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Multicultural and language aspects of
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Contents

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Foreword

This ETSI Guide (EG) has been produced by ETSI Technical Committee Human Factors (HF).

Intended readers of the present document are:

- standards developers;

- hardware manufacturers;

- software developers;

- content providers (including government/public organizations);

- globalization, internationalization, localization and translation (GILT) companies;

- service providers;

- voice technology companies;

- web technology companies;

- policy makers;

- regulators.

Introduction

"Despite popular beliefs to the contrary, the single greatest barrier to business success is the one erected by culture. ", in the words of the world famous experts on intercultural communication, Edward T. Hall and Mildred Reed Hall [D].

With enlargement of the European Union, citizens will come from an ever-increasing range of countries each of which may have a range of different cultures and languages. They will also encounter many more languages and cultures as the context of both business and leisure become increasingly global. The number of tourists and immigrant workers who use non-European languages will also increase within those countries. Therefore, the range of cultures and languages that must be supported in European communication and information services will need to grow significantly. There is a need to consider a wide range of interactions including:

- people communicating with other people;

- businesses dealing with customers or organizations in other countries;

- access to automated services.

Even when language and cultural factors are considered, it will probably never be practical to present services in variants suitable for every language and cultural variation within Europe. The present document proposes various means to ensure that the most appropriate version of a service interaction is delivered to each service user.

One of the key eEurope 2005 objectives [3] is "to give everyone the opportunity to participate in the global information society". By seeking to remove or reduce the cultural barriers that can exclude people from such participation, the issues discussed and the recommendations made in the present document will strongly support the achievement of this goal. In addition, citizens whose cultural backgrounds are not one of the major European cultures or citizens who have various disabilities could easily be excluded from accessing eGovernment, eLearning, eHealth and eBusiness services. Recommendations are also provided to address this issue.

The eEurope 2005 Action Plan [3] aimed to encourage the conditions where broadband enabled communication would bring social as well as economic benefits. It was also hoped that e-inclusion, cohesion and cultural diversity would be supported. Such a goal will only be realized if communication and information services present content to users of those services in a form that they are able to clearly understand. This not only includes presenting information in a language that the user can understand but it also necessitates that the culture of the user is taken into account together with any other special requirements.

Culturally appropriate interaction with emergency services, voice menus and network announcements will also be critical factors in ensuring that everyone can use communications services in efficient, effective and safe ways. Indeed, failing to do so could have severe, possibly fatal, consequences in emergency situations.

The present document proposes ways in which everyone can be offered a cultural variant of a service best matched to their preferences and abilities, even when their preferred cultural variant is unsupported. Achieving this will require a means to determine a person's range of cultural preferences and abilities, a standard way to store them, and a means for services to access them so that the most culturally compatible service variant can be provided to the user.

1 Scope

People communicating and accessing commercial, eGovernment, eLearning, eHealth and eBusiness and emergency services should be provided with an interaction that is compatible with their own culture. Services should ideally be able to support the context dependent cultural and language preferences of a wide range of users, such as:

- people communicating with people or accessing services in other countries;

- a person visiting or residing in a country where the language is not their native language;

- an individual who only speaks a minority language of a country;

- someone who only has a limited vocabulary in their own language;

- someone who lipreads;

- a user of sign language;

- a person using the Blissymbols system;

- businesses dealing with customers or organizations in other countries.

The present document gives examples of the language selection options available in existing products and services. It also describes some of the difficulties and barriers encountered by people attempting to communicate and access information when they are in environments where the cultures and languages are different to their own.

To enable all of the above cases to be supported, the present document gives guidance on:

- ways in which people can define their language skills;

- methods to acquire information about a person's cultural preferences and language skills for storage in a user profile or on a smart card (with minimum effort required by the user);

- methods by which the cultural preference and language proficiency information in a person's user profile (e.g. stored on a smart card) can be accessed to enable the service provider to deliver the service in a form most suited to the user's stated preferences and abilities;

- the feasibility of, and issues related to, the production and delivery of content and the handling of user input taking account of a range of cultures and languages;

- matching of available service variants to specified user preferences and the resolution of conflicts between these;

- existing standards and guidelines that should be adopted and any additions or modifications that could be made to them;

- the need for the development of new standards and guidelines;

- the handling of country-specific legal requirements which might be incorporated into business communication and information provision services.

In practice it will not be feasible to offer services in variants suitable for every cultural variation in all of these scenarios, so the present document proposes ways to ensure that the most appropriate version of a service is always delivered to each user.

Much of the document focuses on language issues rather than the wide range of cultural factors that may need to be taken into account. The primary reason for this is that the cultural factors that may need to be taken into account are less well researched and documented and hence more difficult to provide solutions for. However, the approach taken and many of the recommendations made in the present document will enable support for both language and cultural diversity to be supported where they are well understood.

The present document is focused on European countries and would be applicable to many other developed nations. It also introduces the approach necessary to ensure that products and services are introduced in developing countries in ways that respect the very different social and cultural factors that may be encountered.

Suggestions for new work that will enhance progress towards meeting the objectives of the present document are highlighted in clause 9 and the strategic benefits that may arise from applying the recommendations contained in the present document and carrying out the future proposed work are summarized in clause 10.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

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

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3 Definitions and abbreviations

3.1 Definitions

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

active profile, active user profile: set of all active profile components related to a user

announcement (also referred to as voice announcement): audible indication in the form of speech, utilized for information, instructions and guidance in the telephone service

BLISS: symbolic language used by people with language related disabilities

contact book: entity that contains a number of records describing potential contacts of the user

culture: set of distinctive spiritual, material, intellectual and emotional features of society or a social group, and that it encompasses, in addition to art and literature, lifestyles, ways of living together, value systems, traditions and beliefs

NOTE: UNESCO definition from the 2002 "Universal Declaration on Cultural Diversity".

globalization: integration all of the internal and external business functions with marketing, sales, and customer support in the world market

NOTE: Part of definition from LISA.

internationalization: process of generalizing a product so that it can handle multiple languages and cultural conventions without the need for redesign

NOTE: Part of definition from LISA.

language capabilities: language-related capabilities that a device or service is able to offer to a user

language skills: user's proficiency with one or more languages

localization: taking a product and making it linguistically and culturally appropriate to the target locale (country/region and language) where it will be used and sold

NOTE: Definition from LISA.

modality: path of communication between a human and a computer

EXAMPLE: Vision or touch.

natural language: language used by humans to communicate with each other (as opposed to computing or coding languages)

profile: total set of user related rules and settings which affects the way in which a user experiences terminals, devices and services

profile storage agent: entity that stores information about the profile data and the locations of data repositories of profile data related to users

profile tool: tool that enables a user to view and modify information in profiles

profile provider: entity (e.g. company such as a service provider, organization such as a special interest or affinity organization) that provide profiles and associated services

rule: statement that can be interpreted by the profile agent to produce or limit an action

smartcard, Smart Card: card that has a microprocessor and storage capability embedded in it

speech recognition: ability of a system to recognize and respond to voice input

speech synthesis: computer-generated simulation of human speech

text-to-speech: speech synthesis application used to create a spoken version of the text

user: person or business using ICT services

user profile: see **profile**

3.2 Abbreviations

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

ASR	Automatic Speech Recognition
ATM	Automated Teller Machine / Automatic Teller Machine
CLI	Calling Line Identity
CLDR	Common Locale Data Repository
CRM	Customer Relationship Management
DCMI	Dublin Core Metadata Initiative
DITA	Darwin Information Typing Architecture
DTMF	Dual Tone Multi-Frequency (Signalling)
DXLT	Default XLT Format
GILT	Globalization, Internationalization, Localization, Translation
GUP	3GPP Generic User Profile
HLR	Home Location Register
HTML	HyperText Mark-up Language
IVR	Interactive Voice Response
JSML	Java Speech Mark-up Language
ICT	Information and Communications Technologies
LISA	Localization Industry Standards Association
MARTIF	MAchine-Readable Terminology Interchange Format
NLP	Natural Language Processing
OLIF	Open Lexicon Interchange Format
OWL	Ontology Web Language
PIAP	Public Internet Access Point
SALT	Speech Application Language Tags
SIM	Subscriber Identity Module
SME	Small and Medium-Sized Enterprise
SMS	Short Message Service
SSML	Speech Synthesis Mark-up Language
STML	Spoken Text Mark-up Language
TBX	TermBase eXchange
TMX	Translation Memory eXchange
TTS	Text-To-Speech
UCI	Universal Communications Identifier
UPM	User Profile Management
UTF	Universal Character Set Transformation Format
VoiceXML	Voice Extensible Mark-up Language
XLIFF	XML Localization Interchange File Format
XLT	XML Representation of Lexicons and Terminologies
XML	eXtensible Markup Language

4   Language and cultural variation

4.1   Diversity of languages and cultures

The wide range of languages spoken by citizens and visitors to the European Union and their cultural diversity need to be taken into account, at the earliest opportunity, in the development of European information and communication services. This will apply to:

- person to person communication;

- businesses dealing with customers or organizations in other countries (including how country-specific legal requirements might be incorporated into business communication and information provision services);

- Public Internet Access Points (PIAPs);

- public information, learning, health and emergency services;

- multimedia broadband services.

The eContent programme [5] stressed the need to provide multicultural variants of services, but it is doubtful that services will be created in a form compatible with every possible language and culture. This limitation causes a serious danger that many people will be excluded from effective use of these vital services. Even when information in different languages and different modalities is available, determining what content to present to each individual user will be a challenge that will have to be addressed if public service information services in Europe are genuinely going to bring benefits and not create barriers.

As well as bringing direct benefits to service users, identifying ways to ensure the delivery of appropriate content to all users will also open up large opportunities for businesses in Europe. These opportunities will be in the provision of information and communication services and the various different language and media variants of the content that lie behind these services. The eContent Programme has an objective of "Promoting cultural diversity and multilingualism" and "increasing the export opportunities of European content firms, and in particular SMEs, through cultural and linguistic customization" [5]. One of the premises of the present document is that it is very difficult to achieve this objective in the case of truly pan-European services, or even for services in multi-lingual/multi-cultural societies without a means to ensure that users are delivered a service that meets their own cultural needs with minimal (or no) user effort. Although the present document is focused on European countries, the guidelines would also be applicable to many other developed nations. However, the guidelines cannot be assumed to be applicable to developing nations. Instead it will be important to study the needs of people who are lacking even the most basic computer skills and who are living in a culture where their life experiences may differ significantly from those encountered in Europe, see clause 7.8.

4.2   Internationalization and localization

With the European Union incorporating new countries, business opportunities will increase considerably. In this environment, one important element that must be dealt with is cultural diversity.

Businesses face the need to provide their content in cultural and language variants suitable for their international users" preferences. For many companies, a multilingual Europe means fragmented and rather small markets. Localization is always a cost item that has to be taken into account at the beginning of the planning process. Testing is another big cost issue, as quality assurance tests have to be performed in all the supported languages. However, thorough testing of content in the original language prior to localization can significantly reduce localization costs.

In pan-European companies, multilingualism is embedded in their day-to-day processes. These companies take advantage of their multicultural teams and their presence in multiple countries, using branches or vendors, to deal with multilingual issues. They do not perceive multilingualism as a problem. However, it is fair to say that even in a multilingual organization; documents cannot be immediately available in all working languages. The time factor should also be included in the analysis.

Most companies see providing multicultural services as an opportunity because they will be closer to the customer if they are able to communicate in their language. This is the start of building a good relationship with the customer.

SMEs make up 99,8 % of the European Companies, which amounts to 80,8 million employees in the European workforce. Therefore, clear localization and internationalization guidelines should be made available to SMEs in order to enable them to satisfy customers with varying national languages and diverse cultural traditions. Also, the large multinational companies who are already undertaking globalization processes can also enhance them by adopting guidelines provided in the present document. This would then lead to noticeable improvements in work efficiency and communication with their customers.

At present there is a wide variation in the way that products and services are localized to the needs of their users. The approaches vary from products and services that are designed exclusively for one country and language to those where suitability for a wide range of countries and languages was considered in the earliest stages of design (internationalization) and where the product has been adapted to a wide range of countries and languages (localization).

In between, there are many examples of where attempts have been made to address users from different cultural and linguistic backgrounds. Some of these approaches are very simple and others attempt to use a number of different techniques to predict and satisfy the needs of their users.

4.2.1 Translation memory

Translation memories are databases associated with a certain product, type of text, etc and are used in translation tools designed to aid human translators. They contain frequently used words, expressions, or even entire sentences together with their associated target language(s) variants. The translation memory simplifies translation, by offering a list of matches in the target language, each with their degree of similarity to the source text. There are two distinct possible matches, an exact match (100 % match) or a fuzzy match (less than 100 % match). The human translator still has the job of selecting the correct word when the translation memory has made a fuzzy match.

Translation memory systems can be used in combination with machine translation, as this can provide the fuzzy matches to the translation tool, thus allowing the translator to easily accept, modify or reject the proposed text. This enables the translator to take advantage of machine translation without having to change the whole translation process.

Although not widely practised, using translation memories can also improve the performance of machine translation intended for the end-user, thus providing a better overall user experience.

Translation memory is a powerful technology that can help to lower the cost of localization. In order to allow better interoperability between different tools, LISA has created the Translation Memory eXchange format (TMX) [35], see clause 4.9.1.2.

4.3 Current ways of providing cultural and language variants

For web based applications, web browsers and the underlying protocol allow users to define a set of preferred languages that the target application should honour if possible. In practice, this is not frequently used as there is little support for users to specify these preferences and few services will try to read and respond to them.

Various efforts have been made to find information that can be used to predict what language and cultural variant of a service/application the user may want. IP address detection is often used to provide the country variant of a website. A prominent internet search engine site automatically determines the origin country based on the IP address and loads the page in the local language. Although this method works for many residents of a country, it does not suit business people or tourists travelling with portable PCs. Is it really useful to have the page loaded in another language each time a border of a country is crossed? Also, even determining which country an IP addresses belongs to is dangerous as there are limited cases where IP addresses originally assigned to one country have been reassigned to another completely different country - including countries on a different continent.

Detecting the language based on the operating system's language is another frequently used solution. It is particularly used when installing new applications or services. Nevertheless, before the solution is automatically installed it is very important to take into account that users do not necessarily want to use an application or a service in the language of their operating system. For example, where the operating system or application is installed by a company, visitors or non-national employees may wish to have applications and services in their own different language.

4.4   Text to speech

4.4.1   Text to speech (TTS) engines

Text to speech (TTS) is the technique of rendering textual input as vocal output. Culture and language related factors play an influential role in the performance of a TTS engine. For example, regional accents could play an influential role, as a voice with a strong regional accent could be more difficult to understand by a user. Moreover, accuracy in writing (i.e. correct spelling) or the use of foreign words in sentences can cause an incorrect or unclear vocal rendering.

"Multilingual" TTS engines are characterized by the use of common algorithms for multiple languages [K]. Thus, a collection of language-specific synthesizers does not qualify as a multilingual system. Nevertheless, a truly multilingual system is an ideal state, which in practice cannot be achieved for every possible language.

Multilingual TTS engines do exist, but they are few in number and exhibit clear differences in language quality. It is proposed [M] that research should be oriented towards developing common modules for languages, and possibly also towards the inclusion of a translation engine, in order to allow text messages written in one language to be transmitted as vocal output in another language. Enabling Multilingual Transfer (i.e. re-use modules from existing languages) will be important if the engine is required to accommodate several languages. Whenever a TTS system is integrated into an application, it should be able to switch between languages without being forced to switch between separate engines. Significant standardization efforts will be necessary to achieve this goal.

Creating multilingual applications is an important development step as companies have customers worldwide, and due to the Internet, individuals are able to access services from any corner of the world, including sending SMS messages via a browser. Research into the use of multilingual Text-to-Speech (TTS) engines for the transmission of SMS messages identified TTS engines as the ideal solution to convert textual messages into speech. The research made particular reference to the TTS technologies involved in converting SMS messages into vocal output in the same or another language. At present, there appears to be a lack of any extensive study that maps the progress in using TTS technology for SMS transmission. Some companies advertised their success, and deployed early proprietary services, but no standard has yet been published. The concept of multilingual SMS messages converted into speech is an even newer field of research as studies are only just being reported into this topic.

TransSMS [H], a tool developed under the Intercultural Collaboration Experiment 2002, set a milestone in the development of multilingual spoken SMS capable systems. The product enables users to send and receive text messages in different languages. The system has two main features; firstly it can translate a text message from one language to another and send the translated text as SMS, and secondly "read" the translated text to the user. The second feature is considered to be useful for tourists who do not speak the language of the country they are visiting. Another interesting aspect of the system is that it can be accessed via the Web or a Java-enabled phone. TransSMS is currently available in Malay, Japanese, Korean, Chinese and English [H]. The architectural model of TransSMS is shown in figure 1.
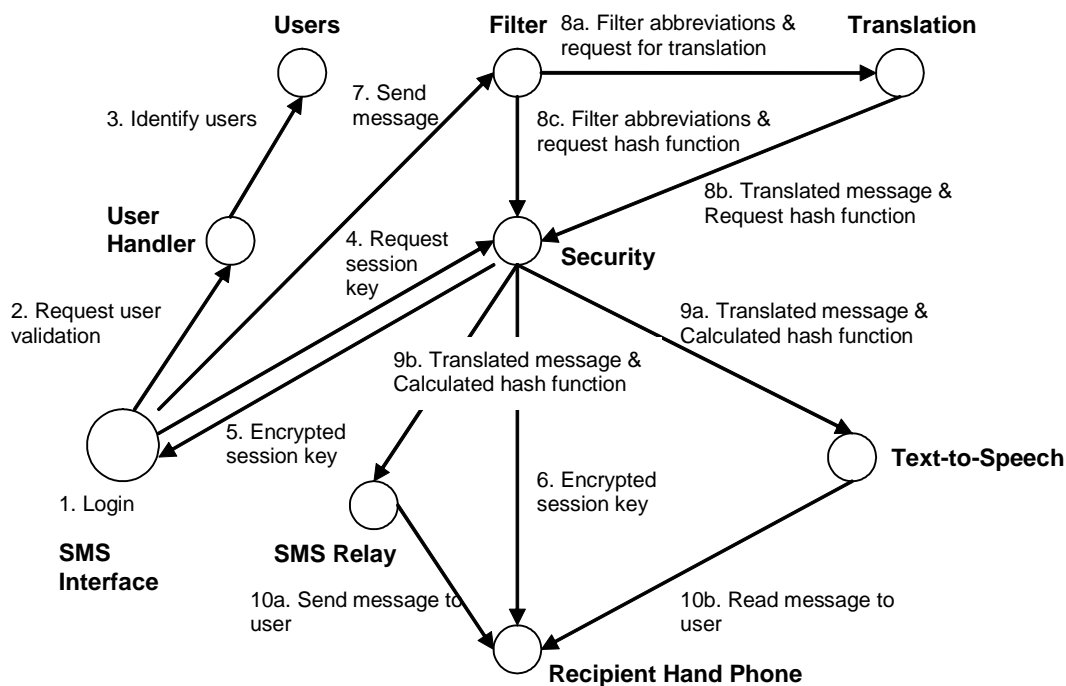
Figure 1: Analysis diagram of TransSMS [H]

As far as multilingualism is concerned, currently available systems can send SMS messages in several languages, due to the multilingual capabilities of the TTS engines, but they are unable to get input text in the user's language, translate it and send the translation as vocal output to the recipient.

There is a large amount of information and guidance available for testing TTS systems in English, and less for other languages [M]. Language-specific TTS tests should be designed specifically for the target language as adapting a test designed for a different language is not always sufficient. For instance, although British English, American English, African English and Australian English are all variants of a common English language, for the purposes of TTS, they may need to be considered as different languages. Canadian French and Parisian French are also examples of language variants that might need to be considered as different languages for the purposes of TTS. Modular design is the best approach so that one can just add an extra module when a new language variant is available.

Until recently, the majority of speech synthesizers only accepted plain text as input. This makes determining the correct pronunciation and prosody of sentences a real problem. as It also greatly impairs the ability to convey emotions. However, the technology to express the information the way the user means to say it is now available and an increasing number of companies make their products compatible with the recognized standards. By using of a series of "tags" different features of sentences, as well as speaker characteristics can be customized. For instance, interrogative sentences can be interpreted easier by the TTS engine if accompanied by the following tags: <quest>How are you? </quest>, similarly the output speech can have attributes such as "<age=child>", "<gender = female>", or "<lang = en>".

4.4.2   Speech Synthesis Mark-up Language (SSML)

SSML is an emerging standard that defines how portions of a text should be spoken by any TTS engine. The Centre for Speech Technology Research from the University of Edinburgh, UK, was the first entity to attempt the development of SSML in 1995 [N].

The goal of SSML is to provide a common framework for TTS elements that include: word pronunciation, abbreviation expansion, pause location and duration, volume and rate control, gender, emphasis, dictionary management, bookmark insertion, audio file blending [44]. Moreover, SSML is a sub-component of the VoiceXML mark-up language providing TTS-specific tags.

4.4.3   Spoken Text Mark-up Language (STML)

STML is a mark-up language for text-to-speech synthesis for voice enabled Web browsers and voice enabled e-mail. STML proposes tags for both text description and speaker directives that control the emphasis, pitch, rate and pronunciation of the text. It is the successor of the SSML and the Bell Labs tags system. Language switching via the STML is possible if the appropriate tags are used.

4.4.4   Java Speech Mark-up Language (JSML)

W3C defined JSML [42] as a text format used by applications to annotate text input to speech synthesizers. JSML elements provide a speech synthesizer with detailed information on how to speak text and thus enable improvements in the quality, naturalness and intelligibility of synthesized speech output.

JSML defines elements that describe the structure of a document, provide pronunciations of words and phrases indicate phrasing, emphasis, pitch and speaking rate, and control other important speech characteristics. JSML is designed to be simple to learn and use, to be portable across different synthesizers and computing platforms, and to be applicable to a wide range of languages.

4.4.5   SABLE

A group of representatives from Edinburgh University, Bell Laboratories, British Telecom, AT&T and Sun Microsystems joined forces to create a single standard for speech synthesis mark-up. STML, JSML and SSML were combined to form SABLE. The language was developed with several goals in mind, namely: to improve the quality and appropriateness of speech output, multilingualism, ease of use, portability and extensibility [L].

Similarly to its predecessors, SABLE supports two types of mark-up: text description and speaker directives.

4.4.6   Voice Extensible Mark-up Language (VoiceXML)

VoiceXML is an XML-based mark-up language for distributed voice applications. VoiceXML is designed for creating audio dialogs that feature synthesized speech, digitized audio, recognition of spoken and dual tone multi-frequency (DTMF) key input, recording of spoken input, telephony, and mixed initiative conversations [45]. Its goal is to provide voice access and to deliver web-content to interactive voice response applications such as telephone, wireless phone, PDA, kiosks, desktop, etc.

4.5   Speech recognition

Speech recognition, also referred to as Automatic Speech Recognition (ASR) or voice recognition, is the ability of a machine or program to receive and interpret dictation, or to understand and carry out spoken commands. It is assumed, in describing speech recognition in this clause, that language identification has already taken place.

At present, the market for information services that exploit automatic speech recognition (ASR) is weak in Europe. This is in contrast with the situation in the USA where these services are widely used and liked. There may be many explanations for this phenomenon, but one may be the expectation that all users of a service launched in the USA will speak American English or American Spanish and hence the potential market for any service that supports one or two languages is the vast majority of US citizen and many visitors to the USA. In Europe such an assumption cannot be made, and, therefore, businesses wishing to create or deploy services using ASR either abandon their plans or launch national services in largely monolingual countries.

At present, launching a pan-European service with ASR would probably necessitate developing the service content and the vocabulary of words to be recognized in the largest possible number of languages. In addition, all users of such services would then be forced to endure a language selection process before accessing the facilities of the service they wished to use. Such expensive and difficult-to-use services might well prove to be uneconomic to develop and run. Europe has a great deal of expertise and experience in cultural and linguistic customization of products to different European and world countries. However, without a way to easily match the correct cultural variant of the service to each user, the market for truly pan-European ASR based services is unlikely to develop.

The present document discusses how new techniques may be able to address some of the limitations of this technology. Recently, considerable progress has been made in the field of multilingual speech recognition. Multicultural elements such as accent or dialect play an influential role in the accuracy of a recognition system.

Studies show that a system has much more difficulties recognizing non-native speech [G], [O] as well as regional accents. The elements that need to be better controlled in speech recognition systems in order to ensure a suitable use in everyday context are inter-speaker and intra-speaker variation and noise. An ideal multilingual speech recognition system should be speaker-independent and support continuous speech regardless whether the speaker is native or non-native in a specific language, and also enable fast language identification. This would allow that in specific situations such as an emergency, regardless of the level of panic or location, a user, with modified voice pitch and speaking a foreign language or having a non-native accent, could also be understood by the suitable authorities.

The present document proposes ways in which speech recognition solutions can be enhanced significantly by the use of Universal Communications Identifier (UCI) (see clause 4.7.1) and user profiles (see clause 6).

The accuracy of speech recognition is highly dependent on the range of possible words that may have to be recognized. Where there are no constraints on the scope of a spoken dialogue, the speech recognition performance requirements will be at their highest. In these circumstances, high recognition accuracy usually requires a speaker dependent recognition solution with a high degree of training.

In contexts where there is a very constrained vocabulary of words that need to be recognized to ensure successful operation of the service "natural language" interaction e.g. a travel booking system where the critical words are destinations and key words like days of the week, times, "to" and "from". For such systems, speaker independent speech recognition solutions can be highly effective (for at least some languages).

A significant cause of potential errors is the use of foreign words in a text that is primarily in one language. These foreign words will cause recognition errors unless an appropriate dictionary that includes these specialist terms is used.

4.6   Language identification

A language identification system can be used to process a text (written or spoken) and determine the language being used. Different systems have different levels of identification ability e.g. certain text to speech engines can perform language identification after the first 6 words.

Research on spoken language identification methods has shown that combining Hidden Markov Models, Artificial Neural Networks and improved language models leads to increased accuracy [C]. Some commercial systems are able to identify the language in a 10 second speech chunk with an accuracy of about 80 %.

The effectiveness of language identification systems can be adversely affected by factors such as:

- limitations in speech recognition performance;

- limitations in the number of languages that the system can identify;

- limitations of disambiguation techniques, such as when there are similarities between words across different languages;

- the language skills of the user (both spoken and written);

- the use of words from other languages known or unknown to the system;

- regional accents;

- the use of abbreviations and acronyms (particularly the highly abbreviated language used in SMS messages);

- the emotional or physical state of the user (e.g. if the user is in a panic or has a cold).

The present document proposes ways in which language identification solutions can be enhanced significantly by the use of Universal Communications Identifier (UCI) (see clause 4.7.1) and user profiles (see clause 6).

4.7   Design for flexible handling of users' needs

The flexible handling of language-needs addressed in the present document will require support to be provided in the design of online services, supporting telecommunications networks, communications terminals and smart cards. If these products and services are designed and rolled-out within Europe without flexible language support being addressed, providing it in the future may not be economically viable. In developing these diverse products and services, each of the companies developing them need to share a common understanding of what is required to provide flexible multilingual facilities.

Previous studies carried out by ETSI have delivered guidelines and recommendations on two areas of work which are particularly relevant to the effective delivery of multicultural services - Universal Communications Identifier (UCI) and User Profile Management (UPM).

Recommendations derived from both these areas of ETSI work provide an important input to the present document.

4.7.1   Universal Communications Identifier (UCI)

The outcome of ETSI's Universal Communications Identifier (UCI) work was a proposal for a new identifier which would rationalize the large number of communications identifiers currently faced by users. At the same time it was possible to take into account a comprehensive list of users' communications requirements. The initial study [12] concluded that any universal identifier should incorporate an additional information field where specific user preferences could be declared. Preferred language of communication was identified as one of the user preferences which should be provided.

The UCI additional information field could be used to exchange information with a service or with the communication environment of another person (via their Personal User Agent [12]). This information could relate to many aspects of the user's cultural or linguistic preferences, e.g.:

- the user's preferred language;

- a request for original language content only.

The values of these parameters could also vary according to the specific context of the communication or information session, e.g.:

- indicating different language preferences according to whether the communication is for social or business purposes;

- indicating different language preferences according to whether information being received is in a spoken or written form.

The benefit to be derived from widespread adoption of UCI is that a user's language and cultural preferences will be available in a wide range of communication and information access situations [I], [J]. Also, context dependent rules can be used to process these preferences in sophisticated ways to deliver simple preference to the service or to the other user.

4.7.2   User profiles

The scope of the ETSI user profile management [14] work was to deliver recommendations regarding the rules and settings a user might require to specify their communication preferences and to provide guidelines on how this potentially complex set of data could be managed. Further details on the application of User Profile Management in the context of the present document are contained in clause 6.

4.8 European multicultural and multilingual research

Multicultural and multilingual issues and their significance and influence in various domains have attracted considerable attention and several European funded projects have been undertaking research in the domain. The present document introduces some of these projects with particular accent on their specific field of action. A detailed analysis of all related European projects is out of the scope of the present document.

FUSION [P] is a European multicultural and multilingual research project that consists of fourteen partners from five European countries (Germany, Poland, Greece, Hungary and Bulgaria). It includes Research Institutes, Technology Developers, Innovation Transfer bodies as well as end users. It is led by a core group consisting of SAP AG, CAS Software AG, NTUA-ICCS and SINGULAR AE. The project aims to promote efficient business collaboration and interconnection between enterprises (including SMEs) by developing a framework and innovative technologies for the semantic fusion of heterogeneous service-oriented businesses applications. Such applications may exist either within an enterprise or in several collaborating companies within the enlarged Europe. In the case of the latter, the intercultural and regulatory aspects of the enlarged Europe are considered instrumental in the FUSION solution. FUSION provides the basis for the multicultural and multilingual business interoperability scenario, see clause 8.1.

The ALADDIN project is a collective research initiative of considerable relevance, as European SMEs in the tourism and travel industry are facing serious challenges from large international companies. Incoming tour operators, tourist offices, restaurants, hotels, museums and comparable establishments are typically small or medium enterprises which need to provide different services for the same customer - the tourist - in a cost efficient and attractive way.

Within the scope of the ALADDIN project [Q], tourists and incoming tour operators can be nationals of any European country, interacting with nationals of any other country. Therefore, the user interface of the planned mobile workspace needs to be localized into a number of relevant languages. Moreover, content relevant to tourists needs to be made available either instantly, or with minor delay, in their own language. By including necessary transnational cooperation aspects in the tourism area, and perfecting tourist relationship management through the mobilisation of CRM features and the inclusion of localized content (with the use of LTC Communicator's web based translation service), ALADDIN will lead to a sustainable enhancement of the competitiveness of European SMEs in the tourism sector.

MuLiMob is another European project whose vision and ambition are to use the multilingual diversity of Europe as a mobile market amplifier, with the aim to:

- show the importance of, and potential applications for, multilingualism in the mobile environment;

- consider development methods, technology and business models;

- lower the barriers that currently limit deployment in the mobile marketplace;

- increase interoperability and openness.

MuLiMob uses the context and the needs of the music industry as a basis for its work. Its main objectives are to:

- enhance the awareness of the wireless community concerning multilingual and multicultural mobile services and applications issues;

- stimulate a rapid take up of innovative ideas within the whole mobile value chain, for usable and cost effective multilingual services for mobile users and workers;

- identify the issues and problems that need further research, applications and solutions.

4.9 Existing standards, recommendations and guidelines

4.9.1 Localization standards

A number of standards and guidelines have been developed by and for use within the localization industry. The principle objective of the majority of these standards and guidelines is to improve both the efficiency and the accuracy of the localization process. Reducing costs and improving quality is seen as an essential direction for the industry to take at a time when the demand for localization work is increasing and the costs of errors in the localization can potentially cause serious failures in business processes (e.g. errors in the translation of contracts can have major consequences for the ultimate success of a business venture).

4.9.1.1 Terminology, lexicon and ontology

One way of minimizing potential confusions in information sources is to control the use of the terminology used within these sources. When a single item or concept is described using different words it can be a source of confusion as the reader may fail to recognize that the same item is being referred to or may believe that there are subtle differences between two items where none actually exist. Using a controlled terminology for the domain of interest is also an aid to improving the quality of automatic speech recognition.

The dominant standards for terminology management have been derived from the work of the SALT (Standards-based Access service to multilingual Lexicons and Terminologies) Project. This project took the MARTIF (ISO 12200) standard (oriented towards human translation) and OLIF (http://www.olif.net/) (oriented towards machine translation) and integrated them into their XML representation of Lexicons and Terminologies (XLT) framework and the default XLT format DXLT. The TermBase eXchange (TBX) [34] standard is a realization of the DXLT format offered by the Localization Industry Standards Association and its OSCAR standards body (which formally took over TBX from the SALT Project). Most software packages that include a terminology database support TBX as an interchange mechanism.

OLIF also co-exists with TBX and is sometimes the favoured choice for terminology processing for natural language processing (NLP) systems, such as machine translation.

Terminology management addresses the issue of consistent usage of multilingual domain specific terms within and between sources of information presented to users. Increasingly, there are applications (e.g. intelligent search algorithms) where it is important that computer applications are able to "understand" concepts used in text sources. In these cases, it is necessary to identify the concepts, relationships and categorization behind terminology. Ontologies and ontology management tools address the issues of describing concepts in a form that allows software applications to reason about the content of the information that they handle.

The W3C have published Ontology Web Language (OWL) [43] to provide an ontology language that is applicable to Web content. Although the sphere of use of OWL is Web content, it is potentially broader and OWL is becoming the de-facto standard used to describe ontologies.

The ISO/IEC 13250 standard on "Topic Maps" [R] is widely used in the public sector. It provides a standardized notation for interchangeably representing information about the structure of information resources used to define topics, and the relationships between topics.

4.9.1.2 Translation memory

Clause 4.2.1 describes the many benefits of the use of translation memory. When used within a single organization, or when used in an environment with a common set of tools, the choice of how to store and use translation memory is simply one of choosing a method that works effectively.

A translation memory is usually built as a result of a large number of translations and may take a significant amount of time to become an essential resource for the organization that uses it. Confining the use of a translation memory to a limited sphere of application represents poor usage of the significant investment that has gone into its creation. It also means that translations made in a different organization or using tools that cannot access the translation memory will be inferior as a result of the inability to utilize the translation memory.

A standard, that specifies how a translation memory can be exchanged between incompatible systems, was seen as the most effective way of maximizing the usage of the work that is put into the creation of a translation memory. Standardizing at this level avoided taking the potentially fruitless path of trying to force all the makers of systems that use translation memories to adopt a single standard way of storing and utilizing their memories in the internal operation of their products.

The standard that is now most commonly adopted for the exchange of translation memory is TMX (Translation Memory eXchange) [35]. The stated purpose of the TMX format is:

"…to provide a standard method to describe translation memory data that is being exchanged among tools and/or translation vendors, while introducing little or no loss of critical data during the process."

Once a standard such as TMX is adopted, it becomes feasible for a number of different organizations working in a common context (e.g. in the same market sector or with a very similar group of customers) to reuse a translation memory created by just one of the companies within that context.

4.9.1.3   Localization markup language

In the process of localizing content for a range of different locales, it become very important for translators to have good information on how the content should be treated during the translation process. Two simple examples of the information that a translator will need to produce an effective translation are to know:

- when certain words should not be translated (e.g. product names or universally accepted technical terms);

- the context in which a section of text is being used, as the translation of the text may be different in different contexts.

The XML Localization Interchange File Format (XLIFF) [36] standard from Organization for the Advancement of Structured Information Standards (OASIS) is becoming widely adopted as the preferred method of creating and using localization markup.

- The quoted aim of the OASIS technical committee developing XLIFF is:"… to define, through extensible XML vocabularies, and promote the adoption of, a specification for the interchange of localizable software and document based objects and related metadata".

XLIFF permits tool developers to read an XLIFF document and to present instructions to translators that enable them to perform more effective translations. Also, the original text and translated text within an XLIFF document can be kept together throughout all the stages of a localization process. In the future, it may be possible to further enhance the productivity of the localization process by having a greater degree of direct machine interpretation of the XLIFF document.

A crucial source of locale data, upon which the localization markup decisions will be made, is the Common Locale Data Repository (CLDR) [39].

4.9.1.4   Structured information

The XML based Organization for the Advancement of Structured Information Standards (OASIS) Darwin Information Typing Architecture (DITA) [33] is an architecture for authoring, producing and delivering technical information. The aim of DITA is to:

- take a topic oriented approach;

- make it easier to automate the information production and management process;

- allow more consistent authoring;

- make it easier to retrieve previously authored content;

- allow topics and topic fragments to be assembled in different combinations for many deliverables or output formats;

- optimize for navigation and search;

- be well suited for concurrent authoring and content management.

The controlled production and management environment that DITA supports will be a potentially valuable approach for the creation and management of multilingual content.

DITA is also an architecture for creating new information types and describing new information domains, allowing groups to create very specific, targeted document type definitions using a process called "specialization", while at the same time reusing common output transformations and design rules. It encourages reuse which will be beneficial in reducing the amount of newly created content that has to be repeatedly translated.

4.9.2 Natural language representation

In order to offer the user a product or service that matches the user's language needs, it is necessary to be able to specify the natural languages that the product or service offers. This specification will only be useful if it is described in a standardized way. The parts of the ISO standard for the "representation of names of languages", ISO 639 [25], [26], are the most commonly referenced standards for describing the names of languages. The language codes are based upon the concept of a set of basic languages together with variants based upon the country in which they are used. Therefore French used in France is coded as "fr-FR, and when used in Canada is coded as "fr-CA". Maintenance, including additions and changes, of the list of languages is managed by the ISO 639/Joint Advisory Committee (ISO 639/JAC) (http://www.loc.gov/standards/iso639-2/iso639jac.html).

The naming of countries and the standardized country codes are defined by the three parts of the standard ISO 3166 "Codes for the representation of names of countries and their subdivisions" [29], [30],[31]. Part 1 [29] lists the names of countries and is the most commonly used standard. Part 2 [30] covers the names of regions within the countries and Part 3 [31] covers formerly used country names. The most important document for the majority of the localization of products and services is part 1 of ISO 3166 [29]. However, it may sometimes be desirable to localize down to a specific region of a country. For this reason, it may be necessary to use all three parts of ISO 3166 [29], [30], [31] in the localization of products and services. Updates to this list of country and region names are managed by the ISO 3166 Maintenance agency (ISO 3166/MA) (http://www.iso.org/iso/en/prods-services/iso3166ma/index.html). The combination of a language and the region within which a particular variation of that language is used, is often referred to as a "locale".

In order that internet applications can handle language in an appropriate way, it has been necessary to explore beyond these basic ISO standards and attempt to find ways to describe language preferences that are compatible with internet technologies. The IETF has produced a series of documents that have built upon the ISO standards and specified how internet applications can handle languages. The current best practice document for the handling of languages on the internet is BCP 47 [24].

All of these standards fail to adequately address aspects of language related to factors such as:

- the larger range of distinct languages than that specified in ISO 639 [25], [26];

- regional variations;

- variation of language related to social factors (e.g. education that does or does not include a study of the classical languages such as Latin or Greek);

- dialectical variations of language.

In contrast to the possible limited range of languages adequately defined by current standards, a move towards trying to codify the range of language dialects identified by research studies (up to 70 000) is likely to create an impractically large set of languages for use in every day ICT products and services. Research and debate is continuing about ways in which improved standards for representing the names of languages can be developed.

4.9.3 Sign languages

One common misunderstanding amongst the wider population is that there is a common sign language used by hearing impaired people from all countries. Unfortunately, the world of sign languages is nearly as diverse as that of the natural languages described in clause 4.9.4. Even within Europe there is a very wide range of sign languages.

It is as important to list and document this range of different sign languages as it is to do so for the natural languages. Codes for sign languages and their regional variants have been created using the same approach as used for the natural language used for text and speech communication. The BCP 47 [24] uses the common ISO-639 code "sgn" to indicate a sign language e.g. sgn-US (American sign language).

4.9.4   Description of language and cultural capabilities

As well as the need for a product, application or service to be able to identify the language and cultural requirements of a user, any applications or agents working on behalf of the user need to be able to identify the language and cultural capabilities of the product, application or service. Therefore, there is a need for products, applications and services to be able to label the language and cultural conventions that they support. Such data about a resource is frequently referred to as metadata. An example of metadata to describe an HTML or XML entity is the IETF's standard for "language tags" to be used in HTML and XML documents [24].

This metadata approach is also recognized more generally in work within the DCMI Accessibility Working Group of the Dublin Core Metadata Initiative related to their AccessForAll Framework [7]. Here, the concept is to have metadata associated with both a user (equivalent to user profile data) and with any resource with which a user may need to interact (e.g. a terminal, an application, a service or a web page). The metadata associated with the resource the user is using is described in the DC-AccessForAll Application Profile (DC-A4A) [8].

In " Language Tags and Locale Identifiers for the World Wide Web" [46] the W3C describe "mechanisms for identifying or selecting the language of content or locale preferences used to process information using Web technologies".

Much further research is needed to ensure that a wide range of cultural requirements can be described with appropriate metadata as, at present, this is not possible.

4.9.5   Character sets and character encoding

Many early communication systems and the internet were initially developed to support the representation of characters in variants of the 7-bit ASCII (American Standard Code for Information Interchange) code. ASCII [23] is a character coding based on the English alphabet and it is not well suited to words written in or containing non-English language characters. Systems that are designed only to support variations of ASCII create an automatic barrier to effective use for cultures that do not use the simple English language alphabet. These simple ASCII based codes only support a very restricted character set.

8-bit variants of ASCII enable a greater range of characters to be handled and ISO-8859-1 [27] was adopted as the default character set for the web in 1992. Although these earlier variants allow a wider range of characters to be supported, they still only support the restricted Latin character set Latin-1. They cannot handle all of the requirements of textual or graphical representations of all languages.

To overcome the problems associated with these limited character sets, a Universal Character Set was developed. Unicode UTF-8 [40] and UTF-16 [40] and ISO 10646 [28], have been developed to define transformation forms for the Universal Character Set. The Universal Character Set is capable of being expanded and is therefore essentially unlimited.

In the past, devices had very limited memory, which was also expensive. At this time, there were also few high speed networks. These factors may have made the adoption of the current multi-byte standards such as UTF-8 and UTF-16 impractical. These reasons are no longer valid for the majority of today's information and communication environments. As system capabilities continue to improve, the rationale for adopting UTF-8 or UTF-16 will increase. The status quo is that the ICT industry has widely adopted Unicode standards for handing characters, although rendering of Unicode characters is not so effectively supported in all systems.

Only systems that adopt these new Unicode character coding standards will be equipped to handle the language requirements of future multilingual information and communication services. The ISO committee JTC1/SC2 (Coded Character Sets) and the Unicode Consortium (www.unicode.org) are the authoritative sources to consult to get current information about the latest state of the evolving standards for the encoding of characters.

4.9.6   Sorting order

Users expect to see lists of words and names collated into the order that is normal for their language and culture. These orders, often called sorting orders, can vary significantly in the position in which certain letters are placed. Even when two cultures share exactly the same set of letters, one culture may treat one letter as a variant of another letter, and group it with that letter, and the other culture will treat the same letter as a separate letter and place it as the last letter in the sorting order e.g. Norwegian and Danish treat the "ø" character as a separate letter at the end of the list of letters whereas in most other cultures it is treated as a variant of "o" and grouped with that letter.

It is very important to ensure that users receive the sorting order that they expect. As data from a common source may be presented to users with a range of different sorting order expectations, it is important to provide mechanisms to present lists produced from these data sources in different sorting orders to ensure that users get the sorting order they expect. If a person uses a list that has a different sorting order to the order that they expect, then it is quite possible that the user may believe that certain items are missing from the list, whereas they many actually be placed in an unexpected place in the list.

The Unicode Collation Algorithm [38] and its ISO equivalent ISO/IEC 14651 [S] define a generic mechanism for describing collations. They both provide a default table for scripts that do not need to be adapted in a given country. In sync with that ENV 13710 [T], the European Ordering Rules, define a default European ordering for multilingual texts that can be used in Europe as a starting point for national definitions.

The Common Locale Data Repository (CLDR) [39] contains a lot of information on ordering rules in various cultures. The sorting order of the characters associated with the keys of a 12-key telephone keypad have been defined [17] for the languages of the European Union (EU) member states as of 2004, some enlargement candidate countries and, additionally, the official languages of the EFTA countries and Russian.

4.9.7   Keyboard layouts

There is a wide range of layouts of alphanumeric keyboard layouts for use with personal computers or computer terminals. Most of these adopt a physical layout that places the majority of the alphanumeric keys in standard positions with relation to each other, with some of the other keys (e.g. the "insert" and "delete" keys) placed in a range of alternative positions in relation to the alphanumeric keys. There is also a range of alternative designs that place these keys in very different configurations that are designed to enhance typing speeds or to reduce the risks of injuries such as repetitive strain injury.

The assignment of letters to the keys on the more conventional computer keyboards varies according to the languages and alphabet(s) that the keyboards are designed to support. These different designs can be approximately categorized according to the countries in which they are intended to be used.

In some cases (e.g. for Sweden and Germany) there are officially endorsed national keyboard layout definitions. In other cases, these layouts are established by mutual acceptance. A source of information on keyboards that has wide industry acceptance is the Microsoft Global Development and Computing Portal.

   NOTE: http://www.microsoft.com/globaldev/reference/keyboards.mspx accessed on 23rd August 2006.

Telephone keyboards also have letters and symbols assigned to the 12-key numeric keypad. ETSI has produced an ETSI Standard (ES) [17] that covers these assignments for many languages used in Europe languages. The work on assignment of letters to the numeric keypad will be expanded to cover a further set of languages.

Where the localization of the keyboard does not match either the user's preferences or the settings of the application or service, the user will experience the disturbing situation where some keys do not result in the letters that are written on them. Such situations are difficult to avoid when people use publicly provided terminals.

One option, instead of having multiple keyboards, is to have keyboards where the key labels and functions can be changed. This option could be helpful in the case of a publicly provided terminal that may be used by people of different nationalities. Predefined sets of keyboard layouts could be offered, and in addition, the user could be offered the option to make modifications to the standard key assignments.

4.9.8   Spoken command vocabulary

The fast evolution and broadened use of ICT is leading to the development of new interactive services and devices, offering global access. A technology enabling the most natural user interaction with these services and devices, is speech recognition. In recent years, speech recognition has become commercially viable on off-the-shelf ICT devices and services.

In order to simplify the user's learning procedure and enable reuse of knowledge between different applications and devices, it is highly desirable to use a standardized set of spoken command vocabulary. This should include the most common and generic navigation, command and editing vocabulary for multilingual voice user interfaces, as described in the ETSI Standard on generic spoken command vocabulary for ICT devices and services [16]. Currently, five languages are supported (English, French, German, Italian and Spanish) but the availability of a spoken command vocabulary in a much wider range of languages used in Europe is considered necessary, in order to cover user needs in the enlarged EU.

Uniformity in the basic interactive elements increases the transference of learning between devices and services using spoken commands and improves the overall usability of the entire interactive environment. Such transference becomes even more important in a world of ubiquitous devices and services using speech recognition. The use of the standardized spoken command vocabulary, described in [16], will thus minimize the learning curve and offer familiarity, knowledge transfer and the development of user trust.

The spoken commands listed in [16] are divided into two major categories:

1)   Common commands that are always available in any device or service for the user.

2)   Domain specific commands with a functionality that differs from one context to another.

Services and devices may also have their own specific spoken command vocabulary, in addition to the standardized set of spoken commands.

4.9.9   Mobile telephony product and service design

Mobile telephony products and services are typically designed to be suitable for use in a wide range of countries. In order to avoid having to produce a different device for each country, regional variants of the same product are produced. These can then be configured by, or on behalf of, the user to match their requirements. The implication of this strategy is that the ability to configure language and cultural settings are essential features of most mobile telephony products and also of many services.

Mobile telephones are consumer products that may be used by a wide range of people, including those with limited technical understanding, such as elderly people and young children. For this reason, the facilities provided for the configuration of language and cultural settings should be provided in a simple manner that is easy to learn and to remember.

The dynamics of the mobile telephony market are such that many people change their telephone handset on a regular basis and frequently this involves changing to a handset made by another manufacturer. To ensure that users remain able to operate the language and cultural settings of their mobile handsets, then:

•   similar language and cultural settings should be available in the handsets of all manufacturers;

•   the methods of accessing those settings should be provided in similar ways.

ETSI has produced an ETSI Guide [11] that identifies generic user interface elements that could be provided in similar ways in the mobile handsets originating from different manufacturers. Amongst these generic user interface elements were key elements relating to user configuration of language and cultural settings.

4.9.10   Smart cards

A Smart Card is a plastic card incorporating an integrated circuit. The card stores information that can be securely and accurately read by card readers in various terminals such as mobile phones (SIM cards), ATMs, ticket machines etc. There are smart cards that need to be inserted into a slot. There are also contactless cards that work at a distance of up to 10 cm, which can be more convenient as no insertion operation is required. This is convenient for all people and of particular importance for people who may have difficulties placing a card in a slot such as wheelchair users, those with Parkinson's disease or arthritis, and people with a visual disability.

Smart Cards can be used for personalization of various terminals and devices. The coding of user requirements is specified in the European standard EN 1332-4 [1]. The CEN Workshop Agreement 13987-1 [2] provides examples of accessibility settings.

Smart Cards provide the opportunity to adapt various terminals to users' needs, including disabled, young and elderly and supporting users' language skills and preferences.

Currently, Smart Cards can provide user preferences to terminals and services to:

•   Allow the user more time. This functionality is originally intended for elderly people and those with a cognitive impairment, but it is also useful to be allowed more time when using a language that is different from the user's native language.

- Provide simplified text. This functionality was also originally intended for elderly people and those with a cognitive impairment, but it is also useful to be able to have simplified text when a language is used that is different from the user's native language.

- Provide the user with a simplified user interface with fewer options and thus avoiding unnecessary dialogues.

- Provide information either audibly, for somebody with a visual impairment, or visually, for somebody with a hearing impairment. It may also useful to have an alternative or additional modality when using a language that is different from the user's usual language.

Currently, languages are only coded in two letters on Smart Cards and this does not allow sign language or language variants to be stored as a person's language choice.

4.9.11   User profiles

The problems with many language and cultural issues in ICT systems relate to the inability to accurately communicate a user's needs to a product, application or service. A central part of most solutions to matching products or services to users is the effective exploitation of data in the user's profile. The primary reference will be the ETSI Human Factors work [14], which is described in clause 6.

Other work related to user profiles includes the following:

- **3GPP** - User Profiles have been described by 3GPP Generic User Profile (GUP) [19], [20],[21]. Their scope is to store and handle communication related data, but the GUP concept does not include the users" preferences.

- **OMA** - The Open Mobile Alliance (OMA) (http://www.openmobilealliance.org/) UAProf work [37] is about static device capabilities, whereas DPE (Device Profile Evolution) is about dynamic device capabilities (such as Bluetooth available/not available). The UAProf and DPE capabilities are device specific, not end user specific.

- **W3C** - The World Wide Web Consortium (W3C) Device Independence Working Group (DIWG) is defining a set of specifications about how to adapt and deliver content so that it can be used on a wide range of devices (http://www.w3.org/2001/di/). This is referred to as 'Access to a Unified Web from Any Device in Any Context by Anyone', where it is stated that 'the characteristics that are most relevant for achieving device independence are those that characterize the capabilities of the access mechanism, the capabilities of the network and some of the preferences of the user. In particular, a user may specify adaptation preferences and rendering preferences that affect the user experience they have of the delivered content.' The W3C has specified CC/PP, a data structure and sample vocabulary for profiles which can convey delivery context information.

- **Dublin Core** - The Dublin Core Metadata Initiative (DCMI) is an open forum, active in the development of interoperable online metadata standards that support a broad range of purposes and business models (http://dublincore.org/). DCMI provides simple standards to facilitate the finding, sharing and management of information. The results will be relevant input to ETSI work on user profiles, as DCMI is developing specialized metadata vocabularies for describing resources that enable more intelligent information discovery systems.

- **SIMPLICITY and Simple Mobile Services (SMS)** - The Simplicity project is a European Union program under IST (reference number IST-2004-507558), which ended in December 2005. The Simplicity project (http://www.ist-simplicity.org/) describes the Simplicity Device, which will be a physical plug-in device or a functional entity that will store users" preferences. The user profile concept is of major importance within the Simplicity architecture.

- **ePerSpace** - The idea of the IST project ePerSpace (http://www.ist-eperspace.org/) is to offer services that allow users to access home applications wherever they are, using any type of terminal and with a single way of authentication. One goal is to develop mechanisms to provide personalized information for each family member depending on the context (morning, arrived home, etc) and the user profile concept is therefore important to achieve that goal.

4.9.12   Universal Communications Identifier (UCI)

As explained in clause 4.7.1, use of ETSI's Universal Communications Identifier (UCI) could provide an effective means to convey information about a user's language and cultural requirements to a service or to another person. It would also provide a means to negotiate between users and services to achieve the best match of service capabilities to the user's language and cultural preferences.

A number of ETSI Guides [9], [10], [12], [13], [15] explain UCI and how it provides the framework that could support many of the user profile and negotiation capabilities needed to satisfy the recommendations contained in the present document.

4.10   Current constraints

The provision of communications systems, which reflect the language capabilities, requirements and culture of the user, is a difficult task. Many constraints exist. Differing commercial and legal requirements pertaining to different organizations and nations must be taken into account. Additionally, there are currently many technical and operational limitations (e.g. the present state of speech recognition and the delivery of user profiles). The present document assumes that the rapid strides in relevant technology seen in the last few years will be continued into the future.

4.10.1   Commercial

When any commercial transaction takes place, there may be a range of constraints that apply. This will be equally relevant to a business offering services to customers from a web site, two businesses carrying out business dealings with each other, customers accessing a business site and individuals buying, selling or exchanging goods or information with each other.

>   NOTE: The term "Organization" has been chosen to cover commercial organizations i.e. businesses, and non-commercial organization such as government departments.

> **Constraint 1: Respecting the business culture**
> Organizations or individuals require that their contacts based in other countries take account of the language, national culture and the business culture of every party concerned. In many circumstances the business culture of the organization can place more constraints on the business and individual communication than those created because of national culture and language.

Business culture incorporates all elements related to the working environment of a company, including working hours, internal hierarchy, enterprise working language, and working style. Companies that want to pursue their business in other countries must take into account to what extent cultural factors affect the enterprise culture.

> **Constraint 2: Market constraints related to potential users**
> The decision to provide a service in a particular language will be significantly influenced by the expected number of users using that language and the costs of implementation. This may result in a limitation on the number of languages supported or it may lead to a tiered approach where different languages are supported in different ways dependent on their expected use.

>   EXAMPLE: A layered approach could be implemented for emergency service provision. For the major European languages, operators fluent in those languages are continuously available to take calls. For less common or unidentified languages the service provider uses a third party interpretation specialist company which then acts as a relay for the remainder of the communication.

4.10.2   Legal

Different countries will have different laws regarding the ways of doing business. These laws may have impacts that prevent or put restrictions on transactions across national or regional borders.

> **Constraint 3: Adhering to national legal requirements**
> Relevant national legal requirements, which may vary significantly from country to country may have a significant impact on transactions of both organizations and individuals.

4.10.3   Technological and operational

Technical and operational constraints are currently inhibiting the means of identifying and meeting the language and cultural requirements of users. These constraints can be addressed by technological advances and by the commitment of service providers to supply the operational capability to apply those new technologies.

> **Constraint 4: Inadequate means of determining the cultural/language requirements of a user**
> The language or cultural preferences required by a user are currently determined by a specific request / response from the user, by the system "guessing" the preferences or by the system storing them from a previous user selection. These methods can lead to inappropriate results for the user.

Methods for determining the language and cultural requirements of users are currently restricted by many technological and operational factors such as:

- **language identification performance** - Analysis of speech or text offers a promising way to identify the language being used but the success of these techniques is reduced by factors such as:

  - limitations in speech recognition performance;

  - limitations of disambiguation techniques;

  - use of words in another language;

  - similarities between words across different languages.

  The larger the number of languages under consideration, the more the risk of an erroneous identification.

- **availability of smart card readers** – Smartcards offer a promising way of identifying user preferences at public terminals, provided that the problem of standardisation of cards can be addressed. Currently, public terminals are not usually provided with smartcard readers. As far as SIMs are concerned, even if user profile data was available on the card, most public terminals are currently unable to access or use the data.

- **identification techniques** – Other methods of identifying the user (even as an anonymous entity) require that data is accessible via the network. User identification methods such as biometrics, magnetic strip card or user keyed codes could then be used as identification.

> **Constraint 5: Inadequate means of delivering multicultural/multilingual services**
> Once the requirements of the user have been elicited by the system it must be capable of delivering the service in the specified language and cultural preference. Terminals, services and networks are currently only able to do this in a very limited way.

- **speech recognition performance -** The performance of speech recognition systems is continually improving and untrained systems can now provide satisfactory recognition under some circumstances. However, in the type of situations encountered in emergency services, for example, where the user may be in a state of panic, or where a person is speaking a dialect or has a strong accent, current systems are often inadequate.

- **support for languages** - Operational developments will need to take account of the fact that many systems already in use cannot easily be made multilingual. An example would be the use of a pre-defined field length where the new language required longer fields. Many networks, terminals and systems are incapable of delivering multi language services. An example is telecommunication network announcements which are typically only designed to be available in one language.

- **populating the user profile data on a Smart Card or into a user profile** - The data on current Smart Cards tends to be kept very much under the control of the card provider. Apart from being able to add phonebook data, SIMs are effectively read-only. To be effective there needs to be a move towards allowing users to write and edit user profile data onto a smartcard.

- **display and button/label size limitations for displaying long words** - Many languages (e.g. German and Finnish) contain very long words that are difficult, if not impossible, to abbreviate. This can be very constraining when it comes to associating these words with buttons or labels on terminals and displays.

- **network capabilities** - Most current networks do not offer support for sending additional information related to user profiles. The increasing use of IP networks for communications will enable service providers to offer such capabilities and allow user profile information to be stored, accessed and used in an effective way.

- **privacy and security of information shared with a service** - The storage of user profiles on the network will require trust on behalf of users. Enabling this trust will require appropriate and well defined levels of privacy and security to be in place.

- **multi-byte character sets** - Current software/firmware limitations mean that many multi-byte characters, such as kanji, cannot be used in some circumstances.

- **poor support in software for multi-language text entry -** Many terminals, whilst supporting multilanguage use, do not make this obvious or easy to use. An example is the use of SMS predictive text on most mobiles which will be in the language set by the user when initially configuring the terminal. Changing this to another language can often be slow and difficult to achieve (or even impossible). Some applications do not support the production of messages in more than one language. For instance, producing diacritical marks in some email applications can be unnecessarily complex.

5   Requirements

5.1   Introduction

The process used in this clause is as follows. The starting point is the top level requirement:

Requirement 1: Top level requirement
When communicating with another person or accessing an information service, users wish to do so in a manner compatible with their language and cultural preferences.

This all encompassing requirement can be broken down into supporting requirements which we then used to help identify the functionality which needs to be provided by the various stakeholders involved.

These derived requirements should reflect the needs of a diverse range of users including individuals initiating a communication, individuals receiving a communication and organizations.

In considering what users require when communicating and accessing information in a multicultural environment, there is a need to identify when requirements are could be considered as needs and when they are preferences. In the context of this present document, requirements are classified as needs if they need to be fully satisfied in order for a person to make an effective communication or successfully access and understand information from an information service. An example of a need is the requirement for a web site to present information to a person who only speaks one language in their own language.

In the context of this present document, requirements are classified as preferences if successful communication or information access can be achieved without the requirement being satisfied. Satisfying a preference will improve the effectiveness, pleasantness or comfort of a communication or information access experience. An example of a preference would be to be given the opportunity to choose which language is used for a person to person communication (e.g. via SMS or Instant Messaging) between two people who can both generate and understand text in the same two languages according to the context of the particular conversation (e.g. the subject of the conversation, the place where it occurs). Whether a requirement is considered a need or a preference will vary from person to person. Therefore no distinction is made.

The primary motivation of this clause will be to look at ways in which all of the identified multicultural communication and information access needs can be satisfied and also to look at ways in which the maximum number of preferences can be satisfied in the most cost effective way.

5.2   User requirements

5.2.1   Generic user requirements

Setting up an ICT service can range from a simple to a highly complex task. The more complex the task, the more important it is that the language of the user interface is understood by the user. The very simple task of initiating a telephone conversation can often be performed with no knowledge of the local language at all. But even this simple procedure may sometimes require feedback from the network or terminal (in the event of unavailable numbers for instance). If that feedback is incomprehensible to the user then the likelihood of a successful set-up is decreased.

Requirement 2: Setting up an ICT service
Users initiating an ICT service require that the user interface available to set this up reflects their language and cultural preferences.

The user interface in this case will include physical aspects of the terminal, the GUI used and any voice menus, network announcements or even responses from answering machines which are delivered to that terminal. Ideally, the user will require the user interface to be precisely aligned with their language and cultural preferences (as specified in their user profile). Solutions that meet the user's preferences in a less optimal manner will still be of benefit to the user. For example, text or voice information sent to the user in multiple languages, that includes the user's preferred language(s), will be less effective than a response in a single language, but will still meet the user's fundamental requirements.

Once an ICT service has been initiated, users will require that the speech and/or text associated with that ICT service is easily understood.

Requirement 3: The language of an ICT service
Once an ICT service has been established, users require that the communication process is conducted in their preferred language and culture.

The definition of "preferred language" may be more complex than simply the specification of a single language. In many situations it will be context dependent (see Requirement 5)

The recipient of a communication may be less motivated to deal with any language issues associated with the communication. In this case it is even more important that the communication offered is in a language understood by the receiver.

Requirement 4: The language of a received communication
If the communication is an incoming one, initiated by a service or another individual, the recipient will require that the communication is conducted in their own preferred language and culture.

In some cases, the preferred language of initiators or receivers of communications may not be a simple choice. For example, they may require text based communications in one language and speech in another, or they may use English for business communications and their own language for private ones.

Requirement 5: Variation of preferred language dependent on context
Users require the capability to make the preferred language of an ICT service dependent on the context of that service.

Users should be able to define rule-based requirements defining the required language in a given context.

Factors to be taken into consideration will include:

- country of receiver of communication;

- modality (visual or aural medium);

- location of user when establishing communication;

- identity of person receiving communication irrespective of location;

- whether business or personal.

In many cases the preferred languages of initiator and receiver will be different. Wherever possible, a mechanism should exist to allow the determination of a mutually acceptable means of communication. The acceptable means could involve the specification of language and communication media.

> **Requirement 6: Matching language preferences and capabilities**
> Where the preferred language of the user initiating an ICT service and the default language of the service (or preferred language of the receiver of the communication) are different, users require a language solution that suits the requirements and capabilities of both.

NOTE: A negotiation mechanism will be required to establish a language and communication media acceptable to both parties if possible.

Sometimes no acceptable language/communication media will be possible which would enable a communication to be established. In such cases, other alternatives, such as translation relay services, could be offered automatically.

> **Requirement 7: Action with no common language**
> Where no mutually acceptable language is available to the initiator and receiver of a communication or between a service and a user, a translation or interpretation service should be offered wherever possible.

In many cases the service will offer an appropriate choice of language which the user will find acceptable. However, the user should always have the opportunity of overriding the system's choice and specifying a different language. This follows a universal Human Factors principle relating to "control". It is impossible for any system to predict with 100 % accuracy the requirements of a user. Even if the user has defined a complex and comprehensive set of rules to cover every eventuality, there will always be exceptional cases when the user will wish to override a previously defined rule. A system providing adaptive personalization (see clause 7.7.2) could prompt the user for rule changes if it detected a trend in overrides.

> **Requirement 8: Overriding system language choice**
> The user should always be given the opportunity to override the language provided automatically by a service or terminal.

5.2.2   Emergency services

In a "life or death" situation, such as the handling of emergency service communications, the time taken to extract relevant information is critical. Detecting which language to use and then accessing either an operator who can communicate in that language or an appropriate language translation third party service must be provided in the shortest possible time.

> **Requirement 9: Handling of emergency service communications**
> Users require that calls to emergency services are handled in their own preferred language (language identified, appropriate operator contacted, or interpretation provided; achieved with minimum delay)

Although there are international standards relating to the 112 number, many citizens of many countries remain unaware of it. Many users still use the historical number once used in their own countries. Whilst many countries support 112 and their own historical number, few support other countries' historical numbers. For example the UK support 112 and 999 but a UK tourist inputting 999 whilst in France would not contact the emergency services. Confusion here could result in critical delay.

> **Requirement 10: Contacting the emergency services**
> Users require that their own national method of contacting emergency services is applicable in whatever country they happen to be in.

5.2.3   Repetition of preference information

Users who access many different services and devices, or return to the same service on a regular basis, will find it frustrating to be repeatedly asked for their language or culture preferences.

> **Requirement 11: Avoiding repetition of language and culture preferences**
> The user should not have to continually specify their language or culture preferences each time a communication is initiated.

The difficulty of meeting this requirement will depend on the terminal used and the service provided. For instance, if the user is communicating via a public access terminal or a fixed line used by many different members of a household, then clearly the terminal can make no assumptions of language based on an analysis of previous communications unless the user can be identified in some way.

5.2.4   Consistency

Any automated approach to the application of language or cultural preferences relating to a service or communication should result in outcomes which are consistent with those preferences. Ideally, this requires that the same user profile data is interpreted in the same way by services and that the rules relating to negotiation produce the same outcome taking into account the limitations of the service or media.

Requirement 12: Consistent interpretation of language and culture preferences
Users will expect to find that the application of their language and cultural preferences produce consistent outcomes, across service variants and media.

A typical user might use many different devices and services. If their language and/or cultural preferences were to change for any reason then they would not wish to enter that change on every device or service they use. Ideally they should only have to enter the information once and a synchronization mechanism would ensure that these changes are made to the information held by all other relevant devices and services.

Requirement 13: Consistent application of language and cultural preference changes across devices and services
Users require that if they change a language or cultural preference on any device or on any service, then those changes will be automatically applied to all other devices and services that they use.

5.2.5   Privacy

Data relating to a user's language and cultural preferences may well include sensitive information. In most cases the information will be used by an application, network or service to set up an optimized communication and the user will need reassurance that this information is stored and applied with due regard to privacy and security. There may also be situations when it will be appropriate or necessary to disclose that information to a human third party (e.g. emergency situations).

Requirement 14: Privacy
Users require that their preferences and capabilities related to language and culture should be stored in a secure manner with user agreed levels of privacy applied to the availability and distribution of that data.

5.3   Factors affecting culture and language choices

5.3.1   Country and region

Users are frequently prompted to select a country from a list of options, frequently by means of a flag. This would be appropriate where the user is being asked to identify a location but it may be inappropriate in other contexts e.g. for choice of language. The selection of country can sometimes be a poor indicator of which cultural and language options will be set. For example, Canada has two official languages and several time zones. On the other hand, there are a large number of cultural conventions which could be reliably assumed, e.g. currency and date format. In cases where options, such as language, are ambiguous, the user should be asked to make a specific selection.

The choice might potentially affect several country related elements such as:

- language;

- content;

- currency;

- date format;

- characters to indicate number values (e.g. 1,00 or 1.00 and 7 000, 7,000 or 7.000);

- measurement system;

- time zone;

- legal matters.

Languages are typically associated with a country and some languages are associated with a region. With increasing international mobility, people have culture and language preferences that differ from those associated with their nationality or the country they reside in.

The use of flags and country names as a language selection mechanism can frequently cause confusion or offence e.g. a Brazilian would not expect to choose a Portuguese flag to select their language (Portuguese) and might not even recognize it. To avoid such confusions, it is recommended that flags are never used as a language selection mechanism.

5.3.2   Language and culture

Language related factors which can influence users' preferences could be:

- Text reading direction - for example, Europeans would consider that Japanese start reading a sentence from the end towards the beginning, and vertically, instead of horizontally.

- Length of sentences - the most common example would be that a text in German is often longer that its English counterpart. Thus, for users who are fluent in both languages may find it more practical to set English as their preferred language.

- Sorting order of alphabets - An example of how different sorting order may be confusing is that the letters "å", "ä" and "ö" are sorted after "z" in the Swedish alphabet, but in German is "ä" sorted with "a", and "ö" is sorted with "o".

- Context - business/private.

For the purposes of this guide cultural factors will be defined as the totality of elements reflecting the conceptions and values shared by a society, be they social, scientific or material.

Individual cultural characteristics can influence a person's choices. Some relevant elements to be considered are:

- time:
  - time zones;
  - date format;
- sizes and measurements:
  - metric vs. imperial units;
  - typographic units;
  - temperature;
  - clothing sizes;
- currency;
- name and address format (see note 1);
- HCI components:
  - colour;
  - graphics and icons;
- religion;
- culturally variable concepts (see note 2);

- ethnic group (see note 3).

Even if the same language is spoken in various countries, besides the well-known country and regional variations, there are a series of elements which can differ. For instance, clothing sizes are not equivalent in the USA and the UK, a dress of size 6 in the American system, would be size 8 in the British system.

Requirement 15: Language independent cultural preferences
Cultural preferences should not be affected by language changes. They should remain consistent with the user's settings.

It is extremely important for some users to be able to set each cultural preference on an individual basis, and separately from the language choices. A good example to illustrate this would be if a user has selected the UK English language, and the measurement units from the imperial system, it does not mean that the currency should also be in pounds, as the business context can determine a need to use Euros.

NOTE 1: In Hungarian, a person's name is of the following format: Surname Given name, whereas in French it would be the other way around. This would have to be taken into consideration when synchronizing Address Books, or entering new names.

NOTE 2: Some African tribes have no concept of hierarchy, hence hierarchical menus and indentation to show hierarchy will have no meaning.

NOTE 3: There is a need to avoid racial stereotyping. Even where some ethnic characteristics are fully supported by solid research findings (e.g. Eastern countries show a tendency to look for consensus in a dialogue) it must not be assumed that every individual from an eastern culture will show this behaviour. Even if a product or service tries to support these ethnic characteristics, there is still a need to offer users flexible alternatives and it may only be safe to use these ethnic stereotypes as guidance when setting default parameters.

5.3.3   Accuracy of information

Users' choice of language of a service or specifically in information clearly depends on the users' language skills. However, the quality of the language and cultural issues used in the text may also be an important factor when selecting language and cultural options. Currently, there is no automatic support for providing standardized information about the quality of the language and cultural issues and further work would need to be done in this area, see clause 9.

The accuracy of the information in a certain language is dependent on the quality of the available text and/or speech. In order to provide a different language variant for a written communication the usual solution is to translate from a source language into a target language. Interpretation, on the other hand, can be defined as the conversion of a spoken communication from a source language into a target language.

A communication that is accurate in its source language may be less accurate when converted into another language. There are a series of factors which play an influential role in the accuracy of the information obtained as the result of a translation or interpretation process. Information on the quality of the text, regarding language and cultural issues, that could be relevant to the user and to the negotiation mechanism, includes:

- how well the service follows guidelines and reveals information related to language and cultural issues;

- whether the content being presented is the original language or if it has been translated;

- the quality of the translation, which depend on various factors such as:

    - the type of translation/interpretation (machine vs. human translation/interpretation);

    - the number of sequential translations that have been performed;

    - the language skills of the translator/interpreter (e.g. by a native speaker of the language, a professional translator etc.);

    - the domain knowledge of the translator/interpreter;

    - the availability of support tools.

Translation/interpretation quality will be maximised if the translator/interpreter is a trained professional, specialized in the relevant domain. As such, it is always recommended that such a trained professional should be used wherever possible.

Machine translation, also referred to as automatic translation is largely used for time-saving and cost-saving reasons. Nevertheless, current systems have serious problems with the accuracy of the translation. These tools work with lexicons, thus their accuracy is largely dependent on the size of the lexicon (i.e. the bigger this is, the higher are the chances that the translation engine will find the suitable variant). Machine translation can never be as fully effective as the use of a suitably trained and experienced professional translator/interpreter as the translation system will not have the broad world knowledge necessary to resolve the translation ambiguities that can arise.

Human translation is still the most reliable method, provided that the translator has good translation skills in that language. However, it is time-consuming and much more expensive than machine translation. Its quality is dependent on various translator-related factors; most importantly on the language skills and on the expertise domain. When a text that has already been translated is retranslated into another target language, it can begin to lose its original meaning. Current systems cannot provide an accuracy estimate that could show to what extent a translated version is different from the original version, although it would be extremely useful.

These methods are sometimes combined, using an initial machine translation, to speed up the translation procedure, and then letting a human translator check the machine translation and correct the wrong translations or enhance the less good ones. General language text, and especially humorous text, is typically not well translated by machine translation and requires human translation.

A common user perception is that original versions could be more up-to-date than localized versions. In some cases this can be true, as language variants are not always readily available for new information, or updates. Thus users' choices can be influenced by whether the information is also available in the source language.

Machine interpretation, sometimes referred to as Speech-to-Speech translation is a relatively unknown technology, as its state of development does not permit wide usage.

The accuracy of a human interpretation relies on:

- the quality of the source document;

- the language skills of the speaker and interpreter;

- the source and target languages;

- the synchronization of the speaker and interpreter;

- the experience of the interpreter;

- the emotional state of the speaker and interpreter;

- domain knowledge of the interpreter;

- clarity of the speech.

Relay services (services that use a human intermediary) are a less common type of human interpreting.

Requirement 16: Accuracy of translated information
If a user is presented with information or a communication which has been translated the following information should be available where possible:
- the original language;
- whether machine or human translation;
- an indication of the special competence of the translator (e.g. technical, legal);
- the number of previous translations (preferably this will always be zero).

5.3.4   Specifying and changing user requirements

Users will need a mechanism to enable them to specify their initial user requirements relating to language and culture. Individual users' requirements may vary over time as their cultural and language skills and preferences change.

5.3.4.1   Changing cultural conventions

People moving to another country may take some time to adapt to the cultural conventions of that country. An example of adaptation to cultural conventions is a person moving to another country and wishing to retain a weight and measure system that they are familiar with (e.g. miles/gallon). With time they will become familiar with the new systems and may wish to use those measures when communicating (e.g. litres/100 km.).

5.3.4.2   Changing language skills

A user's language skills may change over a short or long period of time for various reasons. This might lead to different needs and behaviour as far as the user's communications is concerned. Gradual change to users' language skills may occur over a longer period of time. For example:

- medical reasons such as such as various forms of dementia (e.g. Alzheimer) can lead to a cognitive impairment that affects a person's language skills;

- language skills tend to progressively deteriorate over time when that language is not used;

- language skills can be significantly enhanced when that language becomes extensively used. People typically adjust their behaviour when their cultural and language skills enhance, for example when moving abroad and learning the culture and language of that country.

Changes to users' language skills may occur over a very short period of time. For example, cognitive impairments that affect the brain may arise due to medical reasons, such as a stroke or to accidents.

Requirement 17: Ability to specify and change language and cultural preferences
Users require the ability to specify their communication preferences for culture or language and to subsequently change them.

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6   User profiles to support language and cultural preferences

With the increasing possibility of providing users with a range of language and cultural options, there will also be a need for content and service providers to get information about user's language and cultural preferences. A solution that is frequently used is to provide users with a default language and offer alternative options for them to choose from. This concept is described in detail in [14]. To satisfy the necessary requirements related to this concept, the guidelines in [14] need to be adopted.

6.1   Current situation

Frequently, the choice of cultural options must be done manually and each time a service is used. In some cases, for example when using online services from the same terminal, the service may save (on the user's PC) cookies that contain language preferences in order to relieve the user from selecting a language option each time it is used. However, when using the online service from another terminal, the service will again require the user to choose a language option. When using a new device or a new service, users need to select the preferred language if the user's preference is different from the default language of the device or service.

Some services allow the user to personalize the service by defining their cultural and linguistic preferences in a service specific profile. The problem with this solution is that users need to define their preferences many times - once for each service. Each time it may be necessary for the user to find out how to do this. This solution is not convenient if users wish to update their language preferences because they would have to remember each instance of their service specific profile that needs to be updated.

These solutions do not take account of users' different needs in various situations and roles.

6.2 Ideal situation

Instead of frequently having to choose language options, users should be able to define their cultural preferences and capabilities (see clause 7.5.3.2) only once in their user profile [14]. This would enable devices, services and people they wish to communicate with, access to their preferences in order to provide content and services presented in a way that suit their needs. A language preference set in a user profile should be capable of being overridden by the user at any time.

The user profile concept provides the users with a means to define their language and cultural options in a flexible way that meets their requirements in a range of situations and roles. The most flexible solution for defining language preferences is to have the ability to define rules in a user profile, see clause 6.5.

Some existing technologies could be significantly enhanced when combined with the user profile concept. Speech recognition (see clause 4.5) and automatic language identification technologies (see clause 4.6) could be made more accurate and efficient by limiting the recognition to the languages defined in the user profile.

6.3 User profile support for user requirements

The language and cultural user requirements specified in clause 5 would all be supported by the user profile concept described in the ETSI Guide concerning user profile management [14]. The following table lists specific instances of how support would be provided for a subset of these user requirements. Clause 9 defines what needs to be done to ensure that the full benefits of user profile management approach can be achieved.

Language and cultural user requirements	Support provided by user profiles
Requirement 17: Ability to specify and change language and cultural preferences Users require the ability to specify change their previously defined communication preferences for culture or language. and to subsequently change them.	A profile tool is defined in [14], clause 10.4, as the entity that enables the user to create and edit user profiles.
Requirement 11: Avoiding repetition of language and culture preferences The user should not have to continually specify their language or culture preferences each time a communication is initiated.	Language and cultural preferences are typically useful for several devices or services and should, therefore, be centrally available. Ideally, language and cultural preferences should always be available, over all networks, from all supported devices and services, including fixed and mobile services allowing service continuity and the optimal user experience. Rapid access to the profile data when the user is offline or online is likely to dictate that preferences should also be stored in close association with the device or service to which they relate. For example, profile data related to a specific mobile phone such as language preferences associated with business contacts (in the contact book) will be stored in the business mobile phone or on the SIM-card in that phone. A profile storage agent is defined in [14], clause 4.6.2, "Storage agent and components" as the entity that stores the users' language and cultural preferences and the locations of data repositories of profile data related to users.
Requirement 13: Consistent application of language and cultural preference changes across devices and services Users require that if they change a language or cultural preference on any device or on any service, then those changes will be automatically applied to all other devices and services that they use.	This may be achieved by synchronization of data and transaction security. This capability is provided by the storage agent described in [14] clause 10.10, "Data Storage, synchronization and back-up".
Requirement 14: Privacy Users require that their preferences and capabilities related to language and culture should be stored in a secure manner with user agreed levels of privacy applied to the availability and distribution of that data.	The profile storage agent stores the language and cultural preferences in a secure manner with user agreed levels of privacy applied to the availability and distribution of that data, see [14], clause 4.6.2, "Storage agent and components".
Requirement 6: Matching language preferences and capabilities Where the preferred language of the user initiating an ICT service and the default language of the service (or preferred language of the receiver of the communication) are different, users require a language solution that suits the requirements and capabilities of both.	Users may have defined their language and cultural preferences, but it may not always be possible for an exact match to their preference to be achieved. To resolve such situations, negotiation can take place in order to try and achieve a good, but not perfect, match (see [14], clause 7.5 on "Capability and preference negotiation"). Where the relevant capability is supported, negotiation will take place between: • user's preferences - terminal capabilities; • user's preferences - service capabilities; • terminal - service capabilities; • preferences of two or more communicating users; • terminal capabilities of two or more communicating parties; • service capabilities of two or more communicating parties.

6.4 User profile support for system requirements

The service and terminal related requirements map well to the user profile concept described in [14]. This concept assumes that a user manages their own user profile, that they do not need to have to repeatedly specify the same preferences, and that they do not need to be concerned where their user profile data is stored. The following table lists a number of language and cultural requirements from the service and terminal point of view and match them with the user profile concept [14].

Language and cultural related system requirements	Support provided by user profiles
Access to and interpretation of language and cultural preferences Any service/device should be able to access and interpret the language and cultural preferences of users.	The language and cultural preferences need to be centrally stored and accessible. They also need to be expressed in a standardized form (see clause 9 in the present document and [14], clause 4.8, "Need for standardization")
Combining language and cultural preferences with multimodality Some users such as those with disabilities might want to define their preferences as a combination of modality and language and cultural preferences. An example is people with a visual impairment who would typically prefer audible information that matches their language and cultural preferences. Communication between a disabled person such as a person with a severe hearing loss and a hearing person could include preferences of mode and language. An example is a person with a severe hearing loss who uses an automated system which recognizes his sign language and converts it to speech in a choice of languages.	The user profile concept can deal with combinations of modality and language and cultural preferences, see [14], scenario in clause 8.8 on "A person with a severe hearing loss". That scenario also explains how the combination of the profile concept and the Universal Communications Identifier (UCI) concept (see clause 4.7.1) may further enhance usability.

6.5 Rules

Rules can be used to define language and cultural preferences. For simplicity, only the issue of language preferences have been addressed in detail. The same principles can apply for cultural preferences.

6.5.1 The concept of a rule

Users often express conditional phrases in their everyday life. When doing so, they express rules (even if they do not call them rules) such as "WHEN it rains, THEN I bring the umbrella". This concept is also useful when defining language preferences.

Many users have simple preferences as they only know one or two languages which can be defined in a simple way by choosing the preferred language. However, some users who know several languages might have more complex requirements about the circumstances in which they wish to use each language. The flexibility of rules makes them useful for defining preferences for language negotiation.

Users may define rules which permit maximum flexibility when defining their language and cultural preferences and needs. The rules may take into account a combination of factors such as:

- levels of the users' language skills in each defined language;

- levels of the other person's language skills in each defined language;

- preferred cultural settings depending on the situations, such as currency to be used at home or when travelling abroad;

- different user roles and different situations and the context of use.

6.5.2 Conditions and actions

Rules consist of one or more conditions (e.g. "When it rains") and one or more actions (e.g. "bring the umbrella"). When defining language preferences then the action would be the choice of one or several language preferences. Users should be given the option to define a condition first and then the language option (action) - or the other way around, first define language option and then condition(s). Alternative actions could be defined by using "Otherwise".

6.5.3 Examples of rules

There are different ways of defining and expressing rules. These are described in EG 202 325 [14], clause 8.

Here are some examples of different types of conditions:

- Role:

  EXAMPLE 1:   *When* Role is Business, *Then* Language is English.

- Profile:

  EXAMPLE 2:   *When* Profile is Private, *Then* Language is Swedish.

- Situation:

  EXAMPLE 3:   *When* Emergency situation *Then* Language is French.

- Other user's language and service:

  EXAMPLE 4:   *When* receiving email/SMS/MMS in French *Then* Language (for word completion mechanism or spell checker) is French.

- Modality and language of Origin, use of the specific word "*And*":

  EXAMPLE 5:   *When* Profile is Private *And* Location is Switzerland *Then* Language is French.

6.5.4 Rule exceptions

Users may define a rule and then define zero, one or several exceptions (circumstances where that rule does not apply). Defining rule exceptions could also be compared to defining alternative actions by using the specific word "*Otherwise*".

- Modality and language of Origin, use of the specific word "*Otherwise*":

  EXAMPLE: *When* Textual information is in French *And* French is the original language, then Language is French, *Otherwise* the Language is English.

6.6 Address book

Some services are closely dependent on the language setting such as the word completion functionality, commonly used when writing an SMS and/or MMS, see clause 7.6.4.3. People who know multiple languages who wish to send SMS to people with various language preferences might find it useful to define language preferences in their address book. These preferences can then be associated with their contacts stored in the address book (see [14], clause 12 on "Address book management"). This language preference would then ensure that the appropriate language is selected for writing messages to that person.

This solution could also be used for the spell checking when writing emails (see clause 7.6.4.4). In this case, the requirements might be more complicated as it is common to write emails that will be sent to several people who might have different language preferences. In that case, it would be relevant to let another language preference (or rule) have higher priority, see clause 7.5.1.

Storing language preferences in the address book could become a problem if people with incompatible language preferences use a shared network address book. A possible solution to that problem would be to store alternative languages and also associate them with the person using the Address Book. Further considerations will be given to this issue.

The sorting order in the address book may depend on cultural preferences such as the use of given names or family names and the choice of name when the person gets married or divorced.

6.7 Acquisition of language and cultural preferences

In order to offer services and content in a way that match users' cultural needs, their language and cultural preferences need to be determined. Profiles are usually composed and managed at the start and/or in the course of using the services and devices.

This information may be acquired by asking the user to provide their cultural preferences, or by tracking the user's actions and choices when using services or devices. The key to a successful profile implementation is to gather a user's cultural preferences in ways that are acceptable to users.

Many different factors play a role in how preferences should be gathered, such as:

- user tasks;

- generic or specific preferences;

- privacy;

- context of use such as location, time, used devices/accessories/services;

- language capabilities of services and devices;

- use of assistive devices combined with modality preferences and language/cultural preferences;

- language capabilities of people they wish to communicate with;

- content selections.

The different methods for gathering language and cultural preferences may be more suitable in some situations and less suitable in others. When a user is first supplied with a profile, it is important that an appropriate initial default language is set. Following that, there are two major methods for defining cultural and language preferences; explicit or implicit.

6.7.1 Explicit methods

When the user of the service/device actively defines their cultural and language preferences, this is referred to as an explicit method. Some people would typically fill in their native language as a first choice plus an additional language as a second choice. This might be useful when content is not available, or the service cannot be provided, in their native language, but is available in their second language.

Multilingual people might have more complex preferences that depend on various conditions. They may express their preferences by defining rules (see clause 6.5) or they can be asked to actively provide information by filling in questionnaires and online forms. It would be relevant to fill in their language skills (see clause 7.5.3.2) and to fill in their preferences that relate to different contexts (see clause 7.5.1).

Examples of methods for explicit collection of preferences:

- users rank languages from first choice to last choice;

- users choose the preferred language to match:

    - role (private, business);

    - language skill;

    - language that the user wishes to learn.

## 6.7.2	Implicit methods - adaptive personalization

Implicit methods, also referred to as adaptive personalization, are mechanisms that more or less continuously adapt profile data to match user requirements that have been inferred as a result of continuously monitoring user behaviour. Adaptive profile agents can relieve users of the burden of personalizing their profiles. Thus, the limitations of explicit methods of customization may be overcome. Whether adaptive personalization is seen solely as a benefit to a user or as a violation of their freedom and privacy will depend largely on why the user's behaviour is being monitored, and what control the user has over what is done as a result of the behaviour monitoring.

Where the user is able to observe and control the way in which adaptive personalization is used to modify their profile, adaptive personalization can minimize the frequency with which the user needs to explicitly modify their profile. A common way in which adaptive personalization can be implemented is by means of recommender systems.

Recommender systems attempt to predict users' needs and recommend helpful suggestions which, if the user agrees, would result in a change to the user's profile. For example, a recommender system might suggest a choice that is different from the default preference. It might, for example, say: "Do you wish to always use German when communicating with Hans?" as the profile agent has noticed that the user always manually chooses German when emailing Hans.

An example of a recommender system is when the system discovers that a user is travelling and automatically sets the time to the local time and possibly also reschedules time of calendar events. That might confuse users who might maintain contacts such as phone meetings with people in their original countries and wish to keep times as in their original country. In cases where values have been changed due to implicit methods, then it would be necessary to offer the user to toggle between the new values and the original values whenever they wish. Users should be given the opportunity to get information about which are the original values and which are the values inferred to by the adaptive system.

Other examples of implicit collection of cultural preferences include:

- Suggesting a list of internet sites related to a specific area in a foreign country that the user may wish to place at the top of their listing of favourite internet sites when on vacation in that country.

- Suggesting a good time to telephone one of the user's contacts based upon the time zone where that person lives (or because of an analysis of previous successful and unsuccessful calls to that contact).

As well as basing recommendations on the behaviour of a single user, recommender systems may also make use of information on how groups of users behave. For example, a recommender system might suggest an alternative hotel booking website if a user is experiencing problems. This suggestion could be based on successful bookings made by other users with the same language preference This technique is useful for recommending options on which the specific user has not (yet) expressed any personal opinion or where no previous behaviour can be used for making inferences.

Pros of implicit methods:

- Users are relieved of the burden of personalizing services and devices.

Cons of implicit methods:

- Good human-factors practice is to expect computer interfaces to be more-or-less predictable. There is a risk that a system which suddenly or autonomously changes may be confusing and inconsistent. Consistency is one important goal and adaptive systems do not fully follow that principle.

- Users have to learn a new interfaces and system behaviour.

- There is often a significant cost associated with the implementation of adaptive systems, and this cost would need to be justified.

- Adaptive personalization tends to have a connotation of "Big Brother is watching you". For this reason, users may wish to turn adaptive personalization off.

- The system may misunderstand the user's wishes. This could occur when the user is doing something on behalf of someone else or when another person is using one of the user's devices.

Implicit methods - adaptive personalization

Recommendation 6.7.2.a: Users should be given the opportunity to get information about the original cultural and language preferences and the preferences inferred by the adaptive system.

Recommendation 6.7.2.b: When cultural and language preferences have been changed due to implicit methods, then it would be necessary to offer the user the possibility to toggle between the new cultural and language preferences and the original preferences whenever they wish.

6.7.3 Combination of implicit and explicit methods

Combining explicit and implicit methods can be highly beneficial for users. The profile tool, or another application that communicates with the profile tool, will continually search for patterns in the user's behaviour. When a pattern is detected, the user would be asked an explicit question to check the assumptions made about the user. An example is if the user switches language to communicate with a person, users could be asked if they wish to associate that person's address book entry with that language.

Alternatively, the profile tool may initially ask users to provide information (explicit method), and then update this information based on patterns in the user's subsequent behaviour (implicit method). The profile agent should avoid asking users questions while they are actively engaged in other tasks.

6.8 Information sharing and privacy

Many people would find it convenient to share their language preferences without any limitations with as many people and services as possible. However, some people might prefer to put some restrictions on the circumstances in which they share all or part of their language and cultural preferences. The user profile management concept describes these issues and provides guidelines in this area, see [14], clause 13.

7 Support required for multicultural communication

7.1 Localization and internationalization

Localization is the process of ensuring that a product or service matches the language and cultural requirements of a specific group of users with shared language and cultural expectations. Localization is discussed in more detail in clause 4.2.

To provide enhanced support for a person's language and cultural preferences, it is essential that best use is made of the large resource of localization tools, techniques and guidance that already exist. In the present document, no attempt will be made to duplicate this existing material. Providers of products or services may use existing experienced in-house localization expertise, or they may seek the services of professional localization experts and companies. There are a number of informative resources that can be used to gain a good understanding of the range of localization activities, tools and techniques that can be employed. These include:

- "LISA Localization Industry Primer" [32];

- "International User Interfaces" [B];

- "Usability and Internationalization of Information Technology" [A];

- the introductory text and associated usage guides associated with the various standards described in clause 4.3.

Localization and internationalization

Recommendation 7.1.a: Best-practice localization tools, techniques and guidelines from other sources should be used in addition to the recommendations made in the present document (see clause 4.9 for some suggested sources and approaches).

Recommendation 7.1.b: Organizations may need to produce an internationalised version of their product or service, which can be localized to as many locales as is necessary and commercially viable.

7.2   User profiles

For maximum effectiveness in the delivery of multicultural and multilingual communications, systems and services need to be able to access and respond to relevant information found in a user profile. A description of user profiles can be found in clause 6. Users may define their language and cultural preferences in their user profiles. It will be important to find a balance of simplicity, and also offer a rich enough set of options so that users feel that their language preferences in their profiles suit their needs.

People's language preferences may be expressed in different ways, ranging from the simplest to the most sophisticated methods:

- Definite value: the simple way is to define a definite value such "my preferred language is English as it is my native language and I have not learnt any other language".

- List of language choices ranging from most preferred to least preferred: a more flexible way is to define a list of languages based on the reasoning such as "I prefer information in my native language Swedish but I am rather good in English and I have basic skills in German so my list would be: 1) Swedish; 2) English; 3) German".

- Rules: permitting maximum flexibility for defining language preferences. Factors such as levels of language skills, different user roles and different situations and context of use may be taken into account.

Support for user profiles

Recommendation 7.2: A system that allows a person's user profile to be created, managed and accessed should be supported in order to enable many of the other recommendations in the present document to be achieved. Support for the approach defined in EG 202 325 [14] will satisfy this recommendation.

7.3   Inferred language and cultural preferences

7.3.1   Assumptions

Frequently assumptions about the language preferences of an unknown person are based on:

- the address where the user resides or works;

- the country code of the person's telephone number;

- the domain name of the person's web page or email address;

- the name of the user. An unfamiliar name might also lead to wrong assumptions of the person being a man or woman.

All of these are indirect ways of trying to determine the person's actual language preferences. Frequently the assumptions made from this type of information may be completely wrong.

These will always be prone to error and should not be used if preferences that the user has set themselves can be accessed. Such language preferences may be found in a person's user profile, terminal language settings, cookies or computer application language settings.

Language preferences inferred from information about a user

Recommendation 7.3.1: Systems should make use of user preferences, when available, to configure system behaviour and not make assumptions about their language and cultural preferences based upon other sources of information.

7.3.2 Independence of language and cultural preferences from the location of a user or information source

Not only the language but also the content of a website is usually provided, by default, in the language where the service is located. In many cases it is beneficial to separate the choice of language and the content. For example:

- People who are abroad may often wish to access content that is local to their current destination (e.g. looking for information on hotels, restaurants or transport). However, most people would prefer to receive that information in their own language, which might be different to the language that is used in their current destination. Therefore, the language users want is unrelated to the region about which information is being sought.

- When accessing information about their home location, people abroad might want both the content and the language to relate to their home location and language.

These examples show how, when people are searching for information about a country, their choice of people's choice of language and cultural conventions is independent of both their location and the country about which information is being sought.

Independence of language and cultural preferences from the location of a user or information source

Recommendation 7.3.2: Users may wish to define their language and cultural preferences to be different from their content preferences related to a certain country or region.

7.4 Separation of language and cultural preferences

Currently, a user may choose a language in an application, which might also change cultural settings, such as measurement systems and currency, which could be unfamiliar to and unwanted by the user. Applications should, therefore, give the user the opportunity to make separate selections for these preferences. A good way to enable language choice is to provide the name of the language in the actual language. For example:

- Deutsch;

- English;

- Français;

- Magyar.

This way, users who understand the language can select their preference, without leading to confusion regarding their culture-related settings.

Separation of language and cultural preferences

Recommendation 7.4: Users should be provided with options to set language and cultural preference (such as weight and currency)s separately.

7.5   Language

7.5.1   Choice of language - Negotiation

When two people from different cultures meet and intend to start a conversation, they will choose which language(s) to speak. Typically, they will find out whether one of them speaks the other person's native language or if both need to speak a foreign language that suits both people's language skills. In some cases, two people may speak different languages, provided the other person understands it. Most people would find it confusing to participate in a two-language spoken conversation, unless they are used to it. An example of a two-language spoken conversation is when children grow up in a culture different from the language that is spoken by one of their parents. Many children prefer to talk the language of the country where they grow up, while their parents speak their native language.

Language negotiation is the procedure of choosing or proposing a language from two or more possible languages. It can be used when a person is communicating with another person or when a person is using ICT services and devices. The negotiation procedure can be done either manually, automatically or semi automatically. In spoken conversations, choice of the language to be used is usually determined by the individuals without the need for any ICT support.

Users might prefer a certain language depending on various factors such as who (individual or category) they communicate with, or who wrote some information. Users' language preferences may also depend on the situation and the user role, both of the users and of the people with whom they wish to communicate. For instance, a person who has moved to another country may want to use that country's language during leisure time, but use another language at work depending on their company's official language.

The user has to identify their particular skills and needs. Their preferred language may depend on various factors such as:

- Language skills and preferences of the communicating parties:

    - individuals or group of people known to the user, and where their first language is known (e.g. people in the user's address book, where the languages may be recorded).

    - friends or colleagues, where an established pattern of language usage may have developed (e.g. a group of people from different Nordic countries may choose to speak in English rather than in any one Nordic language to ensure that nobody is given an unfair advantage).

- Various situations:

    - Leisure.

    - Business. The choice of language may depend on:

        ▪ who the company/user is communicating with;

        ▪ the company's official business language, which might be different from the one spoken in the country where the company is located.

    - Emergency situation: people tend to become less competent in languages, especially foreign languages, during a difficult emergency situation.

- Accuracy of information, e.g. if the information is translated or not, and if translated, how good is the quality of the translated text (see clause 5.3.3).

- Specific products or services; users may have to use a version of the communication product that is not in their preferred language in order to communicate with other users, as the original language version (update) of a product may be the most up-to-date version and the localized versions come later.

- Educational purposes: e.g. users attending a language course might prefer to use a foreign language for enhancing their language skills.

The user should be provided with a means to define the factors that will affect the choice between alternatives. An automatic negotiation system would then match the alternatives in order to automatically provide the best (or least bad) option. The user would have to define their preferences in a way that would allow the automatic negotiation system to make a selection of the alternatives. The information to be used for negotiation could include:

- a ranked list of options;

- user language capabilities portfolio (see clause 7.5.3.2);

- the definition of rules;

- a points system: e.g. the user could be given a number of points that the user can assign different choices. The negotiation system can then easily provide the option with the largest number of points.

The automatic negotiation system would need to rely on standardized methods to ensure that the negotiation system will provide an appropriate choice of language. For example, in order to get a language that both people speak, a person's wish to speak a language may need to be weighted against the language skills of the other persons. The use of a standardized method to define language skills (see clause 7.5.3.2) could potentially be used for defining a standardized method for automatic negotiation. Further work need to be done in this area, as described in clause 9).

The method of specifying languages, both in describing user language preferences and in labelling the language of content, should be in conformance with BCP 47 [24].

NOTE: The negotiation mechanism can also be applied to other cultural preferences such as currency, measurement system etc.

Choice of language - Negotiation

Recommendation 7.5.1.a: Users should be provided with functionality that enables automatic or manual negotiation between two or more people.

Recommendation 7.5.1.b: Users should be provided with functionality that enables automatic or manual negotiation support between people and services.

Recommendation 7.5.1.c: The user should be provided with some means to define factors that will affect the choice between alternatives.

7.5.2   Definition of language choices

The language and cultural settings in the user profile can be populated, either manually, automatically or semi-automatically. Users' language choices can then be used in the following ways:

- Manual selection: the user may select language from a set of choices available in the service or device.

- Language provided automatically by the service, based on an assumption about the user. The assumption may be done by using various methods such as the current location of the user or information about the country of the user's services (e.g. Home Location Register (HLR)).

- Language provided automatically based on the user's language preferences in their user profile.

- Language provided automatically based on the user's preferences sent to a web server in the Accept-Language request-header.

- When Universal Communications Identifiers (UCIs) are used, the other person's language preference can be provided as input for an automatic negotiation procedure. See clause 4.7.1 for a description of UCI and the scenario in clause 8.7 for an example related to the application of UCI-based negotiation to meet a user's language needs.

- If the user switches language to communicate with a person, users could be asked if they wish to associate that person's address book entry with that language (see clause 6.6).

7.5.3   Description of language skills

In trying to match a service to a user, it is important to ensure that the user is able to use the service effectively. As well as being a general requirement on services, this is of particular importance in relation to the user's language skills. In order to ensure that a service will not be incompatible with a user's language skills, it is important that the service is able to determine things such as:

- whether the complexity of written information being presented is compatible with the user's ability to read and understand it;

- whether the user is likely to be able to comprehend the meaning of spoken information;

- whether the user is likely to be able to effectively participate in a written or spoken dialogue with another person.

In order to allow such comparisons to be made, it will be necessary for a service to be able to access information on a user's language skills. User Profiles should be capable of holding information that describes a user's skills in a number of languages.

Description of language skills

Recommendation 7.5.2: User Profiles should be capable of holding information that describes a user's skills in a number of languages.

7.5.3.1   List of possible languages

The complexity of the definition of language preferences can be as simple as defining one single language. In the case when a user knows two languages it might still be a very straightforward task to define the preferences, e.g. define native language as the first choice and a second language as the second choice. Similarly the user could just define a ranked list of more languages.

7.5.3.2   User language capabilities portfolio

The definition of a ranked list of possible languages is a very simple method, but not very sophisticated. In practice, it would be more useful to have a standardized way to define language skills. Therefore, the European Council has created a European Language Portfolio: a document in which those who are learning or have learned a language - whether at school or outside school - can record and reflect on their language learning and cultural experiences [6]. This Language Portfolio has three different components: a Language Passport, a Language Biography, and a Dossier containing certificates. Below there is the global scale to which anyone can refer to, however it is important to note that the passport itself contains all the detailed information related to the person's capability in the domains of: speaking, reading, listening and writing.

Table 1: General proficiency descriptions

Proficient User	C2	Can understand with ease virtually everything heard or read. Can summarize information from different spoken and written sources, reconstructing arguments and accounts in a coherent presentation. Can express him/herself spontaneously, very fluently and precisely, differentiating finer shades of meaning even in more complex situations.
	C1	Can understand a wide range of demanding, longer texts, and recognize implicit meaning. Can express himself/herself fluently and spontaneously without much obvious searching for expressions. Can use language flexibly and effectively for social, academic and professional purposes. Can produce clear, well-structured, detailed text on complex subjects, showing controlled use of organizational patterns, connectors and cohesive devices.
Independent User	B2	Can understand the main ideas of complex text on both concrete and abstract topics, including technical discussions in his/her field of specialization. Can interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party. Can produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options.
	B1	Can understand the main points of clear standard input on familiar matters regularly encountered in work, school, leisure, etc. Can deal with most situations likely to arise whilst travelling in an area where the language is spoken. Can produce simple connected text on topics which are familiar or of personal interest. Can describe experiences and events, dreams, hopes & ambitions and briefly give reasons and explanations for opinions and plans.
Basic User	A2	Can understand sentences and frequently used expressions related to areas of most immediate relevance (e.g. very basic personal and family information, shopping, local geography, employment). Can communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters. Can describe in simple terms aspects of his/her background, immediate environment and matters in areas of immediate need.
	A1	Can understand and use familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type. Can introduce him/herself and others and can ask and answer questions about personal details such as where he/she lives, people he/she knows and things he/she has. Can interact in a simple way provided the other person talks slowly and clearly and is prepared to help.

Table 2: Understanding - Listening

A1	I can understand familiar words and very basic phrases concerning myself, my family and immediate concrete surroundings when people speak slowly and clearly.
A2	I can understand phrases and the highest frequency vocabulary related to areas of most immediate personal relevance (e.g. very basic personal and family information, shopping, local area, employment). I can catch the main point in short, clear, simple messages and announcements.
B1	I can understand the main points of clear standard speech on familiar matters regularly encountered in work, school, leisure, etc. I can understand the main point of many radio or TV programmes on current affairs or topics of personal or professional interest when the delivery is relatively slow and clear.
B2	I can understand extended speech and lectures and follow even complex lines of argument provided the topic is reasonably familiar. I can understand most TV news and current affairs programmes. I can understand the majority of films in standard dialect.
C1	I can understand extended speech even when it is not clearly structured and when relationships are only implied and not signalled explicitly. I can understand television programmes and films without too much effort.
C2	I have no difficulty in understanding any kind of spoken language, whether live or broadcast, even when delivered at fast native speed, provided I have some time to get familiar with the accent.

Table 3: Understanding - Reading

A1	I can understand familiar names, words and very simple sentences, for example on notices and posters or in catalogues.
A2	I can read very short, simple texts. I can find specific, predictable information in simple everyday material such as advertisements, prospectuses, menus and timetables and I can understand short simple personal letters.
B1	I can understand texts that consist mainly of high frequency everyday or job-related language. I can understand the description of events, feelings and wishes in personal letters.
B2	I can read articles and reports concerned with contemporary problems in which the writers adopt particular attitudes or viewpoints. I can understand contemporary literary prose.
C1	I can understand long and complex factual and literary texts, appreciating distinctions of style. I can understand specialized articles and longer technical instructions, even when they do not relate to my field.
C2	I can read with ease virtually all forms of the written language, including abstract, structurally or linguistically complex texts such as manuals, specialized articles and literary works.

Table 4: Speaking - Spoken interaction

A1	I can interact in a simple way provided the other person is prepared to repeat or rephrase things at a slower rate of speech and help me formulate what I'm trying to say. I can ask and answer simple questions in areas of immediate need or on very familiar topics.
A2	I can communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar topics and activities. I can handle very short social exchanges, even though I can't usually understand enough to keep the conversation going myself.
B1	I can deal with most situations likely to arise whilst travelling in an area where the language is spoken. I can enter unprepared into conversation on topics that are familiar, of personal interest or pertinent to everyday life (e.g. family, hobbies, work, travel and current events).
B2	I can interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible. I can take an active part in discussion in familiar contexts, accounting for and sustaining my views.
C1	I can express myself fluently and spontaneously without much obvious searching for expressions. I can use language flexibly and effectively for social and professional purposes. I can formulate ideas and opinions with precision and relate my contribution skilfully to those of other speakers.
C2	I can take part effortlessly in any conversation or discussion and have a good familiarity with idiomatic expressions and colloquialisms. I can express myself fluently and convey finer shades of meaning precisely. If I do have a problem I can backtrack and restructure around the difficulty so smoothly that other people are hardly aware of it.

Table 5: Speaking - Spoken production

A1	I can use simple phrases and sentences to describe where I live and people I know.
A2	I can use a series of phrases and sentences to describe in simple terms my family and other people, living conditions, my educational background and my present or most recent job.
B1	I can connect phrases in a simple way in order to describe experiences and events, my dreams, hopes and ambitions. I can briefly give reasons and explanations for opinions and plans. I can narrate a story or relate the plot of a book or film and describe my reactions.
B2	I can interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible. I can take an active part in discussion in familiar contexts, accounting for and sustaining my views. I can present clear, detailed descriptions on a wide range of subjects related to my field of interest. I can explain a viewpoint on a topical issue giving the advantages and disadvantages of various options.
C1	I can present clear, detailed descriptions of complex subjects integrating sub themes, developing particular points and rounding off with an appropriate conclusion.
C2	I can present a clear, smoothly-flowing description or argument in a style appropriate to the context and with an effective logical structure which helps the recipient to notice and remember significant points.

Table 6: Writing

A1	I can write a short, simple postcard, for example sending holiday greetings. I can fill in forms with personal details, for example entering my name, nationality and address on a hotel registration form.
A2	I can write short, simple notes and messages. I can write a very simple personal letter, for example thanking someone for something.
B1	I can write simple connected text on topics which are familiar or of personal interest. I can write personal letters describing experiences and impressions.
B2	I can write clear, detailed text on a wide range of subjects related to my interests. I can write an essay or report, passing on information or giving reasons in support of or against a particular point of view. I can write letters highlighting the personal significance of events and experiences.
C1	I can express myself in clear, well structured text, expressing points of view at some length. I can write about complex subjects in a letter, an essay or a report, underlining what I consider to be the salient issues. I can select a style appropriate to the reader in mind.
C2	I can write clear, smoothly-flowing text in an appropriate style. I can write complex letters, reports or articles which present a case with an effective logical structure which helps the recipient to notice and remember significant points. I can write summaries and reviews of professional or literary works.

NOTE: Copyright: Council of Europe: Common European Framework of Reference for Languages (CEF).

Ideally, the information contained in the European Language Portfolio as well as the information contained in the European CV should be included in the user's profile, see clause 6.

Tables 2 to 6 relate to both spoken and written communication. This system could also be adapted to both sign languages and lip-reading. Specifically, tables 2, 4 and 5 could be adapted with text relevant to:

- understanding of sign language;

- interaction using sign language;

- the production of sign language.

For lip-reading, only table 2 would need to be adapted.

It is unlikely that many users would wish to fully complete every section of a European Language Portfolio specification of their language skills before being allowed to benefit from the language-related enhancements described in the present document . However, if the language skill section of a person's user profile is based on a structure similar to the European Language Portfolio, then a framework will exist that allows a detailed map of a person's language skills to evolve over time. This could be built up as a result of a combination of:

- periodic user-driven refinements to the description of their language skills;

- changes that the system could propose as a way to alleviate observed language related issues in the person's use of ICT services.

However comprehensive and precise the description of a person's language skill is, users will always require a means to specify that they want to use a specific language on a temporary basis for whatever reason they choose (e.g. to send an SMS message to someone in a language that is not one in which they are highly skilled).

7.6   Language and cultural capabilities of services and terminals

7.6.1   Generic capabilities

When ensuring that a service or terminal offers what a user requires, it will be necessary to compare information about a user with information about the service or terminal. Services and terminals, therefore, need to provide information about their language and cultural capabilities, both in a human readable and a machine readable form.

There is potentially a very large range of items that a service or terminal may reveal about its capabilities. Some of these will be exclusively related to language and cultural issues and others will have some relevance in a linguistic and cultural context.

Examples of exclusively language and culturally related information are:

- the language(s) in which the service is (or can be) presented;

- the cultural convention(s) used (or that can be selected) for the presentation of culturally varying factors such as currencies and temperature scales;

- whether the content being presented has been translated;

- the number of sequential translations that have been performed;

- whether content has been translated by a native speaker of the language, a professional translator or whether it has been machine translated;

- the quality of the translation;

- other factors that are not exclusively related to the linguistic and cultural aspects of the service include:

  - the expected target audience;

  - the complexity of the written or spoken information (e.g. whether it may be easy or difficult to understand).

No universally accepted assessment methods exist for many of the above items (e.g. translation quality and what constitutes a "professional" translator). The localization community already recognizes the importance of defining measurement standards for these items. However, the importance is generally seen from the perspective of the value of using such measures within internal localization processes. The contents of the present document make it clear that these measures would also be of great value in helping to optimize the service that an end-user will receive.

Examples of some of the language and cultural preferences that a system could provide are shown in clause 5.3.2.

Language and cultural capabilities of services and terminals

Recommendation 7.6.1.a: The language and cultural capabilities of services and terminals should be available in both human and machine readable form.

Users should be clearly notified when their language or cultural preferences cannot be met and what outcome has been achieved e.g. if the user's profile specifies that they wish to see prices in Euros and the prices they see are in Swedish Crowns, then they should be informed about which currency they are viewing.

Research is likely to be needed to help in understanding how language and cultural requirement negotiation can be successfully achieved, see clause 9. This is also an area in which the standards community needs to continue to create standards relating to factors such as translation quality assessment.

Information on language and cultural capabilities

Recommendation 7.6.1.b: Services need to provide information about their language and cultural capabilities.

Recommendation 7.6.1.c: Information on language and cultural capabilities should be available in both human readable form and machine readable form.

Recommendation 7.6.1.d: Users should be clearly notified when their language or cultural preferences cannot be met and what outcome has been achieved.

7.6.2   Setting up language preferences for complex multilingual situations

Multilingual people have difficulties defining their language preferences as they may vary depending on factors such as the people with whom they communicate, and on a variety of services and situations (e.g. whether they are in a private or business context).

Setting up language preferences for complex multilingual situations

Recommendation 7.6.2: Multilingual users should be provided with the means to define language preferences that relate to factors, such as the people with whom they communicate, and on a variety of services and situations (e.g. whether they are in a private or business context).

7.6.3   Information provided in two modes and two languages

Some people who know a foreign language might prefer to listen to streamed video news in that foreign language but have subtitles in their native language. In this case the second language choice is used as complementary information in case the person has difficulties understanding the foreign language.

Information provided in two modes and two languages

Recommendation 7.6.3: Users should be able to have different language settings simultaneously in multimodal applications.

7.6.4   Language support functionality

7.6.4.1   Enhanced language identification

Language identification systems (see also clause 4.6) provide the functionality of processing a text (written or spoken) and determining which language it is. Analysis of speech or text offers a promising way to identify the language being used but the success of these techniques can be reduced by factors such as those mentioned in clause 4.6.

These factors tend to become more serious when a larger number of languages are to be considered. Therefore, the larger the number of languages under consideration, the more the risk of an erroneous identification. However, these systems could be significantly more accurate and efficient if the system only had to choose between a small number of possible languages that correspond to the user's language skills and preferences stored in their user profiles.

7.6.4.2   Enhanced speech recognition

An ideal multilingual speech recognition system (see also clause 4.5) should be speaker-independent and support continuous speech regardless of whether the speaker is native or non-native in a specific language. It should also enable fast language identification. However, the success of these techniques can be reduced by the same factors such those mentioned in clause 4.5. A more accurate system could be provided if the system would be able to access details in the user profile that gave information about what country or region from which the user comes.

7.6.4.3   Writing text in a range of languages

Word completion is a common feature in mobile phones for writing SMS messages, as well as in web browsers and similar text entry contexts. When a user begins the entry of a frequently-used word, the word completion functionality (in the mobile phone or the computer) automatically completes it, or proposes a list of choices.

To avoid frustration because of a language completion functionality that suggests wrong alternatives, people need to change the language setting each time they wish to use another language when writing text. Frequently making language selections, and remembering to restore the setting to the most common language, may be annoying for multilingual people contacting different people using different languages. It would be beneficial if the user could associate language preferences with the people they communicate with, see clause 6.6. The word completion functionality could also be significantly enhanced if it could quickly identify the language being used, see clause 7.6.4.1.

Writing text in a range of languages - word completion

Recommendation 7.6.4.a: Users should not have to manually change language settings each time they wish to send a message to a person in a different language.

When correctly set, spell checking functionality can aid the user in producing accurately spelt text. However, if the text is being checked against the wrong dictionary, then the spell checking functionality may hinder rather than help the user. Spell checkers will mark most words as wrong when people write email messages in a language that is different from their current language setting. It would be beneficial if the user could associate language preferences with the people they communicate with, see clause 6.6. The spell checking functionality could also be significantly enhanced if it could quickly identify the language being used, see clause 7.6.4.1.

Writing text in a range of languages - spell checking

Recommendation 7.6.4.b: In order to benefit from the advantages of using a spell checker, users should not have to manually change language settings each time they write an email message that is in a different language from their current language setting.

7.6.4.4   Flexible use of diacritical marks

Words containing letters with diacritical marks such as accents and cedillas may be a source of problems when performing search operations. If the word is entered into the database without the diacritical mark and the person searching for it uses the diacritical mark on the word or phrase to search, then the search tool might not present any hits. If instead, the word is entered into the database with the diacritical marks but the user writes the word without the diacritical mark, then the system might not present any hits. The more advanced search engines, however, are aware of the normalization and fallback rules, and usually handle these cases properly.

In addition, many keyboards severely limit the repertoire of diacritical marks that can be typed, thus forcing them to be entered in different ways. Also, many systems still have fonts that cannot present all diacritical marks in a correct way.

Flexible use of diacritical marks

Recommendation 7.6.4.c: Words with diacritical marks should be presented as a result of a search operation whether or not the diacritical mark has been stored or input.

7.6.5   Time zones

The time zone of a person's home location is one of the most fundamental culturally related settings that will need to be configured for a person's devices and applications. This setting will influence the interpretation that many applications will make about times entered into a person's calendar (schedule).

When entering times into a scheduling application (e.g. calendar), users may chose from a wide range of different strategies. Typically, people will enter times in a form that relates to both the way that they received the time information and the way that they expect to use that information. For example, people will frequently enter the time of a meeting in another country in exactly the form it is given to them i.e. the local time of the meeting. This will ensure that, when they enter the country to attend the meeting, the time shown will be correct in the time zone that they are now in. These same users may choose to adjust the time of telephone conference meetings they are informed of to ensure that the time in their schedule corresponds to the equivalent time in the time zone in which they will be when the conference call takes place (frequently their home time zone).

In the above example, the user has used context information about the nature of the meetings (face-to-face or via a remote link) in order to determine how to record the time in their schedule. This context information will not usually be available to an application or service, and neither will the rules that the user chooses to apply. For this reason, it is likely that any applications or service that tries to "intelligently" adapt the times that a user enters into a schedule is very likely to produce unexpected and unwanted results. Several scheduling applications adapt the times that the user has entered into their schedule when the user alters the time zone on their PC to a new, local, time zone. Many users find that these changes, about which the usuries not informed, can create situations in which appointments are missed or mis-timed.

In order to ensure that users do not experience unexpected behaviours, the following set of principles should be followed by application designers. The application should either:

- not alter user entered times under any circumstances;

- notify the user each time that an attempt is made to amend a user-entered time;

- notify the user that a rule will be run that will amend several user-entered times in one operation.

User notifications in the above options should always initially be active. Users should be provided with the option to suppress either of the above types of notification.

When it is necessary to negotiate times on behalf of users (see clause 7.5.1), it is important that the negotiation process knows both the required time and the associated time zone for both of the negotiating parties. It should be noted that abbreviations for time zones can be ambiguous e.g. EST is used as an abbreviation for at least 2 different time zones, one in the USA and one in Australia.

Time zones

Recommendation 7.6.5.a: Applications should either:
- not alter user entered times under any circumstances;
- notify the user each time that an attempt is made to amend a user-entered time;
- notify the user that a rule will be run that will amend several user-entered times in one operation.

Recommendation 7.6.5.a: When it is necessary to negotiate times on behalf of users (see clause 7.5.1), it is important that the negotiation process knows both the required time and the associated time zone for both of the negotiating parties.

7.6.6   Automated voice services

Automated voice services are voice applications that provide a voice interface driven by a voice dialog manager to drive the conversation with the user in order to complete a transaction and possibly execute requested actions. They rely on speech recognition engines to map user voice input into textual or semantic inputs to the dialog manager and mechanisms to generate voice or recorded audio prompts (text-to-speech synthesis, audio playback,). They may also rely on additional speech processing techniques such as speaker verification. Typically telephony-based automated voice services also provide call processing and DTMF recognition capabilities. Examples of traditional automated voice services are traditional IVR (Interactive Voice Response Systems) and VoiceXML Browsers.

7.6.7   Call centres

"Call centres" is the collective term for systems that support the effective management of a large number of telephone calls. Their use is widespread across a range of market sectors, both public and private. The functions of the call centres vary from pure sales to providing life saving support services. The common factor is that all call centres offer automatic queue management and the co-ordination of calls and customer data.

Figure 2: Graphical representation of market sectors of, and types of, call centre

Emergency Services
Emergency services are a unique type of call centre as the calls are highly critical. Emergency services such as police, ambulance and fire brigade are controlled by Call Centres. Callers may often be in a distressed condition which could affect people's language and reasoning ability.

Crisis lines
Crisis lines typically offer support and information to people in difficult or distressed situations (e.g. potential suicides, child violence victims). Dealing with the incoming calls effectively can be critical.

Message Centres
Message centres are those Call Centres that handle calls for many companies, providing an answering and message service for those companies. This is a service found valuable by many small businesses, particularly those such as plumbers or similar tradesmen who work on customer's premises.

Public information services
Many services have been established, based on publicly financed Call Centres, which offer free information services such as medical advice or railway timetable data.

Customer Services
Customer services and technical support for many organizations are handled by Call Centres on a commercial basis. Customer services can range from highly technical help to straightforward directory enquiries. Unlike public information services above, callers to this type of service may already be known to the organization so it may be possible to deliver language and cultural preferences semi automatically.

Order and invoice handling
The handling of orders is common in the retail sector where routine ordering is done via the Call Centre.

Tele-sales
Call handlers may be required to bring new products or promotions to the attention of callers (upselling) or to contact callers.

The number of languages which should be supported in a Call Centre will depend on the function of the Call Centre. Sales centres will typically be driven by cost constraints where provision of operators skilled in minority languages may not be cost effective. At the other extreme are emergency service centres where as many languages as possible should be supported (in line with the European policy statements stressed by Information Society and Media Commissioner Viviane Reding [4]).

7.6.8   Emergency service centres

7.6.8.1   Basic emergency service access

In most European countries the European preferred 112 code has been implemented to make calls to all emergency services (e.g. fire, police, ambulance). In many countries, however, different numbers are allocated to each of the emergency services.

Where separate numbers are allocated to individual emergency services, the calls are answered by call centres operated by the appropriate emergency service. In most countries where a single number (e.g. 112) is used, emergency calls are answered at a call centre operated by one of the emergency services (most commonly the police) and then calls are forwarded to other services as appropriate. In the UK and the Irish Republic, all emergency service calls are directed to call centres operated by the incumbent telephony operator and both the historic 999 code and the European preferred 112 code are supported.

To access an emergency service when travelling in another country, a person may:

- try to enter the emergency service number for their own country (which might be outside the EU) which may not be valid in the visited country;

- use the standard European code (112) which may not be fully supported in all circumstances in the visited country.

When an emergency call is received and the language being spoken by the caller is not the primary language of the country there may be problems in understanding the nature and the details of the emergency.

In the UK, if the telephone company operator is unable to understand the person making the emergency call, then the call is directed to the police service. The police service (and also the ambulance service) is an appropriate service to choose as members of the police service frequently have to cope with contacts on the street where the person they are dealing with does not speak the English language. The police forces may have people able to speak and understand the language of the person calling them. Alternatively, the UK Police Forces use the "Language Line" service which provides real-time language interpretation between the caller and the Police operator by means of a conference call with a skilled linguist.

When handling an emergency call from someone not speaking the official language(s) of a country, it will be necessary to correctly identify the language being spoken by the caller. Only when the language has been identified can effective interpretation be employed. Language identification currently would have to take place:

- either by the first person who receives the emergency call;

- or (in the UK) the person in the police who receives the call that is handed to them by the initial call handler;

- or the person in any "Language Line" service that is called by the emergency service.

In many countries, when a call is made to the emergency services, the Calling Line Identity (CLI) information will be available to the emergency operator. If the phone used to contact the emergency services is a mobile phone, then the country code information contained in the CLI information may give the emergency operator some idea of the language being spoken. However, there are many instances where inferences made from the CLI information may be misleading. For example:

- in some countries there are several official languages spoken;

- the person from a country (indicated by the CLI) may not be speaking any of the languages of that country;

- the person may have acquired a local SIM card (e.g. to save calling costs). In this case, the caller may have a SIM card of the country in which the emergency occurs but be speaking a language from their country of origin and not one of the official languages of the visited country.

Cultural issues may be very important when dealing with callers to emergency services. As an example, it is not acceptable or allowable for some Muslim women to be treated by male paramedics or doctors. Such information needs to be available to the emergency services as soon as possible.

The best method of determining the language and cultural preferences of a caller to an emergency service would be to look at the language and cultural information in their user profile, see clause 6 and scenario in 8.4.1 on "Car crash". Some of this data may be protected under normal circumstances and special agreements for release of this data in an emergency may have to be considered.

Emergency service centres

Recommendation 7.6.8.a: An emergency service call centre will need a means to gain access to the user profile of a person calling the emergency service.

Recommendation 7.6.8.b: The emergency service provider may need special permission to access disability, medical, language and cultural preference information that might be denied to other categories of people communicating with the user.

Recommendation 7.6.8.c: Care should be taken in using CLI information to predict the language requirements of the caller.

Some developments in the provision of emergency service call handling have minimized the requirement to fully understand everything that the person contacting the service is saying. One of the most important pieces of information that is conveyed when calling the emergency services is the location of the emergency. Describing their location may, unfortunately, be one of the most challenging tasks for someone calling the emergency services in another country. For somebody who is blind, for example, it could be an almost impossible task. Location based services are now being used by emergency services to identify the location of the emergency caller and this may be of great assistance in ensuring that this most important information is accurately understood. Even with the location information that is automatically provided, the emergency service operators (in the UK) will always ask "Where are you?". Although getting accurate information on an emergency caller's location is a great step forward, it does not remove the need to find ways of removing or minimizing the barriers that exist between the caller and the call handler if language and cultural problems arise.

It would be a natural extension to the location based service applications provided within some mobile networks. use the similar mechanisms to deliver language capability/preference information obtained from the caller's personal profile.

7.6.8.2   Access to emergency services for deaf people and people with speech impairments

People using Text Phones (usually used for text communication between hearing impaired people) frequently have to use a different number to the number used for national emergency telephone calls made in that country. Most organizations representing deaf and hearing impaired users wish to have universal adoption of 112 as the emergency number to be used when using a Text Phone.

At present the UK has a Text Telephony service that provides emergency calling for deaf and hard of hearing customers and it is looking at SMS delivery of emergency information. Using SMS to contact emergency services is seen as being of value to younger people who are regular users of SMS and to people who have less severe hearing impairments and who do not use or wish to use the Text Telephony service. The use of SMS can also be useful for people with a speech impairment. The Danish emergency services provide guidelines on how to use their suggested templates which could be created in advance and into which the appropriate information could be filled in when an emergency situation has occurred. However, those templates would need to be made available at an international level.

Where text calls or SMS messages are used to call emergency services, there is a good case for utilizing automatic translation to deliver the original and translated caller information and to provide translated responses. However, in all cases it is likely that using a suitably skilled human operator as an intermediary rather than an automated translation service will be capable of providing better translation. Automatic translation between different languages will be likely to fail badly if the user makes extensive use of special SMS shorthand or abbreviations (e.g. some languages frequently use abbreviations whereas in others abbreviations are never used).

Users of relay services for people with communications difficulties can, in some cases, access a specialist relay operator in emergency situations. To do this they may have to dial a special code which could be 5 digits. In a situation where user profiles are readily accessible there would be no need to have a different number. Calls using 112 would be automatically routed to a relay operator.

7.6.9   Relay services with a human intermediary

7.6.9.1   Human Simultaneous translation/Interpretation

Such services are already available commercially for simultaneous translation or interpretation of a wide range of languages (Language Line).

Relay services - Human simultaneous translation/interpretation

Recommendation 7.6.9.a: Access to user profiles will enable the relay operator to be pre-warned of language compatibility issues. The operator can then either invoke automated support or pass the call to a more suitably qualified person.

7.6.9.2   Textphone relay services

Several national telephone relay services exist in Europe for people with communication difficulties. In one example, a Textphone user dials 18001 followed by the full telephone number of the person they wish to call. Once the call is answered by a hearing person a specialist Operator will join the line to relay the call. The text user can type or speak their conversation to the hearing person, the hearing person will speak their part of the conversation and the specialist Operator will type exactly what is being said.

An additional option to this service is where the operator rather than the user sets up the communication.

Problems include:

- in some implementations, a number different to 112 must be dialled;

- privacy - human intermediary in personal or sensitive conversations;

- legal - a third party effectively using another person's credit card;

- mobile use - not all mobile service providers provide support for two way text communication with a relay service.

Textphone relay services

Recommendation 7.6.9.b: It should be unnecessary to dial special numbers if providers exploit the full capabilities related to user profiles to relay services.

7.6.9.3   Signing relay services

Video Relay Services are being piloted in Europe. The service works by putting a deaf person in visual contact with a sign language interpreter via a webcam or video phone. The interpreter relays the deaf person's conversation using a telephone and translates the other person's response into sign language. Support is typically for one specific sign language appropriate for the country in which the service is operating. It would be desirable other sign languages should not be supported but there are likely to be problems in finding operators skilled in a wide range of sign languages and spoken languages.

7.6.9.4   Automated relay services

People are implementing or experimenting with automated relay services to address the following problems with human operated relay services:

- cost of employing skilled human operators;

- numbers of people with these specialist skills (the need to book a call is commonplace);

- the finite range of language capability which one person can reasonably possess.

Historically the problem of text to speech (or text/speech to signing) is an easier one to solve than speech to text (or signing to speech/text). This means that several text to speech systems have been successfully implemented. Most successful speech to text based systems are currently restricted to those that are speaker dependent or those that have to handle a limited vocabulary.

Automated relay services

Recommendation 7.6.9.c: Access to user profiles of both called and calling parties will enable the system to allocate appropriate translation/interpretation facilities. (Choosing a specific speech recognizer or text to speech engine)

7.6.9.5   Automated text to speech

Automated text to speech services are already in use on a wide scale in some countries (e.g. automatic implementation when sending an SMS to a fixed line). This type of service would be ideally suited to automatic translation.

7.6.9.6   Signing avatar

Many trials have taken place over the last few years involving the use of avatars and language/video processing instead of a human intermediary. The use of avatars has met with great success in one way communication with a limited vocabulary (e.g. translating a web page into sign language). The consensus of opinion is that real time two way communication is still some way off but a hybrid system (human one way - automated the other) is a more viable possibility. The use of automation to translate text/speech into a sign language opens up the possibility of being able to easily translate into a range of different sign languages.

7.7   Organizations (including businesses)

Business culture incorporates all elements related to the working environment of a company, including working hours, internal hierarchy, enterprise working language, and working style. Companies that want to pursue their business in various countries must take into account to what extent cultural factors affect the enterprise culture.

> NOTE: The term "Organization" has been chosen to cover commercial organizations i.e. businesses, and non-commercial organization such as government departments.

Support required for organizations (including businesses)

Recommendation 7.7.a: Adhering to national legal requirements

When setting up communications, services should take account of relevant national legal requirements, which may vary significantly from country to country and which may have a significant impact on transactions of both organizations and individuals.

Recommendation 7.7.b: Respecting organizational culture

Services should wherever possible take account of the language, national culture and the organizational culture of every party concerned. In many circumstances the culture of the organization can place more constraints on communication than those created because of national culture and language.

In certain cases, the productivity of employees can be increased by the provision of tools, which take into consideration their language and cultural preferences. Customer satisfaction and business opportunities could also be positively influenced by the provision of products and services that respect customers' preferences. Nevertheless, the legal implications of these actions will need to be considered.

Activities to be carried out by organizations (including businesses)

Recommendation 7.7.c: Adhering to national legal requirements

Organizations should take into account the multicultural and language-related requirements and preferences of customers, employees and other organizations.

7.8   Needs of developing nations

The present document is focused on European countries and would be applicable to many other developed nations. However, it would not be fair to assume that the requirements and guidelines can be applicable to all cultures including the developing nations. The UN Millennium Development Goals stress the importance of making available "the benefits of new technologies - especially information and communications technologies" to developing nations [41]. Usability engineering is also social engineering within a cultural context [E]. To achieve this, it will be important to study the needs of people who are lacking even the most basic computer skills and who are living in a culture where their life experiences may differ significantly from those encountered in Europe. This should be done in the cultural and social context of the targeted users.

In today's ICT user interfaces, typical office metaphors are used such as desktop, files, folders and windows. These metaphors cannot be assumed to be part of the life experience - and understood among all cultures such as financially constrained user groups in Asia, Africa and south America [E], [F]. In some languages, words to describe those metaphors might not even exist. Requirements related to concepts such as time and ownership, personalization, confidentiality and sharing of information and devices can be different from the requirements in Europe and it is, therefore, important to perform detailed studies of the users' needs. Also, issues related to religion may lead to important requirements that should be taken into account. This clause summarizes results from studies carried out in Ghana [E] and in Columbia [F]. At a high level, both studies have several similar conclusions. They stress the importance of involving users from these cultures in order to address their needs.

The two examples below illustrate the potentially fundamental differences that can exist between different cultures:

- The dominant European values of "always on" and "constant connectivity" that are valued by telecom operators (and presumably their customers), they maintain, conflict with all major world religions which prescribe certain times when followers must be disconnected from the material world and interaction.

- The European "personalization" bias leads to individual ownership being taken for granted. In many Asian and African cultures, however, some form of "community" is the basic unit that should be addressed, be it the family, extended family, tribe or village. Mobile phones are frequently shared among family members, partly as a necessity, but not uncommonly as a social good.

8   Scenarios

8.1   Multicultural and multilingual business interoperability

Issues addressed

The scenario illustrates:

- personal data protection - Country legislation, EU legislation -culture-related privacy;

- culture variable self-assessment;

- harmonized inter-cultural and multilingual search;

- European CV and language proficiency.

Current situation
Companies in various countries have differing expectations about and ways of interpreting the information contained in the CVs of their prospective employees. Currently, there is no common scale of measurement for qualifications/grades obtained in different countries, for instance "1" in Germany is the best grade, whereas in France is the worst, in the UK grades are marked with letters ranging from A to F. When considering language skills most candidates use self-assessment and base their choice on cultural norms. E.g. a language skill marked with "fair", could be interpreted as "poor" in the UK, or "moderate" in Germany. A proposal for a clear language proficiency measurement has been made by the Council of Europe (see clause 7.5.3.2), and its use would be most beneficial. The presentation of personal data is regulated by both EU law (EU Data Protection Act) and by country-specific personal rights, nevertheless it is rarely that users are aware of their differing levels of confidentiality.

Future scenario
The recruitment agency "Candidates4U" with offices in various European countries wants to create a platform, which would enable the provision of standardized CVs of candidates to interested companies in accordance with their cultural and language expectations. Pierre, a 35-year old engineer from France is actively searching for a new position abroad. He has made his CV in French using the EUROPASS [22] template. Two companies, "Firma X" from Germany "Enterprise Y" from the UK, have expressed interest in his skills. "Firma X" expects to see on the CV his education background starting from school, whereas "Enterprise Y" is satisfied having the academic background starting from A-levels, and rather see a description of his extra-curricular activities.

The multiculturally-aware solution will convert Pierre's grades into a commonly understood version. When considering language skills Pierre uses the language portfolio and assesses his English language knowledge with B1.

Taking advantage of the multicultural profile filled in by the companies and Pierre, "Candidates4U" can satisfy the companies' preferences, by providing Pierre's CV in the business language and cultural variant of both companies (i.e. German and English) and by matching his skills to the job descriptions. On the other hand, it can also provide Pierre with the vacancy description in French, according to the language preference from his user profile. The software solution used by "Candidates4U" takes into account confidentiality information, both imposed by law (EU Data Protection Act) or by country specific personal rights. As a French citizen, Pierre has the right to refuse the publication of his photo on the CV, or his salary expectations. The availability of the multicultural user profile allows:

- Pierre to specify the parts of his CV he would like to make public.

- Pierre can receive information in his preferred language.

- "Candidates4U" to perceive this information in a suitable format in order to search and to filter different fields according to the companies' preferences.

- "Firma X" and "Enterprise Y" can, therefore, receive the preferred format of Pierre's CV.

NOTE: This scenario is being implemented in the FUSION [P], co-funded IST European project that concentrates on creating an interoperable platform for business applications using ontology standards. In order to facilitate the user to access information in his/her preferred/required language the use of a multicultural profile proposed by ETSI could be a potential solution.

8.2   Accessing services across borders

Issues addressed
The scenario illustrates:

- automatic time settings - dealing with time zones;

- automatic answering systems;

- application of user profiles.

Current situation
People who go on a business trip expect to access their usual information and carry out their tasks in the same way they do when they are at home.

Nevertheless, in the current situation several things can go wrong. First of all, when the computer is switched to local time, the meetings planned in the agenda are also converted to the local time. This problem is caused by the fact that calendars store all times as UTC, and they use the local time zone when rendering the view. An absolute time option for the calendar is not supported, also there isn't an option for "in what time zone?" The system makes its own assumptions.

Future Scenario
Hans, a young German manager is travelling to Finland for a one week business trip. On arrival he switches his computer to local time, but the meeting times in his agenda remain the same as when he planned them in Germany. Hans could specify in his user profile which time settings should be used, thus the agenda reflects his preferred times, and the system does not take the initiative.

8.3   Network announcements

Issues addressed
This scenario illustrates:

- Matching the language of a call failure network announcement to the language requirements of the caller.

Current situation
If problems occur in the set-up of telephone communication, the user may receive a message that explains the nature of the problem. Depending on where the problem occurs, the message may be sent from the network from which the person is calling, the network which the caller is trying to access, or from some intermediate network.

Currently, networks have no reliable information about the language and cultural requirements of those using the network. Therefore whichever network issues the announcement can only realistically do so in the language of the country in which the network is located. If a person making a call is calling from their own country and the problem occurs in their home network, it is likely that the message will be understood. In most other cases it is likely that the message will be in a "foreign" language and there is a strong chance that the user will not be able to understand the message.

Some mobile networks make assumptions about the required language based upon the country of origin of the SIM card. This can lead to undesirable outcomes if the person who uses the SIM card does not speak the majority language of that country. This is often the case for tourists or people who are temporarily resident in a country.

Future scenario
Mike makes a call from England to his colleague Tatiana in Slovakia. He dials the wrong number and this is detected at the remote end of the call. The Slovakian network reads the language information from Mike's profile, and substitutes the English language message "The number you have dialled has not been recognized. Please try again" for the Slovakian standard message.

8.4 Emergency situations

8.4.1 Car crash

Issues addressed
This scenario (from [14]) illustrates:

- emergency situation;

- language preferences;

- sensor in car activating the emergency profile;

- profile data made available to emergency personnel;

- medical data in profile;

- other people's contact information in profile.

Current situation
Currently, when an emergency call is received, there is no indication of what language the caller may be speaking. If the caller's language is not understood by the emergency operator, or if the caller is communicating unclearly in a language that is unfamiliar to them, a number of problems may occur. There may be two principle problems. Firstly the caller may be unable to clearly convey the type of emergency service required and the severity of the incident. Secondly, the caller may be unable to communicate their current location, which can be a very critical piece of information in achieving a successful outcome.

Future scenario
Catherine moved from France to Sweden three months ago due to her new job. She lives with her husband Pierre near Malmö. She is interested in learning Swedish, but has not yet progressed very far with her Swedish lessons. She thinks it is OK to speak English at work and in most other situations.

As Catherine will fly from Copenhagen to Nice on a very early flight, she has to get up at five. Unfortunately it has been very cold and her car skids, crashes and she loses consciousness. Luckily, Catherine's car has a crash sensor that detects the crash, identifies the location and calls for help. As the intelligent car knows who is driving, it automatically activates the part of her profile associated with emergency situations.

Thanks to Catherine's profile the following happens:

- An ambulance will be sent to the place where the accident took place. Her profile says that she does not speak Swedish, but is very good in English. All ambulance personnel speak English, but they prefer to bring a French speaking nurse as Catherine's language preference for emergency situations is French. It is very common that people prefer their native language when they are in a state of shock.

- The ambulance personnel receive the information that she is seriously allergic to the acetylsalicylic acid (commonly used in pain killers) and might die if given it.

- When the ambulance personnel realize that Catherine is injured, they decide that she needs to be sent to the closest hospital.

- Catherine is in the ambulance and regaining consciousness but she is still in great pain. Unfortunately, she is unable to phone her husband as she is in a state of shock. Her profile contains information about who to contact in an emergency situation: her husband Pierre and it also indicates that his preferred language is French but English is also OK. The French speaking nurse initiates a call to her husband and tells him about the accident and his wife's condition. The nurse suggests that he talks to her to help her recover from her state of shock. After having talked to him for a while, Catherine calms down a bit, especially as he has told her that he will soon arrive at the hospital where they will meet.

8.5   Public access terminals

Issues addressed
The scenario illustrates:

- terminals used by multiple people;

- automatic language selection according to user preferences stored in a user profile;

- manually overriding language and cultural preferences;

Current situation
When using a public access terminal abroad, users cannot expect it to provide information in their preferred language.

Future scenario
Roberto from Italy is on holiday in Malmö in Sweden where he is invited by his old friend Ingrid. They decide to visit Copenhagen at the end of the week. When Ingrid shows him the nice library in Kungsparken, he gets the idea to use the library PC to read about interesting places to visit in Copenhagen.

His profile is automatically activated when he logs on. Roberto automatically gets information in Italian, when available, or otherwise in English, thanks to the language preferences in his profile. However, after a while, when they want to look at the information together, Italian is no longer an option as Ingrid does not understand Italian but she does understand English. Therefore, Roberto manually changes the language to English which then overrides the language preference set in his profile.

8.6   Supporting tourists

Issues addressed
The scenario illustrates:

- services and terminals support for multicultural and multilingual preferences;

- public transportation information;

- voice menus.

Current scenario
The increasing number of international tourists generates new requirements for service and terminal providers. There is a growing need to deal with multicultural and multilingual requests and to offer users information according to their preferences. Nevertheless, various tourist contexts have no or very little support in this sense. In restaurants, menus are normally provided in the local language or perhaps a very limited number of foreign languages. Thus, for tourists not understanding those languages this is a major problem as it can affect various cultural and personal requirements, e.g. halal eaters, vegetarians, Buddhist, or people allergic to certain ingredients etc. In train stations, announcements (i.e. delays, changes of track) are frequently only provided in the local language. Another issue, faced by travellers who phone a service with a voice menu, is that instructions and questions are normally only spoken in the local language. If the questions are not answered correctly, the user cannot proceed further and may not be connected to an operator.

Future Scenario

During her summer holidays, Ildiko a 23 years old student from Hungary visits Italy. She has a user profile containing her language preferences constantly available for any service at any time via her smartphone. Her first language preference is set to Hungarian for any situation including reading, writing and spoken language. When Ildiko visits a museum, her user profile is accessed and her earpiece picks up the signal from a radio frequency tag in each exhibit. This provides her with spoken descriptions of the exhibits in Hungarian. In the museum restaurant, Ildiko's smart phone shows the menu in Hungarian, pointing out the vegetarian dishes, according to her particular requirements. Ildiko uses public transportation to travel around the city. The announcements appearing on the electronic display boards, regarding the arrival times and directions of the buses, are sent as SMS messages in Hungarian to her smart phone. Two days before leaving, she phones up the local agency of her airline company. The system accesses her profile stored on her SIM card and identifies her language preferences. As a result it plays an automatic message in Hungarian stating that the voice menu is currently not available in Hungarian. Therefore, Ildiko is re-directed to an operator and she successfully reconfirms her return flight.

8.7   A person with a severe hearing loss

Issues addressed in this scenario (from [14]) include:

- language preferences;

- using data from the address book (see clause 7.6) to determine the role of the person being called (e.g. business or friend);

- choosing the communication solution dependent on the role of the person being called;

- UCI which supports negotiation to help set up a call that suits the user's preferences;

- assisting people with hearing loss, optimized by the use of personal video;

- invocation of human or automated relay service offering sign language translation.

This scenario is about Bill who is 37 years old and who has a severe hearing loss. Bill uses:

- a mobile video phone to communicate in sign language via an automated service;

- an automated system which recognizes his sign language and converts to speech in a choice of languages.

From this it is clear that Bill has access to two alternative ways of using sign language to communicate with people or services that expect spoken communication. Without a profile, Bill will have to make a decision about which of the services to use each time he makes a communication to a person or service that expects spoken communication. Having made the decision, he will have to remember how to access each of these services and then enter details of the person or service he wants to communicate with.

If Bill has a profile, this can contain details of the method for accessing each of the sign language to speech services. This profile can also contain rules that express Bill's preferences for when he uses each service. These rules can be used to automatically choose the appropriate service to use, based on Bill's judgement about when it may be worth using the more costly human mediated relay service and when the cheaper automatic service would be best. The rules about which service to use may take into account a large range of factors, including:

- the role that Bill is currently in (e.g. if he is in his business role and his company wishes Bill to have the best possible communication with business customers the company will be willing to pay for the dearer relay service);

- the identity of the person Bill is communicating with (e.g. Bill's best friends may understand and tolerate the inferior quality of communications via the automated service as they realize that it is saving him money);

- the language preference of the person Bill is contacting (e.g. if Bill's relay service is an English language service and the person Bill is contacting is German, then it will be essential to use the multi language service).

In the above examples, the profile agent that processes the rules in Bill's profile will need to communicate with various communications services and networks to achieve what Bill requires.

If a Universal Communications Identifier (UCI) [13] is used, the Personal User Agent (PUA) that controls Bill's communications would take care of all of the communications complexities. In particular, in the example in the last bullet, Bill's PUA would communicate with the PUA of Bill's German contact and discover that this contact speaks German but not English. Without this PUA to PUA communication, specifying the correct output language would be something that Bill would have to do himself (if he was aware that the person he was contacting only spoke German). If Bill and the person he was contacting did not use UCI and Bill did not know that he only spoke German, then he might choose to use the English language relay service. In such a case, everybody involved in the attempted communication would be very frustrated and embarrassed.

9   Areas for further study

9.1   User profiles

It will be necessary to standardize user profile elements that will allow products and services to respond to users' language and cultural requirements. These user profile elements would be in a form which ensures that they can be defined by users and easily stored and accessed by services. It would be necessary to address the standardization of names for different elements such as language preferences and skills, currency, measuring system, etc. Standardization of these terms will allow international services to read the elements in the profile and respond by providing appropriate content or service options as described in clause . It will also be necessary that services and devices convey relevant data in order to deliver the expected user experience.

Clause 7.5.3.2 has already identified ways in which the European Language Portfolio approach could be extended to cover competence in the use of sign languages for the hearing impaired and the future work would define in more detail a data model that maps to the Language Portfolio.

9.2   Preference and capability negotiation

The ability of systems to negotiate language and cultural options that are acceptable to a user is a crucial part of the future direction suggested by the present document (see clause 7.5.1). Four areas for future study arise from this area of negotiation:

- Research and support is needed for an approach based upon user profiles and that supports negotiation between users and communications systems. Current proposals for a Universal Communications Identifier (UCI) (see clause 4.7.1 and [12]) suggest that this could be a viable approach to supporting the required negotiation. The possibility of a large scale trial involving UCI should be investigated.

- In order to achieve the best possible match to a user's requirements, there is a need to assign varying priorities to the factors that are taken into account by the negotiation mechanism. How these priorities can best be determined will need careful study to ensure that they reflect real user needs.

- The mechanisms and algorithms which support the negotiation function need further investigation to provide a solution which delivers a successful and acceptable outcome from a user's perspective.

- There is a need for future work to develop standard assessment methods that measure language quality and cultural appropriateness of textual information. Methods are required in order that the quality measures can be automatically generated, used to tag the analyzed text, and be made available to the user and to the negotiation mechanism.

9.3   Content markup

In order to deliver the requirements in the present document, it will be necessary for software to be able to process and edit or assemble content so that it can be presented to users in ways that meet their cultural and linguistic requirements. To enable such behaviour, it will be important for this software to be able to identify characteristics of the content that can be matched against a user's requirements (contained in their user profile). Such software will need to understand things about any content that may be presented to the user in order to request a specific and appropriate variant of that content. The software may need to know things such as:

- the language in which a segment of text (or whole document) is written;

- the script/character set in which a segment of text is presented;

- alternative language/script/character set variants of a segment of text that are available;

- the language and dialect of a segment of spoken audio;

- the subject matter and context of the spoken or written content;

- characteristics of images that may be culturally relevant (e.g. certain images will be unacceptable to some cultures, hence these must be identifiable).

All of the above represent metadata about content or about sources of content.

A similar need for metadata will occur when the user's software agent tries to assess which variant of an input mechanism should be requested. Examples of such metadata could include a description of:

- the language and regional/dialect variants of spoken input that can be recognized by a speech recognizer;

- the input languages that a form processing application will accept.

Many of the standards and guides referred to in clause 4.9 (e.g. DITA and XLIFF) describe such metadata. However many of the standards have been written with the objective of providing support for the human or machine translation process and not for processing by user agent software. It is likely that new standards or significant variants of these existing standards will need to be written to ensure that they are suitable to support the requirements identified in the present document.

The method of specifying languages, both in describing user language preferences and in labelling the language of content, should be in conformance with BCP 47 [24].

9.4   Time zones

There is much scope for advanced support for time zones (see clause 7.6.5). This support needs to take into account all aspects of people's needs in relation to time zones and should not apply simplistic rules that change the times that users have entered into their calendars. Research will be needed into the design of rules for time handling that are in line with the widely ranging strategies that users may choose to adopt.

Negotiation mechanisms to agree a time between users, or between users and a service, will need to ensure that the times they are negotiating are accompanied with information that identifies the associated time zones. This points to the need to develop scheduling software that stores and shows times together with the associated time zone.

Where sources of time zone data are available (e.g. the tz database - http://www.twinsun.com/tz/tz-link.htm), they will only improve the handling of time zones if the data is made available in ways that are easy for software agents to process. Currently, these sources do not meet this criterion well, and improvements will be required if poor handling of time zones is to be avoided.

## 9.5		Speech related technologies

Currently TTS engines (see clause 4.4) are mainly used in the context of hands-busy situations, the main domains of application being telecommunications and tourism. Nevertheless, these applications have a very significant potential and their domains of use should be extended. Moreover, in order to increase considerably the target audience, the number of languages supported should be augmented, and certain cultural preferences, such as regional accents, should be taken into account.

An important task of the standardization organizations is to identify standardization activity that will help to improve the capabilities of all TTS engines, regardless of their provider.

In order to extend the use of speech recognition systems, it is important to try to decrease the time allocated to training each time a different device or service is used. A speech profile, based on accumulated training data, which could be accessed at all times by all applications and devices, could be a potential mechanism for reducing the need for users to have to repetitively train speech recognition systems.

## 9.6		Language identification

The performance of language identification (see clause 4.6) could be enhanced if the applications could access the user's profile where the language abilities of a user are specified. This could be specifically useful for foreign speakers and people with speech impairments.

## 9.7		Translation related technologies

Developing multilingual standardized terminologies (see clause 4.9.1.1) for specific domains and services can be seen as a major step forward in the field of internationalization and localization. Knowledge sharing and transfer of translation memories data, could contribute to considerable advancements in the translation domain, specifically those related to certain industries, such as health, technology and emergency services.

## 9.8		Widening the concepts of language

Throughout the present document, a broad approach has been taken to the meaning of language. People with various disabilities use languages that are significantly different to those that are most commonly considered by the language technology community. However these languages are just as valid as any other language, and should be considered equally seriously when exploring how a person's wish to use their own language can be met.

Sign languages, that deaf and hearing impaired people throughout the world use to communicate, have been examined and two areas of inferior language support have been identified:

- Smart card standards are unable to identify any form of sign language as the owner's preferred language as a two character code [25] is used for language rather than a 3 character code [26], and the language code for sign language(s) is the 3 character string "sgn" (see clause 4.9.10).

- Instead, use of sign language is coded amongst the disability data and not the language data. This approach would complicate or even defeat future applications that wish to read language information from a person's smart card and provide them with a suitable service option e.g. provide a signing avatar as the output mechanism for signing users.

- A single language code "sgn" is used as the language identifier for all sign languages. Although it is possible to specify national variants by appending a language or region code [29], [30] e.g. sgn-uk, many applications only support the basic language code and not the country and region variants. Where this is done, the language will be identified only as a sign language, but as identified in clause 4.9.3, the sign languages used in different countries can be almost completely different from each other. Whereas a simple indication of "sign language" may be acceptable in limited national applications, in a global ICT environment the current approach will be of no use. It would be completely inadequate in helping to identify the correct sign language to be used by a signing avatar application or the signs to be recognized by a sign interpretation application.

The standards used for storing a person's language requirements in a user profile or smart card should therefore be capable of storing the language in a way that allows a coding for a specific national sign language to be stored.

Most of the language coding standards listed in clause 2 were originally drafted in the context of written languages. In practice, they are now being applied more widely and are extensively used in the context of spoken language applications. There has been a long-standing debate about how languages should be categorized and about the significance of factors such as regional language variations (dialects) and accents. This debate may be simplified somewhat by considering the following:

- When considering the language used for presenting information in textual or spoken form, the details of dialect and accent may be relatively unimportant. In most countries, citizens will be familiar with and generally accepting of information written in or spoken as a "standard" form. This standard form may be the default form taught in schools, the form used by the national media, or some variant of these. In most circumstances it will be acceptable and effective to deliver content in this standard form and it will be unnecessary to provide a version closely tuned to the recipient's specific regional or social variant of the language. People from other countries who have learnt the language are also likely to be most familiar with this form of the language.

- In certain situations where people are required to enter information into an application (e.g. for when completing an online tax form), they will adapt the language they use to conform to expectations of the required "correct" form of language. Words that they might use in day-to-day conversation with other people from their region would be substituted for the official language version. This tendency can reduce the need for applications to have to try and recognize and understand every dialect word that they could in theory encounter.

- In contrast to the simplifications above, when using speech recognition technology, every minor variation from the "standard" vocabulary and way of pronouncing words represents almost an independent and unique language variant. Each variation from the "standard" form represents a potential reduction in the accuracy of the speech recognition.

- It would be fruitless to try to categorize all of these potential variants in fine detail as it would be unrealistic to expect that specialized speech recognition engines could be produced for each one of these huge number of minor variants. In application fields such as speech recognition it will be important to identify the most significant factors that impact speech recognition accuracy and attempt to ensure that these are listed in a person's user profile. This might include region of birth, place of current residence, any speech impediments such as a stammer. In all of these cases, it would seem unnecessary to define these combinations of factors that may affect speech recognition accuracy as separate language variant.

Ongoing work in the IETF on " Best Current Practices" (BCP 47 [24])recognises many of the points above and it is hoped that this may be improved when this work finalises and is adopted.

The current standards for coding the characters used in textual information [40] enable all characters to be coded. However, the characters used in some languages (e.g. Lithuanian) are coded by combining elements together into what are termed decomposable characters instead of being represented by the more common and simple base characters. Whereas this allows these characters to be stored, communicated and represented accurately on screens, the software that processes the text needs to handle them differently. Most software will recognize a continuous string of ordinary character as a word and the application logic that controls features such as word wrapping will treat them as such and not split words across lines when a page is reformatted. However this same application logic could fail to correctly interpret these decomposable characters as an integral part of a word. Frequently this can cause what is seen by the user as a word to be split across two lines by the application logic that does not correctly handle the word.

Fortunately, all of the latest versions of computer system software correctly handle decomposable characters, so it is clear that industry is providing robust solutions to the existing problems that can occur with decomposable characters. Until system software that correctly handles decomposable characters is universally deployed, the writers of software applications will need to understand these complexities (which may only emerge when an application is localized) and ensure that their application logic can treat the text in ways that users will see as logical.

9.9 Mobile telecommunication devices and services

The dynamics of the mobile telephony market are such that many people change their telephone handset on a regular basis and frequently this involves changing to a handset made by another manufacturer. To ensure that users remain able to operate the language and cultural settings of their mobile handsets, then:

- similar language and cultural settings should be available in the handsets of all manufacturers;

- the methods of accessing those settings should be provided in similar ways.

The adoption of EG 202 132 [11] will make a significant move in this direction (see also clause 4.9.9). Therefore its adoption should be encouraged.

To support automatic selection of the correct text messaging word completion language (see clause 7.6.4.3), it will be necessary for address book entries to be able to store the appropriate language with each address book entry. To allow text messaging to benefit from this capability, it will be necessary for mobile terminal software to allow the user to choose the recipient of the message before the message is typed.

The standard chosen by the mobile industry [18] gives two optional ways to code the characters sent in SMS messages. The single byte code specified in the standards is sufficient to code the characters used most frequently in many of the languages used within Europe. It is when this coding is used that the commonly recognized 160 character limit for a single SMS message applies. To write the characters that appear in the alphabets of many European languages that are missing from the set of single byte set, the whole SMS message will have to use the two byte coding, and the length of message is reduced to a very restrictive 70 character length. By avoiding the use of letters that are not in the single byte set, users from all countries can send 160 character messages. However, if a user enters a single letter that is outside the single byte set, the message that is being written will be split into 70 character segments and sent. Thus, by using just one legitimate letter from their national alphabet, a user can treble the cost to them of the message that they send.

There is no immediate and quick fix to the above regrettable situation with regard to SMS messages. What this example does illustrate is the importance of giving very full and well informed consideration to all of the potential language and cultural aspects of a system in the initial design stage. It is clear that the amount of global communication is increasing at the same time as expectations about the importance of fully supported and respecting all languages is growing. It is clear that situations in which people who speak certain languages will experience discriminatory treatment when using a global service will be even less acceptable in the future than they are at present.

9.10   Application of standards

As is evident from the list of references in the present document (clause 2), there are many standards and guidelines related to enhancing the support for language and culture in ICT.

At present the awareness of the appropriate standards and guidelines is relatively low. In order to see continued enhancements to the handling of language and culture, it is important that these standards and guidelines are brought to the attention of, and used by, the designers and operators of all ICT products and services.

Widespread dissemination of the present document should provide one valuable way to help to achieve this outcome. However, this will only prove effective if the recommendations within the present document are applied at every opportunity.

9.11   Public policy

SMEs make up 99,8 % of the European Companies, which amounts to 80.8 million employees in the European workforce. Therefore, SMEs should be made aware of, or provided with, clear localization and internationalization guidelines in order to enable them to satisfy customers with varying national languages and diverse cultural traditions.

European policies should be developed in order to encourage organizations to satisfy multilingual and multicultural requirements of both customers and employees.

10   Strategic conclusions

The top level requirement (Requirement 1), that underlies the approach taken throughout the present document, states that:

- When communicating with another person or accessing an information service, users wish to do so in a manner compatible with their language and cultural preferences.

Achieving this aim will require a number of key activities, as described in clause 9, including:

- the development of a standard that specifies language and cultural preferences that should be included in user profiles;

- the maximum exploitation of existing standards and guidelines;

- extending the scope and field of application of these standards and guidelines;

- better co-operation, synchronization and general synergy between related standards activities in the formally structured standards bodies and between these bodies and the differently organised, more open, standards making activities such as those in the IETF and W3C;

- conducting research into better ways to ensure that a correct matching is made between a user's language and cultural requirements and the capabilities offered by services;

- continued improvements in the quality of technical solutions such as speech recognition and text to speech.

At present, the inability to accurately identify the potential audience for translated or interpreted content significantly reduces the opportunities to deploy it. If it cannot be successfully deployed then there is little point in creating it. This inability is a significant barrier to the demand for the localization of content.

By following the recommendations within the present document, the ability to identify what language and cultural variant of a service is required by any user should be greatly increased. Once this can be achieved, the opportunities to deliver translated or interpreted content to the appropriate audience should also be correspondingly increased.

An inevitable outcome of efforts to meet the top level requirement is that greater use will be made of automatic translation and interpretation solutions. Nevertheless, it is likely that there will be a correspondingly increased demand for the superior quality that can be achieved by professionally translated or interpreted content. It is probable that the localization market will greatly increase by a combination of:

- a large increase in automatic translation/interpretation for dynamically changing and lower value content;

- a corresponding increase in human translation/interpretation for slower changing and/or high value content.

This change in the localization marketplace that could arise from following the proposals in the present document should provide significant benefits for:

- users;

- technology solution providers;

- companies that provide translation/interpretation services.

Annex A (informative):
Requirements summary

Requirement 1: Top level Requirement
When communicating with another person or accessing an information service, users wish to do so in a manner compatible with their language and cultural preferences.

Requirement 2: Setting up an ICT service
Users initiating an ICT service require that the user interface available to set this up reflects their language and cultural preferences.

Requirement 3: The language of an ICT service
Once an ICT service has been established, users require that the communication process is conducted in their preferred language and culture.

Requirement 4: The language of a received communication
If the communication is an incoming one, initiated by a service or another individual, the recipient will require that the communication is conducted in their own preferred language and culture.

Requirement 5: Variation of preferred language dependent on context
Users require the capability to make the preferred language of an ICT service dependent on the context of that service.

Requirement 6: Matching language preferences and capabilities
Where the preferred language of the user initiating an ICT service and the default language of the service (or preferred language of the receiver of the communication) are different, users require a language solution that suits the requirements and capabilities of both.

Requirement 7: Action with no common language
Where no mutually acceptable language is available to the initiator and receiver of a communication or between a service and a user, a translation or interpretation service should be offered wherever possible.

Requirement 8: Overriding system language choice
The user should always be given the opportunity to override the language provided automatically by a service or terminal.

Requirement 9: Handling of emergency service communications
Users require that calls to emergency services are handled in their own preferred language (language identified, appropriate operator contacted, or interpretation provided; achieved with minimum delay).

Requirement 10: Contacting the emergency services
Users require that their own national method of contacting emergency services is applicable in whatever country they happen to be in.

Requirement 11: Avoiding repetition of language and culture preferences
The user should not have to continually specify their language or culture preferences each time a communication is initiated.

Requirement 12: Consistent interpretation of language and culture preferences
Users will expect to find that the application of their language and cultural preferences produce consistent outcomes, across service variants and media.

Requirement 13: Consistent application of language and cultural preference changes across devices and services
Users require that if they change a language or cultural preference on any device or on any service, then those changes will be automatically applied to all other devices and services that they use.

Requirement 14: Privacy
Users require that their preferences and capabilities related to language and culture should be stored in a secure manner with user agreed levels of privacy applied to the availability and distribution of that data.

Requirement 15: Language independent cultural preferences
Cultural preferences should not be affected by language changes. They should remain consistent with the user's settings.

Requirement 16: Accuracy of translated information
If a user is presented with information or a communication which has been translated the following information should be available where possible:

- the original language;

- whether machine or human translation;

- an indication of the special competence of the translator (e.g. technical, legal);

- the number of subsequent translations.

Requirement 17: Ability to specify and change language and cultural preferences
Users require the ability to specify their communication preferences for culture or language and to subsequently change them.

Annex B (informative): Recommendation summary

B.1 Acquisition of language and cultural preferences

Implicit methods - adaptive personalization

Recommendation 6.7.2.a:
Users should be given the opportunity to get information about the original cultural and language preferences and the preferences inferred by the adaptive system.

Recommendation 6.7.2.b:
When cultural and language preferences have been changed due to implicit methods, then it would be necessary to offer the user the possibility to toggle between the new cultural and language preferences and the original preferences whenever they wish.

B.2 Localization and internationalization

Recommendation 7.1.a:
Best-practice localization tools, techniques and guidelines from other sources should be used in addition to the recommendations made in the present document (see clause 4.9 for some suggested sources and approaches).

Recommendation 7.1.b:
Organizations may need to produce an internationalized version of their product or service, which can be localized to as many locales as is necessary and commercially viable.

B.3 User profiles

Recommendation 7.2:
A system that allows a person's user profile to be created, managed and accessed should be supported in order to enable many of the other recommendations in the present document to be achieved. Support for the approach defined in EG 202 325 [14] will satisfy this recommendation.

B.4 Inferred language and cultural preferences

Language preferences inferred from information about a user

Recommendation 7.3.1:
Systems should make use of user preferences, when available, to configure system behaviour and not make assumptions about their language and cultural preferences based upon other sources of information.

Independence of language and cultural preferences from the location of a user or information source

Recommendation 7.3.2:
Users may wish to define their language and cultural preferences to be different from their content preferences related to a certain country or region.

B.5   Separation of language and cultural preferences

Recommendation 7.4:
Users should be provided with options to set language and cultural preferences (such as weight and currency) separately.

B.6   Language

Choice of language - Negotiation

Recommendation 7.5.1.a:
Users should be provided with functionality that enables automatic or manual negotiation between two or more people.

Recommendation 7.5.1.b:
Users should be provided with functionality that enables automatic or manual negotiation support between people and services.

Recommendation 7.5.1.c:
The user should be provided with some means to define factors that will affect the choice between alternatives.

Description of language skills

Recommendation 7.5.2:
User Profiles should be capable of holding information that describes a user's skills in a number of languages.

B.7   Language and cultural capabilities of services and terminals

Language and cultural capabilities of services and terminals

Recommendation 7.6.1.a:
The language and cultural capabilities of services and terminals should be available in both human and machine readable form.

Information on language and cultural capabilities

Recommendation 7.6.1.b:
 Services need to provide information about their language and cultural capabilities.

Recommendation 7.6.1.c:
Information on language and cultural capabilities should be available in both human readable form and machine readable form.

Recommendation 7.6.1.d:
Users should be clearly notified when their language or cultural preferences cannot be met and what outcome has been achieved.

Setting up language preferences for complex multilingual situations

Recommendation 7.6.2:
Multilingual users may wish to define language preferences that vary dependent on factors, such as the people with whom they communicate, and on a variety of services and situations (e.g. whether they are in a private or business context).

Information provided in two modes and two languages

Recommendation 7.6.3:
Users should be able have different language settings simultaneously in multimodal applications.

Writing text in a range of languages - word completion

Recommendation 7.6.4.a:
Users should not have to manually change language settings each time they wish to send a message to a person in a different language.

Writing text in a range of languages - spell checking

Recommendation 7.6.4.b:
In order to benefit from the advantages of using a spell checker, users should not have to manually change language settings each time they write an email message that is in a different language from their current language setting.

Flexible use of diacritical marks

Recommendation 7.6.4.c:
Words with diacritical marks should be presented as a result of a search operation whether or not the diacritical mark has been stored or input.

Time zones

Recommendation 7.6.5.a:
Applications should either:

- not alter user entered times under any circumstances;

- notify the user each time that an attempt is made to amend a user-entered time;

- notify the user that a rule will be run that will amend several user-entered times in one operation.

Recommendation 7.6.5.a:
When it is necessary to negotiate times on behalf of users (see clause 7.5.1), it is important that the negotiation process knows both the required time and the associated time zone for both of the negotiating parties.

Emergency service centres

Recommendation 7.6.8.a:
An emergency service call centre will need a means to gain access to the user profile of a person calling the emergency service.

Recommendation 7.6.8.b:
The emergency service provider may need special permission to access disability, medical, language and cultural preference information that might be denied to other categories of people communicating with the user.

Recommendation 7.6.8.c:
Care should be taken in using CLI information to predict the language requirements of the caller.

Relay services - Human simultaneous translation/interpretation

Recommendation 7.6.9.a:
Access to user profiles will enable the relay operator to be pre-warned of language compatibility issues. The operator can then either invoke automated support or pass the call to a more suitably qualified person.

Textphone relay services

Recommendation 7.6.9.b:
It should be unnecessary to dial special numbers if providers exploit the full capabilities related to user profiles to relay services.

Automated relay services

Recommendation 7.6.9.c:
Access to user profiles of both called and calling parties will enable the system to allocate appropriate translation/interpretation facilities. (Choosing a specific speech recognizer or text to speech engine).

B.8 Organizations (including businesses)

Support required for organizations (including businesses)

Recommendation 7.7.a: Adhering to national legal requirements
When setting up communications, services should take account of relevant national legal requirements, which may vary significantly from country to country and which may have a significant impact on transactions of both organizations and individuals.

Recommendation 7.7.b: Respecting organizational culture
Services should wherever possible take account of the language, national culture and the organizational culture of every party concerned. In many circumstances the culture of the organization can place more constraints on communication than those created because of national culture and language.

Activities to be carried out by organizations (including businesses)

Recommendation 7.7.c: Adhering to national legal requirements
Organizations should take into account the multicultural and language-related requirements and preferences of customers, employees and other organizations.

Annex C (informative):
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History

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