip-speaking from the relay agent (which in that case, is successful). Agents in Total conversation relay may need to move towards agent plus status where they are able to manage all three of the options of text relay, sign language relay and speech relay.

Feedback from relay agents who began to work on this as a result of REACH112 most of the time express their enthusiasm for this service as they perceive the obvious advantage of being able to support many more users in a shorter space of time than they can with on-site interpreting.

7.8.5 Person to Emergency Services

The case study in the Appendix of D7.1 which presents an account of an emergency call and provides some context to it, illustrates the conduct of the call and the users' perceptions (both end user as caller and emergency call taker) which catches the theme of surprise that this interaction should work. There is a simple conclusion here that this will save lives. To do so effectively, it will need to be embedded in the mainstream telephony system and become part of the "normal" call patterns. End users, as indicated in the analysis for cost benefit, are still likely to reach for a hearing person in case of problem.

The value of REACH112 is in identifying the longer term issues for adequate mainstream technology, for end user support and training. It also indicates the challenge in regard to visual contact with the incidents for both the relay agent and the call taker. In nearly all the feedback from end users, the ability to be able to call for emergency help is the true aspiration which provides equality.

7.8.6 Creating a service

However, as can be gleaned from the component case studies, the creation of a new means of communicating within a community is not always easy. Even if the

technology is proven without establishing the community engagement and influence on the project from the outset the achievements will be reduced. The very extensive qualitative data from the French pilot points to the enthusiasm of users when they feel they are contributing to the design of the service.

The other aspect which has provoked considerable discussion is the nature of a pilot which is not linked in at the other end to social policy – although in this particular situation, the overall economic climate in Europe works against any social policy initiatives which require an outlay to begin and a commitment to support into the future.

The cases and the feedback say clearly that the smart and evolving technology has to be supported at both ends by the community of users and by the decision-makers and policy-makers.

7.8.7 Exploiting the service

In the end, it is this part which worried most users – what happens at the end of the project?

Six months after the project ended, it is obvious that the parts of the services that by tradition require society funding are not continued directly. That was the message that needed to be distributed to end users, relay agents and call takers. The knowledge about this and the impossibility to influence authorities to rapidly fund continuations appear as a pressure on the partnership knowing that important parts of the service is withdrawn

The project addressed this aspect of exploitation and sustainability but the case studies make it a real personal and social issue. European policy states clearly that services with functional equivalence shall be provided, but in reality this happened only during the short time period of the pilot performance. After the end of the project, limitations or gaps in service provision appeared in all pilot countries.

7.8.8 In summary

Case study data presents in some detail the users' enthusiasm for the service development and validates the approach. The analysis also teaches us about the process of implementation and the training and support needed for such a marginalised community. It also moves the agenda to the questions of sustainability and drives the debate forward into public planning and social policy.

7.9 Impact by dissemination

The project has performed a very large number of dissemination activities. A short afterthought on impact and advice on further actions are given here.

The objective of the dissemination activities is to improve conversational communication and emergency service access for all and especially for people with disabilities by creating awareness and decisions for action towards these objectives by various stakeholders. The need is global. The means to make conversational communication services and emergency service access better is by applying Total Conversation and providing relay services.

There are a number of groups of stakeholders who need to know about this in order to get actions to reach the objective. These stakeholder groups are identified as target groups.

- ***Target A: People with disabilities and hearing loss, and authorities in***
- ***charge of inclusion and accessibility***
- ***Target B: Emergency services***
- ***Target C: Relay services***
- ***Target D: Technical solution providers***
- ***Target E: EU policy and decision makers***
- ***Target F: Standardisation bodies***
- ***Target G: Related services***

The project has turned to these target groups with information and discussions. The dissemination activities from REACH112 are only part of the influence the target groups get through different sources.

Since the REACH112 concept deals with the combination of two areas dominated by services supported by society: accessible communication and emergency services, the most urgent impact is on the authorities responsible of policy in these two areas. Informing the user groups about the opportunities of the Total Conversation solutions compared with what is available without it is another primary task for the dissemination activities.

The support from the eInclusion unit of the European Commission was very positive. Total Conversation and REACH112 has been mentioned and described by eInclusion representatives many times, in parallel with the dissemination activities by the REACH112 project. The impact is that in many countries the access to emergency services and relay services are discussed and defined and actions planned.

It is quite natural that these activities have not yet resulted in many established improvements on the opportunity to communicate through relay services, and the ways to call 112 and be served in suitable modalities. The process is started and the continued REACH112 consortium is there to support the activities.

7.10 Sustainability

7.10.1 The situation in the pilot countries

The situation regarding continued service is a first indication of the sustainability of the provided services.

7.10.1.1 UK

In UK, Total Conversation and RTT were both used in the pilot. Total Conversation was fully integrated with legacy videophones, with textphones and including RTT applications and links to text relay services.

The service is continued for peer-to-peer calls 24/7 for Total Conversation and for RTT.

New service initiatives and engagements are allowed. New users are registering on the service.

The cost modeling is different for different service providers. End users continue to have a free service. Funding is partially from the service providers, partially from charities.

The service is not provided on equal terms as for traditional voice telephone users. Instead, the end users have a free service currently. There is resistance to payment models which have been suggested.

Text relay service access is possible. Sign relay service has stopped, but there is an intention to start again in 2013.

For emergency service calling, both directly and through relay services, there continue to be some logistical difficulties and liability issues. Emergency calling is not currently encouraged.

The goal of the REACH112 project was to make 'telephones' accessible to all people. That aim includes person to person telecommunication for social conversation right through to calls to 999 Emergency Services.

Users of the myFriend software are able to see each other when they call are able to use relay services (started in 2011) and are able to reach 999 emergency services. They are able to use standard telephone numbers and can connect with existing textphone users and with hearing people who are automatically routed to the relay service.

In the myFriend Community, there are over 1,700 people who have registered to use myFriend (and a further 400 using the text version of the software). In the pilot period, there were over 6,000 calls each month. There were over 21,000 minutes of Total Conversation each month. MyFriend allows people to talk to a range of other devices –videophones or text phones (minicoms). MyFriend users can also talk to voicephone users (automatically – just dial the number – no prefixes) through a relay agent in myFriend Relay service. Over 1,600 hearing people were connected each month through the relay service. Myfriend service continues to be available 24 hours for person to person calls and for text relay calls.

MyFriend works on PCs, on notebooks, netbooks, tablets (including iPad) smartphones (with a front facing camera, including iPhone)–download from www.myfriendcentral.com.

We have extensively monitored traffic data and reported on user satisfaction, conducted focus groups, collected case studies, analyzed each component of the service including emergency call taking. All evidence points to the value of the services, an enormous demand and considerable cost savings for public services. Data collected from users indicates that Total Conversation is welcomed, life-changing and liberating. There is very little question in the minds of Deaf end users that these services are required. Other users such as relay agents and emergency service call takers have embraced the training needed in order to provide the service and have very positive feedback on its use. Hard of hearing people who are primarily text users may be less ready to embrace video interaction but are shown to be considerable users of the text interaction capacity of the myFriend network.

A cost benefit analysis has been carried out (with counterfactual data from non-REACH112 countries) which confirms that the costs of running such a Total Conversation service per person and per month, are not high – as more users join, there are efficiency gains and the per-person cost reduces. By examining the cost of providing all these services within REACH112, that is, in a true design-for-all environment, actual monthly costs per user will be relatively small (in the range of mobile phone rental costs) for user populations of 2,000 and greater.

It should also be understood that in this context, 'design for all' includes provision for all voice phone users (i.e. the mainstream telephony system). When a Deaf or hard of hearing user makes a call through a relay service, then a mainstream phone user is enabled in the interaction.

The UK project has been met with great enthusiasm. It has overcome major obstacles in reaching a wide range of users. It has evolved with the technological environment and has produced mobile, ubiquitous solutions which enthuse and encourage the inclusion of this group of people who have hitherto had difficulty with voice telephony.

Summary conclusion for UK.

The peer-to-peer service in UK continues, both for Total Conversation and RTT. The Total Conversation users are increasing. Funding is currently arranged through charities. Text relay services are available. Sign relay services are planned to restart during 2013. An investigation is ongoing about sign relay services.

Emergency services are not currently encouraged through the service.

7.10.1.2 Spain

Spain was a RTT pilot, Total Conversation was only tested by some of the users. RTT is not well appreciated by some users for Peer to Peer and relay assisted calls. The users seem to see it acceptable to be used for direct emergency calls until video is available

At the moment the service is up for Peer to Peer and direct emergency calls due to an agreement between AXEGA and ATOS, but only for those registered during REACH112 project, and there is no terminal deployment. There are no actions at the moment as Atos is not a service provider and currently there is no planning to become one.

The relay services are paid by the government, and the Relay services exist and service continues for sign relay and text relay calls using their own system, not related to REACH112.

Summary conclusion for Spain.

The sustainability of the project in Spain is limited to the agreement between AXEGA and ATOS and also limited to the scope of REACH112. Users don't have a unique communication method for peer-to-peer and relay service assisted calls, and use different ones depending on the called, friends, family, and business. They also are not used to pay for any of these services; users only pay broadband connections, getting government support for most of the initiatives, or telecom company's support for terminals.

With this scenario, one possible way to create a Total Conversation network is that the Spanish government includes the Total Conversation service in the Public Relay portfolio, or that some telecommunications company's accept that role in their business including this service on their broadband offer.

7.10.1.3 France

Total Conversation is already used in the biggest Relay Center service in France provided by Websourd for companies (for example: more 100 Orange's collaborators use it in their workstation) and administrations (Job Centers, City hall, Family Allowance Fund, etc.).

Total Conversation is also planned in the 2013 roadmap of the Personal Relay Center Experimentation with 900 users launched by the French Government.

The peer to peer calls are possible now for professional & paying users and planned for the CRT personal experimentation in 2013.

The results of this experimentation will allow estimating the costs for an operating deployment of the services of relay services in France, and it is intended to be free of charge for the end users.

For the emergency calls, France chose a 114 specific number to set up quickly (as required by deaf associations) an accessible solution for access to emergency services.

This access is done since September 2011 by fax and SMS, at a national level managed by the Hospital of Grenoble (CHU).

It is planned that 114 becomes accessible by Total Conversation in 2013. The specifications issued of the REACH112 works are indicated in the specifications of the request for proposal launched by the CHU.

The organization of the REACH112 platform will also be resumed in particular with the use of deaf operators to answer in an optimal manner the people using the Sign Language for an emergency calls.

It had constituted a world premiere validated by 10 real emergency calls received by the French pilot.

Summary conclusion for France

Total Conversation is continued for some users with peer to peer and relay services in France. The relay service support is about to be enhanced form a labor related service to a service for all, starting with a trial.

Total Conversation based Emergency service access is planned to be revived during 2013.

7.10.1.4 The Netherlands

Real Time Text as a method was already in use in the Netherlands when the project started. During the project mobile use, use through a web client and more integration in the PSAP was added to the environment.

During the project there were different developments that had an influence on the business and public environment regarding the Total conversation usage;

- The telecom law was changed and promises for text and video relay were made for 2013,
- The funding model of this relay service is under negotiation at the moment. Most probably it will be a solidarity funding model where the telecom operators will fill a fund based on market share,
- AnnieS/4CT stopped their activities because of the lack of enough revenues selling mobile text phones,
- Health care insurances and government announced that the device used for TC will no longer be founded (they are not "special" anymore)
- The government arranged for a new software real time text solution after AnnieS stopped which works on PC, web client, Android and will later on also support other OS's and functionality wise video.
- The 112 first level PSAP decided that they will use the promised relay service as a connection layer between the disabled and 112.

Looking at the engagement of the 112 first level PSAP, interest groups and governmental bodies, sustainability based on involvement, actions and intensions looks very good.

Summary conclusion for the Netherlands
Selling end user equipment to the (commercially) small user group of persons with communication disabilities is very hard to make profitable without financial support of the government and health insurance companies. So in that regards the Total Conversation solution in the Netherlands is not sustainable for commercial businesses when targeting this specific user group.

The government stepped up and took responsibility in creating a new service when AnnieS stopped and also has promised to establish relay services for Total Conversation in the near future based on the open standards for Total Conversation. With this in mind sustainability of communication for people with a hearing and/or speech disabilities for the longer term is guaranteed. Some discussions will still have to be performed and results agreed upon like; opening hours of the relay services for all functionalities, possibility of reimbursement of the device to use and the funding of the relay services.

7.10.1.5 Sweden

Total Conversation was trialed in Sweden. It was appreciated and well used.

Service continues for Peer to Peer calls, Terminal and service deployment continues, through governmental procurement.

It is this on economically feasible terms for service providers and manufacturers.

Users pay broadband connections, and in some cases small subscription fees. The provision is on approximately equal terms as voice phone users have voice telephony.

But they do not pay call charges for sign relay calls. That is a positive discrimination.

Relay services exist and service continues for calls through relay services. Text relay services and sign relay services are available. The sign relay service is only open 7 - 22 (with intention to increase in 2013 to 6-24).

The relay services are paid from taxes through the Post and Telecom Authority PTS.

The direct emergency service calls, and relay service assisted emergency services do not continue as direct Total Conversation calls provided during REACH112. Some alternatives are available, but not as straightforward and accessible as the Total Conversation emergency call.

The whole 112 responsibility is under investigation. Therefore it was not possible to assign resources for the purpose of continuing the Total Conversation emergency service the way it was provided in the project. The investigation is supposed to be ready during April 2013. If the recommendations from the investigation propose to prioritize accessible emergency services, then work for funding and planning can begin.

Summary conclusion for Sweden

The situation is relatively good in Sweden, regarding sustainability through government funding of communication and relay service provision. The lack of current continuation of the emergency service side is the major missing component. Alternatives are available, but they do not meet the availability and usability requirements completely. An investigation is going on with the goal to evaluate 112 handling and propose what new urgent improvements should be introduced.

7.10.2 Conclusions on sustainability

It is evident from the sustainability overview above, that the sustainability of the provided accessible services are depending on society support. That conclusion is also clearly visible in the European directives on electronic communication where society support for the provided services is enforced. Changing society support is a long process. REACH112 has influenced that process towards solutions for persons in need of Total Conversation services, but the process is now at varying stages and in some cases not yet sufficient for continued services.

A Total Conversion service can be built around a multi-actor value chain including operators, relay services, PSAPs and technology vendors. Because it is currently mainly used to provide an accessible telecommunication service for people who are deaf and hard of hearing, the current potential user base is relatively limited. The funding of social services and inclusion policy implementation is under pressure. Building and maintaining a technology for only one relatively small segment of a population is costly and the target users may not be able to pay the full price for the service that they need, especially the interpretation costs. The EU directives for electronic communication recognise this fact, and various measures for funding such services are described. Anyway, cost can be reduced and benefit increased if the technology was to be used by larger parts of the population.

There are topics of interest for the general population in this concept: the migration of emergency calling to IP protocol (also called next generation 112), the migration of national operators to IP technology, and the availability of interconnection in audio, video and text in personal communication. These are important windows of opportunity for implementing total conversation and obtaining economy of scale.

The rationale behind total conversation is the same as that made for the delivery remote controls for TV screens. TV remote controls were once a device for disabled people with mobility problems, while now everyone uses them. In the same manner, rather than imposing total conversation as a technical add-on to provide accessible communication, one should consider the idea of embedding accessibility inside the mainstream telephony services. Sustainability of total conversation depends on how much this is understood and supported by policy, standardisation and businesses.

From a policy perspective:

- All communication providers (incumbent operators, VoIP operators but also well-known communication service providers such as Google, Apple, and Microsoft) should interconnect to enable video text and voice calling using Total Conversation. Citizens should be able to call each other regardless of their service subscription.

- In order to bring fair competition, the interconnection rules should be uniform and regulated by relevant telecom authorities. European policy should aim to reduce the gap between universal service obligation imposed upon incumbent operators and big communication providers at European level or recommend other schemes to achieve the same goals.
- Relay services should be recognised as a crucial piece for inclusion and national authorities should ensure a stable funding mechanism and quality standards while fostering R&D on automation of the translation processes between speech, sign and text. Such automation are long-term goals, with automatic translation between speech and text being closer to realization than between sign and speech. Disabled people should pay the same price for network access and communication services as others, and should be granted free use or at least a rich monthly allowance of minutes of relay service usage.

From a standard perspective:

- Procurement for relay services and all call centres with accessibility should mandate interoperability and reference Total Conversation protocols while allowing other standard to be supported.
- Push for continued inclusion of Total Conversation in all mainstream real-time communication standards.
- The foreseeable migration of national interconnection between telecommunication operators to IP technology must be examined at European level to harmonise the standards and rules. It is crucially important that future IP based interconnections support Total Conversation. Simpler interconnections for communication service providers should be established to foster competition.
- Next generation emergency services (NG 112) efforts should be pursued to prepare the migration of emergency calls to IP technology and by that enable handling of multiple media and mobility. All communication providers should have obligations imposed upon them to provide location and 112 call routing for total conversation calls as well as voice calls.

From a business perspective:

- We consider that fiscal policies should be adjusted to encourage large companies and call centres serving the public to provide accessible communications.
- Initiatives should be taken to encourage actors in the video communication and VoIP business field to provide the accessible solutions, and promote them to provide interconnection and interoperability.

From the business models identified and the overall investigation realised, we have defined a number of different lessons learnt and recommendations to implement a REACH112 business in a new pilot country. In particular from the definition of the mixed model with total conversation interconnected. The main insights we have learnt are that the services should be provided as follows:

- Communication service providers should be mandated to be interconnected using SIP protocol according to Total Conversation standards. Everybody can call everybody regardless of the provider they are subscribed to.
- Communication service providers may keep their own access protocol but are encouraged to provide a standardized Total Conversation interface for terminals.
- Relay services can collect calls directly from service providers using Total Conversation. Relay invocation mechanisms are supported by both types of service providers.
- Emergency service calls are sent in Total Conversation to Emergency Service PSAP according to the standards for IP based emergency calling and Total Conversation Access to Emergency Services. All service providers are mandated to send emergency calls to Emergency Service PSAP.

In addition, the discussion within the consortium has led to the identification of a number of issues and barriers that should be overtaken for a full implementation of the REACH112 business:

- Support by national authorities in defining obligations to provide access to relay for all telecommunications providers, or public procurement of such services.
- A basic level of relay services should be provided by the telecommunications providers or publicly procured.
- Telco providers or the government should be providing the relay services (there may be a limitation to a certain amount of minutes per month per user).
- The users should pay a small charge per minute, in the same range as regular call charging for voice calls (apart from the sustainability issues, this will also avoid the misuse of the services)
- There should be a high level "cost sharing" to be defined by the regulator (e.g. U.S. and Sweden models, social taxes, etc.)

7.11 Follow-up of the current policy situation in Europe

In parallel with performance of the REACH112 project, work has been going on in Europe to strengthen the policy support for electronic communication and for emergency service access for people with disabilities. The base has partly been the same, the work in the INCOM group and the following actions supported by the eInclusion unit.

The policy work has resulted in a completed revision of the EU directives for electronic communication in December 2009. The directives now have strong requirements on member states to make sure that Total Conversation, relay services and emergency services are available and accessible and provide functional equivalence to what is provided to the population in general. The stronger language is required to be implemented in national law in the member countries since May 2011.

The REACH112 project and concept can be seen as an early practical response on the sharpened directives, intended to lead the way for the practical implementation of the directives with harmonized well-functioning solutions.

It is of great interest for the continued support of the REACH112 services to know the level of take-up of the revised directives.

The stronger language requiring access to communication and emergency services are spread all over the directives, but for follow-up a few statements of special clarity are selected here.

2009/136/EC Amending 2002/22/EC on universal services.

1. Whereas statement (12)

"(12) Equivalence in disabled end-users' access to services should be guaranteed to the level available to other end-users. To this end, access should be functionally equivalent, such that disabled end-users benefit from the same usability of services as other end-users, but by different means."

A conclusion from this statement is that since other end users can have voice phone conversations in real time with anybody else in the voice telephone system, persons with disabilities should have access to other kinds of conversational services for real-time conversation in suitable modalities that result in functional equivalence. Total Conversation suitable for any mix of sign language, real-time text and voice and availability of suitable relay services for sign language, text and voice is the obvious response to this requirement.

2. Whereas statement (13)

"(13) Definitions need to be adjusted… Publicly available telephone services also include means of communication specifically intended for disabled end-users using text relay or total conversation services."

This is a clear requirement that text relay services and Total Conversation services shall be available on similar terms as other "publicly available telephone services"

3. 2009/22/EC Universal service directive, article 23 A

"Article 23a - Ensuring equivalence in access and choice for disabled end-users

1. Member States shall enable relevant national authorities to specify, where appropriate, requirements to be met by undertakings providing publicly available electronic communication services to ensure that disabled end-users:

(a) have access to electronic communications services equivalent to that enjoyed by the majority of end users;
and
(b) benefit from the choice of undertakings and services available to the majority of end-users.

2. In order to be able to adopt and implement specific arrangements for disabled end-users, Member States shall encourage the availability of terminal equipment offering the necessary services and functions."

This is a clear statement requiring actions to make Total Conversation and relay services available.

The financial arrangements to accomplish this does not need to be by any Universal Service Obligation, but can be arranged in any of a number of ways leading to sustainability, described for example in Articles 12-15.

4. 2002/22/EC Article 26

"Emergency services and the single European emergency call number

…

4. Member States shall ensure that access for disabled end-users to emergency services is equivalent to that enjoyed by other end-users. Measures taken to ensure that disabled end-users are able to access emergency services whilst travelling in other Member States shall be based to the greatest extent possible on European standards or specifications published in accordance with the provisions of Article 17 of Directive 2002/21/EC (Framework Directive), and they shall not prevent Member States from adopting additional requirements in order to pursue the objectives set out in this Article."

There are three parts to this requirement.

a. Disabled end-users shall have equal access to emergency services. According to the reasoning above, that means having the opportunity to use real-time conversational services used for daily use also in the emergency situation for direct contact with the emergency service. Thus that is Total Conversation with the support of relay services when needed but not resulting in loss of direct communication. A clear requirement is also that the access must be available 24/7.

b. Emergency service access also when travelling. This requires specific consideration, either in that new technologies for emergency service access are implemented in a harmonized way all over Europe, or that emergency calls are handled by the users' home relay service and home emergency service, that then need to coordinate with the one closest to the site of the emergency. There is a clear need to specify this, and REACH112 has only touched the surface of this problem.

c. Standardization and publication of the selected standards to accomplish the above in the Official Journal according to Article 17 of Directive 2002/21/EC.

The mechanism of Article 17 can be a good way to harmonize new technologies so that the desired trans-European effect is achieved.

Work is going on in the emergency telecom group EMTEL in ETSI to standardize Total Conversation Access to Emergency Services. This work was initiated by REACH112, and it is partially completed. The result could be considered for partial fulfillment of the standardization requirement in this article.

It would be a huge task to investigate the state of implementation of the revised Electronic Communication Framework Directives. An effort is made here to find out if actions are taken in the member states to comply with the requirements.

One way to investigate this is to analyze a report from the European Communications Authority Berec. Berec BoR (10) 35 "Berec Report on Universal Service - Reflections for the future". It is from June 2010. The revised directives should be implemented in May 2011, so any exact report about implementation of the new directives cannot be drawn from this report.

Even so, in a list of actions taken, a dominating part of the member countries respond that they have measures for better access to communication for people with disabilities. Very few mention specific measures.

Specific measures mentioned by single countries are large print telephone bills, free directory information, text telephone access to 112, video access to 112, and support for provision of accessible terminals.

Through other observations it has been evident that some countries are reviewing both the availability of Total Conversation, the availability of relay services and the access to emergency service in usable ways.

No indication has been received indicating that the required standards for emergency service access are about to be listed in Official Journal according to USD Article 26.4.

It is a clear need to get that standardization and publication done, and a recommendation from the project is that the EC would need to coordinate and encourage this activity. It should then be emphasized that the work in the Total Conversation area by ETSI EMTEL should be considered, as well as the other standards used by REACH112.

Similarly for everyday communication, there is a clear need to encourage harmonization around the Total Conversation standards and get sign and text relay services implemented and running 24/7, e.g. in order to enable the access to emergency services.

7.12 A kit for deployment of Total Conversation Services.

A common question from parties interested in deploying Total Conversation services is of course: What needs to be done, what is available, how do we hook in to the growing Total Conversation network?

This section provides some answers on these questions while more information is found in other deliverables, the referenced standards and from the web-site http://www.reach112.eu .

7.12.1 Technical service establishment

Establishing Total conversation services technically is described mainly in deliverable D3.2 "Platform Specification".

The main principle is that for communication with other service providers, SIP shall be used for call control and a specific set of media codecs shall be used for media coding and transport in video, audio and real-time text.

This is described in chapter 4 of D3.2.

Central to the technical service implementation are servers for authenticating subscribers, and for routing of calls and setting up calls with agreed media streams.

User terminals verified to work with the implemented system are also important parts of the implementation.

Equipment and functionality for interoperation with other providers of both the same technology and also with other new and legacy systems, relay services and emergency services are also important components in a complete Total Conversation system.

The factors that need to be agreed with the other Total Conversation providers are described in D3.2 chapter 8. That is protocol details in the interoperability interfaces between services, addresses used by the servers where calls are routed between the providers, so that protection against harmful network traffic can be established. It is also information about other service providers' numbering and addressing systems, so that call by number can be used between users of different providers.

The design of a Total Conversation service provider environment follows mainstream habits in SIP based communication service establishment.

The description is valid for implementation in native SIP. It is possible to implement it in IMS and other call control environments. Then, translation to native SIP must be provided for interworking with services based on native SIP. The standards used for the IMS case are briefly introduced in D3.2.

The technical providers of REACH112 can on request provide products suitable for building the production environments for new Total Conversation services.

On all topics below, D3.2 gives further guidance.

7.12.1.1 Addressing and numbers

It is recommended to allow both phone number addressing and sip-URI addressing. For conversion from phone number to SIP URI, ENUM conversion is used, with corporate roots. The search path for each provider's ENUM resolution therefore needs to be agreed between any new provider and the current providers. A more universal number resolution system is desirable but was not available when REACH112 was established.

Logic for number and address evaluation and resolution needs to be implemented in both user terminals and the Total Conversation service.

The first step in the evaluation is to decide if the call is an emergency call and in that case apply the specific handling of emergency calls that should contain location provision routing, relay service invocation considerations and security.

Further steps are to verify if the called address is internal to the provider or to a user of another provider, if a relay service is desired to be included in the call, and to resolve a called number to a suitable network addresses, and then act on the routing information appearing from these steps.

7.12.1.2 User terminal communication

Communication protocols with user terminals for each service provider are in principle at each service provider's decision. However use of the same protocols as for the inter-service communication is strongly recommended, because then the same terminal types may be used with more service providers. The signaling of all calls are routed through servers in the own network, so that translation of call setup procedures can be provided if the external contacts require.

Terminals for Total Conversation based on the native SIP protocols are available from the technical providers in the REACH112 consortium as well as from other technology manufacturers, both in specific hardware form and as softphone applications in smartphones, pads and personal computers suitable for different operation situations.

It is important to consider the accessibility features of terminals when deciding on terminals to be supported in a Total Conversation service. That is quality of moving image from the camera in all light conditions, usability of the screen in all light conditions where it shall be operational, alerting mechanisms, convenience of the keyboard for the text part of calls, sufficient processing power for good video transmission quality and the ability of calling so that an appropriate relay service is invoked when wanted.

General factors to consider are possibility for location provision for the emergency calling, and compliance to the communication standards to be used in the Total Conversation service.

7.12.1.3 Emergency service communication

For communication with emergency services the guidance of ETSI TR 103 170 Total Conversation Access to Emergency Services can be used. Also D3.2 chapter 6 gives guidance on this topic as well as EENA NG 112 Long Term Definition.

For full integration in Emergency Services, the emergency service need to have IP based access.

A higher integration level in the PSAP technology than what was done in most REACH112 pilots is highly desirable. It is important to give the Total Conversation calls same treatment as other calls in emergency handling queue systems, call recording systems and ability to transfer calls and make multi-party calls with them.

Still it is possible to start with different kinds of semi-integrations as was done in the REACH112 pilots.

Verification if any relevant standard for this purpose is registered in the Official Journal of the EU according to article 17 in directive 21/2002/EC should be done before deciding on how to do the implementation. New standards compared to what REACH112 used may be registered there as required by Article 26.4 in directive 22/2002/EC.

7.12.1.4 Relay service communication

Relay services are specialized call centres aimed at modality translation.

Calling by destination number and getting relay services invoked should be applied both for calls from relay service users and from voice users. Methods for such invocation are described in deliverable D3.2. Both discrete user indication of a wanted relay service type, a fixed profile connected to the service subscription and more dynamic user profile definitions and evaluations can be used for invocation of a relay service in the call. The invocation is part of the number and address resolution in the Total Conversation Service.

Invocation of relay services in relation to emergency services is also described in the ETSI document TR 103 170 Total Conversation Access to Emergency Services. A general description is found in D3.2 chapter 5.

The established relay services should follow ETSI ES 202 975 Harmonized Relay Services.

7.12.1.5 Legacy textphone communication

Legacy text telephony interworking should be considered in countries where the text telephones still prevail. Such interworking is briefly described in deliverable D3.2 and IETF RFC 5194 and thoroughly described in ETSI EG 202 320 Duplex Universal Speech and Text.

The calls with legacy textphones are enabled by setting up gateway functionality between the networks. Conversion is made between the modem tone based transmission of text in the legacy telephone network and the real-time text standard in the Total Conversation calls. The legacy text telephony protocols have functional limitations in simultaneity, character sets etc, that need to be considered ehrn designing the conversion procedures.

The technical providers in REACH112 can provide gateways and information on them.

7.12.2 Verification

Verifying the technical systems should be done using the test specification in deliverable D4.2 Test Plan for Intra Service.

For further detailed verification of 112 calls, the use cases listed in deliverable D5.1 could be performed.

A set of test call cases are defined, for a large variety of normal calls and error situations, and test according to these test cases are performed and outcome compared to expectations.

7.12.3 Service establishment

The services can be established in at least three parts: The user communication service, the relay services and the access to emergency service.

Financial considerations for establishing these services have been studied with the REACH112 pilot countries as examples. Some findings are reported in deliverable D7.1 "Project evaluation".

Other considerations for setting up the services are found in D8.3 "Final plan for Disseminating the Foreground".

7.12.3.1 User communication services

A service provider intending to set up Total Conversation services for user communication will, beyond the technology aspects described above, need to provide:

- Logistics for provision of terminals or terminal software.
- Support and user education.
- Production of the communication service.
- Follow up on service provision and improvements of the service.

For services provided to sign language users, the support and information about the services should be provided in the sign language of the users.

In order to meet national, regional and international policy goals, society support should be sought, so that the communication services can be provided with comparable affordability and user experience for people with disabilities as voice calls for the general population. Such aspects are described in this report in sections about sustainability.

The reports from the REACH112 pilots in deliverables D6.1 and D6.2 can provide insights in a lot of topics that may appear for a service provider of Total Conversation services.

7.12.3.2 Relay services

Relay services are needed for both everyday communication needs and for emergency service needs in calls where the communication modalities of the parties do not match.

A service provider intending to set up and run Total Conversation relay services will need to consider a range of topics beyond the technical considerations described above. Many of these are described in ETSI ES 102 975 "Harmonized Relay Services", in a form that can be used as a requirement specification on the service level or as an internal or external service description and code of practice for the provider.

Further material for establishing codes of practice is found in deliverable D6.0 "Guidelines for Total Conversation Codes of Practice".

The technical means for invoking a relay service in calls, and the provision of user-to-user communication services should be kept separate from the call centre and operational service aspects, so that new communication service providers and service providers who use other than the standard Total Conversation protocols internally, can provide interfaces to the relay services according to the relay service interface specifications and have calls for their users relayed.

In order to meet national, regional and international policy goals, society support is clearly needed for running relay services, so that the relay services can be provided with comparable affordability and user experience for people with disabilities as for voice calls for the general population. The economic benefits of relay services are usually only visible on the national economy level, where the gain in better efficiency at work, and less cost for care and loss of life and property outperforms the cost for personnel and technology for relay services.

7.12.3.3 Access to emergency services

Setting up the service conditions around handling of Total Conversation emergency calls contain other tasks than the pure technical establishment.

Operational aspects such as concentrating the total conversation calls to a limited number of PSAP workstations may be considered. The collaboration with relay services needs to be established and personnel educated.

Advices on operational aspects are provided in ETSI TR 103 170 "Total Conversation Access to Emergency Services", as well as in the deliverables from the pilot year of REACH112, D6.1 and D6.2 and operational documents from EENA.

In order to meet national, regional and international policy goals, society support is clearly needed for running total conversation emergency services, so that the

emergency services can be provided with comparable user experience for people with disabilities as for voice emergency calls for the general population.

7.12.4 Conclusion

New Total Conversation services with all required components can be set up by advice from this chapter and use of the REACH112 deliverable documents and contacts with organizations within the REACH112 consortium.

7.13 Business development and exploitation

A number of actors are involved in the value chain bringing Total Conversation services to the users. Successful deployment requires that all links in the value chain can develop their business case for their contribution.

For the use as a service motivated by accessibility, the business case as a whole is driven by governments and end users seeing the benefit of the service providing functional equivalence to mainstream communication.

For mainstream usage, there are other actors involved as dominating the business case, mainly the big telecom operators and mainstream telephone and ICT users.

Best for all is when these two strands can be combined, and the accessibility strand just adds what is needed in addition to the mainstream provision.

For emergency services, it is apparent that Total Conversation calls make it easier and more rapid to assess an emergency situation and decide the most proper action. So the direct access by Total Conversation should be developed in emergency services in the ongoing move to IP technologies. Part of the business case is that legacy telephone technologies are about to be outdated and when replaced, it is a good and economic improvement to add real-time text and video to the audio call capabilities.

Thereby only the relay service inclusion in emergency calls need to find its full business case development in the accessibility strand. Governments, relay service providers, Total Conversation service providers and emergency service providers need to deploy that part.

The chapter above on a kit for deployment of Total Conversation provides other business case related information, mainly for the accessibility strand.

The standards and technology to use in Total Conversation services are mature. Components for building the services exist, and the service and technology providers in REACH112 are willing to provide parts in the value chain.

8 Distributing emergency alerts to group of users

The project dealt in the emergency service area with the accessible emergency call.

Another closely related topic is the distribution of emergency alerts in a way that is accessible for persons with disabilities. When establishing new ways to do the emergency calls, it is also relevant to verify if emergency alerts at least can use the same devices so that it becomes realistic to keep track of emergency alerts as well as doing the emergency calls in an accessible way, without carrying multiple devices.

8.1 Requirements

When emergency alerts are distributed to the population in an area, there should be ways to make people with communications related disabilities in the same area aware of the emergency situation.

There should also be ways to provide emergency alert information in accessible formats conveniently perceivable for the same persons.

This implies that the signal creating awareness about that there is an emergency alert situation should be selectable between flashes, vibrations and strong sound, similarly as the requirements on signals for incoming conversational calls.

The alert message should be available at least in the following forms:

- Video with the dominting sign language in the area of emergency.
- Text message in the dominating language of the area, or multiple selectable languages if the language situation calls for it.
- Text message in easy reading style.
- Spoken message

The message should be repeatable. There should be a close to automatic procedure to create the accessible alerting signal and the accessible alert messages, so that it is not forgotten in the event of an alerting situation.

8.2 History

It has for a long time been a struggle to establish alerting systems with modern technology and deploy them before the technology they are based on get outdated.

Examples of technologies used for this purpose and partly outdated are RDS-radio, text pagers and number pagers.

There are also scaring examples of alerts e.g. poisonous clouds from industrial accidents in areas where the general population got well warned by audible alerts, but deaf and hard-of-hearing people were not alerted and got in danger.

8.3 Current approach

Because of the problem to decide, deploy and maintain one technology for accessible alerts, there has become a tendency to plan for deploying multiple technologies, and to plan for alert message distribution by the CAP standard that can carry multiple versions and modalities of the same alert message, and the receiving distributing agency selects the ones suitable for their way of alert distribution.

Among the multiple methods to reach persons in need of emergency alerts, the modern social media technologies of Twitter, Facebook are mentioned.

8.4 Solutions

Some solutions have been or are tried or deployed nationally or regionally. An alert system is best based on an international or European agreement, so that regional or multi-national emergencies can be well handled.

8.4.1 EU-Alert

There is a standard from ETSI, called TS 102 900 "European Public Warning System (EU-Alert) Using the Cell Broadcast technology".

Short 93 character text messages can be distributed with this technology using mobile cell broadcast. The system is intended for mainstream use. The standard has a short section on accessibility.

The information is initially provided in text form, so it is accessible to a quite large part of the deaf and hard-of-hearing users, but not all. Sign language is also needed. If links to accessible format information will be allowed in these short text messages, they could be a way to inform also those needing other formats. A note in the standard says that national authorities may decide if links will be allowed in the messages.

Further work will be needed together with authorities implementing EU-Alert to make sure that procedures to assure accessibility are developed.

The standard is available from

http://webapp.etsi.org/workprogram/Report_WorkItem.asp?WKI_ID=38226

8.4.2 Alert4All

Alert4All is a current project partly funded by the European Commission. It has goals of improving emergency alerting in modern ICT environments.

Suitable communications protocols are required to allow a cost-effective transport of alert messages over a variety of communications technologies. In this area, Alert4All's

objectives are: To develop a suitable communications protocol and a scalable alert message dispatcher that connects several mass market communications technologies to disseminate alerts in a multi-channel approach.

Just as with EU-Alert, the basic technology of Alert4All seems fruitful for the needs of persons with disabilities. So, it is likely a matter of assuring that the needs of persons with disabilities are met when Alert4All is deployed. Accessibility for people with disabilities is covered among the requirements, and seems feasible. There is a need to make sure that the development will include accessibility issues in a comprehensive way.

Information on Alert4All is available at http://www.alert4all.eu/

9 Overall recommendations

The main idea of Total Conversation is to provide as many conversational media as possible in a call, so that the opportunity for communicating users to find support for a common modality between the users is optimized.

The combination of video, real-time text and audio is known to provide good communication opportunities. Even so, there may be subsets of these media that can provide valuable services. In the REACH112 project a few subsets were tested.

- Real-time text only. This limited subset was used in The Netherlands. There were a substantial number of users when the project begun and the number increased according to plan during the project. This indicates that users may find this limited communication suitable in some situations.
- In Sweden, on the other hand, some efforts were made to introduce mobile terminals with only real-time text as a complement to full featured Total Conversation terminals. Very little interest was noted. It is likely that the terminal model influenced the reaction. The smartphone revolution had occurred, but the real-time text terminal was a traditional feature-phone that was outdated when the pilot started, and no user was interested in it. Omnitor also has its traditions in the Total Conversation area, and found it hard to find users with interest in pure real-time text.
- In UK, some users had real-time text only, in the talk-by-text service. They were mainly hard-of-hearing non-signing users, who were used to this kind of service and were satisfied with its simplicity and good flow. Action on Hearing Loss (one partner in the UK) determined that their staff should have a text-only version of the software and this was distributed to all desktops in their organization. However, we have no detailed reports on its use and the reactions of users to this cut-down version of Total Conversation.
- Real-time text and audio. This subset was used in the Spanish pilot. The Spanish partners agreed with the Spanish Deaf Association to test text only terminals among some members in Galicia. Not surprisingly, these users who were already able to use video communication software on the Internet were less than happy to revert to text communication. The users did not feel that a service without video filled their communication needs well for everyday communication.

There may be some situations when a subset of the Total Conversation service satisfies user needs well. Some service providers may be more interested in providing such limited services. In the UK, OfCom is now promoting the idea of a 'next generation' text relay system. We take the view that this is unnecessary when a Total Conversation service can be delivered just as easily and users can choose the subset of text if they wish.

The Dutch partner offered the following observations on this topic. For hard of hearing people who are still able to use voice with their hearing aids, the presence of video will greatly increase their ability to communicate since they can lip-read as well. Also real-time text communication with video greatly enhances communication with emotions and non-verbal information.

The move to include video for 112 creates a problem where there is no relay service available for signing. Publicizing the concept of video media may give sign language users the impression that they can sign. When they call and find there is no sign language interaction, leads to hopelessly staring at each other and being unable to communicate.

If the deaf user can use text they will switch over to real-time text. But this may cause delays and confusion. There could be a situation where the 112 operator motions/mimics typing and then types text and the deaf person cannot read?

The 112 centre with Total Conversation must be able to offer sign via a relay or have signing operators available. Callers who have sign language as their first language can sign with the 112 call taker/relay. Non sign language users will have the added value of video to support their audio communication, or RTT communication.

We recommend that the complete service provision of accessible communications in a Member State should include the full Total Conversation service, in order to not lock out any user from conversational communication.

In REACH112 there are enormous aspirations for all in the value chain. We are in fact dealing with the next generation of telecommunication services and next generation for emergency services. While user focused information is vital for the take-up, the changes needed to create equivalence in telecommunications will come from legislation and then from the mainstream operators and services providers.

Lesson learnt from the activities realized within the project have been evaluated, and results and feedback collected during the pilots and the dissemination actions have been reported and commented both at a general level and per pilot country.

Based on the feedbacks received from the dissemination activities and the findings from the analysis of the 12 months of pilots' running, the consortium has identified 9 key recommendations for the take-up and sustainability of REACH112 types of services in Europe.

No	Project recommendations	Target group
1	Data roaming fees should be strongly reduced and/or other ways should be found to make SIP Multimedia calls with other users, with relay services and with 112 emergency services affordable to users even when visiting another country than where their mobile broadband subscription belong.	• European Institutions
2	A funding scheme to support the use of smartphones and other equipment necessary for Total Conversation needs to be implemented (public and/or private funding)	• National Authorities
3	Relay services available 24/7 should be set up and authorities should mandate the use of Total Conversation standards for interoperability and appropriate functionalities rather than functionalities only	• National Authorities
4	Next Generation standards and regulation on emergency calling should be proposed at EU level along with a test of the entire Next Generation emergency calling chain	• European Institutions
5	When upgrading PSAPs, national authorities should ensure that the deployments are in line with Next Generation standards and therefore Total Conversation requirements	• National Authorities
6	European Institutions should promote the establishment of Europe-wide number translation systems based on ENUM, for calling by number to anyone, with or without support of relay services as appropriate for each communication situation.	• European Institutions • SDOs
7	European Institutions should ensure that a set of standards and regulation for accessible communication and accessible emergency service calling applies on mobile manufacturers and mobile network operators	• European Institutions • SDOs
8	Implementing measures of the article 26.4 of the Universal Service Directive should be established so that to highlight the support to REACH112 types of services, while current regulation remains vague and allows for any types of (supposed) accessible solutions to be deployed	• European Institutions
9	Total Conversation should be supported as a communications facility to be used in other communications than between user-to-user and to emergency services. This applies in particular to other public/government services.	• European Institutions • National Authorities

Table 23 – Project recommendations

10 Conclusions

The positive cost/benefits of establishing accessible emergency services, available relay services and accessible communication services are clearly on the member state level. The positive return on the investment in these services come back on the state level as reduced cost in care, reduced labor authority costs, reduced social insurance system cost, reduced social service cost, reduced emergency service cost because cases get less severe and higher industrial productivity.

The costs for actually running the services are higher than the available funding through the project. Therefore, the economical load on the partners involved in running the services was high, with little hope to get good return after the project.

A better balance would have been possible if the authorities responsible for emergency services relay services, and communication services would have participated in the project with part-funding for the provided services. The EU project form seems however not easily acceptable for national authorities, who have strict requirements on them to procure everything according to fixed requirements.

Also, the opportunity to influence national policymakers to make rapid decisions to continue the demonstrated services seems low. The authorities need longer terms from experiencing a good service to arranging funding and setting up conditions to run these kinds of services than the three years REACH112 lasted.

Continued efforts are therefore needed to harvest the efforts spent in REACH112, and await positive outcome of the investigations by the national authorities in their initiated decision processes to improve and permanent the funding of the trialed services.