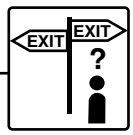
*Chapter 8*

# *Wayfinding*




## Contents



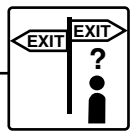
## Introduction

The term “Wayfinding” is defined as services and products, which could be used as a tool for users to access information which is associated with geographically located information. These tools are used to navigate from one place to another, but could also be used to access other information services, which are location aware.

Wayfinding is the process the user does when moving from one location to another. E.g. from the hospital to visit a family member and need to find the correct department and room. For the user, this process can be divided in to several subtasks: Where am I going? How to get there? Where am I? Am I on the right track? Am I there?

To do these tasks the user need to get information both in the planning stage and from the environment when moving there. This could be a problem for many people - if they are not able to read, they have problems with the orientation, they have problems with handling new information, and they have problems with keeping track of the sequence.

Several projects have shown that properly designed supporting tools will be of great help to persons with these problems.




## Standards

Standardisation work is today mainly located under two headings: – geographic information systems and Transport information and control systems. There are groups working under ISO and CEN within these areas, but today the main activities is under the ISO umbrella.

In the World Wide Web Consortium (W3C) there is also input to potential activities which could be of great benefit in a Design for All perspective.

Some areas, which could have specific interest for a Design for All perspective, are the following:

**ISO /TC 204 Transport information and control systems.**
Standardisation of information, communication and control systems in the field of urban and rural surface transportation, including intermodal and multimodal aspects thereof, traveller information, traffic management, public transport, commercial transport, emergency services and commercial services in the transport information and control systems (TICS) field.

**ISO / TC 211 Geographic information/ Geomatics**
Standardisation in the field of digital geographic information. This work aims to establish a structured set of standards for information concerning objects or phenomena that are directly or indirectly associated with a location relative to the Earth.

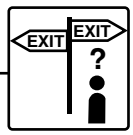
**ISO / TC 213 Dimensional and geometrical product specifications and verification**
Standardisation in the field of geometrical product specifications (GPS). The standardisation includes the basic layout and explanation of drawing indications (symbols).

### Potential future work

CEN/TC 293 Ad-hoc Group on Communication Aids has identified electronic maps as an area for standardisation.

There are also currently under consideration to come up with a proposal for a standard for wayfinding technology under the ISO / TC 204 Transport information and control systems. This has its origin in “Talking Signs” technology.

Under the Mobile Access area in the User Interface Domain of the W3C there has been submitted several proposals for markup languages to enable location and related information to be available to web enabled devices.




## Output from Projects

There have been several projects looking at how to support people navigate in the physical space. In TIDE there were three projects: Ariadne, Mobic and Open. Results from the first two projects are reported. In this chapter there is also some results from a national project in Norway. In addition there have been other projects like SEAL in Italy and Talking Signs in USA.

### ARIADNE

ARIADNE - Access, Information and Navigation Support in the Labyrinth of Large Buildings (4th fw EU project). The main project goal has been to develop and evaluate a technology for navigating in buildings by means of user-adapted information supported by a building network of signs and speakers.

**Spoken messages:**
The use of verbal messages, whether natural or artificial voice, is a challenge for the user, as he can not investigate and absorb the information at his own pace.

Spoken messages should be presented in a compact language, and should not be too long. Messages should not contain more than 3-4 information elements (geographic references and/or directional cues), as users tend to forget or mix up elements if they are too many.

The user expects to receive information relevant to his navigational goal. Irrelevant information about the environment and localisation descriptions that include features in the environment will often distract or mislead the user.

Relative directional references (e.g. ”turn right”) as part of route information should be avoided, unless the user movement is controlled in a way so that his facial orientation is always predictable.

Different types of verbal information (e.g. route descriptions and environment information) should be presented by use of different voice characteristics, e.g. male and female voice. The use of voice characteristics should be consistent throughout the system.

Verbal messages should have a user-controlled repeat option.

Messages should be offered by a ”wearable speaker” or headphones as some messages are only for individual use.

Positioning and use of public speakers should consider the room acoustics and environment background noise.

**Sound buoys:**
Blind users depend upon the use of sound buoys as directional references when navigating in unfamiliar surroundings.

Sound buoys should be placed with sufficiently short distance between them, so that the next sound buoy can easily be detected from the present position.

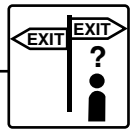
Blind users want to be able to control the performance of the sound buoy, in terms of onset, offset and duration. In unfamiliar surroundings the user will normally require a sound signal to guide them all the way to their (sub) goal.

Blind users will need an auditive confirmation that they have reached their (sub)goal.

When sound buoys are accompanied by a verbal message, the message should be played first, and end of message should trigger onset of the sound buoy. Users will have problems focusing on both sound messages at the same time.

Sound buoys should be positioned so that room acoustics does not make it difficult to localise. Open halls with concrete walls are particularly unsuitable.

Sound buoys should be positioned in relation to relevant reference points along the route.




**Visual information:**
Visual information includes directional and orientation signage, architecture and use of low-tech solutions (colour, tactile markings etc.). It is important to apply a complete way-finding strategy that includes all aspects contributing to better or worse orientation in a building. The use of dynamic information (information changing with the situation) requires thorough analysis of expected user activity.

Visual information must be positioned so that it is visible from all areas where the user might have a natural interest in the information conveyed. There should not be obstacles between the sign and the user, and it must be considered that users are of different a height (e.g. wheel-chair users, children).

When using many signs in the same area denoting several possible destinations, it is important to emphasise/attract attention to the information relevant to the user in the situation. Illuminating or marking relevant information can do this.

The use of bright, flashing or coloured signs will normally attract the users attention. Irrelevant information of these types must be placed well away from essential way-finding information to avoid distractions.

When using flashing signs and illumination, it is important to consider the light conditions in the environment (light glares and reflections), choice of colours and contrast in the signs, and size of the text information.

The appearance of the information must be consistent throughout the system, i.e. the same sign behaviour (e.g. flashing) should convey the same information in all situations for the same type of signs. Dynamic information must appear in a predictable way to the user, and same type of information should be controlled/ varied by the same principles.

Use of symbols on the signs should be consistent with corresponding use of symbols in other everyday situations (e.g. telephone, toilets, elevator signs).

When using multiple mode information (sound and illumination) the appearance of the information must be timed correctly. When a sound message address specific visual cues, the user will normally do a visual search for the information when it appears in the verbal message.

When using multiple mode information (sound and illumination) the visual information should last until after the message has finished. This because the user will normally face the direction of the sound source when it is played.

## TIDE Mobic

The following was found to be essential in the TIDE Mobic project. The service needs to know:

• *The user's current location* including: direction currently facing/travelling.

• *Directions to destination* for example: number of streets/turns, distances (in feet, metres or approximate number of steps).

• *Layout of the environment f*or example: grading of roads/junctions, changes in pavement surfaces/levels, steps/underpasses, ramps, one way streets.

• *Street information* including: numbers of buildings.

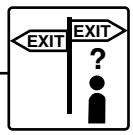
• *Roadworks.*

• *Street furniture* for example: trees, parking meters, stands, tables etc. outside shops, grading of street furniture/"clutter"1.

• *Pedestrian crossings* including*:* Is it meant to bleep? If it is out of order? Layout of complex crossings.

• *Useful items in street* for example*:* post boxes, public telephones, public toilets

• *Useful buildings and landmarks* for example: post offices, hospitals, medical centres, schools, banks (including those with cash machines), libraries, restaurants (including whether guide dogs are admitted), shops.




## Speech navigation

The speech navigator is a project funded by the research council of Norway. A pre-project investigating technological and user-centered potential for development of a hand-held route planner and navigation unit for the blind, based on GPS, electronic maps and speech interface.

**Interface requirements for blind users**
All information from the wearable unit (WU) should be available in speech, with an option of tactile output.

Input should be based on speech command and/or single button presses.

The command set should be limited and have a logical structure related to the navigational task when moving along a predefined route.

User interaction with the WU must be profiled for the specific user. This profile should be possible to tailor and set up for personal needs, and be possible to alter at a later stage when the user's needs and experience change.

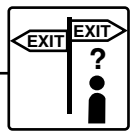
Interaction with the WU must not interfere with the users normal way of navigating, meaning: 1) it must be possible to operate with one hand (as blind users use a cane or a dog) and 2) The information from the WU should be considered optional to their traditional navigation aid, and function as supporting the user with extra information.

**Navigation**
The WU must be able to give the user's position at any time with a simple command. The position information should be available both with reference to the destination and by description of local surroundings.

Route information must be available at any point along the route.

The system must give an unsolicited warning when the user moves away from the predefined route, and preferably offer information on how to get back on track.

If the speech navigator should replace traditional mobility aids (dog or white cane), the available information must be more detailed, positioning must be more accurate, and the information supplied must be 100% trustable. Meaning that today's GPS technology must be radically improved.




# User Requirements

## Location and Accessing Terminals

**Home Environment**

- The system should enable the user to have access to planning information on the terminals in his/her home via TV and/or PC.

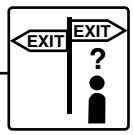
**Public Environment**

- The user should have access to his position both outdoors and indoors in an understandable format on his preferred terminal.
- The user should have access to basic information of his environment both indoors and outdoors in an understandable format on his preferred terminal.

**Mobile Environment**

- Basic wayfinding information should be available on standard mobile service technology.

| Requirements | Standardisation |
|---|---|
| **Physical** | |
| - The wayfinding service should be based on a standard format such that the user could use a terminal which meets his requirements<br>- The wayfinding service should be able to deliver services to terminals with different output media and input modalities. | Required:<br>- A terminal independent format for accessing multimodal navigational information. |
| **Auditory** | |
| - None identified. | |
| **Visual** | |




| Requirements | Standardisation |
|---|---|
|  **Cognitive** | |
| - If a public area is supported with Wayfinding technology is should be clearly and understandable marked with a standard symbol. | Required but not urgent:<br>- Standard symbols for marking wayfinding technology present. |
|  **Dexterity** | |
| - The wayfinding service should be based on standard format such that the user could use a terminal, which meets his requirements<br>- The wayfinding service should be able to deliver services to terminals with different output media and input modalities. | Required:<br>- A terminal independent format for accessing multimodal navigational information. |
|  **Combination** | |
| - None identified. | |


## Physical Handling

**Home Environment**

- The system should enable the user to have access to planning information on the terminals in his/hers home e.g. TV and/or PC.

**Public Environment**

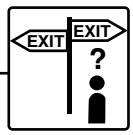
- The user should have access to his position both outdoors and indoors in an understandable format on his preferred terminal
- The user should have access to basic information of his environment both indoors and outdoors in an understandable format on his preferred terminal.

**Mobile Environment**

- Basic wayfinding information should be available on standard mobile services technology.
- Specialised terminals should not require specialised formatted information.


## User Interface

| Requirements | Standardisation |
|---|---|
| **Physical** | |
| - None identified. | |
| **Auditory** | |
| - The service should support both delivery of both spoken messages and use of synthetic speech.<br>- Messages should not contain more than 3-4 information elements.<br>- Different types of verbal information should be presented by use of different voice characteristics. | No need for standardisation. |
| **Visual** | |
| - The service should support the delivery of the information in a visual format both with plain text and with graphics.<br>- The use of symbols should be consistent with corresponding use in other everyday situations. | Required:<br>- Maps should be accessible to different technology and to different user requirements. |
| **Cognitive** | |
| - The appearance of the information should be consistent throughout the system.<br>- When using multiple mode information, the visual information should last until after the message has finished. | No need for standardisation. |
| **Dexterity** | **Combination** |
| - None identified. | |




## Operation

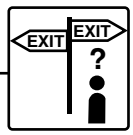
**Home Environment**

- These should be standardised location technology with high enough resolution in horizontal and vertical space for indoor and outdoor use. This technology should be able to store important information or decision points in the indoor and outdoor environment.
- The location technology should contain necessary multimodal information about the environment.
- The location technology should be readable with a user portable wayfinding technology.
- The wayfinding system should have access to relevant information for the user such as described in the Mobic project.

**Mobile Environment**

- The wayfinding system should give direction to destination.
- Interaction with the wayfinding service must not interfere with the users normal way of navigation e.g. with cane or dog.

| Requirements | Standardisation |
|---|---|
| **Physical** | |
| - The location technology should be easy to install and support. | - No need for standardisation. |
| **Auditory** | |
| - Messages should have a user-controlled repeat option.<br>- The wayfinding system should notify the user when he has reach a goal | - No need for standardisation. |
| **Visual** | |
| - The wayfinding system should give visual feedback when a (sub)goal is reached. | - No need for standardisation. |




| Requirements | Standardisation |
|---|---|


**Cognitive**

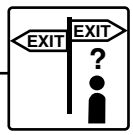
- The user should not receive other information than what is relevant for his navigational goal.
- The command set should be limited and have a logical structure related to the navigational task.
- Relative directional references should be avoided.

Required:
- A standard set of commands for navigation tasks.

**Dexterity**

**Combination**

- None identified.




## Adaptation to User Profile

| Requirements | Standardisation |
|---|---|

**Physical**

**Auditory**

**Visual**

- None identified


**Cognitive**

- It should be possible to tailor and set up the service based on personal needs.

Request:
- A standardised way of storing and using user profiles with navigational tasks.

**Dexterity**

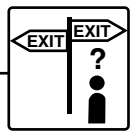
**Combination**

- None identified.

## Security of Operation

**Public Environment**

- The technology should not put the user in dangerous situations.




## Conclusions

A terminal independent format for accessing multimodal navigational information should be specified in W3C.

These should be standardised a location technology with high enough resolution in horizontal and vertical space for indoor and outdoor use in ISO/TC 204.

Electronic maps which are accessible to different technology and to different user requirements should be standardised in CEN/TC 293 or a CEN Workshop.

A standard set of commands for navigation tasks should be developed.

Standard symbols for marking wayfinding technology present should be developed.