**Open data and the needs of older people for public transport information**

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## Abstract

People’s life expectancy is increasing throughout the world as a result of improved living standards and medical advances. The natural ageing process is accompanied by physiological changes which can have significant consequences for mobility. As a result, older people tend to make fewer journeys than other adults and may change their transport mode. Access to public transport can help older people to avail themselves of goods, services, employment and other activities. Hence, public transport is important to older people’s quality of life, their sense of freedom and independence.

Within the European Commission funded FP7 project GOAL (Growing Older and stAying mobiLe), the transport requirements of older people were studied on the basis of five different profiles/groups of older people defined within the project, according to their ‘fitness to travel’. It was found that easily-accessible information provision on public transport was important for all of these groups, but that the required content and delivery of the information varied between groups. Even though new technologies can provide useful real-time information in the palm of a hand, the study highlighted that devices and content are not user-friendly for many older people, particularly relating to web sites and ‘apps’ (applications, usually on portable devices). As the system developers target bigger markets from their economic point of view, many products do not address the requirements of specific groups of older people (e.g. those with mobility difficulties). However, this could change with the apps-based traveller information because of the relatively lower cost of apps development when data is available in an open data server.

In this context, the on-going EC-funded TIDE (Transport Innovation Deployment in Europe) project is exploring the issue of open data for apps-based traveller information as one of the innovative urban mobility measures. The benefits of open access data is that it allows third parties (private or public) to access data and develop apps to provide information to users in a variety of ways according to user needs. For example, older people may need larger font displays and primary data only, while mobility impaired people may need information on walking distances and the existence of gradient, steps, seats, etc. Reviewing the international cases of open data implementation, the study found examples of authorities initiating the market by running competitions to develop apps for targeted groups such as older or disabled people.

This paper will present the findings of the information needs of older people using public transport from the GOAL project and then explores the possibility of apps-based traveller information for them currently being looked at in the ongoing TIDE project. The aim here is to address information needs of older people particularly using public transport to make it more attractive in the 21st century.

Key words: older people, public transport, open data, traveller information

## Introduction

People’s life expectancy is increasing throughout the world as a result of improved living standards and medical advances. In the EU, life expectancy at birth is projected to increase from 76.7 years in 2010 to 84.6 years in 2060 for males and from 82.5 years in 2010 to 89.1 years in 2060 (EC 2012). It is predicted that the population aged 65 and above will almost double, rising from 87.5 million in 2010 to 152.6 million in 2060 in the EU (EC 2011).

The natural ageing process is accompanied by physiological changes which can have significant consequences for mobility. A list of age-related changes and their consequences for mobility have been identified by various researchers including Gewalt (Gewalt 2011). These changes include: reduced flexibility and strength; impairment of visual perception; increased vulnerability to bone fracture; etc. In addition, Mollenkopf & Flaschenträger (2001) found that “almost all older persons, regardless whether they participate in walking, cycling, driving or using public transport, suffer from the tighter and more aggressive traffic”. As a consequence, older people tend to make fewer journeys than other adults and may change their transport mode. Mobilität in Deutschland survey (2008) found that with age, older people start to walk more, drive less and use more public transport. After 55, car usage was found to decrease constantly, whilst walking increased and public transport became a more used alternative for those aged 75 or older. The mobility of older people can therefore be strongly dependent on the provision and quality of public transport services.

Available, effective and affordable transport facilities provide access to people and places necessary to maintain a good quality of life (Metz 2003). Access to public transport can help older people to avail themselves of goods, services, employment and other activities. With the current generation of older people being more active than previous generations of equivalent age, public transport will play a crucial role in maintaining their active life style even when they are unable to drive. We should note here that whilst car ownership rates for older people are increasing (Follmer et al 2009), car use decreases with age for older people, partly because of the increasingly challenging driving environment for them. Hence, public transport is important to older people’s quality of life, their sense of freedom and independence. This has been confirmed in an extensive survey in the UK (Gabriel and Bowling 2004) and features in the World Health Organisation’s checklist of essential features of age-friendly cities (WHO 2007).

In this context, this paper presents a review of the public transport information needs of older people as carried out within European Commission funded the GOAL (Growing Older and stAying mobiLe) project. The paper then describes current trends of open data supporting such provision of public transport information aimed at older people, including some of the findings from the TIDE (Transport Innovation Deployment in Europe) project.

## Older people and public transport

Available, effective and affordable transport facilities provide access to people and places necessary to maintain a good quality of life (Metz 2003). Access to public transport can help older people to avail themselves of goods, services, employment and other activities. Travel purposes of older people revealed from a survey carried out in Germany (MiD 2008) showed that shopping and leisure are the main motives for travel of those over 60. Access to healthcare, food shops, post offices and other cultural, social and leisure facilities (including libraries, leisure centres, non-food shops, town centres and places of worship) were considered important in a review of local transport accessibility planning (Help the aged 2006). Of these, healthcare was overwhelmingly recognised as a key service to which access was important.

With the current generation of older people being more active than previous generations of equivalent age, public transport will play a crucial role in maintaining their active life style even when they are unable to drive. We should note here that whilst car ownership rates for older people are increasing (Follmer et al 2009), car use decreases with age for older people, partly because of the increasingly challenging driving environment for them. Hence, public transport is important to older people’s quality of life, their sense of freedom and independence. This has been confirmed in an extensive survey in the UK (Gabriel and Bowling 2004) and features in the World Health Organisation’s checklist of essential features of age-friendly cities (WHO 2007).

In many cases changes in mobility patterns can be linked to the decreasing ability of older people to overcome different barriers. Older people face a number of barriers when undertaking journeys such as physical, psychological and economic barriers to travel, including diminished motor, sensory and cognitive abilities for some (ECMT 2002). An Austrian study investigating the mobility patterns and barriers of 15 different groups of transportation disadvantaged people (e.g. people with physical or sensory disabilities, people at risk of poverty, single parents) showed that older people particularly experience barriers related to lack of accessibility of the physical environment, insufficient provision of information and inadequate public transport services (Sammer et al. 2013). All of these aspects specifically affect people who are dependent on the use of public transport services. For many of those no longer able to drive, public transport remains the only form of transport available. In order to keep the rapidly increasing population of older people actively involved in their daily activities, it is therefore vital that public transport facilities available are adequate to provide acceptable levels of mobility for the specific needs of older people. To address this issue, it is essential to identify the requirements of public transport for older people depending on their circumstances.

The requirements of older people using public transport have previously been studied by considering them in groups with particular characteristics. Neugarten (1974) and Baltes (1997) distinguished older people in different age intervals and explored the needs for each of those intervals. In the Euro Access project (Ståhl and Wretstrand 2008), a differentiation was made based on the impairments of older people: Mobility impairments, visual impairments, hearing impairments and cognitive impairments. Older people are reluctant to take public transport not only because of changes in their physical health, but also especially because of the challenges that public transport poses to them. Older people who have used public transport throughout their lives can more easily cope and are more open to considering the various transport alternatives than those who have always used the car as their main mode of transport. Older people need to know the public transport offering, including accessibility, as well as the areas served and service provision. Information detailing different aspects of public transport operations (timetable, accessibility, changes, fares, etc.) is very important in encouraging older people to use public transport (PT). Lack of information is one of the key barriers for PT users, particularly for older people. The information provision needs to address these issues to become successfully acceptable to older people.

## Public transport information for older people

Older people need travel information more than other people because of declined physical and mental conditions, as for example, many older people cannot stand for long, are sensitive to weather conditions, cannot do things quickly, and cannot walk large distances. Vision, hearing and other impairments may mean special information services are needed to deliver information, and older people may require additional items of information not typically asked for by other travellers, such as the location of lifts at multi-floored stations.

Older people find pre-journey traveller information in public transport more important than younger ones (Grotenhuis et. al., 2007). “An older or disabled traveller may wish to know not only the time that the bus or train will arrive at the appropriate stop, but also whether it will be low-floored and have adequate internal manoeuvring space” (Edwards et. al. 2001). This type of objective information on physical accessibility allows the older or disabled traveller to assess the subjective usability (Iwarsson & Ståhl, 2003). Targeted traveller information may thus become very useful for the individual when planning a journey by public transport. Targeted traveller information allows older travellers to activate their individual competence to a greater extent than before and consequently cope better with the public transport services (Waara, 2009).

Clear, concise, accurate and timely traveller information is useful for all older people regardless of their physical restrictions. A wide range of information may be needed, for example PT network, routes, stations/stops, service timetable, and ticket price. However, the level of usefulness relates to the impairment of the traveller. Information, especially regarding the accessibility of buses (vehicle, bus stop) is crucial to older people with mobility problems. Again, the information needs could differ from person-to-person depending on their ability to extract information and the route choice behaviour. For example, some may want a route served by a low floor bus whereas others may be prepared to spend more time on one bus rather than making a journey needing change (SU, 2007). New users of bus service (including those older people who have just given up or plan to give up driving) are expected to have a high demand for PT information (from EBSF, 2009). When travelling to or in an unfamiliar area, user demands for bus service information will be higher in terms of content and urgency.

* Bus/tram networks and routes.
* Stop locations, including those for inter-change between different routes, and connections with other PT (e.g. train, air and waterway transport).
* Service timetable (e.g. the first and the last service, timetable during weekdays, weekends and national holidays).
* Ticket price (e.g. single, return, seasonal).
* Payment (e.g. paper ticket, travel pass, electronic payment).
* Physical requirements of use.

Amongst various ways of providing information, only a few of them are focussed on older people, and information provision is not consistent across Europe. The various forms of information provision useful for older people include: Printed booklets (very useful for those not using latest technology), real time information at bus stops (help removing the uncertainty, and announcement service helps visually impaired people), on board “Next bus stop” announcement and display (help people with visual impairment as well as those with hearing difficulties) and web based services (providing individual door-to-door journey information). These various systems providing public transport information (shown in Figure 1) are described and discussed in the context of older people.

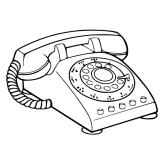
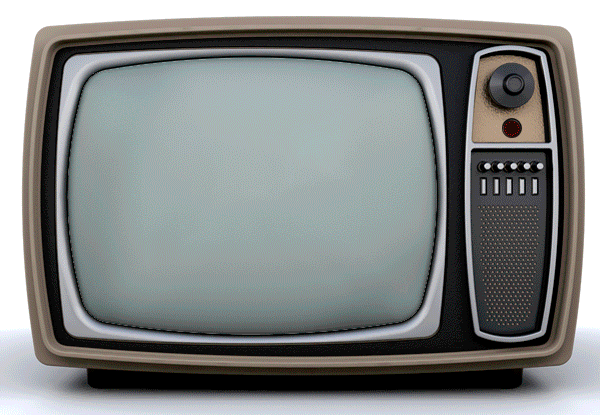


Figure 1: Current provision of public transport information systems

Paper-based information

Maps and transport network information (flyers or booklets) provide information for orientation and navigation (maps) or route- and transport mode-specific information (e.g. timetables). Generally, maps and network information are easy to use although they require a little experience, and they are cheap or free. They are the most commonly used paper-based information sources for older people. Paper based information is the most important pre- and on-trip aid for older people. They are usually accustomed to the use of maps and timetables and are also comparatively open to special group-oriented offers.

Although paper-based information (maps or timetables) are much more accepted among older people, their contents as well as their design is not always appropriate, in particular for older people with cognitive and physical restrictions. Few maps provide relevant information such as the location of physical barriers (e.g. subways and overpasses, long staircases) or important facilities (e.g. public toilets, rest areas). In addition, older people often find it difficult to handle them, as maps sometimes use shortened words and do not give explanations of places and buildings, and they do not reflect the “real” situation but a generalized version of the environment (Blase et al., 2010; Goodman et al., 2005). Other drawbacks of this medium of information include: the provision of only static information (not real time information) and usually providing information for users collectively rather than addressing the need of a particular group.

### Telephone enquiry

Telephone enquiries for the provision of travel information can be based on static information (e.g. delivering information on the bus time schedules) or it can work with dynamic information, thus providing real time travel support by means of route instructions from the user’s current position, for instance. Such systems are typically automated, and the potential advantages of these successful systems are both varied and well-known. Just as in the communication process between humans, recognition errors and misunderstandings may occur. But to successfully complete the query, the speech must be recognised correctly which may need repetitive attempts that can become extremely frustrating for the system´s user (Collingham, Johnson, Nettleton, Dempster, Garigliano, 1997).

Most existing services are also quite directive, restricting the caller to use limited formulations and to provide only the requested information. Other limitations of the system include: long length of call waiting time, cost of call charges and mis-hearing could be some of the issues for older people using such a facility.

### Television and Radio

Television and radio stations provide traffic and travel information on live traffic incidents and other travel news, which can come from many sources, including central and local government traffic/road maintenance agencies, such as the Highways Agency in the U.K., vehicle breakdown companies, and individual drivers calling in. They can provide some useful travel information for older people, particularly in terms of traffic information relating to other major travel disruptions, including delays and the impact on public transport services.

As nearly all older people already own television and radio sets, the use of such sources for travel information is largely free, at least through the public broadcasting channels funded by government (or commercial channels funded through advertising), which makes these media very accessible for older people. However, information provided is focussed on incidents rather than static information needed for journey planning. Other drawbacks pf such systems include the information not being targeted at certain group of users as the area coverage is generally large.

### Field device

Field devices include systems such as real-time passenger information boards at stops or audible announcements at stations. Field based information could use multi-sensory (visual, audible, tactile) systems to provide information to all passengers with impairments. Accurate and real-time traveller information at public transport stops strongly contributes to the quality of public transport systems and the trust of the passengers in the service. For example, the personal feeling of safety is increased after dark, the waiting time appears shorter because time can be organised better and uncertainties are minimised. As older people often feel unsafe at public transport stations after dark because they run a higher risk of being involved in accidents or the perceived victim of a crime, real time information is particularly valuable for them to reduce uncertainty and anxiety (Dziekan et al. 2007). However, to improve its usability to older people, the design should be consistent with the principles of recognition and readability. Readability (font size, typeface, reflections) as well as continuous information, position of signs and easily understandable symbols are necessary.

The main drawbacks of such systems include: information availability only at a stop/station, higher cost of installation of such devices and lack of flexibility to customise to meet the need of certain group of users. Again, in some cases, the provision of information at the stop is less useful as the user may not have alternative choices to spend time in the case of delayed services (for example).

### Website

Public transport websites generally provide good information on services for trip planning that include route maps, stops/stations, and service frequencies/timetables and ticketing. Assuming the content is updated continuously, websites can also deliver travel information in real‑time. With the development of technologies such as Geographical Information Systems (GIS) and Automatic Vehicle Location, the information can be visualised and used in ever-more sophisticated ways (Peng and Huang, 2000), including interactive mapping and customised trip planning. Content from travel websites has moved increasing beyond providing ‘static’ information (e.g. public transport route maps and schedules) to optimised trip plans for route and modes between origins and destinations. They also supply real-time travel information including: expected bus arrival times and other associated information such as traffic delays en‑route. Traveline (<http://traveline.info/>) is an example of such websites.

Real-time travel information delivered through websites can provide significant benefits for older people, in allowing them to plan their journeys in advance, be informed of disruptions to services, and reduce the waiting times e.g. for public transport connections. While all the information is very useful, the content is presented in such a way that it is not necessarily easy to read or remember, which can be daunting for some older people. Research from the U.S. on touchscreens (Dobres et al., 2013) suggests that older people benefit from more simplified displays and optimised typefaces, which reduces the visual demand imposed and user interface workload. The ergonomic design and optimisation of travel websites need to be considered seriously to benefit older people, specifically to account for gender differences and between profile groups. Similar to previous systems, web-based systems also have drawbacks of having lack of flexibility in addressing the needs of a certain group of users and less flexibility than apps based systems.

App based

With growing use of smartphone in recent years, apps based public transport information is also growing popularity. With the availability of information at any stage of travel (pre-trip or during a trip), they can provide static as well as real time information in a variety of formats (text, audio and visual) which could support the users’ confidence. They offer several advantages over other information sources. Firstly, they provide a much richer source of information, especially devices with internet (data) connections. Secondly, the information is usually more up-to-date (sometimes real-time) and the use of localisation technologies and profiling leads to customised and location-specific information. Thirdly, the provision of information can also be specifically customised to the needs of the individual user, including the user interface (e.g. different format, font sizes, audio information, etc.).

These devices can usually provide much richer and targeted information and are therefore perceived as having very high potential to support older people’s self-determined mobility. Different forms of digital maps and navigation services could be utilised for different mode of transport. For example, landmark-based navigation requiring lower cognitive effort for more efficient wayfinding (Goodman et al., 2005; Veldkamp et al., 2008), tactile “wayfinders” indicating required changes in direction by tactile signals in a belt (Heuten et al., 2008; Hub, 2008), or combinations of walkers or mobility aids and information systems such as the “iWalker” (Kulyukin et al., 2008), which all have the potential to be provided through apps.

As the share of older people using smartphones is increasing, modern mobile technologies are expected to be developed further to address the need of older people in the future. Despite the usefulness of mobile communication devices, the use of mobile technological devices to retrieve travel information is still relatively limited among older people. The main concerns regarding their use are ergonomics and usability, due to the physical and mental characteristics (e.g. cognition, reading capacity, fine motor skills for handling small featured devices). However, the development of apps being a relatively less resource-intensive task, it is feasible to develop apps addressing the requirements of older people of certain characteristics. As such apps could be developed by an individual person, and many local authorities open out their data provision (see below), there is potential to develop apps addressing the different needs of groups of older people. Assuming the travel data is available, different apps are increasingly being developed by private parties to utilise that data. As a result, there has been a proliferation of many different public transport information apps using the information provided by the authorities in recent years, particularly in the major cities. Given this growing trend of opening up traffic and other PT information collected by public authorities, the rising development of apps to provide traveller information is set to continue, and users will increasingly look for added value, such as inclusion of integrated ticketing or aids for tour planning (e.g. suggested local points of interest or availability of hotels).

The discussion of these different systems of providing public transport information showed their strengths and weaknesses in relation to older people’s requirements. Table 1 shows a comparison of these systems in terms of different attributes that are relevant in the context of providing public transport information to older people.

Table 1: Comparison of different ways of providing public transport information

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| System | Ease of use | Information  content | System cost | Real time | Anywhere | Personal need |
| Paper | √√√ | √ | X | XXX | √ | XXX |
| Phone | X | √ | XX | √ | √√√ | √ |
| Television/radio | √√√ | √ | X | X | √ | XXX |
| Field device | √√√ | √√√ | XXX | √ | XXX | XXX |
| Web based | X | √√√ | X | √√√ | √√√ | X |
| Apps based | √√√ | √√√ | X | √√√ | √√√ | √√√ |

Notes: √√√ - Excellent, √ - Very good, √ - Good, X – Bad, XX – Worse, XXX – Worst

Table 1 shows that the apps based public transport information is the best amongst all the systems considered in the comparison. With the good information content, real-time information provision, possibility of customisation, easy to use and portability to access the information on the move, apps based systems are found to be the best comparatively. The customisation and flexibility possible in these systems for addressing the needs of certain user groups is not possible in many other systems such as field based systems (e.g. RTPI at bus stops) or Radio/TV. The cost of these system is also amongst the lowest as the development of apps is expected to be done by private parties rather than local authorities themselves.

It is to be noted that apps (and web) based information systems work only when there is provision of suitable and timely data to underpin such information. In recent years, there is a growing trend of opening up transport data by relevant authorities to allow private parties to develop apps providing traveller information. In this context, a review of different cities providing such information was carried out within the EC funded TIDE project to explore the implementations issues to bring out important lessons learnt, which also has relevance to the application of apps (and web based services) for older people.

## Open data and current trends

“Open data is data that can be freely used, re-used and redistributed by anyone – subject only, at most, to the requirement to attribute and sharealike” (Open data handbook, 2012). The benefits of the open access data is that it allows third (private or public) parties to access the data and develop apps to provide information to the users in a variety of ways that are useful and easier to comprehend. With the availability of travel information in e.g. an open-access data server, it is possible to develop mobile applications capable of providing travel information based on different user needs. For example an app could be targeted to address the needs of specific older people groups, that uses larger font displays or provides primary data only for the visually impaired, while providing information on walking distances and the existence of gradient, steps, seats, etc. for mobility impaired people. One particular area of significance is journey recovery after a delayed/cancelled service or missed connection. This will be very useful for people who are not frequent traveller and/or find it difficult to analyse different travel options to choose the best.

In recent years, there is a growing trend in opening up the transport data collected by local authorities for managing traffic and local PT in their respective cities. The issues of opening up data for apps-based traveller information as one of the innovative urban mobility measures were explored in the EC-funded TIDE project. The mission of TIDE is to enhance the broad transfer and take-up of 15 innovative urban transport and mobility concepts throughout Europe and to make a visible contribution to establish them as mainstream measures. The project refines existing and well proven methodologies for the transfer of innovative measures and integrates them into an easy to apply handbook. Within the project, examples of open data implementation in different cities in Europe and North America (London, Toronto, Ottawa, Vienna and Reading) were explored. The study looked at issues of implementing open data in a city, and the four main implementation issues were: practice of data fee, use of access regulation, data coverage and the data processing carried out. In addition, factors supporting the successful implementation and those acting as barriers for implementation were also explored.

The review showed that all the Authorities included in the study have opted to provide the data without charge. Most of the cities have opted to provide data (rather than apps) so that apps may be developed by private parties. The types of data provided varied from city to city, with the most common data provided being real time passenger information (RTPI) of public transport. London was found to be leading the way by publishing a huge amount of travel data accessible to third parties. In addition to RTPI data, London also provides other transport data, e.g. to reflect the real-time status of cycle hires and network journey time status.

In the review process, the following factors were identified as important for the successful implementation of open access data:

* Robust data: Availability of good quality data from reliable sources is needed to convince developers to spend their resources to develop apps. Without the certainty of good quality data, apps may not be developed and the data in an open server may not realise its potential.
* Policy: A supportive policy of an authority is one of the main factors in implementing open access data. The implementation in most of the cities has been carried out to address the city’s policy rather than cost benefit analysis of the implementation. As the open data policy is in line with EU and central government policy in most Member States, the implementation of such a measure is also on the rise.
* Interaction between apps developers: The success of open access data largely depends on the take-up of the data by the apps developers to provide better travel information choices. Hence positive engagement with third party apps developers to encourage them to develop apps using the data in the open access server is very important.
* Market demand: The implementation of open access data, in many cases, is driven by the demand for traveller information which encourages private parties to develop apps using the information in the open data server. The demand is influenced by the size of the city and its transport network as well as the quality of the data. Demand is a key success factor for this measure. Low demand for apps (due to city or small user group size) may not lead private parties to develop apps. Such a barrier could be addressed with limited funding from the authority, and competition or challenge funding could be provided to ‘pump prime’ the market. Running activities such as competitions or challenges encourages private parties to develop apps and helps developer profiles. Ottawa (2013) has successful experiences of such activities in starting up good apps.

Among these success factors, market demand is an issue for developing apps for older people as the demand of such apps will be lower than common apps for the younger generation. In such situation, private parties may not be interested to develop apps for such targeted users. However, authorities could initiate the apps development process by running competitions to develop apps for targeted groups. For example, in 2013, Transport for London (TfL) hosted a competition to find new accessible apps to make it easier for disabled and older people to travel around the city. Developers were asked for ideas of new 'Accessibility Apps' which will make the TfL real time information easier to use for customers with vision impairments. The competition resulted in a number of good apps being developed: for the visually impaired person (allowing the user to find the nearest buses and live departure times from their location); for colour blindness (displaying the London Underground map in various formats); apps providing accessibility/step free information; and other apps for finding the nearest station and providing automatically updated live departure information and status alerts. These examples (London and Ottawa) demonstrate that useful apps addressing the needs of a certain group of people could be developed either by market force or by initiating competitions/challenges to do so.

## Discussion

This paper suggests that apps based information systems have a realistic possibility of providing travel information for addressing the needs of the older people, anytime and anywhere. However, it should be noted that older people are not a homogenous group of people and the physical and mental abilities amongst them vary considerably. In GOAL, five different profiles/categories of older people were developed on the basis of different levels of health and mobility (GOAL, 2012). The initial identification of common sets of characteristics in the older population in Europe has been based on a cross-national panel database comprising data on health, socio-economic status and social and family networks of more than 55,000 individuals aged 50 or over from 20 European countries, i.e.the SHARE database (Survey of Health, Ageing and Retirement in Europe - <http://www.share-project.org>). The five categories were Fit as a Fiddle, Hole in the Heart, Happily Connected, An Oldie but a Goodie and Care-Full, as illustrated in relation to two substantial characteristics: predominant range of age and level of activity in Figure 2 below.

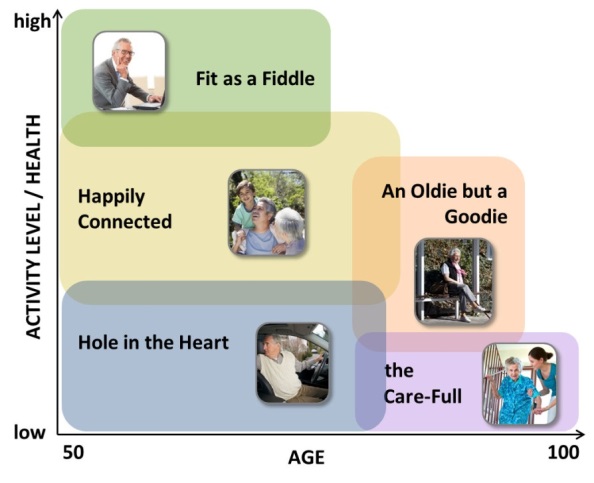


Figure 2: Age and activity level of the profiles of older people (GOAL, 2012)

It may be seen in Figure 2 that the profiles cover a range of age of older people (from 50 to 100) and activity (from very high to very low activity). The variation in the activity level is dependent on the physical and mental abilities of the older people in that category. In the context of using apps based traveller information, as in the case of activity level, there will also be considerable differences amongst them. The requirements of an ideal system for each of these categories will be different. For example, map based information may be suitable for an active group whereas a simple text-based information may be better for a group not that familiar with the technology. Hence, apps development should not be generic for older people, but it should be targeted to a category of older people. Development of guidelines detailing the requirements of different groups of older people in relation to the development of apps development is therefore very useful.

## Conclusion

Public transport is important to older people’s quality of life, their sense of freedom and independence. Access to public transport can help older people to avail themselves of goods, services, employment and other activities. In the ideal world, older people would like to have accessible, affordable, frequent, comfortable, door-to-door, spontaneous services with access to a large variety of destinations over an extended period of time. In this paper, the public transport information needs of older people and the existing systems of delivering such information were described and discussed. Comparison of these various systems show that apps based travel information is the most realistic channel to provide real-time traveller information for addressing the need of older people at the time and place of the need. However, to provide such apps based traveller information, there needs to be a policy of open data server provision, that providing this access to third parties.

Open access data provision in the transport sector has a huge potential to encourage dissemination of targeted traveller information using mobile apps with the involvement of the private sector. Supported by the rapid advances in information technology, this is already being demonstrated in a number of cities around the World, and will continue to grow. The suse of apps with open data servers has the potential to address the specific needs of different groups, including older people, and to encourage them to use more sustainable transport.

This paper also highlighted that implementation of open access data is driven mostly by an open data policy in the implementing authority, rather than economic or social benefits. However, the success of this measure is dependent on the take-up opportunity by apps developers. For this to occur, there needs to be demand for the information and a continuous commitment to the availability and robustness of the data. The consistency, format and quality of the data will influence how apps are developed, and hence the use of data available. In this context, a positive engagement with third party developers is very important, and these factors have to be considered for successful transferability to other cities.

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## References

Baltes, P. B. (1997). On the incomplete architecture of human ontogeny: Selection, optimization, and compensation as foundation of developmental theory. American Psychologist, 52, 366-380.

DfT – Department for Transport (2011). Annual Bus Statistics 2010/11. Department for Transport, October 2011. Available at: assets.dft.gov.uk/statistics/releases/annual-bus-statistics-2010-11/busstats2010.pdf

EC – European Commission (2011). The 2012 Ageing Report: Underlying Assumptions and Projection Methodologies.European Commission. European Economy 4|2011

EC – European Commission (2012). The 2012 Ageing Report: Economic and budgetary projections for the 27 EU Member States (2010-2060). European Commission. European Economy 2|2012.

ECMT - [European Conference of Ministers of Transport](https://www.google.co.uk/search?espv=2&biw=906&bih=602&tbm=bks&q=inauthor:%22European+Conference+of+Ministers+of+Transport%22&sa=X&ei=2IGFVJuPHa2M7Abwh4DYBQ&ved=0CCkQ9AgwAQ) (2002). Transport and Ageing of the Population. European Conference of Ministry of Transport.

EGALITEplus (2011): Ein gleichberechtigter Alltag im Verkehrsgeschehen – Quantifizierung von mobilitätsbeeinträchtigten Personengruppen. Unpublished project report, University of Natural Resources and Life Sciences, Vienna.

Follmer, R. et al. (2009): Mobilität in Deutschland 2008, Ergebnisbericht, infas Institut für angewandte Sozialwissenschaft GmbH, Bonn (Germany); DLR - Institut für Verkehrsforschung, Berlin (Germany).

Gabriel, G. and Bowling, A., (2004). Quality of life from the perspectives of older people. Ageing & Society, Vol. 24, 2004, pp. 675–691.

Gewalt, S. (2011). Wirtschaftsfaktor Alter - Körperliche Veränderungen verstehen, Angebot anpassen, RKW Kompetenzzentrum, Eschborn (Germany).

GOAL – Growing Older and Staying Mobile (2012): Profiles of Older People, Deliverable 2.1, GOAL project, <http://www.goal-project.eu/>

Help the Aged (2006). Travel, access and older people: A review of local transport accessibility planning. A report for Help the Aged by Helen Lesowiec, Help the Aged, London

MiD 2008: Mobilität in Deutschland 2008. Available at: http://www.mobilitaet-in-deutschland.de, Bundesministeriums für Verkehr, Bau- und Stadtentwicklung (BMVBS), (Germany)

Mollenkopf, H., Flaschenträger, P. (2001): Erhaltung von Mobilität im Alter, Bundesministerium für Familie, Senioren, Frauen und Jugend (Hrsg.); Verlag W. Kohlhammer, Stuttgart (Germany)

Metz D. (2003). Transport Policy for an Ageing Population. Transport reviews, vol. 23, no. 4, pp 375-386

Neugarten, B. (1974). Age groups in American society and the rise of young-old. Annals of the American Academy of Politics and Social Sciences, 187-198.

Sammer, G., Uhlmann, T., Unbehaun, W., Millonig, A., Mandl, B., Dangschat, J., Mayr, R. (2013): "Identification of Mobility-Impaired Persons and Analysis of Their Travel Behavior and Needs"; Transportation Research Record, 2320; S. 46 - 54.

Su, F. (2007): Understanding and Satisfying Older People’s Travel Demand. Dissertation. Imperial College University of London.

TfL – Transport for London (2006). Accessible Bus Stop Design Guidance. Bus Priority Team Technical Guidance Note BP1/06, January 2006

TRB – Transport Research Board (2002). Improving Public Transport Options for Older Persons. TCRP Report 82, Volume 2: Final Report. Transportation Research Board, Washington

WHO - World health Organisation (2007). Checklist of Essential Features of Age-friendly Cities. Available at: <http://www.who.int/ageing/publications/Age_friendly_cities_checklist.pdf>

TfL - Transport for London (2012). Syndication Developer Guidelines: Transport for London Data Service. Version 2.0. Available at: www.tfl.gov.uk/assets/downloads/businessandpartners/syndication-developer-guidelines.pdf

TIDE (2013b). TIDE Handbook for Transferability analysis in urban transport and mobility

Reading Open data (<http://ods.reading-travelinfo.co.uk/api/1>)