Project number:	European Commission - 033685
Project acronym:	CHORIST
Project title:	Integrating Communications for enhanced environmental risk management and citizens safety
Instrument:	Integrated Project
Thematic priority:	Information Society Technology
Call identifier:	FP6-2005-IST-5
Start date of project:	01/06/06 **Duration:** 36 months

Deliverable reference number:	SP1.D1
Deliverable title:	User inputs methodology
Version:	1.0
State within Consortium:	DRAFT: - FOR APPROVAL: - APPROVED: **X**
Due date of deliverable:	MONTH 3 (08/06)
Actual submission date:	04/01/07
Lead contractor of this deliverable:	BAPCO
Other contributing contractors:	- EADS Secure Networks - EADS Defense and Security - VODAFONE España - TRADIA TELECOM - Teknillinen Korkeakoulu (Helsinki University of Technology)

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
DISSEMINATION LEVEL		
PU	Public	**X**
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

CONTENTS

1 INTRODUCTION

1.1 PROJECT SCOPE

The CHORIST project will propose solutions to increase rapidity and effectiveness of interventions following natural hazards and industrial accidents, in order to enhance citizens' safety and communications between rescue actors.

The CHORIST project focuses on early warning and alert phases of the risk management cycle. As such, it complements previous Integrated Projects which cover the other phases of risk management.

1.2 PURPOSE OF THE DOCUMENT

The purpose of the present document, within the framework of CHORIST Project, is to list the operational and technical domains of activity into which user requirements inputs will have to be collected during the SP1 “Users inputs and overall engineering” . This document will be a guideline to focus on the requirements that are relevant to CHORIST and thus avoid major overlaps with other projects.

1.3 DOCUMENT VERSIONS SHEET

Version	Date	Description, modifications, authors
1.0	04-01-07	First release

Table 1 : Document versions sheet

2 REFERENCE DOCUMENTS

2.1 REFERENCE DOCUMENTS

[1] CHORIST - Annex I - "Description of Work" ver 1.05, April 2006.

[2] Schach, S. R., Object-oriented and classical Software Engineering, McGraw-Hill, New York, 6th Edition, 2005.

[3] Neil Maiden, http://crinfo.univ-paris1.fr/RE05/tutorial.html

[4] Kotonya and Sommerville 1998, Requirement Engineering (RE) process

[5] Soberit (http://www.soberit.hut.fi), Basic course in Software Engineering–Requirement Engineering

[6] ETSI SR 002 180 V1.1.1 (2003-12) - Requirements for communication of citizens with authorities/organizations in case of distress (emergency call handling)

[7] ETSI TS 102 181 V1.1.1 (2005-12) - Emergency Communications (EMTEL); Requirements for communication between authorities/organizations during emergencies

[8] ETSI TR 102 182 V1.1.1 (2006-03) - Emergency Communications (EMTEL); Requirements for communications from authorities/organisations to the citizens during emergencies

2.2 DEFINITION

Actor:	Expressing a role who may be individuals, groups or organizations.
Customer:	Party that pays for the telecommunication and IT service(s) provided.
System:	A combination of interacting elements organised to achieve one or more stated purposes
User:	Individuals (citizens or professional) or groups of them who/which is the intended beneficiary of system operation.
User Requirement:	Requirements made by users, based on their needs and capabilities, on a system and any of its supporting components, equipments and interfaces, in order to make use of this system in the easiest, safest, most efficient and most secure way

The list of definition and abbreviations used in this document are the same as: ETSI TR 102 538 V1.1.1 (2006-07) Technical Report and ISO 15288 "System engineering - System life cycle process".

2.3 ABBREVIATION

CAP	Common Alerting Protocol
CB	Cell Broadcasting
DAB	Digital Audio Broadcasting
DVB	Digital Video Broadcasting
HMI	Human machine interface
ITC	Information technology / communication
ERM	Environmental Risk Management
MBMS	Multimedia Broadcast Services

QoS	Quality of Services
PMR	Private Mobile Radio
SP	Sub Project
TEDS	TETRA Enhanced Data Service
TETRA	Trans European Trunked Radio (Narrowband PMR system)
TETRA-TEDS	TETRA Enhanced Data Service
TETRAPOL	Narrowband PMR system (not an acronym)
UAB	User Advisory Board
WiMAX	Worldwide Interoperability for Microwave Access (type of WMAN; IEEE.802.16 standard)
WP	Work Package

3 ORGANISATION AND PROCESS

3.1 ORGANISATION

An analysis of the Environmental Risk Management (ERM) life cycle phases have identified four categories of user-type stakeholders:

1. Public Safety organisations and Authorities, which have a pro-active role in defining and deploying crisis responses;
2. Citizens and utility organisations (e.g., public transport), who must react to a crisis, either on their own initiative or with some guidance;
3. Telecommunication and media operators that have a major role in rapid and efficient response implementation;
4. Standardisation bodies that have an upstream role in contributing to provide solutions which can be used everywhere.

The CHORIST UAB will include representatives of the first three categories. The fourth category is strongly related to technological developments and innovation-related activities and will be addressed in a specific task within other areas of project.

The UAB will provide inputs and/or meet to discuss specific topics upon requests from the board managers. The UAB will, subsequently, be organised in three branches associated to the three member categories as follows:

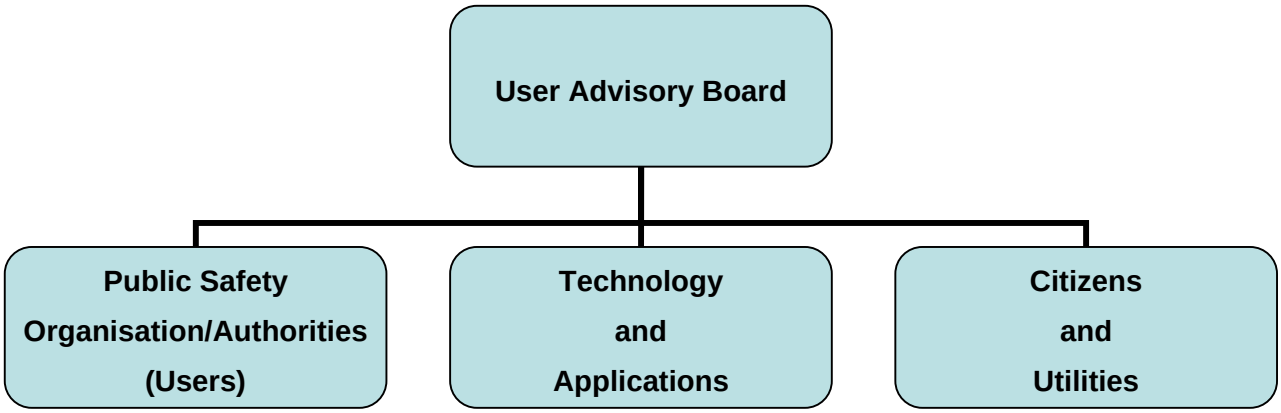

Figure 1: UAB structural organisation

Membership of the UAB will, initially, be by invitation from the ERM community within Europe. Once appointed the UAB will identify other key players throughout Europe, particularly in those countries not represented in the first round of invitations or from other user organisations that are not fully represented on the UAB and those persons will be invited to join the UAB.

A Chair for the UAB will be appointed and that person and the UAB will then, with project management support supplied by BAPCO, be responsible for all future activities conducted by the UAB.

An important element of the ongoing work of the UAB, in addition to providing inputs to Project CHORIST, will be the development, in collaboration with Project NARTUS, of a pan European public safety communications and information management forum which will have members from all stakeholders in each European nation. These members will, according to their expertise and the organisation to which they belong, be members of one of the branches of UAB.

At a time when the three branches have sufficient members and are fully operational with clear lines of communication and consultative procedures, the UAB will become a coordinating authority that provides the point of communication and input to the project.

At this time each branch of the UAB will appoint a Chair and the respective branches will be responsible for liaison and consultation within that branch and the input of their requirements to the UAB.

The UAB will conduct its consultation processes by:

- Close co-operation with all Project Work Packages
- Collaboration with Project NARTUS
- Interactive Web Bulletin Board
- Discussion papers
- Newsletters
- Meetings
- Workshops
- Conferences
- Co-operation with other Projects.

The UAB will also be active in the innovation-related activities of the project concerning information dissemination, impacts analysis and perspective assessment.

3.2 REQUIREMENTS GATHERING PROCESS

For the CHORIST Project there is a need to identify at an early stage the requirements products that need to be produced and the types of requirements that will be collected. Indeed, ensuring that requirements are of high quality, robust, within scope and on track to satisfy the needs of the users will help provide a solid foundation for the project.

It is also essential that within the CHORIST Project that those requirements are appropriately organised and tracked. This will ensure that requirements are traced and managed throughout the project lifecycle and help guarantee that any technological solution fulfils the original needs identified by the users. It will also ensure that the impact of any changes to the requirements as the project progresses can be identified and understood.

Outlined below is a high level process intended to provide a structured and consistent method for capturing requirements within the CHORIST Project. The supporting diagrams demonstrate a number of requirements products that together make up a good requirements specification, based on industry-recognised structured methodologies. A full description of each product, and the implications of not producing it, is also included. Whilst it is possible that the CHORIST Project may not require all of the requirements products specified, the WP leader will consider their inclusion based on the most effective and efficient means of delivery of products against project timescales.

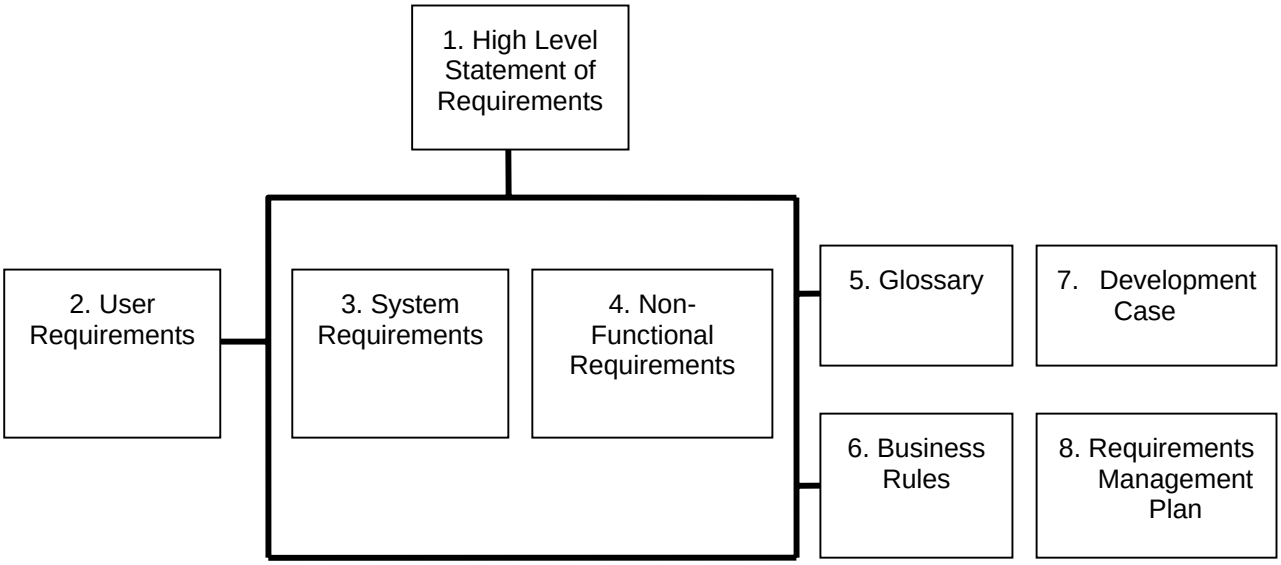

Figure 2: Potential requirements products.
(Bold line indicates traceability relationship between products)

3.2.1 High Level Statement of Requirements

The High Level Statement of Requirements will define a high level view of the product to be developed from the stakeholders' perspective. It is an outline of the high-level requirements and will help to define the scope of the work.

It is proposed that information to construct this product will be obtained via requirements elicitation workshop(s), although this will be informed by the synthesised requirements previously captured as part of other EU projects or related initiatives.

The workshop(s) will be facilitated by BAPCO and attended by readily identified stakeholders in the domain of Environmental Risk Management (ERM). It is intended that at this stage the information gathered will produce requirements at a very high level. By-products of the workshop(s) are likely to initially include a glossary of terms, relevant issues and supporting information, including the identification at a high level of the benefits likely to be accrued on delivery of the technological solutions.

It is proposed to adopt the following process to manage the workshop(s) and deliver a comprehensive output. More detailed guidelines for each of the activities will be developed prior to any workshop(s) being held.

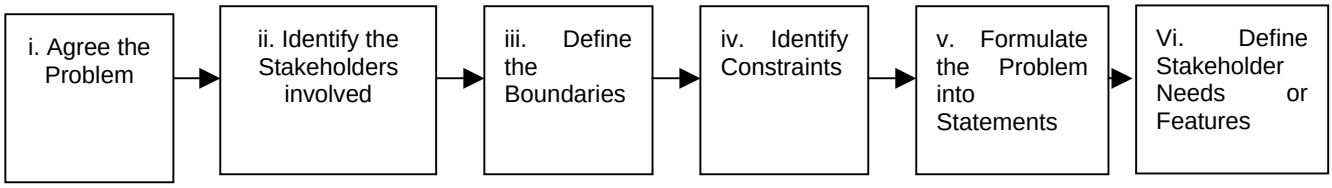

Figure 3: Workshop management process

3.2.1.1 Agree the Problem

This activity will help set the scope for CHORIST and will aid communication between workshop attendees and other stakeholders, particularly the User Assurance Board (UAB) and consortium partners. It is intended that this should be referred back to regularly throughout the lifecycle of the CHORIST Project.

Potential Impact of not completing this step:

- If a clear problem is not established and agreed workshop attendees will prove difficult to control. This is a method to ensure attendees are clearly focussed on the same problem and keep them on track.
- If the problem is not agreed it can be difficult to control the scope of the workshop and the workshop outputs.
- If the problem is not clearly defined, subsequent workshops and/or analysis runs a high risk of scope creep as stakeholders' differences in opinion emerge.
- Without a clearly defined problem area it will be difficult to obtain and maintain stakeholder commitment.

3.2.1.2 Identify the Stakeholders Involved

This activity helps to identify who needs to be involved in the ERM problem space being explored. It will help everyone see that there may be other people who may have a view on the problem being discussed that could differ from theirs. It will also aid understanding of who may have been overlooked and might need to be involved in the work.

Potential Impact of not completing this step:

- If stakeholders are overlooked there is a risk of missing the opportunity to collect all relevant requirements.
- If stakeholders are overlooked from the outset it will prove difficult to obtain retrospective buy-in.
- If negative stakeholders are not considered vulnerable areas could be left open.

3.2.1.3 Define the Boundaries

This purpose of this activity is to define the boundary of the business to be modelled, and in this case specifically to improve the overall process of Risk Management before, during and after any critical incident or disaster. It is intended to outline the business processes and to define who or what will interact with the business of ERM as the project is developed.

Potential impact of not completing this step:

- Without shared understanding of the scope there is a likelihood of time consuming and unnecessary work being done.
- Not defining the business boundary may result in scope creep.
- Important functionality may be missed.
- Communication will suffer due to a lack of clarity.

3.2.1.4 Identify Constraints

This activity will help define those factors that will impact on the problem identified and which cannot be changed. They generally comprise political, economic, social, technical, environmental and legal 'givens' within the project area.

Potential impact of not completing this step:

- If constraints are not identified then technical or project risks might be missed.

- Potential further stakeholders may not be identified.
- Not understanding constraints may extend timescales and increase complexity at later stages.
- High level rules underpinning the project aims or technological solution may be missed.

3.2.1.5 Formulate the Problem into Statements

This activity will help users focus on the important aspects of the ERM problem identified at 3.1.1.1 above. There are likely to be three or four core ERM problems, each of which will be summarised within a problem statement template. This is to be defined but is likely to include:

- The problem of (description of the problem) affects (list of the stakeholders affected by the problem). The impact of which is (the potential impacts of the problem). A successful solution would (a list of the key aspects of a successful solution).
- A supplementary statement describing the benefits of the solution is also likely to be incorporated at this stage.
- Potential impact of not completing this step:
- Workshop attendees may still be unclear about the underlying problems being addressed.
- Other stakeholders may be missed as more can emerge at this stage when the problem is considered in the context of who it affects and how they are impacted.
- Opportunities to identify key benefits may be missed.
- Solutions may not link back directly to the problem.
- Stakeholder expectations do not match the problem being solved

3.2.1.6 Define the Stakeholder needs/features

This activity helps elicit the priorities of the workshop attendees, based on the benefits identified in the problem statements and improvements to what is wrong with the current business process/system

Potential impact of not completing this step:

- Stakeholder priorities may not be co-ordinated or understood.
- It will not be possible to define when the work package is completed as finished product may not match stakeholder expectations, giving potential for scope creep.
- It will be difficult to define if the project is successful as it may not be possible to know if or when stakeholders' needs have been achieved.

3.2.2 User Requirements

The products of SP1 are designed to help inform - and be complimentary to - those to be produced within other sub-projects, notably systems to communicate with the citizen, risk assessment report systems and emergency telecommunications systems at crisis sites, are developed under SP2, SP3 and SP4.

It is proposed to present user requirements in the form agreed with the CHORIST technology suppliers. Initial output will comprise High Level User Requirements and a Glossary (of Terms), but over time will comprise a series of scenarios and potentially may include other formats, for example Business Use Cases– representing clearly defined business functions, from the event that triggers it to its conclusion - if appropriate.

In order to produce user requirements which are comprehensive, robust and realistic it will be necessary to identify appropriate Business Actors (stakeholders expressing a role who may be individuals, groups or organisations) who currently, or may at some future point, interact with the outcomes of the CHORIST Project. They are likely to be future users of the CHORIST solution. They will be consulted through a series of user workshops, by survey and questionnaire. Through their input it will be possible to capture the current

('as is') and the future '(to be') business processes, the 'as is' to be used as a baseline against which the benefits of business change in the 'to be' can be measured. Generally these processes will be supported with workflow or process diagrams.

The workshops will be used to 'test' that requirements and information existing in other projects and initiatives is accurate and complete; they will assist in the development of workflows and scenarios relevant to CHORIST, and contribute to their prioritisation. All output will be subject of review and approval by the User Assurance Board prior to wider dissemination.

3.2.3 System Specifications

It is imperative that within the CHORIST Project that the following areas are appropriately defined:

- The functionality of the system;
- What it is intended handling within the system and what will be handled outside the system; and
- Who and what will interact with the system

It is anticipated that System Use Cases to support these definitions will be developed based upon the High Level Statement of User Requirements and scenarios as they are produced. The most important feature of this methodology will be to provide early communication of the system's behaviour to the end user, and provide assurance that the system will actually do what the user wants and needs

3.2.4 Non Functional Requirements

Non Functional requirements concentrate on system qualities and constraints. A System Quality is a characteristic that adds to stakeholder satisfaction and could include, for example, a solution that responds to user queries within a specified time, or a system with a graphical user interface requiring minimal training.

A Constraint is a factor that cannot be changed or ignored and has an impact on some phase of the project. In the case of CHORIST this may include the deployment of a specific technology, or other factors such as available resources or finance.

Non Functional Requirements will be captured with a view to understanding the characteristics required to ensure the quality of the CHORIST solution and assist the technology provider partners in the consortium determine the most appropriate way of including those characteristics in the eventual solution. The capture of non functional requirements (NFR) will also assist the stakeholders understand the constraints within the ERM and CHORIST environments that will restrict the type of solution that can be delivered within the timescale and budget allocated, and provide them with assurance that any stated quality criteria are being met.

3.2.5 Glossary

The Glossary is where all terms and acronyms that are important to the requirements should be captured and defined. It is the primary product used to capture information about the User Requirement domain and forms a key reference document that is used to establish a common language amongst those involved and to reduce any misunderstanding that might arise from any requirements term.

The Glossary will be created at the start of the requirement capture process in order to agree a common vocabulary across requirements early on. Any new terms used during changes made to requirements will be captured and added to the glossary. It will be kept updated with new terms and all requirements products will be kept consistent with the latest version.

The UAB will be asked to verify terms relating to requirements defined in the glossary at regular intervals. This will ensure that each term has a clear and concise definition, is used consistently throughout the requirements process and represents the same thing in all requirements products.

3.2.6 Business Rules

All organisations are governed by rules that regulate how they operate and are structured; they ensure that organisations abides by external restrictions (e.g. legislation, laws and regulation) or adheres to internal restrictions such as policies and as such they represent a valuable asset of the business to be captured, documented and linked to the other parts of the requirements specification. This will help ensure that the requirements are robust and underpinned by the rules that govern the business of Environmental Risk Management in the area of CHORIST solution deployment.

Capturing business rules will be an ongoing activity throughout the requirements capture process.

3.2.7 Development Plan

This is a document that describes how the generic development process it is proposed be adopted might be customised to meet the needs of the CHORIST Project.

This is recognised good practice where an iterative approach to solution development is being considered and will describe the risks, goals and milestones for every iteration.

In the case of the CHORIST Project whereby it is proposed to build a new bespoke ERM system the following process is recommended for adoption:

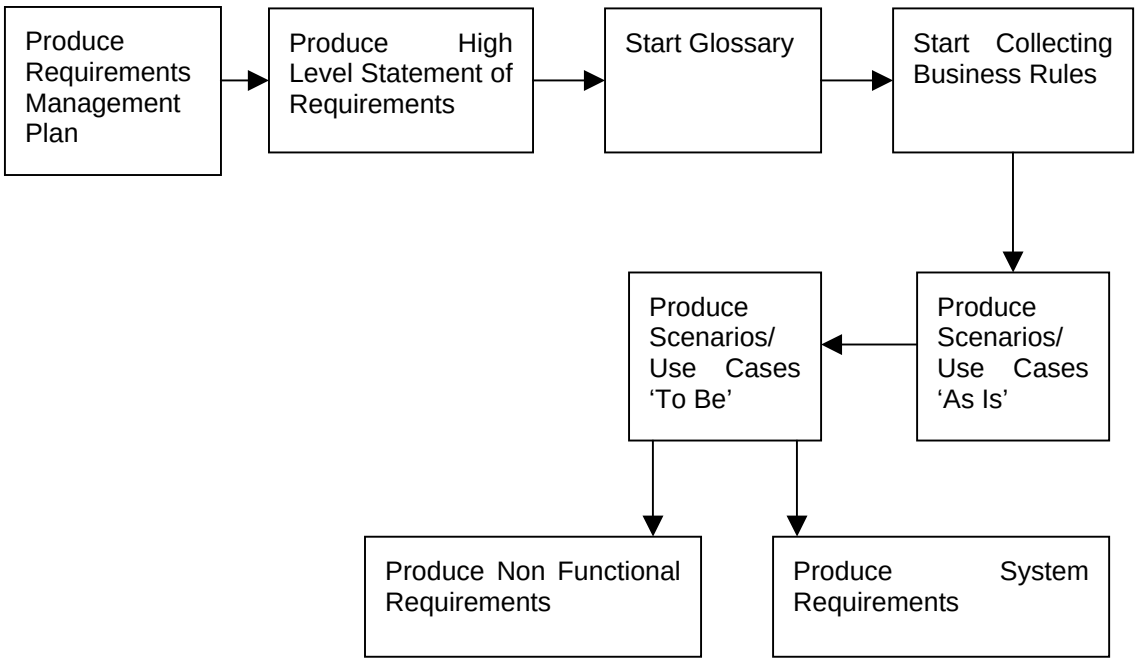

Figure 4: Proposed requirements Capture Process for CHORIST Project

3.2.8 Requirements Management Plan

The Requirements Management Plan is the document which is to be used as a way of organising and tracking requirements to ensure they are traced and managed throughout the lifecycle of the CHORIST Project. It will describe the traceability strategy that CHORIST will use for its requirements and will seek to document how all the outputs need to be linked together across the project as they emerge.

It will also provide the means of ensuring that any technological solution will fulfil the original needs identified by the ERM stakeholders and that the impact of any changes to the requirements can be identified and understood.

Within CHORIST there are likely to be a number of requirements documents or products, each containing requirements of one type or another. By establishing a link between these requirement types the requirements can be tracked, and any changes quickly identified and assessed.

The Requirements Management Plan documents the requirements products that CHORIST will need to produce and what types of requirements will be collected. It will also incorporate the associated set of attributes which provide supplementary information about the requirement. As an example there may be an attribute to record whether the priority of the requirement is high, medium or low, and another which details the benefit of realising the requirement. This information will be used to assist decisions regarding trade-offs of time, cost and functionality as solutions are developed

4 CHORIST DOMAINS OF ACTIVITIES

4.1 RISK MANAGEMENT AREA AND TRAINING

Project CHORIST will bring sizeable progress compared to the current state-of-the-art, in the area of risk management.

As presented in Fig. 1 we can identify in the *domain of risk management* the following parties involved:

- Various actors involved in the Risk Management cycle (Police, Health, Civil Protection, Utilities, Transportation, Rescue Teams, fire fighters etc.);
- a set of physical variables or conjunction of them that are captured from the field via specific remote sensors that can collect this info and report them, through a communication system, to a central Data Base;
- systems that are used for risk assessment and planning that can also include simulators for the prediction of future scenarios and can help in early warning alert;
- citizens;
- ITC infrastructures to support the dissemination of information and citizens alert;

All parties are involved before and after the possible disaster and interact between them according to certain procedures and communication systems that allow the transfer of relevant information in different format, voice, data, images, etc

CHORIST Project will deal with all these actors and systems in order to improve the overall process of Risk Management before, during and after the crisis/disaster.

CHORIST area in the ERM cycle presented in Fig.1 covers:

- Early warning or alert elaboration by exploiting the results of the forecast systems (covered by other IPs such as PREVIEW and ORCHESTRA) and combining these results with direct observations coming in real time from in situ sensors or witnesses (112);
- Alert dissemination when a threat becomes real and endangers citizens and/or goods, or when a disaster has occurred;
- Alert status update as a function of the events: many disasters are not limited to an instantaneous effect and the disaster management can evolve during a (long) period of time (floods, fires, chemical pollutions, etc.). There is therefore an essential need to update the response actors and the citizens of the evolution and to issue updated alerts and protection measures.

To fulfil its functions, CHORIST will therefore highly benefit from inputs of permanent monitoring systems (covered by other IPs or STREPs) before and during the disaster and from inputs of response Command and Control systems (also covered by other IPs). These inputs will be completed and clarified by the witnesses' feed-backs (SP2) or response team's feed-backs (SP4).

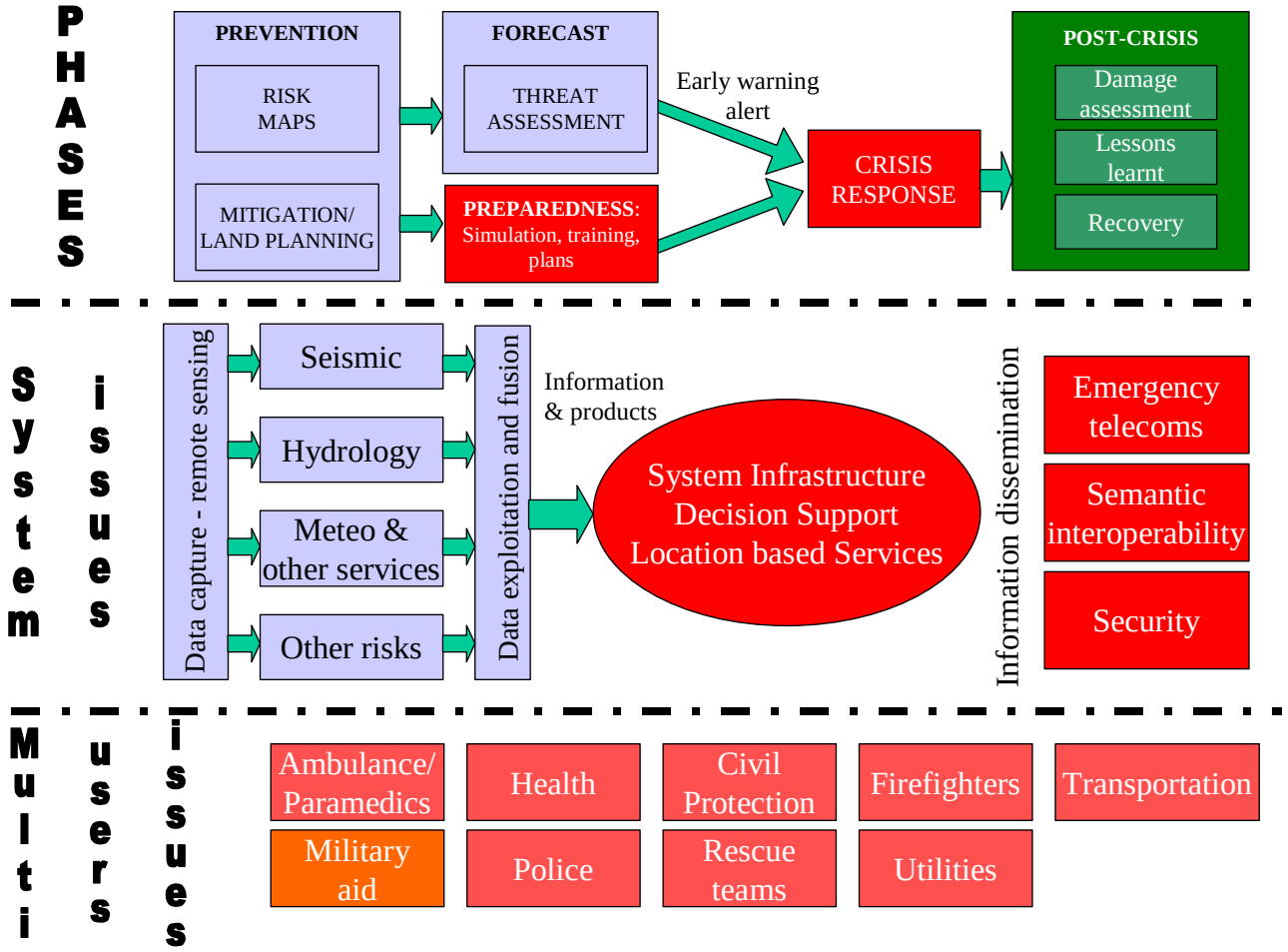

Figure 5: Parties involved in risk management

Currently, in the **Environmental Risk Management** (ERM) domain several organisations involved to interact and coordinate without relying on a real Integrated Communication System or ICT and normally base their operations on the use of more traditional communications such as voice and fax.

CHORIST aims at improving this aspect concerning communications among subsystems of the ERM and between the organisations involved. This improvement will provide the Risk Managers powerful tools that can range from *semantic analysis techniques* to *databases* based on the collection where important volumes of information from the field will be collected.

Another important issue to be considered and included in the domain of CHORIST Project should be the area of modelling, simulations and **Risk Assessment**. The idea is that the future risk management systems will be able to manage multiple scenarios or scenarios with several risks at the same time. Present systems are oriented to the management of single risk situations and the introduction of prototypes for Multi Risk management is to be considered as very strategic. Considering that today's models are very tightly linked to specific cases, CHORIST will have to address models with some degrees of independency from the traditional models of risk management and at the same time be able to manage different disaster scenarios. Since the focus of existing systems is narrowed down to specific situations, such systems do not usually consider a wide range of information sources. On the other hand, CHORIST models shall not only focus on multi hazard simulations but shall also significantly improve the decision-making process by drawing from an extensive range of datasets in the course of the analysis, and therefore drastically increase the situation awareness of decision-makers.

A consequence of that is the corresponding development of an **Alert Platform** that can enhance the coordination between actors on the field and information to the citizens, which is of utmost importance.

To complete the picture, it is very critical to stress the importance of the **training activities** that are necessary to guarantee a correct use of all the subsystems involved and properly prepare all people involved in the different phases of the process. From this perspective the development of training systems for coordination purpose between all stakeholders to prepare the crisis response is one of the main targets of the project and the main domain to be considered for the activities to be performed in the first phase of CHORIST.

4.2 TECHNOLOGICAL DOMAINS

4.2.1 Alert processing (SP2)

4.2.1.1 Communication from the citizens

Currently, there is no well defined, standardised and globally agreed protocol for messages sent by the Control Centres of 112 to authorities. For this reason, and considering the importance in the operations of a reliable risk management situation picture, a definition of such a protocol, in order to enable 112 to provide relevant information from the field on the situation in an optimal way, will be part of the scope of SP2. Note that the collection of information from the citizens by the 112 call centres is out of the scope of CHORIST.

4.2.1.2 Situation awareness

In the domain of situation awareness, CHORIST will mainly focus on processing real time observations (from citizens and sensors networks) to complete and to enhance the risk situation picture elaborated by the permanent monitoring systems (outside the scope of CHORIST).This real time (in situ) observations are transmitted through various channels and generally in an “unformatted” way. The aim of CHORIST will be to design an ITC sub-system capable of integrating the various types of data and information to produce a comprehensive (centralised) risk picture which will be the reliable base to elaborate the alerts and to monitor the operations.

4.2.1.3 Situation assessment

The previous CHORIST module (Situation awareness) provides a comprehensive picture on the situation. The Situation assessment module will analyse this situation picture through the use of thresholds, models and previous knowledge to elaborate the alert situation.

This domain of CHORIST is of utmost importance because the two major problems that can occur in this phase of the risk management cycle are due to:

- Bad identification (or sometimes lack of identification) of an alert situation,
- Alerting the citizens without reason.

The results in the first case are evident and generally catastrophic, as demonstrated during the tsunami in Indonesia. The second situation can generate unjustified panics and, in a longer term, make the citizens distrust the alert systems or agencies.

In this domain, there is obviously a great need of European standardisation (thresholds, models, knowledge), but also a great need of flexibility for the system, as the threats greatly depends on the local topography and land occupation and use.

Performing an accurate situation assessment is also paramount for operation management. The foreknowledge of the seriousness of an unfolding crisis allows for an adapted allocation of resources in the response phase. Indeed, underestimating the seriousness of a crisis situation leads to the allocation of too few resources with all too often dire consequences. On the other hand, overestimating a crisis situation

results in the commitment of unneeded resources which would not therefore be available should a new crisis emerge, without mentioning the obvious economic argument against deploying unneeded means.

4.2.2 Communication to the citizens (SP3)

4.2.2.1 Communication channels

In this area CHORIST would like to introduce several substantial improvements according to the evolution of media and channels available to provide relevant messages to the citizens.

Traditionally communications to the citizens, in case of risk and alerts, has been always managed via sirens with limited capabilities and semantic content and traditional media communications like analogue radio and TV. The aim of the present project is to introduce innovative siren systems based on two way data protocol that can allow a more flexible management of the communications and alert messaging.

In terms of broadcast communications, CHORIST will address the application of digital radio and TV that is DAB and DVB technologies that will be available for the trial.

When moving to personal communications, and considering the importance that mobile telephony has acquired in today's society, one additional channel to have effective communications to the citizens is GSM/UMTS mobile technology and more specifically Cell Broadcast and Multimedia Broadcast Services.

In this field CHORIST will try to develop some innovative solutions to be tested within the project.

4.2.2.2 Messages to the citizens

Once defined the technology to provide the communication channel to the citizens, the other important aspect to be considered within the framework of the project is the type of message to be provided to the citizens.

Today's systems allows only to provide standard messages without any automated management thus requiring human intervention to deliver specific messages to a defined area. Aim of CHORIST Project will be to set up a platform that allows, automatically, the definition and composition of messages based on language and cultural aspects. At the same time it will be very important the possibility to offer messages that are location sensitive, that means that take in consideration the geographical area and discriminate the alert message depending on the distance from the risk area or the disaster.

Another important aspect that is missing from today's solutions is the integration of different communication systems in a unique platform that allows an effective management of the message delivery. CHORIST Project will be focused on the design, development and test of a **communications channel dispatcher** to allow alerting citizens through the most appropriate channel according to the geographical position, the targeted people and of course the nature of the risk and or disaster.

4.2.3 Emergency telecommunications (SP4)

An additional tool that can be very helpful during risk management situations is the availability of effective and robust telecommunications systems. Among them there are several types that we have to explore and deal with in the framework of the project.

4.2.3.1 Ad hoc broadband hotspots and Backhaul

For the time being, public safety applications do not rely on the availability of real broadband systems that on the contrary are mostly available for public use. In this sense some trial has been done using WiFi (802.11xx) technologies without so much success especially due to the limited coverage and the usage of free licensed band that does not ensure availability of communications with proper QoS.

One of the most important aspects in this field will be the development of an **Ad Hoc mobile broadband network** based on WiMax that will feature a better coverage and provide better performance for Public Safety applications overcoming in this way the WiFi limitations.

WiMax technology will also allow implementing a **backhaul** with high data rate transfer capabilities and larger hops allowing better fulfilling of the requirements from Public Safety applications. This backhaul will be mainly used to provide connectivity in case of fast deployment of mobile network allowing providing higher data rate and coverage whenever needed by the emergency situation.

4.2.3.2 New broadband services: wideband extended network

Today's PMR networks are available to provide basic services like voice, short data services and some data transmission at limited speed rate. Emergency incident communications in most cases requires some additional capability that only wideband extended networks can provide in order to exchange effectively information that is crucial for the risk management. In this respect TETRA-TEDS PMR technology will be tested and based on that, new data services up to 100 kbps will be available. At the same time new generation equipment will be tried to ensure fast deployment and ergonomics benefits.

Based on the new technologies in the PMR access network and in the backhaul a new platform will be defined to provide support to enhanced messaging, differentiated classes of services (data, soft real time) and localisation. This will be supported by optimised routing capabilities and will provide an answer to scalability and performance problems. The platform will allow for a set of new services such as geo-localization, status reporting, file and image exchange, modem messaging, database access, etc.

4.2.3.3 Interoperability of Public Safety Communication systems

The interoperability between PS communication systems is an historical issue that is present in the daily activities of many countries and of many organisations. So far, few developments have been done in this area, thus leaving the different PMR networks and ad hoc networks in most cases as isolated island of coverage without any interconnection that can provide a basic interoperability. Some work is ongoing in standardisation bodies especially within ETSI Tetra, in order to guarantee certain interoperability between Tetra networks from different manufacturer (Inter System Interface).

CHORIST Project will definitely address this field of improvement that is crucial for the success of the coordination and management of the forces involved in a crisis scenario. As a consequence, the project will aim at the definition and implementation of gateways contributing to enhanced in-field communications through extension of PMR network coverage and high bit data rate service offering.

4.2.3.4 Rapidly deployable broadband network

Where needed, today's PMR Operators offer the possibility to install mobile TETRA Base Stations in the interested area, requiring a network planning prior to the deployment. Network set up always requires human intervention and some extensive preparation.

This project is aimed at identifying possible solutions to rapidly create and manage services and applications by developing dynamic addressing, routing and dynamic service discovery.

4.2.4 Summary of technologies used in the different SP

As summary the following table sums up the involvement of the technologies mentioned in the doc within the different Sub-packages (SP) of the project. Only SP2, SP3 and SP4 provide subsystems, so only these SPs are listed.

SP	Title	Technologies involved
SP2	Risk assessment report systems	CAP
SP3	"Communication to the citizen" system	DVB (Digital Video Broadcasting) DAB (Digital Audio Broadcasting) CB (Cell Broadcast) MBMS (Multimedia Broadcast Services) – Study only Sirens
SP4	Emergency telecommunications systems on crisis site	TETRAPOL TETRA TETRA TEDS WiMAX (802.16)

Table 2: SP2, SP3 and SP4 technologies

5 METHODOLOGY

5.1 USER REQUIREMENTS

The collection of user requirements is the basis for the system specification and design, where users are expressing their needs and preferences on what the system should do. Without this, any further progress is non-realistic, as providers must always understand what their customers want. The description of the functions of the system (functional requirements) helps the potential users to know if the specific system being developed meets their needs. Obviously, it is easier, cheaper and better for providers to change a product, or at least correct some of its ambiguities during this first step of development cycle, instead of a later-stage modification. As a result, well-documented requirements reduce cost and total effort. Additionally, well articulated requirements that accurately describe system functionality make cost estimations more accurate. The non-functional requirements consist of the performance and the reliability of the system. Every component of the system which can be tested should therefore be included in the requirements. Finally, devoting enough time and effort to the first stage of requirement documentation will result in the creation of a useful network of personal contacts and sound working relationships for the duration of the project..

In considering the approach it should be stressed that there is not a pre-defined successful structure and type of documentation. Significant time and effort must be invested to develop high quality requirements documentation, essential for the development of the product.

As stated above, the requirements document is a communication and reporting tool, so it should be understandable by every project participant and user participating in the user requirement collection process, And should reflect the needs of the different user groups, customers and stakeholders.

It is essential that, whilst special technical terms will be included in a glossary (to be prepared by the project participants in agreement with the UAB), the meaning of each requirement should be presented in a clear language for everyone. For instance the functional requirements should be definitely understandable by the customers. The functionality of the system is also important for the users and that is why the low level use case model including use case diagrams is likely to be used.

Finally, the requirements document must include all those factors that restrict the product development such as hardware and software availability, compatibility with operating systems and interaction with other systems.

The plan-driven or methodology based approach is to spend a lot of time up front defining the requirements, which are being sought from the public safety communication users in the CHORIST project, in order to reduce the cost of the implementation. The theory is that planning and interviewing is cheap, and programming and implementation is expensive [1].

Requirements collection is too often seen as a "stenographer's task", one where the requirements engineer passively listens and records while the users state their needs. However, this approach relies on stakeholders knowing what they need, and what they want. Experience suggests that except for rare visionaries, people do not know what they want until they see it. Many of the useful products that are taken for granted today did not come about from the stakeholders' imagination, but from an invention. The mobile phone, text messaging, the World Wide Web and many, many others are inventions. So in describing how to use creative techniques to get user requirements that result in more useful, usable and competitive products. a guide for invention is effectively created. The next stage is to demonstrate to users how this process can assist in articulating innovative requirements for a useful and familiar system. [2].

5.2 MAIN GROUPS OF REQUIREMENTS

The requirements can be divided into user requirements and system requirements as depicted in Figure 6.

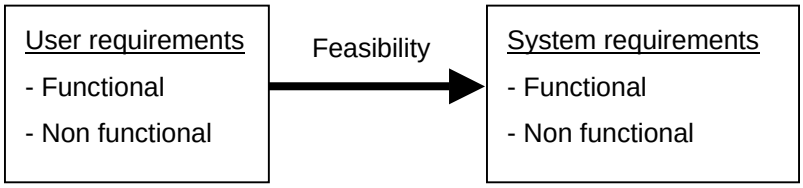

Figure 6: Categorization of the requirements

This report focuses on the non-functional requirements, that can be divided to external interface requirements, physical requirements, system quality factors, environmental requirements, transportability, flexibility and expansion, portability, design and construction, documentation, integrated logistic support, personnel training etc.

The system is only seen by the users through the human machine interface (HMI). Some functional requirements can therefore emerge at later stage in the project as a result of the conception phase(s). The conception phase can therefore trigger evaluations in the requirement specification documents.

5.3 METHODOLOGY

Since user requirements provide the basis for system specifications they have to be developed using systematic and repeatable techniques and methodologies. The requirement definition process includes a requirement elicitation and analysis, representation and validation phases. All these steps are described in Figure 7 and in the following subchapters.

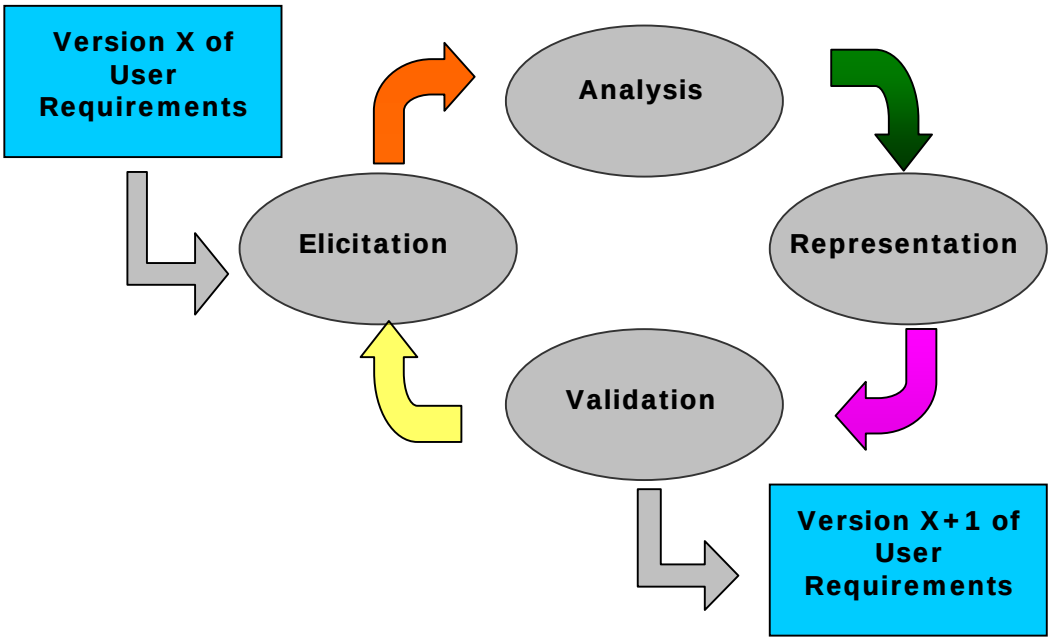

Figure 7: Steps for requirements definition process

5.3.1 Elicitation

The various user groups of users involved in public safety are often unfamiliar with recent technological breakthroughs and they may prove unwilling to start using any new communication system perceived as being imposed on them. For this purpose the first step in the user requirement development process is to elicit the needs of different user groups. As soon as the prospective emergency users are identified (e.g. fire fighters, police officers, paramedic units, etc) the interaction between them and user requirements engineers must begin. Based on the time constraints of the project an appropriate method of intercommunication is selected. For elicitation purposes traditional methods (e.g interviews and questionnaires), group methods (e.g. workshops) or prototyping (e.g. paper prototypes or drawings of use cases and scenarios) can be applied. Summing up, the engineers should encourage the users to express their needs.

5.3.2 Analysis

As the next step, the user requirements engineers must analyse the informal user needs to create formal requirements and split the possibly high level user needs into more detailed user requirements. This step will also include evaluation of the user requirements, feasibility studies and prioritisation of the user needs. The evaluation of the most essential properties of the system must be done from the user point of view. For instance, it is considered that voice communication is the most important service that the public safety system must support.

5.3.3 Representation

After the analysis and prioritisation of the user needs, the resulting user requirements must be documented. The user requirements documentation must be numbered (well-structured using identifiers), understandable (clear and simple language), correct (correspond to a user need) and unambiguous (having only one possible interpretation). Besides the narrative text the requirement document can also include scenarios for public safety situation (giving an example is always useful), use cases and power point diagrams or images (to facilitate communication to users and improve understanding). It is important that the chosen emergency scenarios reflect the usability and importance of the system under development. To facilitate the next step in the requirements development process it is useful to develop draft reports of the user requirements. It is not necessary to make draft reports of all the requirements at this stage of the process.

5.3.4 Validation

The user requirement drafts must be documented in a way that can be reviewed easily. At this stage many requirements may be changed, removed or added to meet constraints around functionality, time and cost.. For this purpose some informal meetings between user requirements engineers, system engineers and system developers (multidisciplinary teams) must be arranged. The accepted requirements are passed to users for elicitation and the process is repeated. Several iterations might be demanded.

5.4 TECHNIQUES TO GET USER REQUIREMENTS

5.4.1 Interviewing

The first stage in any system development is, of course, to find out about the target users and what they want from the system. This could involve talking to prospective users (fire fighters, policemen etc.) direct and referring to organisations (including ministries). The requirements team should meet with the user organisations until convinced that they have elicited all relevant information from the future users of the targeted product.

To assist the process structured and unstructured interviews may be utilised.. In a structured interview, specific and preliminary planned questions are asked, frequently closed-ended. During the interviews closed-

ended question requires a specific answer. Examples may include, “Why is the current device that you are using unsatisfactory?” or “What are the main communication problems during the operations?”

In an unstructured interview the interviewer may start with one or two well prepared questions, but the discussion is flexible. As the focus will remain on the expert field of the interviewed person, it is likely the interview will provide more information in this way.

However, conducting the interview is not always easy and the interviewer must be fully familiar with the application domain.

Challenges:

The main challenge with asking potential users what they want is trying to get a reliable response:

As an example, if you ask people what they want in a system, they might not appreciate the possibilities. For this it can prove useful to provide mock-ups or prototypes to demonstrate likely functionality and improve understanding.

It should also be acknowledged that even when stakeholders state what they would like the proposed system to do, they are often resistant to change and hence reluctant to use the product once it is released.

5.4.2 Questionnaires

One way to gain knowledge is to distribute questionnaires targeted public safety communication users.

This technique is useful when many individuals need to be consulted, when careful thought-out written answers from users may be more accurate than the verbal response from a more limited number of personal interviews.

Challenges:

The work involved in a questionnaire in an early prototyping phase, even without the development of much live content, is likely to be very intensive - and therefore demanding and costly. Many of the targeted users will not respond to questionnaires, demanding follow-up activity which can be disproportionate to the task.

5.4.3 Direct observation of users

During this process the members of the requirements team write down the actions of the users while they are performing their duties, either through personal or video observation. One weakness of this technique is that it can take a long time to analyse the recorded material.

Challenges

This technique has been known to be problematic as employees may view any form of observation as an unwarranted invasion of privacy. As observation is performed at specific locations it may overlook user interaction with related and/or supporting systems that may occur at other sites. Because of this, observation alone cannot be considered a comprehensive means of determining user need.

5.4.4 Written specifications

These are supposed to describe exactly what the system must and should do. They are drafted by the participants of the project, and then reviewed by the UAB. The potential inputs that have to be used to collect these requirements are:

- some of the existing documents already provided by standardisation bodies (see EMTEL documents [6], [7] and [8]),

- some national or regional initiatives providing information on the Web about risk management (see www.ukresilience.info, www.fcc.gov/cgb/emergency …)

- the requirements collected at the beginning of other projects; However, the scope of these projects is most of the time not exactly the same as the one of CHORIST, and so, these requirements apply to other systems and are not usable.

Challenges:

Designed to ensure that the client and the developer knows what to expect and that neither side changes the requirement halfway through the contract, a written specification for user interfaces and screen designs can cause all sorts of misunderstandings and problems.

More fundamentally, though, formal system specifications were traditionally produced in conjunction with the end-users. Probably possible (although difficult) with internal systems, where future users can define their work processes, it would be nearly impossible to produce such a specification in conjunction with public users. Whilst forming a focus group may assist with the process, there is a risk that the continued involvement of the same people for too long would reduce objectivity. Should this path be followed it would be appropriate to ensure a mechanism for external validation was built in.

5.4.5 Scenarios

A scenario is a way of describing how a system is used in a particular situation, i.e. when a user carries out a specific task or set of tasks. It might be used to demonstrate a system or to see whether testers can carry out one particular course of action. Scenarios can be presented in text format.

Challenges:

The linear, fixed nature of a scenario might limit the value of the user requirement studies. The limited nature of a scenario means that an interviewer generally needs to be on hand to help

5.4.6 Brainstorming sessions

The use of brainstorming techniques involving users, developers, or a combination of the two, can prove useful at an early stage of requirements identification when scope and options are not constrained.

Challenges

A significant amount of preparation is necessary prior to any brainstorming session. Skilled facilitators are required to ensure continuity and maintain focus, and it is desirable in advance to prepare ‘straw man’ flow diagrams and navigation schemes in order to show how the system would work from the user point of view.

5.4.7 Workshops

The key issues in considering a workshop approach are to select the right people to be invited and to ensure participation. One method is to provide them with information on the project including any scenarios that are being considered.

Challenges

It is imperative that workshops are planned properly, to ensure that when they take place they remain fully focused and that maximum value is obtained from the participants in the time allocated.

Preparatory steps are all-important, with an investment in time from the requirements team vital to ensure clear understanding of the aims and objectives and provide clarity around outputs and next steps.

5.5 CONCLUSION

The above processes are not, of course, the only way to get the user requirements. Other techniques including discussion forums, news letters, and interactive websites have been acknowledged, but are not included within this document. In practise none of the above mentioned methods is sufficient when taken alone. Some methods are well applicable for HMI, others for functions, other for performance. The need therefore is to make a choice, taking into consideration the following factors:

- Scenarios will determine the concept of the operation of the system and give orientations to its mode of utilisation.
- Functional requirements are difficult to express. As such help by real users is required.
- Performance issues are more easily expressed by users, and can be obtained through a range of techniques (such as questionnaire, interviews, workshops, discussion forums etc.)
- New HMI design can be highly enhanced by the use of rapid prototyping techniques
- The main problem in every project is to obtain from all the users a formal validation of the requirement documents. Hence the need to have then in the loop for each project phase and explain clearly what is being done.

Focus should be placed on involving a high number of users in capturing detailed user requirements specific for CHORIST project in a manner that is both timely and efficient. Too early and the target audience may not understand what you can offer them, and what are the user requirements we would like to get form them. Too late and it can prove costly in terms of finance and wasted effort.

After consideration of each of the options, and in conclusion, it is proposed to adopt three main ways to perform user requirement analysis studies in the CHORIST project.

1. Brainstorming – in which the users express their requirements in an unstructured way, and acknowledging that sometimes requirements will be inevitably confused with solutions..
2. Observation, interviewing and questionnaires – through which the users are asked specific questions in order to complement requirements collected in existing standards, other projects, people's own experience, acknowledging that this requires that information is collected, analysed and synthesised before the users are asked questions.
3. Users are oriented by structured draft documents and react on these documents (which is easier for users but can limit the reflection of users)

The first method needs highly skilled facilitators who know where they want to go and have already a good user perspective and simultaneously knowledge of the system.

The third method needs a lot of preparatory work and it may waste a lot of contributions when documents are not at all agreed. But it limits the involvement of the users.

However, following recent works with the UAB, the second method seems to be more appropriate to CHORIST at the time the document is released (early 2007): This requires more work to the Consortium than originally planned in the beginning of the project (mid 2006).