# POSEiDON

**P**ers**O**nalized **S**mart **E**nvironments to increase **I**nclusion of people with **DO**wn's sy**N**drome

## Deliverable D2.5

# Report on Standards

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# Contents

# 1. Introduction

The aim of the standardisation work of this project has been to combine the already available knowledge concerning people with Down's syndrome with the knowledge and best practise which has been confirmed or created by the POSEIDON Project. It then worked to identify current or imminent standardisation activities to which this knowledge can be passed. The work has involved both inward communication with the standardisation team and outward communication with suitable standardisation experts.

The aim of this report is to document how the POSEIDON project was able to communicate with and share knowledge with standard writers in order to share the best practice knowledge with respect to the design of technology used by people with Down's syndrome gained during the POSEIDON project. The project was able to share knowledge with respect to design for all and personalisation and with respect to some of the detailed interface design work involving mixed methods of communicating (text, images and photographs).

During the project best practice knowledge was acquired and used with respect to the methodology to be used when working with young adults with Down's syndrome, with respect to the design of technology to be used by these people and with respect to personalisation and evaluation.

Not all the knowledge acquired and verified during the POSEIDON project was able to be transmitted to standards writers. This was for two reasons;

- Firstly due to the difficulty of framing all of the knowledge into appropriate terminology and concepts to fit the standardisation environment.
- Secondly due to the time frame of the project and the need to fit in with the timeframe of relevant standardisation activities.

In spite of these difficulties successful contact was made with a number of standardisation groups and knowledge sharing is currently ongoing.

By sharing the relevant knowledge gained on the POSEIDON project with standard writers the project acquired a legacy with respect to how systems that meet the needs of all users including those with Down's syndrome can be met.

**Please note**

This report does not cover the use of generic technical standards used by the project team for the creation of the software such as HTTPS or JSON. A full list of all the generic standards would demonstrate those standards needed to create working systems but would not identify the specialist activity of the POSEIDON project.

# 2. Attributes of People with Down's syndrome

People with Down's syndrome are not a homogeneous group but there are a number of common attributes and common behaviours which can be identified using theoretical and practical work. These factors can be used both to inform the design of technology and to inform the writers of standards to ensure that products, services and systems which are created and maintained following these standards are accessible by people with Down's syndrome. With respect to the design of ICT systems, products and services for all people including people with Down's syndrome it is important to consider both the physical and cognitive abilities of the end user. It should be noted that ` All

people with Down's syndrome experience cognitive delays, but the effect is usually mild to moderate'[1].

The increased life expectancy of people with Down's syndrome (from 25 in 1983 to 60 today[1]) has served to widen the range of interests, skills and competencies demonstrated by them. This has further served to reduce the homogeneity of this group. The work of the POSEIDON Project focused (but not exclusively) on the needs of young adults with Down's syndrome and their family members, carers and support workers. Although people with Down's syndrome have an increased chance of developing dementia as they age[2] this is not normally apparent until their sixth decade[3]. The choice of volunteer subjects and the scope of this research did not consider this aspect of their lives and the standardisation needs of people with dementia was only considered theoretically but was not part of the prototype testing.

A number of organisations exist that provide advice and help for people with Down's syndrome, their families, friends and carers (intermediators)[4]. The changing nature of the lives of people with Down's syndrome has been identified, `Adults with Down's syndrome in some countries are now leaving home, living independently with varying degrees of support, holding down jobs, forming relationships and generally getting the most out of life.'[5]

The use of technology to benefit young adults with Down's syndrome to function effectively and happily has been researched into, it was discovered that `Young individuals with Down's syndrome are using a variety of computer applications and computer related devices, and computers and computer-related devices play important roles in the life of individuals with Down's syndrome'[6].

The role of the POSEIDON project and the importance of the standardisation element can be seen to be an obvious next step by transferring knowledge of the both the common and varied needs of people with Down's syndrome. The standardisation results of the POSEIDON project, their variety and the way they link to usability standards for people with and without disabilities are not surprising. This variety serves to show that it is not the medical diagnosis but the individual needs that determine the design of ICT products, systems and services, but that common ideas exist which can be passed to standardisers and designers.

## 3. The Aim of the POSEIDON Project

The aim of the POSEIDON project was to;

[1] National Down Syndrome Society, Down Syndrome the Facts http://www.ndss.org/Down-Syndrome/Down-Syndrome-Facts/

[2] Head E, Silverman W, Patterson D, Lott IT. Aging and Down Syndrome. Current Gerontology and Geriatrics Research. 2012;2012:412536. doi:10.1155/2012/412536.

[3] Aging in Down Syndrome: morbidity and mortality. Torr J.; Strydom A.; Patti P.; Jokinen N. Journal of Policy and Practice in Intellectual Disabilities); 2010 Vol. 7, p70-81, 12p. Document Type: article; (AN JPPID.G.GJ.TORR.ADSMM) [Citation Record], Database: EBSCO Publishing Citations

[4] Organisations of and for people with Down Syndrome see http://www.dhg.org.uk/links.aspx?umbrella

[5] Down Syndrome International, Adults 18+ General https://ds-int.org/resource/adults-18-general

[6] Feng, J., Lazar, J., Kumin, L. and Ozok, A., 2008, October. Computer usage by young individuals with down syndrome: an exploratory study. In Proceedings of the 10th international ACM SIGACCESS conference on Computers and accessibility (pp. 35-42). ACM. http://dl.acm.org/citation.cfm?id=1414480

` ….exploit ICT as an instrument to inclusion in society, to increase the quality of life and support independence for people with Down's syndrome…..Personalisation is one of the key elements in achieving our vision'.[7]

`Personalisation in POSEIDON means we are aiming to meet the needs of individuals with Down's syndrome in ways that best suit their learning and communication profiles and ensures an optimum user experience. The abilities may vary significantly for people with Down's syndrome. For the primary end users, the personalisation may mean ordinary ICT-related accessibility and implementation of special features to meet their abilities in best possible ways.'[8]

This personalisation approach was used extensively within the project, it combined the use of best practise accessibility regulation (as encapsulated in accessibility standards), with the use of personalised design elements. It therefore followed a `design for all approach' with the addition of customisable elements. This approach, and the effect of the use of this approach resulted in the project producing information which was relevant to current standardization activities with respect to the design of ICT products, systems and services for people with cognitive impairments.

## 4. The potential benefit of standardisation to people with Down's syndrome

Standardisation can function as a bridge to existing knowledge on how to design with inclusive approaches for designers and developers that are not familiar with best practice. Qualities in design that will improve the situation for persons with Down's syndrome can be encapsulated in the standard and transferred into the design processes. Designers who follow the standard will automatically create better solution for people with Downs Syndrome, without having to know their exact and specific needs. For members of user groups whose requirements may be out of the direct scope for the current design process this might be the only way to be "represented" in the design process.

The International standards organisation (ISO) definition of a standard is `A standard is a document that provides requirements, specifications, guidelines or characteristics that can be used consistently to ensure that materials, products, processes and services are fit for their purpose'[9].

Fit for purpose for an ICT product or system would mean being usable by the full range of likely users, likely users include people with cognitive impairments including people with Down's syndrome and their carers but not all designers or specifiers know this or are aware of their specific needs. Standards can be used to ensure that designers and specifiers who do not have the specialist knowledge of how to design for people with a range of cognitive impairments and other associated health conditions, can be enabled to meet their needs.

The POSEIDON project was user centred and used existing research methods in a co-creative manner, for example during the workshops in the beginning of the project, where persons with Down's syndrome played computer games and carried out similar activities, to investigate their motor abilities and interests for gaming. The results of this research will hopefully be used to produce new ICT products which increase the quality of life and support independence for people

[7] http://www.poseidon-project.org/about/
[8] http://www.poseidon-project.org/wp-content/uploads/R2-review-2-POSEIDON-personalisation-V3-final.pdf
[9] ISO, What is a standard? http://www.iso.org/iso/home/standards.htm

with Down's syndrome (both within the POSEIDON project and afterwards). In addition the products being developed have a particular application to people loosing cognitive skills associated with dementia. People with Down's syndrome are at a higher risk of developing dementia, in which the progressive nature of the disease causes skills and cognitive ability to be lost[10].

Research and work on "accessibility" and individualized adaptability of systems have led to the development and continuing development of standards and projects within the domain of accessibility and individualisation. There exist international standards such as the ISO/IEC 24751:2007, which are currently being revised now to better reflect current practice and technology, which can be updated to incorporate the needs of people with cognitive impairments. One major principle of these standards and work is that there is no specific category of people with disabilities such as cognitive or functional disabilities e.g. blind, deaf, uncontrolled movements etc., instead they are being created to meet the needs of the individual. We all have different preferences for how IT should adapt for the individual to be usable (and/or understandable). Personal preferences could be "High contrast" – "captioning" – "transcribed/described audio" – "simple user interface" etc. In addition, these preferences could need to be adapted during the day, or based on the location, or based on the surroundings. For instance If we are in a noisy environment, we would like to have audio-described, and captioning. If we are outside in the sun, we would like to have high-contrast to avoid glare, and many other examples can be identified. In this regard the work on context awareness done in the POSEIDON-project has international relevance.

# 5. POSEIDON Contribution to Current Standardisation Activity

The aim of this section is to cover knowledge gained or used in the POSEIDON project which could potentially be useful to the standardisation field. The transfer of knowledge focused on (and will focus on (the work is ongoing)) the special needs of people with Down's syndrome as a subset of the people with a cognitive impairment.

## 5.1) Terminology

Cognition can be described as an umbrella term for how our brain manages attention, judgement, evaluation, calculation, memory, time, language, thinking, problem solving, planning, prioritization, selection, or to refrain irrelevant and unwanted behavior. With a brief description; to take in, process, and then use the information.

Cognition is the understanding, integrating and processing of information that includes abstraction, organization of ideas, reasoning, analysis and synthesis. Cognition is dependent on a number of functions including:

1) Global functions such as

- Intellect
- Consciousness
- Energy
- Motivation

2) Specific mental functions, such as

[10] Adams, D., & Oliver, C. (2010). The relationship between acquired impairments of executive function and behaviour change in adults with Down syndrome. Journal Of Intellectual Disability Research, 54(5), 393-405. doi:10.1111/j.1365-2788.2010.01271

- Perception
- Attention
- Remembering
- Learning
- Communication (verbal, non-verbal)
- Reasoning
- Problem solving
- Decision making
- Reading
- Estimating and calculating

3) Affective functions, such as

- Emotion
- Mood
- Regulation

Cognitive impairment

A **cognitive impairment** occurs when a **cognitive ability** is so reduced that it seriously affects how an individual functions in daily life. A cognitive disability occurs when factors in the environment contains barriers preventing persons with cognitive impairments from participation and activity. **Cognitive accessibility** is the extent to which products, systems, services, environments and facilities can be used by people from a population with the widest range of cognitive characteristics and capabilities to achieve a specified goal in a specified context of use.

Impairment is a problem in body function or structure. Disability is an umbrella term for impairments, activity limitations, and participation restrictions. It denotes the negative aspects of the interaction between a person's health condition(s) and that individual's context (environmental and personal factors).

What is considered to be impairment and what is experienced as disability varies over time and is influenced by a complex interplay between many factors. When using the term cognitive disability, the underlying understanding of that term is "a person with cognitive impairment experiencing disability". It is important to recognize that there is no disabled person but there are people who experience disability due to a lack of cognitive accessibility.

Disability may be difficult to understand. Cognitive impairments are sometimes invisible and often manifested in a way that might cause other people to moralize or have a hard time understanding why something that they regard as easy can be difficult for someone else. Cognitive impairments may sometimes manifest in such a way that they create anxiety and uncertainty in other people.

Some examples of abilities that can be affected:

- Ability to plan, initiate, carry out and terminate activities;
- Ability to organize thoughts and activities;
- Ability to sustain attention, concentrate on important stimuli/information and ignore distractions;
- Ability to multi-task (i.e. to divide attention among several operations, tasks or individual task elements);
- Ability to maintain skills (e.g. how to drive a car);
- Speed in performing tasks/activities and in responding in a timely manner;

- Ability to store and retrieve information (e.g. remember episodes in relation to time, recall facts);
- Ability to perceive information (e.g. accurate and fluid word recognition);
- Ability to learn;
- Ability to make generalizations and associations;
- Ability to solve problems including recognizing the problem, identifying, choosing and implementing solutions, and evaluating outcomes;
- Ability to understand and/or express oneself (e.g. comprehension, communication, speech, fluency, writing, repetition, naming, signs, symbols);
- Capacity for self-control and self-motivation (including increased irritability, rigidity, lower stress tolerance, confusion, disorientation, anxiety, loneliness and depression);

Down's syndrome often leads to mild or moderate impairments connected to thinking, learning, attention span and judgment. Therefore current standardization activity designed to benefit people with cognitive impairments will be relevant to people with Down's syndrome.

### 5.2) Research with End Users

The development framework of this project included following three methodologies for working with end users consisting of R4C-AS (methodology for requirements elicitation in context aware systems), UC-SDP (user centred development process) and eFriend (ethics framework).

### 5.3) Attitude to People with cognitive impairments.

The current research and standardisation activity focusing on people with cognitive impairments including the work on the POSEIDON project is changing the way in which we view people with cognitive impairments. The aim of this work is to increase the quality of life of all people to benefit and to support independent living. The POSEIDON project has particular relevance for the standardisation activities focusing on individualisation and ICT-accessibility both with respect to the content and the aim and approach of the standards to serve to include people with cognitive impairments including people with Down's syndrome.

### 5.4) Interface

There is a wide range of user requirements for interface design within the community of people with Down's syndrome. The interface to the POSEIDON artefacts had therefore to meet accessibility standards and be personalisable to the specific end user. There exists many standards with regard to user-interfaces and user-interface design and icons to be used for common functionalities[11]. Unfortunately none of these standards are currently being updated so the POSEIDON project could not pass information on the requirements of end users with cognitive impairments to them. The project therefore benefited from the existing content of these standards but could not contribute to their updating.

POSEIDON guidelines for developing accessible user interfaces[12] are based on the principles of universal design, European standards for making information easy to read and understand, guidelines for the development of accessible mobile interfaces by associated project partner Funka, and Cognitive Accessibility User Research of W3C. Karde has compiled the guidelines, which includes

[11] ISO/IEC JTC 1/SC 35 - User interfaces http://www.iso.org/iso/home/store/catalogue_tc/catalogue_tc_browse.htm?commid=45382&published=on

[12] Poseidon Deliverable D4.5 HCI user and developer manuals, Appendix 1: POSEIDON guidelines for developing accessible user interfaces http://www.poseidon-project.org/wp-content/uploads/2015/11/D4.5-v1-HCI-user-and-developer-manuals.pdf

POSEIDON-specific recommendations. While accessible user interfaces are most important for the users with cognitive impairments, much of the guidelines are generic and also applies to secondary user applications.

### 5.5) Security and Privacy

The POSEIDON project has created and evaluated a number of apps specifically aimed at assisting people with Down's syndrome. The apps can run on either a tablet or a smartphone. The use of the tablet or smartphone presents issues of privacy or security and consideration needs to be made as to how standards can be used to keep users with cognitive impairments safe and also how they can be used to support users with shared use of a device with a carer or parent (primary and secondary users). This is particularly important due to the increased use of smartphones to control items in the built environment, to enable access to financial systems and to hold personal and identity information.

The data protection rules in the EU are currently being updated, the regulation and directive has just been published, they will come into force in May 2018. The objective of this new set of rules is to give citizens back control over of their personal data, and to simplify the regulatory environment for business.

Privacy and security standards need to be carefully designed for people with cognitive impairments when using smartphones as there may be conflict of interest between the user and the carer on the management of information, in addition the practical management of devices and information may be more difficult (remembering to turn tracking off and on, managing personal information etc).

### 5.6) Requirements Intermediators (carers, family members and other supporters).

Many people with Down's syndrome (even those who are adults) rely on the support of family-carers in order to achieve many life goals. The needs of the individual with Down's syndrome need to be paramount, especially as, in some cases, their needs and those of their carers could be in conflict e.g. wanting to be more independent, staying out late, socialising in a way that a parent might night not approve.

An intermediator[13] is often a trusted person (from family, an organization, a friend) The role of the intermediator is to be both sender and receiver of information up to a point when the participant decided to participate and to trust the researcher or the project leader. From that point the intermediator shift to a reminding, supporting and encouraging role. Another important task is to act as mediators if something goes wrong during a meeting. It might happen that someone becomes very upset, sad or angry and in such a situation the intermediator's role is to prevent an escalation of the situation. An interesting observation is that almost all participants, if needed, also acted as temporary intermediators or mediators. For example participants often calmed things down if someone was acting out too much. A similar approach is described by Dee and Hansson,[14] where they use a manager to match participants from a pool of users with a suitable supporter.

### 5.7) Navigation

One important form of data in POSEIDON is that of routes for navigation. A route defines a way from a start to a destination, and is used to provide instructions guiding the user and to track progress and

[13] Johansson, Stefan, Jan Gulliksen, and Ann Lantz. "User Participation When Users have Mental and Cognitive Disabilities." Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility. ACM, 2015.

[14] Dee, Marianne och Hanson, Vicki L. ACM, 2014. Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility. ss. 35-42.)

detect deviation. The POSEIDON project could not find any non-commercial standards instead the data model has been based on two of the most significant route planning systems – Google Directions and OpenTripPlanner. Their conceptual models are similar, resulting in a POSEIDON model which can be compatible with route data from either service.

### 5.8) Shared Data (Calendar and others)

A common form of shared data is for calendar events. It seems that the closest thing to a standard for exchange of calendar data is the iCalendar format[15] . The POSEIDON project made use of Google's Calendar service for storage of the events, so that data could be exchanged in their format with the option of adding custom fields. Two other forms of shared data is the definition of product and shopping lists for the money handling aspects of the system, and a video play list. These are fairly simple, and have recently been added to the framework to make sure applications are interoperable. As with other forms of data, content is typically input by carers and then transmitted to the primary user applications. No standardisation has been considered yet.

## 6. Current pan-disability standardisation activities of relevance to people with Down's syndrome

Currently high level pan disability standardisation activities have the potential to benefit people with Down's syndrome.

### 6.1) European Accessibility Act

The European Accessibility Act will set common accessibility requirements for certain key products and services that will help people with disabilities at EU level to participate fully in society. The products and services covered include ATMs and banking services, PCs, telephones and TV equipment, telephony and audio-visual services, transport, e-books and e-commerce. POSEIDON aims to present examples on how many of the areas pointed out as important by the Accessibility Act can be accessed by persons with cognitive impairments (and especially with learning difficulties).

POSEIDON links to the European Accessibility Act: No direct links

### 6.2) European Commission Mandate M/530, Standardisation request to the European standardisation organisations as regards European standards and European standardisation deliverables for privacy and personal data protection management.

To develop European standards as follows;

i) How to address and manage privacy and personal data protection issues during the design and development and the production and service provision processes of security technologies and services, allowing manufacturers and service providers to develop, implement and execute a widely recognised Privacy by Design" (PbD) approach in their processes;

ii) European standards addressed to the manufacturers and service providers when specifying the privacy and personal data protection management processes with an explanation how to realise them, including descriptions of the necessary roles, tasks, documentation, hardware and software requirements, and templates to be used when applying the requested standard(s).

[15] iCalendar format https://en.wikipedia.org/wiki/ICalendar

The POSEIDON project has identified the requirement for consideration to be made for systems to be accessed by both an end user and a carer. This co-use with respect to potentially sensitive or private information can be effectively dealt with if commercial design practises are followed, for companies there are long used solutions for several persons login in on the same account. The issue is ensuring how that private persons can also have shared use when required. It is important that this work also considers the difficulties for persons with intellectual impairment to use current methods for login/identification? There should be simple but yet safe ways to log in/prove who you are

POSEIDON links to the European Commission Mandate M/530: The project has direct links to this activity.

### 6.3) Current Education and Training Activities focused on the Use of Standards

- ETSI Specialist Task Force on Design and Development of Teaching Materials for Education on ICT Standardisation
- IFAN (The International Federation of Standards Users) Guide to Standards Education
- Informal Ad Hoc Group under SAGA – Accessibility training and support

The creation of curricula for teaching about standards is ongoing. The use of standards to support users with special needs should be part of this process, a case study of the work of the POSEIDON project could be passed on to assist with this work.

POSEIDON links to IFAN (The International Federation of Standards Users) Guide to Standards Education: The project has direct links to this activity.

### 6.4) ISO/IEC TR 29138-3 First edition 2009-06-15 Information technology — Accessibility considerations for people with disabilities — Part 1: User needs summary, Part 2: Standards inventory and Part 3: Guidance on user needs mapping

This standard provided information which is relevant for the POSEIDON project and the end users of the project in the following way;

- ISO/IEC TR 29138-1: Information technology – Accessibility considerations for people with disabilities – Part 1: User needs summary, Published (2009)[16], Identifies a collection of user needs of people with disabilities that can be taken into consideration by standards developers when developing/revising standards[12]
- ISO/IEC TR 29138-2: Information technology – Accessibility considerations for people with disabilities – Part 2: Standards inventory, Published (2009)[17], Identifies a collection of standards that provides guidance to meet the needs of people with disabilities. The updated version is available as “The inventory of Accessibility and Accessibility-related Standards and Specifications” this was published in 2013.
- ISO/IEC TR 29138-3: Information technology – Accessibility considerations for people with disabilities – Part 3: Guidance on user needs mapping, Published (2009)[18], “Provides guidance

[16] ISO/IEC TR 29138-1:2009, Information technology -- Accessibility considerations for people with disabilities -- Part 1: User needs summary from http://www.iso.org/iso/catalogue_detail?csnumber=45161

[17] ISO/IEC TR 29138-2:2009, Information technology -- Accessibility considerations for people with disabilities -- Part 2: Standards inventory from http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=51341

[18] ISO/IEC TR 29138-3:2009, Information technology -- Accessibility considerations for people with disabilities -- Part 3: Guidance on user needs mapping from http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=51342

on the mapping of the set of user needs with the provisions of a particular standard, technical report, or set of guidelines."

POSEIDON links to ISO/IEC TR 29138-3: The project had some links to this activity.

### 6.5) ISO/IEC Guide 71:2014, Guide for addressing accessibility in standards (and CEN-CENELEC Guide 6 (2014), Guide for addressing accessibility in standards

These standard set out a methodology for considering accessibility and integrating relevant requirements during the development and revision of standards for a wide variety of products, services and environments. It is intended for use by standards developers, as well as by designers, manufacturers, service providers, service users and policy makers. The new edition of CEN-CENELEC Guide 6 replaces the previous edition (published in 2002). CEN-CENELEC Guide 6:2014 is identical to ISO/IEC Guide 71:2014 which was published on 1 December 2014.

POSEIDON links to ISO/IEC Guide 71:2014: The project had direct links to this activity.

# 7. Current standardisation activities of relevance to people with Down's syndrome

The main current standardisation activities with which members of the POSEIDON project has had the chance to contribute and share knowledge are;

- Revision of EN 301 549, Accessibility requirements for public procurement of ICT products and services in Europe
- ETSI TC Human Factors STF 488 on Recommendations to allow people with cognitive disabilities to exploit the potential of mobile technologies.
- ISO ISO/TC 173/WG 10 - Assistive products for cognitive disabilities,
- W3C Cognitive and Learning Disabilities Accessibility Task Force

### 7.1 Revision of EN 301 549, Accessibility requirements for public procurement of ICT products and services in Europe

The European Standard on 'Accessibility requirements suitable for public procurement of ICT products and services in Europe', pdfEN 301 549, is being updated by CEN, CENELEC and ETSI with the participation of the ICT industry and organizations representing consumers, people with disabilities and older person. This standard is intended in particular for use by public authorities and other public sector bodies during procurement, to ensure that websites, software, digital devices are more accessible – so they may be used by persons with a wide range of abilities.

POSEIDON links to the EN 301 549, Accessibility requirements for public procurement of ICT products and services in Europe: The project has a direct link to this activity but relevant standardisation activity has not yet started.

### 7.2) ETSI (European Telecommunications Standards Institute) Human Factors (HF); Guidelines for the design of mobile ICT devices and their related applications for people with cognitive disabilities

The aim of this work is to classify and analyse the ICT needs of persons with limited cognitive, language and learning abilities. This includes persons with cognitive impairments and some older people. The result will be a Technical Report (TR) that will describe the functional needs of persons with limited cognitive, language and learning abilities for an improved user experience when using mobile ICT devices and their related applications.

Based upon these functional needs, the STF will also provide an ETSI Guide (EG) with design guidelines for mobile devices and applications. These design guidelines will enable people with cognitive impairments to obtain the maximum benefit from the use of mobile technology. The guidelines will apply to the design of:

- mobile ICT devices;
- mobile applications (whether they are standalone or whether they provide access to related services).

The STF will produce two documents:

- TR 103 349: "Human Factors (HF); Functional needs of people with cognitive disabilities when using mobile ICT devices for an improved user experience in mobile ICT devices", and
- EG 203 350: " Human Factors (HF); Recommendations: for the design and development of mobile ICT devices and their related applications for people with cognitive disabilities"

Within the TR 103 349 there is a section called Intellectual impairments fact sheet using Downs Syndrome as an example of a diagnose leading to cognitive impairments.

POSEIDON links to ETSI (European Telecommunications Standards Institute) Human Factors (HF); Guidelines for the design of mobile ICT devices and their related applications for people with cognitive disabilities: The project has a direct link to this activity. Members of the Poseidon project have participated in workshops with ETSI in the process of writing the documents.

### 7.3) ISO/TC 173/WG 10 Basic Principles and General Guidelines on Cognitive Accessibility

The ISO/TC 173/WG10 is currently producing a future standard on principles and guidelines in cognitive accessibility, covering all products and all services. The main writer of the draft document is a member of the Poseidon team and persons with cognitive impairments are heavily involved in the production through the Swedish Begripsam-group (www.fungerandemedier.se/begripsam). In this group there are persons with intellectual and learning difficulties participating. Methods for participation in standardization processes for persons with intellectual and other cognitive impairments are developed in this project.

The ISO/TC 173/WG10 is also producing a specific standard on Assistive products for persons with disability — Guidelines on cognitive accessibility — Part 1: Daily time management and are planning a similar work on handling money, payments, calculation, understanding values and sizes.

POSEIDON links to the ISO (International Standards Organisation) future standard on cognitive accessibility: *The project has direct links to this activity.*

### 7.4) Web Accessibility Initiative, Cognitive and Learning Disabilities Accessibility Task Force (Cognitive A11Y TF) of the APA WG and WCAG WG

The objective of the Cognitive and Learning Disabilities Accessibility Task Force is to improve Web accessibility for people with cognitive and learning disabilities. This work is ongoing and information could be passed to it from the POSEIDON project. This work is important, and all findings from the POSEIDON project, and especially the work on context awareness and the framework, should be shared with these communities.

POSEIDON links to the Web Accessibility Initiative, Cognitive and Learning Disabilities Accessibility Task Force: A member in the Poseidon project has just become an invited expert in the Task Force and will be a link between the Poseidon project and the ongoing work.

# 8. Conclusion and Way Forward

"The POSEIDON project developed personalised technology solutions to help people with Down's syndrome become more independent in their daily lives."[19]It achieved this by carrying out;

- Research into user needs (both end users and carers).
- Identification and codification of those needs into technological systems
- Creation of suitable technological systems.
- Evaluation of the systems with end users in `real world' pilots.
- Investigation of possible funding models for these systems.
- Dissemination of the knowledge gained to researchers, designers and creators.
- Dissemination of the knowledge gained to standardisers.

During the POSEIDON project standards assisted in the research activities involved in the collection of relevant information, the design and creation activities of the project and the specification of the deliverables. The results of the project are being used to contribute to current and future standardisation activities. A number of different types of standard exist, in the HCI field standards are designed to "Usable products can be designed by incorporating product features and attributes known to benefit users in particular contexts of use"[20]. The standardisation and accessibility guidance from POSEIDON will hopefully supplement existing standards in the areas of physical and sensory impairment by providing information to ensure the design benefits people with a cognitive impairment and meets their personal needs with respect to understanding, remembering, learning, reasoning and problem solving.

It was important that relevant information from the POSEIDON project was passed onto the relevant standards bodies to assist with future standardisation. Information on the use of standards to support the full range of end users, the special security and privacy needs of co-dependent users and the need for standards to support designers and specifiers to meet the needs of users with special needs are all important outcomes of the POSEIDON project. Particular consideration was made to collating and passing on information of help to the standardisation process in the following areas;

- Privacy and Security Standardisation with respect to shared use of location based systems used by intermediators and end users with a cognitive disability.
- The specific design considerations for people with Down's syndrome to the committees and individuals active on standardisation activities for people with cognitive impairments.

[19] Poseidon webpage http://www.poseidon-project.org/about/

[20] Bevan, Nigel. "International Standards for HCI", Updated May 2006 Based on chapter in Encyclopaedia of Human Computer Interaction. Idea Group Publishing, 2006, from http://www.nigelbevan.com/papers/International_standards_HCI.pdf