

# Ensuring Accessibility in SUPERHUB: a Multimodal Urban Mobility Platform for European Cities

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## ABSTRACT

SUPERHUB is an European Mobility project that aims to implement measures to improve urban mobility and encourage environmentally friendly travel behavior by providing an Advanced Transport Information Service (ATIS) to users where real-time mobility options can be ranked according to their profile and preferences. Users will be able to make informed decisions on the mode of transport they use in urban situations as well as highlighting any accessibility issues by reporting them to the transport providers and to others with a similar profile. The primary aim of SUPERHUB is not as a specialized accessibility system, however, a User Centred Design (UCD) Approach was adopted to ensure the system will be useful to everyone. A series of Focus Groups and interviews with people with physical and sensory impairments was held as part of this process. This paper describes some of the issues people with a visual, hearing or mobility impairment face when accessing and using public transport and some possible technical solutions that an ATIS such as SUPERHUB may be able to provide for those with disabilities. We describe here some preliminary findings of the Focus Groups and interviews we carried out in the UK, Milan, Barcelona and Helsinki and suggest some functionality that could be implemented by applications such as SUPERHUB to provide better information and support to increase the accessibility of Public Transport.

## Categories and Subject Descriptors

User Interfaces - User-centered design

## General Terms

Design, Human Factors

## Keywords

User Centred Design, Accessibility, Public Transport, Multimodal Transport Information Systems

## 1. Introduction

Ensuring that the specific needs of people with visual, hearing and physical impairments are met is extremely important if

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*Conference'10*, Month 1–2, 2010, City, State, Country.  
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SUPERHUB is to provide a system to help people access public transport (PT) services. Despite huge investment by transport operators and authorities to grant accessibility, barriers still exist for some people. People with a physical or visual impairment (who usually do not have a driving license because of their loss of vision) are often very reliant on the public transport network, yet may be less inclined to use it because of current problems. The Visual Impairment Centre for Teaching and Research at the University of Birmingham produced a report for the RNIB entitled *Travel, Transport, and Mobility of people who are blind and partially sighted in the UK* [1]. This gives some useful information on issues faced by people using various different modes of transport including public transport and being a pedestrian. The RNIB estimates that there are almost 2 million people with sight problems in the UK. The Rail Safety and Standards Board carried out research on wayfinding systems for blind and partially sighted customers [2] and found that a significant proportion of those interviewed said they would not use the rail network because of lack of information, uncertainty about assistance, and general difficulty in using the network easily. This suggests that a large number of potential passengers are not currently using rail services. These findings are further compounded by the fact that in the interviews / Focus Groups we carried out, most people stated a preference for rail travel over bus services, so it is expected that the number of people not using bus services because of barriers to uptake could be even higher.

Our preliminary investigations indicate that recent technology developments such as smart phones are having a major positive impact on mobility options for people with visual impairments, improving their access to public transport. SUPERHUB hopes to utilise the technology now widely available in smart phones to provide a personalized service to aid the use of public transport across Europe. Current functionality includes a multi-modal journey planner, incident reporting and basic goal setting features, for example making more journeys by public transport.

## 1.1 State of the Art on Existing Technology

Existing applications and web sites to support multimodal transport were investigated, via a literature review and seeing what apps were available in the App store, in order to understand the problems with existing systems. Apps such as Citymapper [3] & TFL[4] give passengers real-time information on Public Transport, but accessibility information has to be found separately to the journey plan provided. Several attempts to improve public transport for people with a visual impairment, have made; OneBusAway [5] supplies information on approaching buses in Seattle USA; Ubibus [6] provided haptic feedback to passengers to notify them when their bus approaches. Haptic technology use

for improving public transport is discussed by Jacob et al [7], and for wayfinding by Zelek [8].

### 3 SUPERHUB's Approach to Designing an Accessible System

SUPERHUB's UCD process is considering the needs of the citizens who will use the system. Scenarios to exemplify how SUPERHUB will be used were developed, each had a focus on one or more stakeholders/end-users, in this case, people with a physical disability. It introduces the person, including the city they live in, and shows how SUPERHUB functionality impacts their transport related experiences. Scenarios were presented to elicit further discussion and to produce requests for other matters we had perhaps overlooked. Current difficulties faced when planning and taking journeys on public transport were also discussed. A template for the Focus Groups was produced, which was then translated into the local language(s) – in this case Italian, Finnish, Spanish and Catalan. Focus Groups and interviews were held in Aberdeen, Barcelona, Helsinki & Milan with a total of 22 people. 8 had a visual impairment of whom 5 were registered blind, one had a hearing impairment, one a temporary mobility impairment (after an accident) and 12 had a permanent physical impairment (including some wheelchair users). Our results showed that people with both physical and hearing and visual impairments do use public transport, including rail, bus, tube, metro and taxis, but some are not able to use all the modes they would like to use because of various problems. Participants described many issues, and from their comments and discussions, requests for functionality were produced, these are listed and grouped by type in Table 1 (below).

Almost all participants stated a preference for rail travel over bus services. This preference is due to a combination of factors, including more level access (or ramps) and support available in train stations and the fact that trains routinely provide audio and visual information both in the station and on the train. Trains also stop at a given platform (no need to flag it down), whereas buses have a tendency to pull up near a stop but perhaps not at it, if another vehicle is in the way, or indeed to not stop at all if the passenger does not signal for the bus to stop. We found that one of not being able to flag down a bus was a big problem for most of the visually impaired people we spoke to, therefore effectively preventing them from using this mode of transport. Finding bus stops was also problematic. Research carried out by the RNIB confirms that this issue is widespread. The 'Stop for me speak to me' report [9] indicates that blind and partially sighted people often have to rely on other people to help them at bus stops, and that: **9 in 10** people with sight loss cannot see an approaching bus in time to hail it. **8 in 10** people with sight loss say they have missed the bus they want. **7 in 10** missed the bus because it boarded away from the official bus stop.

Once on the bus, getting off at the correct stop is another issue. Visually impaired people often have to rely on the driver to remember to tell them when they reach their destination. This often does not happen and the person may end up far from their desired destination. The recent tendency for buses to cover their windows with advertisements also contributes to the difficulty in knowing where to get off the bus for those with any visual impairment (and for those without). Missing the correct stop due to not being able to tell whereabouts the bus is has been reported to be an issue at night time for people without a visual

impairment, so a solution for this is likely to be helpful to a large number of people.

### 4. Impact of the Results on the Design of SUPERHUB

SUPERHUB will help to provide a solution for some of the problems mentioned by providing real-time data on all urban public transport and ensuring this information is accessible to everyone. Some of this information exists in some form already, but it should be presented in a way that is useful and accessible to the person, so having a profile setting for example, will ensure that the user receives the relevant information on accessibility for their needs and in a way that the person can easily access, given at the same time as their journey options. Often another website has to be visited to check on the accessibility of buses, trains etc. Being able to choose the best option based on ability rather than mode of transport was highly desirable for the participants we spoke to. "I need level access for the wheelchair and if I use the underground I would need lift access, but I would rather see all the options available to me with this than have to choose a mode in advance"

We could investigate having a 'stop for me' request built into the application, which would alert the driver of the need to stop at the user's location (as in the UbiBus system). The other approach which is probably more feasible would be to alert the user when the bus they wish to alight is approaching via audio or haptic signaling such as a vibrate alert. A similar alert could be given when the person reaches their desired destination. This type of functionality should be relatively easy to incorporate into SUPERHUB given the existing infrastructure and the transport companies involvement in the project [10].

SUPERHUB could also be beneficial for arranging on demand transport, having preferences stored in the system (e.g. wheelchair user) would enable easier booking of accessible transport and also be a way of providing travel requirements in advance of the journey. Several people reported having issues with taxi drivers not taking their Guide dog or not wanting to deal with wheelchairs. *"It would be useful to have the driver of the taxi pre-warned about the guide dog or wheelchair. Although it is the law for drivers to take disabled passengers some of them can't be bothered. I would prefer to know that the driver is willing to put a wheelchair in his boot or take the guide dog."*

Having an ATIS such as SUPERHUB would certainly not be a panacea for every problem, but it could alleviate some of the difficulties reported by our visually and physically impaired participants. It does not plan to replace the existing physical services for people with disabilities but should be integrated with them as much as possible, for example arranging staff support at stations. To optimise accessibility to people with diverse impairments and across diverse platforms, the SUPERHUB user interface will be designed to follow the W3C Web Content Accessibility Guidelines (WCAG) and the guidance set out in the W3C Mobile Applications Best Practices: [11]

We are currently working on the second iteration of design features for SUPERHUB's Second Integrated Prototype (SIP) and intend to implement some of the user requests in Table 1 to provide a useful and accessible tool. If SUPERHUB can provide the most important information that our participants requested in combination with its other functionalities such as journey planning, car & taxi sharing, disruptive event reporting [12] and

motivational features [13], it is hoped that it will enable people who could not access or avoided public transport before to make better use of more sustainable transport modes and to become more empowered in both their choices and in their mobility.

#### 4.1 Table 1: Functionality Requests for SUPERHUB: Advanced Multimodal Transport Info System.

Type of Request	Request
<b>Navigational Information</b>	Navigation to guide inside stations
	Information on which direction to start walking – this is usually lacking in most navigation apps.
	Information on road gradients (eg. warnings about steep hills.)
	Information on the surface of the road / pavement (e.g. is it a gravel surface making it difficult for wheelchairs or is it currently being repaired)
	Notification on the best place to cross roads
<b>Accessibility / Safety Info</b>	Accessibility of the station and platform. (are there multiple levels, lifts etc.)
	Accessible toilet facilities nearby
	Accessibility of the bus / train in real time.
	Ability to inform transport provider / taxi driver about a guide dog
	Info on less busy alternative routes (or a flag alert for busy routes)
	Info on really lonely areas – best avoided at night
<b>General Information</b>	More information on the surrounding area
	Alerts on disruptions
	Information in real time before and during travel, through one channel
	Seating availability at stops / stations
<b>Customisation</b>	Profile settings to receive specific and well customized information
<b>Overcoming Barriers to Use</b>	Real time information on what bus will be arriving at the stop you are waiting at
	An alert for when the bus approaches and for when the stop to get off is reached (Haptic)
	A way to flag down the next bus (when it cannot be seen)
	Accessible SUPERHUB system
<b>Links to Other relevant sites</b>	A way to access support provided at stations
	A way to book / access mobility devices via companies such as shop mobility (UK)

	Book and Buy tickets (including accessible seat reservation)
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## 5. ACKNOWLEDGMENTS

Thanks to Elena Montafia (ATM Milan), Anu Lehtiö (University of Helsinki), and Circe Serre (BDigital Barcelona) for running the Focus Groups & Interviews in Milan, Helsinki and Barcelona respectively.

Our thanks to all the participants involved who gave us their time and lots to think about. Special thanks to Matthew Tylee Atkinson & Hussein Patwa for their valuable insights. This work has been supported by the FP7 IP Project SUPERHUB N. 289067.

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