A case study of 'grass roots' innovation:

AccessAdvisr

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Andrew May, Chris Parker

Design School, Loughborough University, UK

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1 Aims and scope

This report is written by Loughborough University, and forms Deliverable 37.3 from the IdeasInTransit project. It presents the main findings from the initial and final interviews which were completed with the innovators within Workpackage 37, and also presents preliminary findings from the evaluation of the first Beta (proof of concept) version of AccessAdvisr undertaken with a limited sample of users.

2 Initial innovator interview

This interview was undertaken with Neil Taylor and Jon Parker of Integrated Transport Planning (ITP) Ltd on 4th July 2011. ITP had received £27,000 funding from GeoVation® to develop the idea behind AccessAdvisr into a 'proof of concept' model.

2.1 Aims

The aim of the initial interview was to understand the innovator perspective early on in the innovation process.

2.2 Confidentiality

It was agreed from the outset that there were some issues to do with confidentiality or commercial sensitivity within this first interview, and hence a few points have been omitted from this summary.

2.3 The problem space

AccessAdvisr is tackling the problem of providing effective, easy to use travel information for public transport users who have mobility impairments. Nearly 20% of the UK population experiences a degree of mobility impairment (DfT 2009). This represents a user community of 10 million people of which two thirds are aged 70+, and these numbers are forecast to rise to 12.5 million by 2014. Despite the 1995 Disability Discrimination Act, there is still believed to be a perceived lack of reliable and up to date information on accessible transport networks. Those with mobility impairments have reported that they find it difficult to obtain information that enables them to undertake independent travel. Information about travel networks and destinations is either lacking, or is distributed across a range of sources including journey planners, online maps and destination websites. In addition, a range of discussion forums and information made available from individuals (i.e. non-official sources) is used by travellers with limited mobility to help plan suitable routes. These official and unofficial information sources are disparate, sometimes hard to find, and not easily integrated by a traveller in order to plan and undertake journeys successfully.

AccessAdvisr will be a website that provides professional and user generated transport data, to enable people with limited mobility to make better informed decisions about their travel. The website will bring together disparate sources of pre-journey information on a single website. It will access travel information databases and 'scrape' data in order to integrate official sources of information. It will also enable blogging and user contributed videos and images, so that individual travellers can both add useful travel data, and comment on the accuracy of information already provided on the website.

The root cause of the problem being addressed is that the transport network has been historically and generally designed around able-bodied travellers. Some of the basic infrastructure dates back over a century and it is only relatively recently that the needs of those with mobility impairments have been explicitly incorporated into the design of transport networks.

Neil and Jon (and the company they work for, Integrated Transport Planning Ltd) are driven by a strong philosophy of user centred transport. They have undertaken several years of research in the area of accessible travel, and feel strongly that it is morally wrong for those with mobility impairments to have to expect a lack of access to transport. The mobility that is provided by transport is key to individuals earning a wage and playing an active part in society.

There are several societal trends that underpin a demand for this innovation:

- The ever increasing numbers that have mobility impairments, due largely to the increase in individuals over the age of 70.
- A shift in emphasis to providing one inclusive transport network, rather than separate approaches to (1) able bodied and (2) less able travellers.
- Introduction of legislation that sets out the right of all individuals to play a role in society, and for services and facilities to be accessible to all.
- Increasing awareness of cost and environmental impact of providing specialised transport solutions.

2.4   History and development

Having seen the GeoVation call, Neil circulated the idea for AccessAdvisr internally around ITP. It was submitted to GeoVation and ITP were shortlisted. Through Ordnance Survey, they were introduced to Rob Trent (an employee at Ordnance Survey who uses a powered wheelchair) who had set up a prototype of something reasonably similar. Rob was unable to take the site any further and offered the site (including name) to ITP for them to use freely as an element of their GeoVation entry. The GeoVation support and funding has been important in enabling ITP to take the idea forward.

In the short term they aim to develop a localised product that works for Nottingham, so they can undertake user testing. They also aim to develop a range of useful contacts. Medium to long term, the plan is to take AccessAdvisr to potential sponsors in the public, private and third sector. Longer term they see the user feedback proving insights that can be used to help accessible design of transport networks and locations/facilities.

A short term barrier is finding the right web / app developer to work with. They are looking to appoint someone who has a genuine passion for the area, and who can help them create the vision of an accessible transport network. A longer term barrier is the need to potentially secure additional funding to ensure that it is nationally or even internationally relevant, and the risk that this poses. There are also a range of other issues going forward:

- Data quality and the availability and release of data from a wide range of stakeholders
- How user generated data is combined with commercial data
- The need to have something useful, reliable and robust from day one, so that it can be validated and tested by end users
- The presentation of information in an accessible format, using a map-based format

- The need for the website or mobile app to be accessible

In terms of software development, they are developing a non-technical specification based on existing research into accessible transport needs. They now need to finalise this functional spec with the help of a web / app developer – both to understand how best to develop the functional spec, and to take into account what is technically feasible, both now and in the near future.

2.5   People involved in the development of the innovation

The original idea came from Neil at ITP. Neil will act as conventional project manager, and Jon and other directors at ITP have been offering advice to Neil. It was planned that in the longer term Rob Trent (Ordnance Survey) will be able to act as an advisor, to bring direct technical and a first-hand experience perspective to the project.

ITP has set up a small team, including more technical members of staff who have GIS and data analysis expertise. These supporting staff members have attended OS open data workshops in order to better understand this aspect of the project. A graduate in the Nottingham office has also been supporting Neil and Jon.

There are a number of potential partner organisations, including Nottingham City Council and Nottingham University (computer science skills). ITP is also keen to collaborate and share experience with other innovators completing similar projects.

2.6   Stakeholder/end user involvement

The main stakeholder groups involved with AccessAdvisr are:

1. The primary service users – those who they are aiming to help with AccessAdvisr. These include all individuals with mobility impairment including those with disabilities and older transport users with limited mobility. The service users can also include normally able-bodied individuals with temporary mobility restrictions, e.g. those travelling with young children or heavy luggage, and those with injuries. This group could also potentially include those who are not native English speakers who would benefit from richer and more accessible information.
2. Secondary service users who would see benefit in either contributing data or receiving inclusive design feedback, for example infrastructure or service providers. These could include leisure centres, healthcare sites, supermarkets, employment sites etc.
3. The data owners, e.g. ATOC, local bus operators, city councils, RADAR.
4. The delivery team, including ITP, and a web / app developer.
5. Interest or advocacy groups, including official bodies such as RNIB, other local and national bodies, user groups etc.

In terms of engagement with stakeholders, ITP is looking to engage from the outset with one or two key interest/advocacy groups, such as the RNIB. Once they have got a proof of concept running, they will publicise it more actively to other user groups.

There are no plans to undertake further initial engagement with end users in order to establish user requirements, since ITP has many years' experience working with older and mobility impaired transport users, and have past research findings that they can use to inform the design of

AccessAdvisr. They may however run some user engagement activities later in the development process, when they have developed a working concept. At this stage they would be looking for feedback from potential users of the site. These would probably take the form of full tests, demonstration days and structured interviews etc.

ITP plan to get a charitable group involved in the development of the site, plus one or two other key groups such as Disabled Motoring UK or Nottingham City Council. Their original view was that they would have a range of end users actively involved in the development of the site. However, they have moved away from this approach, due to the practicalities involved, and that they have a lot of research evidence already to help them design the site. Their approach is relatively pragmatic – i.e. get something up and running, and then get feedback on it, starting with users in Nottingham.

ITP has a range of internal metrics for success, which are given in their venture plan. From an end-user perspective, the measures of success are still to be formalised, but can include:

- The number of people with some form of mobility impairment who are using AccessAdvisor to enable more independent travel
- The amount of data being volunteered for the site, and accounts of successful journeys that have been undertaken
- The volume, type and categorization of user feedback
- Interest from partners, sponsors and funding bodies

2.7   Financial/commercial

There are a few similar initiatives that ITP reviewed prior to deciding to go ahead with AccessAdvisr, which look to provide accessible transport information, including:

- Direct Enquiries (http://www.directenquiries.com/) have built a nationwide access register using the RADAR data.
- DisabledGo (http://www.disabledgo.com/) is a website for disability information, including access details for a range of different places.
- Open Britain (http://www.openbritain.net/) is a directory of accessible accommodation and travel

The unique perspective of AccessAdvisr is that it will focus specifically on the transport network, and involve crowd-sourced, rather than audit-derived information about the accessibility of places and transport systems. These factors differentiate it from other sites providing information for disabled travellers.

In the short term, ITP is looking to match the funding from GeoVation, using internal budgets, in order to support it as a larger project and provide it with the greatest chance of success. Longer term, ITP will explore ways in which it may be more commercially successful, with a number of different business model options.

2.8   Technology

Although AccessAdvisr is based on relatively mature technologies, there are a number of key technological/design challenges, including:

- The use of an appropriate colour palette for visual presentation
- The ability to write code that scrapes information from existing sources and can also capture data as it is updated on external websites for integration with user-generated content.
- The use of open source software (and licensing) within the project

2.9 Having impact on society and transport

ITP feel a key to maximising the impact on transport and society is to develop the links and relationships with representative groups so that they help raise awareness of the tool. Involvement of other groups in AccessAdvisr is potentially a win-win since it enables groups to demonstrate provision of benefit to members.

The reliability and usability of the site, and the confidence in the data, are vital to ensure that positive rather than negative feedback is given by users. It is also important to create the correct expectations with individuals so that they understand the limitations of the data provided.

They will ultimately judge whether the innovation has been a success by whether it enables individuals to travel more independently – in the way that non-disabled travellers take for granted. The scale of the impact will influence the level of satisfaction that ITP has with the development of the tool.

3 Final interview

This interview was undertaken with Neil Taylor and Jon Parker of ITP on 1st July 2012, towards the end of the development of AccessAdvisr.

3.1 Aims

The aim of the final interview was to reflect on the activity undertaken by ITP during the innovation process, and to make comparisons with the findings from the initial interview. The most relevant aspects are reported below.

3.2 Confidentiality

There was some confidential discussion during the interview. Loughborough and ITP agreed to jointly approve the summary from this meeting. It is agreed by both parties that the content below can be made public.

3.3 Main changes in perspectives or outcomes since the outset

The views that emerged from the final interview are largely consistent with those that ITP put forward during the initial interview undertaken with them in July 2011, with the following exceptions:

3.3.1 The importance of a mobile phone 'app'

The overall philosophy behind AccessAdvisr has remained unchanged and is as stated in the original interview. The original idea during the time of the GeoVation competition was that AccessAdvisr might be a smartphone application. ITP considered the demographics (2/3 of the people who are likely to benefit from the information on AccessAdvisr are over the age of 70) – this led to a shift in thinking towards developing a website rather than a phone application, and this was the GeoVation proposition. However, they realised early on that some of the relevance of AccessAdvisr was related to the collection or use of information at the 'point of activity' on the street – i.e. the use was

inherently mobile, and in real time. In addition, the last year in particular has seen increasing numbers of people buying smartphones, with embedded GPS and web access. Many of the individuals within more specialist user groups (e.g. the Stroke Association) already had the technology needed to support mobile applications. The main shift in perspective by ITP came from the realisation that they could prove out the concept with a website, but actually improve the user experience by developing a native mobile phone application as well. One of the key challenges was that applications on a mobile phone have to be simple due to the small screens, limited bandwidth, limited processing power and restrictions on data input. The AccessAdvisr website was relatively complex, and ITP realised that it was going to be very difficult to simply develop a mobile version of the website that worked well on a mobile device. This has led to the development of separate Android and iPhone mobile application versions of the AccessAdvisr website. ITP felt that the limitations of a mobile environment could be overcome by effective mobile design, e.g. by having local caching of content. This mobile application is currently nearing completion.

3.3.2 Increased importance of the feedback to Government and operators

Originally, the thinking behind AccessAdvisr was that it was almost entirely focussed on the individual using access information to help them travel. ITP had always envisaged a feedback loop to Government and transport operators, and the importance of this has increased due to the discussions they have had during development of the site. However, the ethos and overall aim hasn't changed – it is still the user community that is fundamental focus within AccessAdvisr.

3.3.3 Financial commitment by ITP

ITP did not receive the full amount of funding from GeoVation that they had applied for, and the final sum of £27,000 was less than half of the amount they had bid for. They recognised at the outset that they were likely to have to provide some financial support for the development of AccessAdvisr; however the final financial commitment required from ITP was greater than anticipated. ITP is fully committed to the success of AccessAdvisr, and although they have been willing to provide internal resources to support its development, substantial time was spent early on in the project looking for low cost software development options (paid interns / students) which proved fruitless.

3.3.4 Creation of a separate limited company for continued development of AccessAdvisr

At the outset, ITP was considering a range of longer term options for future development of AccessAdvisr. They took the decision to spin out a separate company, AccessAdvisr Ltd, for the following main reasons:

- It enabled individuals from organisations other than ITP to be formally recognised as having a role in the development of AccessAdvisr.
- It allowed the clear focus of a small team on the development of AccessAdvisr.
- It enabled some separation to be created between AccessAdvisr and ITP as a transport consultancy, so that different approaches could be used in terms of marketing and revenue streams.
- It creates a more transparent and accountable structure via the framework of a stand-alone limited company.

3.4 Main issues they faced

3.4.1 Technical expertise

ITP, as a transport planning consultancy, recognized from the outset of the development process that they had detailed knowledge of the needs of the end user, but not some of the specific technical expertise that was needed to develop the software. Securing this additional technical resource was not straightforward, and their experience differed from the advice provided to them at the start of the development process. Mentoring on the topic of software development would have been very helpful to the team at ITP.

3.4.2 Access to transport data held by organisations

Most of the local authorities and transport operators ITP spoke to were willing to provide their accessible transport data, although this was often in formats that were not directly usable within a web interface (e.g. MS Excel files). The reformatting of this data by ITP, and regular updates, proved time consuming and has demonstrated a lack of available OpenData on accessible transport topics in readily consumable/regularly updated XML/JSON formats. It has also validated to ITP that a significant aspect of the challenge going forward will be putting data into correct formats, which is a service ITP can offer to data providers. The team has prepared its own data specification in order to help local authorities and other organisations that hold relevant accessibility data and information to provide it in consumable formats.

3.4.3 Contribution of data

The key feature of AccessAdvisr is the ability of individuals to contribute access information on the site, so that it can be used by other individuals. ITP realised that (beyond the consumption of information in future) there is little incentive for an individual to start contributing data, and creating a critical mass of data that encourages further use and contribution of data, is a challenge. ITP felt that the key to the contribution of data via AccessAdvisr is to work alongside local user communities or disability groups, and helping them to contribute local data, to gain a critical mass of user contributed information. It is then immediately obvious how useful this information is, which should create a cycle of using and contributing data via the site.

3.4.4 Conflicts between user groups

The initial views of ITP were that AccessAdvisr would be a broad tool useful to all groups with disabilities and mobility impairments, this latter group including parents with pushchairs. However, the current view of ITP is that AA may have to be tweaked to suit particular user groups, and that there will need to be a way of managing potential conflicts between different groups. An example of this is where parents with pushchairs and wheelchair users are both using the site to obtain information on space on trams. If the accessible space is trying to be used by both groups, then the pushchair users will complain about the space being taken up by wheelchair users, and vice versa. The paradox is that a highly accessible transport system could actually end up being rated by both groups as poor in this respect.

3.5 The most positive outcomes

There were many positive outcomes from the development process, including:

3.5.1 The value of enhancing the level of technical awareness at ITP

The technological learning process that ITP has been through has been beneficial in enhancing their capability as a transport consultancy.

3.5.2 The publicity
AccessAdvisr has been referenced as an open data case study in innovation events, and has been featured in the national press.

3.5.3 Feedback from user and community groups
Community response to AccessAdvisr has been very positive, both from local user groups such as the Nottingham Stroke Association, and from local authorities. Almost across the board, local authorities have supported the concept and been willing to provide data. This helped develop confidence in the concept of AccessAdvisr, and its viability going forward.

3.5.4 Contacts and networking
GeoVation was a useful networking opportunity, and ITP is now working with at least two of the other organisations who were present.

3.6 Doing things differently
There are just a few things that in hindsight, ITP would have done differently, including:

- Been more forthright at the funding stage to highlight the impact of the reduced award (in relation to their bid) on the ability to fund the technical development of AccessAdvisr.
- More actively sought out technical guidance at the beginning of the project.
- Would have probably recruited a software developer to work at ITP on the technical aspects of the project. This would have meant that software development could have been more responsive, with less of an administrative and management overhead. It would have also enabled easier control of timescales.

4 Evaluation of AccessAdvisr

4.1 Introduction

4.1.1 Background
AccessAdvisr was developed with the help of funding through GeoVation. The research team within the Design School at Loughborough University took the opportunity to use this development as a research test-bed, with the aim of assessing it from an end user perspective. This would provide results relating to the key concepts embodied within AccessAdvisr, and would also provide useful feedback on the development of AccessAdvisr, and suggest ways in which it may be improved.

4.1.2 Aims
The aims of this work were to employ a theoretically grounded, user-centred approach to the evaluation of a Beta version of a 'minimum viable product' website for AccessAdvisr with representative users. The specific objectives were to:

- Identify suitable theoretical frameworks that can be used to assess AccessAdvisr
- Undertake user-trials of the Beta version of AccessAdvisr and report on the results

Since the website being developed was a Beta concept of a 'minimum viable product', the focus of the usability aspect was on identifying what the key usability issues were that would promote or hinder the success of this kind of tool, and to identify potential revisions that the team behind AccessAdvisr might need to make through future rounds of development. As such this primary research activity was not a usability audit of AccessAdvisr.

4.2   Method

The first stage of this work involved a review of theoretical, user-centred perspectives, to identify an appropriate framework to use to evaluate AccessAdvisr. This involved literature review and discussion with ITP of the application of various theoretical perspectives.

The second stage of this work involved planning and then undertaking a series of user centred evaluations of AccessAdvisr. These were done face to face with individual end users.

4.2.1   Theoretical perspectives

A number of meetings were held between ITP and Loughborough to develop a theoretical framework that could be used to evaluate AccessAdvisr. Several approaches were considered, including:

- Perceived value (Zeithaml 1988; Sweeney & Soutar 2001)
- Information value (Badenoch et al. 1994)
- Information relevance (Barry & Schamber 1998; Saracevic 2007)
- Quality and authority (Rieh 2002)
- Usability (ISO 1998; Bevan 2001)

It was decided to use the latter two as the theoretical basis of the work within this study, as they had been used successfully in other information products where user-contributed data is a key component.

4.2.2   Overview of user trials

The format of the evaluation was to ask participants to use the initial Beta version of AccessAdvisr for a range of journey-related tasks involving finding out the accessibility of different places and modes of transport. Evaluation data were then gathered from participants using rating scales based on discrete theoretical constructs, a 'think aloud' protocol during scenario-based activity, and a short structured interview.

4.2.3   Participants

A total of 19 participants were recruited who: were adults aged at least 18, were users of the internet, and either did, or were willing to use public transport. Two specific user groups were targeted: (1) those who have physical restrictions on their mobility, due to disability, illness or injury; (2) parents with young children who had to use a child's pushchair when using public transport.

4.2.4   Scenario design

Travel scenarios were designed to incorporate multiple transport modes, and a variety of different destinations. Their purpose was to get participants to explore as much of the AccessAdvisr Beta website as possible. They are shown below:

'You are travelling from the Holiday Inn Express hotel on Maid Marion Way, where you have stayed the night) to Loughborough and need to find an accessible way of doing this. A journey planner has suggested you travel to Station Street by tram from Old Market Square and then access the rail station to catch the train back to Loughborough. How useful is AccessAdvisr in helping you to plan this journey?'

'You arrive in Nottingham by train from Loughborough, where you are catching a National Express coach from the nearby Broadmarsh bus station. How useful is AccessAdvisr in helping you to find your way from the station to the bus station?'

'You will be arriving by bus from Loughborough at the Broadmarsh bus station, and you are trying to get to Marks and Spencer on Albert Street in the centre of Nottingham to meet a friend for coffee. How useful is AccessAdvisr in helping you to plan your trip?'

'You are trying to get to Café Rouge on Bridlesmith Gate in Nottingham and plan to drive from home into the city centre. How useful is AccessAdvisr in terms of finding some accessible parking spaces nearby?'

'You are arriving at Nottingham Rail Station from Leeds and need to change trains, and purchase a ticket at Nottingham station for the remainder of your journey to Loughborough. How useful is AccessAdvisr in helping you to plan this trip?'

4.2.5   Procedure

Participants were selected using a screening questionnaire to ensure they had the demographic characteristics desired. Participants were either met in the Design School, or at their home or other convenient place, with a chaperone if necessary (requirement of Loughborough University ethics).

Participants were then given an information sheet and completed an informed consent form, in line with ethical and best practice guidelines at Loughborough University. A short demographic questionnaire was completed by the individual, and they were then given a description of AccessAdvisr, and a demonstration of the key features. Participants then spent 20 minutes working their way through up to five of the scripted journeys, using AccessAdvisr to find out the accessibility of the different transport modes and points of interest involved. The focus of these scenarios was not to test the ability of the individual to complete the task successfully, rather to give the individual experience of using the various features on the AccessAdvisr website in the context of a set of realistic activities. Participants were encouraged to 'think aloud' while they were completing the scenarios, and comment on any aspect of AccessAdvisr as appropriate.

After participants had spent around 20 minutes working through the journey scenarios, they completed the rating scales, and then the structured interview. This was recorded and later transcribed. On completion, participants were given a £20 shopping voucher.

4.2.6   Dependent variables

There were three key dependent variables of interest within this study. The user trial set out to investigate AccessAdvisr from the perspectives of quality, authority and usability. Quality and authority are constructs used by authors such as Rieh (2002) and Parker et al. (2012a) to assess user contributed data. Quality is defined as *"a user criterion which has to do with excellence or in some cases truthfulness in labelling"* (Taylor 1986, p.62); authority is defined as *"the influences that a user*

would recognize as proper because the *information therein is thought to be credible and worthy of belief"* (Wilson 1983). These two constructs focus mostly on aspects of the information that is conveyed via a product. The construct of usability is well established within the discipline of user-centred design, and is defined as the 'extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use (ISO 1998).

Table 1 – Definitions of Quality and Authority used within this study (Rieh & Belkin 2000; Parker 2012)

Facets	Values	Description (keywords)
Information Quality	Good	Good job, bad, better, excellent, fine, nice, great, best, perfect, wonderful, incredible, cool, the state of art, well-kept site, well developed site
	Accurate	Accurate, correct, right, precise
	Current	Current, recent, up-to-date, out-of-date, old, timely
	Useful	Useful, useless, hard to use, informative, helpful, doesn't help, can't understand, it's not going to be of much use, didn't make good use
	Important	Important (being of importance to the user)
Cognitive Authority	Trustworthy	I trust it, trustworthy, believe in, confidence that this is true, seems real, faith in the quality
	Credible	Credible
	Reliable	Reliable, reliably done
	Scholarly	Scholarly, serious, academic, professional, biological, superficial, deep thing
	Official	Official
	Authoritative	Authoritative

The usability construct determines the extent to which a product (in the widest sense) meets the needs of its end users. Although it also measures aspects of the information being presented to participants, it also measures the effectiveness of the design of the user interface.

These three independent variables were measured explicitly using participant ratings using Likert scales. The qualitative data was also analysed in relation to these three main issues, as a means of triangulating results.

4.3   Results

4.3.1   Demographic details
Table 2 and Table 3 present a breakdown of the demographics involved within this data set.

Table 2 – Males and Females involved in the Research (mixed groups)

Gender	Number of Participants
Male	7
Female	12

Table 3 – Persons with limited mobility and persons who use pushchairs involved in the Research (mixed genders)

Group	Number of Participants
1. *Limited Mobility*	10
2. *Pushchair User*	9

4.3.2   Statistical analysis

Due to the low sample sizes and violation of certain statistical assumptions, parametric statistics comparing the influences of the experiment independent variables on the dependant variables (MANOVA) was not possible with this data set. Consequently, the non-parametric equivalent of MANOVA (Kruskal-Wallis) was used.

The only tested element with statistically significant differences between persons with limited mobility and pushchair users was Quality: Currency; X^2 (1, n=19) = 4.94, *p* = .026. The pushchair users recorded a higher median score (*Md* = 12.00) than the Limited Mobility participants who recorded a median value of 9.50. This may be due to the pushchair users being younger than the limited mobility group.

The consequence of this is that currency should be considered separately for the two participant groups; see Figure 2. All other dependant variables should be considered together; see Figure 1 and Figure 3.

4.3.3   Quality and Authority

Although the figure includes a range of answers, box plots with the median (thick bold line) falling outside of the 'Good' range should be considered as in need of further development.
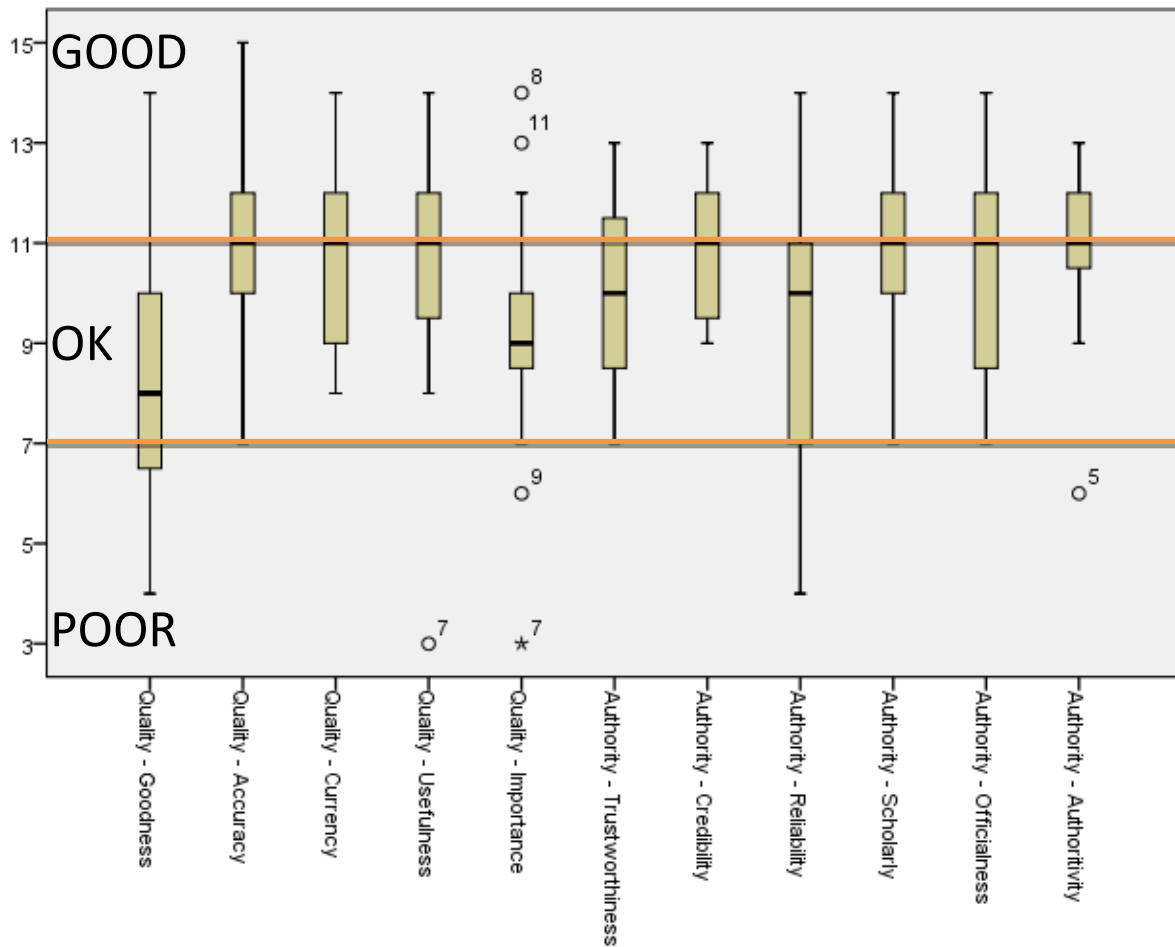
Figure 1 - Boxplots representing the range of scores for Quality and Authority (mixed groups)

Figure 1 demonstrates how, while the website was viewed as having a sufficient degree of quality and authority as to make it acceptable to use (Rieh 2002), the scores are unlikely to impress users of the site who visit the website on a casual basis. In particular, the website was not rated particularly highly in relation to *goodness* (its ability to impress), *importance* (the data's ability to help with the important task of access advice), *trustworthiness* and *reliability* (the likelihood that the information will prove to be correct). In comparison, and possibly more relevant in relation to a Beta concept, other factors such as the *accuracy* of information, *usefulness*, and *credibility* of the information were rated more highly.
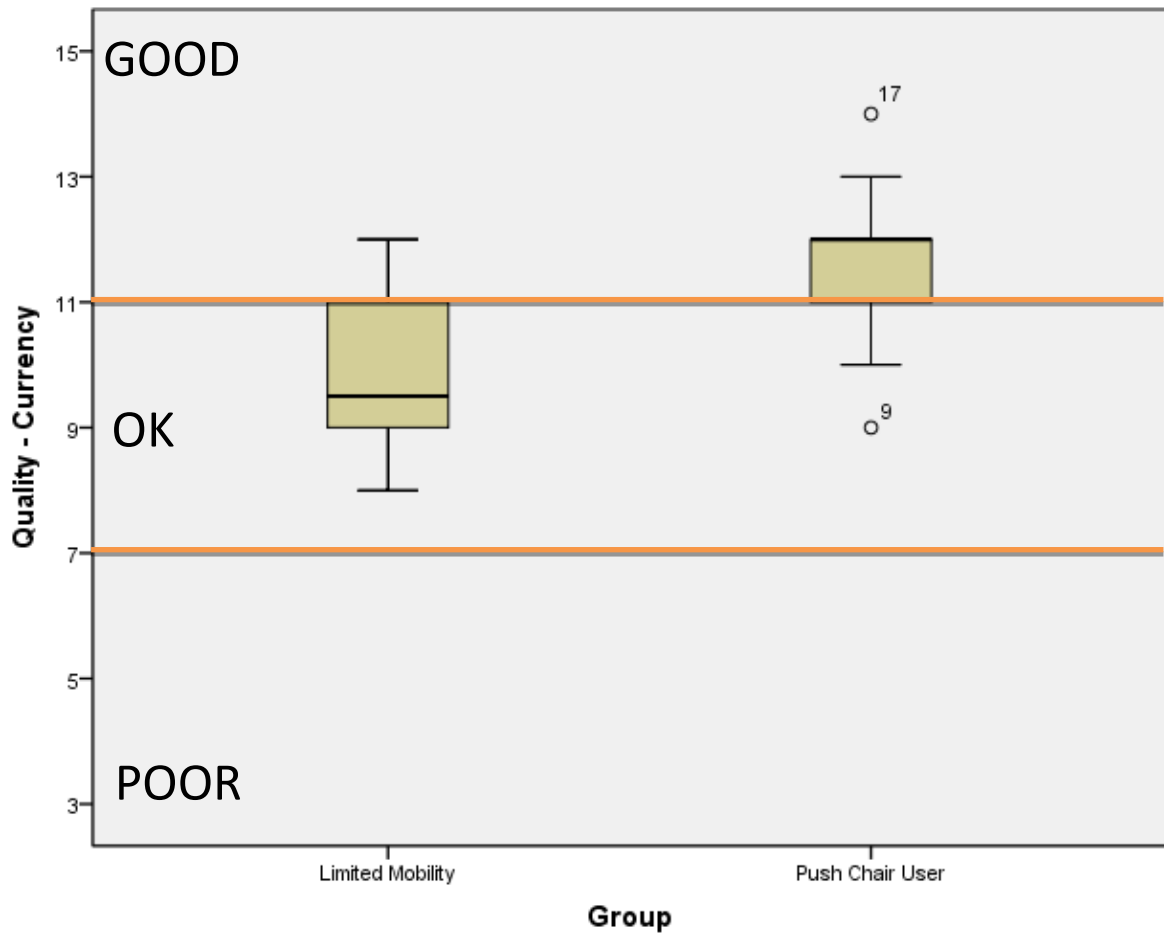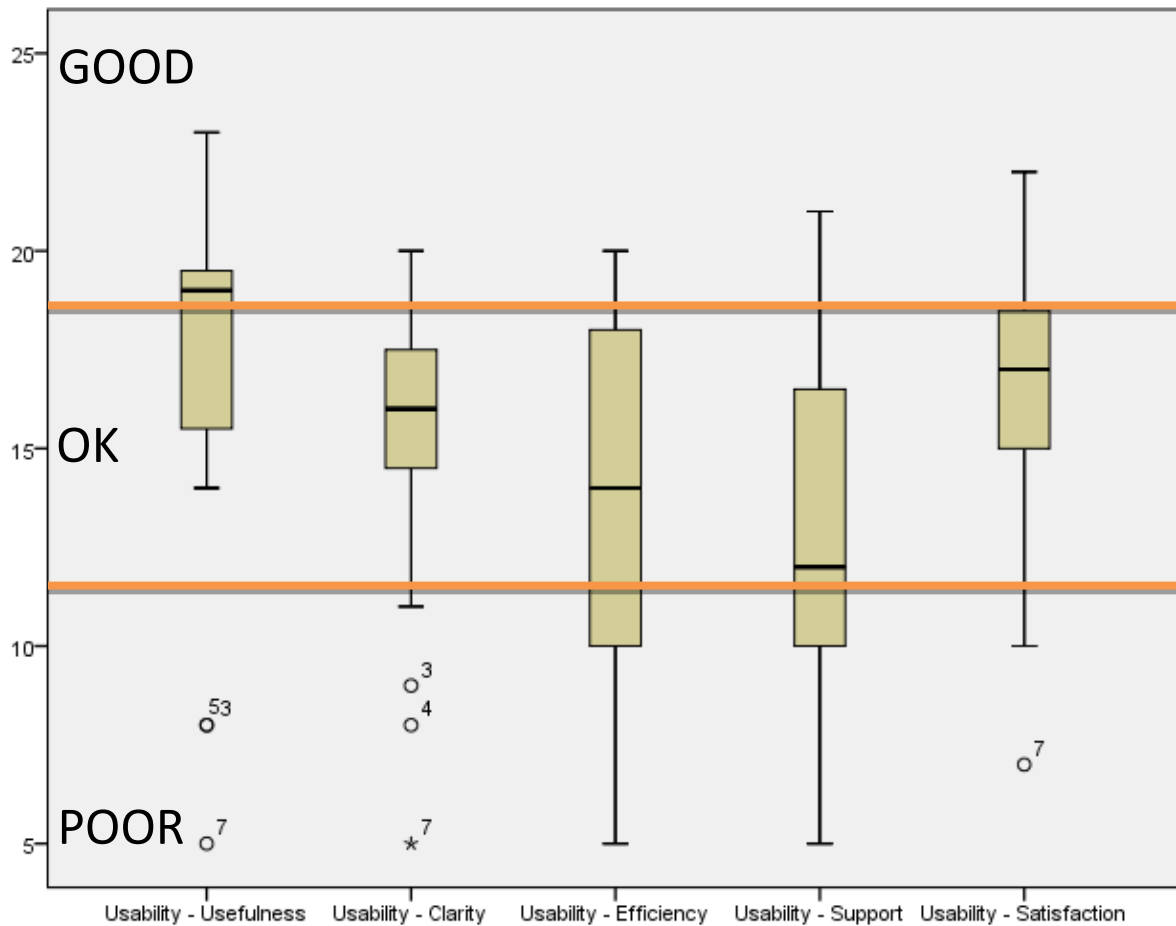
Figure 2 - Boxplots representing the range of scores for Currency across both groups

Figure 2 highlights how the younger participants (parents with push chairs) perceived the information within the website to be significantly more *current* than those older participants with mobility issues. Currency is a key influence on how people view the information set as relevant to their needs (Parker et al. 2012a). Consequently, the highly visible nature of volunteered information informing the participants is likely to make the website more appealing to younger persons.

4.3.4 Usability

Although the figure includes a range of answers, box plots with the median (thick bold line) falling outside of the 'Good' range should be considered as in need of further development.

Figure 3 - Boxplots representing the range of scores for Usability (mixed groups)

Figure 3 demonstrates the varied spread of views relating to the usability of the website, with the majority of views being within OK limits. This denotes how the majority of users could move around the site and achieve tasks successfully, although this did not provide a highly functional, efficient and satisfying experience. This feedback is useful for the team behind AccessAdvisr in respect of planning additional development activities, and enhancing the platform in the future. The user feedback reported above emphasised a number of issues the team were previously aware of, and had already begun addressing through iterative phases of follow-up development.

4.3.5   Qualitative Analysis
Qualitative analysis in this section focuses on the key points brought out of the interviews from the participants, and focuses on any comments related to the constructs described above.

4.3.5.1   Authority
The authority of the professional information was never questioned by participants during the trials. However, volunteered information received a more varied response. Older participants were more generally cautious of the crowd-sourced data, seeing it as potentially opinionated and lacking authority. Younger participants were generally more positive towards its content, giving it greater authority with its description of access at the given locations.

4.3.5.2   Officialness

Participants felt that the framework data (i.e. locations and names of points of interest on the map) provided a certified element to the website which was not questioned. This added to a feeling of professionalism within the website.

4.3.5.3   Reliability

Due to the lack of situated and sustained use of the website, participants were not able to comment on the reliability of the information relative to their *actual* use of it. However, because some participants were familiar with Nottingham, comment was made in relation to knowing where locations were, rather than relying on the information presented through the website (external information).

4.3.5.4   Appropriate

Particularly in relation to advertisements, the general feeling amongst participants was that of indifference towards hosting adverts on the site. This was particularly true if the adverts were appropriate to accessible travel or interests, and were non-obtrusive. When asked if they usually pay attention to adverts or click on them, the majority of participants said that they tend to ignore them.

4.3.5.5   Accuracy

The greatest criticism of the website was the highly visible lack of information from volunteers. This is to be expected with a Beta concept, where the aim is to stimulate feedback on the concept. While some points of interest contained enough volunteered information to satisfy the questions of the participants regarding access, they were never completely without question. The feeling of the group was that if more volunteered information was provided, giving a more complete overview of accessibility, the website could be considered accurate. Until then, the perceived accuracy of the website as a whole is questionable within the minds of the participants. This is a fundamental aspect of the crowd-sourcing approach, whereby the larger the sample of information contributors, the greater the likelihood of wide coverage and information quality combining to enhance accuracy.

4.3.5.6   Trustworthiness

Participants did not question the location or nature of the professional information within the website. Older participants were more likely to question the validity of the volunteered information, being concerned that it might be incorrect or malicious. Younger people were more likely to trust the volunteered information without undue hesitation. In both younger and older participants, the volunteered information was actively considered before judgement was made.

Where participants were uncertain whether to trust the information, this often referred to the uncertainty of the travel context, i.e. how plans and aspects of the travel network change over time in ways which are not predicted. This lack of trust in these cases can be understood by having no frame of reference in relation to the website's long term reliability relative to actual use. This long-term reliability and relevance to actual use could be explored further in the future, given these are factors that are likely to influence the extent to which people will choose to use AccessAdvisr.

Note: Trust can be considered 'a bet' that the information will turn out to be correct. Such judgements of trust formed without active use over a period of time can only be considered indicatory of how people will trust the website in the long term. Enforcing verification of how information turned out to be true can be a useful way to encourage positive trust.

4.3.5.7 Usefulness

The display of access information was seen as useful by participants. However, the greatest and almost universal concern was that the website did not provide a journey planner as a core feature of its design. Here, participants wanted an '*AA Route Planner'* or '*The Train Line'* style planner where they could put in start, destination, and possibly intermediate points of interest, and be informed how to get from A to C via B. Not having this feature caused a great deal of confusion amongst the older participants, and frustration in the younger. In many cases, the scenarios completed with the participants had to be abandoned because they knew about start and end points, but could not determine how to move from one to the other.

Further to this, participants greatly desired access information about the *journey* between points of interest. This was a position held by both young and older participants, who felt that without such information they may not even attempt the journey, even if the start and destination were accessible.

Possibly because of the lack of journey planning functionality built into AccessAdvisr - there is an integrated journey planning link to the Transport Direct website from every AccessAdvisr point of interest page, but none of the participants utilised this service - information relating to public transport points of interest (e.g. tram stops) were hardly noticed through the trials. While this report cannot comment on the utility of the information within those points of interest, the consequence of a lack of a route planner is that the information on transport-related features is less relevant or useful to the participant. *Note: An overview of how people relate to access issues through journeys between points of interest is given by Parker et al. (2012b).*

Some of the information on the website (e.g. the large number of 'destinations' shown) produced clutter. This appeared to reduce the perception of the usefulness of the website, even when the necessary information for the trip was presented within the data. Largely (but not universally), participants felt that the concept of the website was appealing and useful, and/or that they would like to use the website in the future. However, this was to a degree dependent upon the usability and aesthetics of the website being improved over time.

4.3.5.8 Clarity

While volunteered information about minor points of interest was generally sufficient (e.g. particular cafes) at larger locations (e.g. Nottingham Rail Station) participants did not feel that the way the volunteered information as presented was sufficient. A photograph of a staircase or door step could not be related to any particular space in the complex, leaving the participants unsure if they were likely to encounter it, or if any of the positive access features (e.g. lifts) would help them navigate it. One suggestion was to contextualise such complex locations with internal building maps.

On the main map, the cluster of points of interest was commented on as being so dense it was difficult to pick out particular features. Additionally, comments were made on it being of all one colour and with limited variety of icons. Consequently, rather than provide a helpful overview of local points of interest, the mass of superfluous information hid the important and relevant information. The consequence of this was to make it very difficult to pick out relevant features on the main map. In addition, the information returned via the search function was not particularly clear. The smaller map presented as a result of search made it difficult to see the wider context around a destination.

4.3.5.9 *Efficiency*

One of the most important aspects of the *efficiency* of use of the website is related to the ability to find easily the information being searched for. Search was a vital component of this kind of site. However, the results were not clear enough to distinguish between the items returned as a result of search, due to the lack of context. For example, while there may only be one 'Ye Old Tripp to Jerusalem' pub in a city, there may be multiple instances of 'Tesco' and 'Marks and Spencer', where selecting the right one may require a degree of personal experience in the city. This is at odds with the main strength of the website; providing information on locations which individuals are unfamiliar with.

Often, participants wanted to flip between multiple pages when investigating access issues associated with a multi-stage journey. Their main worry here was that there was no obvious link between these points – i.e. places 'joined up' in the format of a journey planner rather than a set of separate points of interest. Additionally, they wished for their preferences, filters and search terms to be remembered and linked through all these stages (an in-development facet of the website, which has now been addressed by the team behind AccessAdvisr). As this was not so, a lot of work had to be done to remember the purpose of the journey, and to a degree, the geographic relationship between the locations.

4.3.5.10 *Satisfaction*

Possibly due to the limited time of the trial in a laboratory setting, very little positive or negative comment was made on the satisfaction of use. A longitudinal study of situated use is more appropriate to investigate these attitudes.

4.3.5.11 *Support and Help*

A high proportion of participants commented that the combination of cluttered front map, and lack of integration of the search features led to a feeling that the interaction with the site was not particularly intuitive, and that extra guidance was needed. Of course it is preferable if no additional help is actually needed in order to use the site effectively. *Note: As Keller and Staelin (1987) commented, while to a degree multiple sources of information improve the user's overall assessment of quality, the ambiguous presentation of too much information causes a reduction in the user's overall assessment of information quality.*

4.4   Conclusions

Various conclusions can be drawn from the work with ITP in relation to AccessAdvisr. Despite the challenges they faced, ITP was able to deliver a Beta version of the AccessAdvisr website, which was trialled successfully with a range of end users. The tool that was developed was in line with their initial 'minimum viable product' vision, and consistent with what was set out in their project plan.

The AccessAdvisr team experienced a number of challenges that were faced during the development process. The main ones were related to: (1) the requirement for more specific technical guidance at the beginning of, and throughout the project, (2) the lack of available open data on transport accessibility, in usable formats; (3) recognition of the challenge associated with motivating users to start contributing data so as to generate a critical mass of information.

The assessment of different theoretical approaches to evaluating AccessAdvisr was a useful exercise. The final choice of a quality, authority and usability perspective, and the methodology employed,

were ultimately a pragmatic decision based on the Beta concept nature (and minimum-viable product) of the website, and the availability of participants to provide user input.

The idea underpinning AccessAdvisr is seen by individuals as a fundamentally sound one. Although a large number of travel related sites provide access to information from individuals, those involved in the user trials saw AccessAdvisr as novel in that it overlays on a map base both 'official' and 'volunteered' information. However, the key purpose of the site, and the stand out message, must be clear. While it underpins the philosophy behind the AccessAdvisr website, the term 'access' was not readily understood by all participants. The purpose of the site was clear to some, but not all participants.

The quality and authority of the site (focusing on the information shown via the map-based interface) are relatively high. Despite the Beta concept nature of the website, participants do not rate the information (including the user-contributed aspects) as having poor quality, or a lack of credibility. This demonstrates how participants can differentiate between aspects of a particular construct, and provide useful feedback on the concepts underpinning a site, without being overly swayed by the actual design of an interface.

The usability of the current Beta concept is relatively low overall, and usability was identified as one of the key issues that would present a barrier to future use by many participants. The assessment of different aspects of usability clearly showed how the concept was seen as useful. Although the current site is perceived as generally difficult to use, many users were relatively forgiving as it is clearly identified as a Beta version, and explained to users as a concept, rather than a live site.

The main issue that arose with the user ratings (aside from some confusion over the term 'access') was the subjectivity involved. There were various levels of trust associated with the ratings, and recognition that the greater the number of individuals contributing to a rating, the more that rating could be trusted – which is a fundamental principle behind the crowd sourcing concepts that the AccessAdvisr platform is built upon. The lack of traceability (anonymity) of the individual ratings was seen as a potential issue by some respondents - e.g. whether the 'rater' was local and therefore possibly more knowledgeable.

In comparison, the photographs on AccessAdvisr were universally well liked by participants, and particularly useful because they provide objective 'evidence' of the accessibility of an aspect of the transport network. In order for them to be of maximum value, their layout needs to be consistent with the path a user would take through a set of facilities, and placed within a travel context. This is a stated aim of the website and a suite of tools the AccessAdvisr team are working towards developing on top of the existing platform.

In addition, the user trials enabled the identification of a number of key usability issues that are critical to the future success of a site like AccessAdvisr.

- The pages were considered too cluttered, especially at 'zoomed out' levels.
- An effective search function is essential, as users will often be unfamiliar to an area. The search in AccessAdvisr was quite clunky, and did not seem to pick up on items. Many participants were unable to find some of the basic locations incorporated in the scenarios.

- Navigation around the site must be easy to understand. It is particularly problematic if functions within a site present the user with inconsistent views of similar information. There were particular problems moving from the search results page back to the main map page, and moving around the main map display.
- The Beta concept nature of the site also highlighted how various purely technical issues can detract from the perceived usability of the site. In some cases, the map display was unstable, and jumped when you place the cursor over destinations. Although a fairly minor point, this actually made it quite difficult to use the website. In addition, turning on and off the layers did not always work – this was resolved by closing and reloading the site.

The AccessAdvisr team had also recognised all of these issues through its own testing activities and was developing an enhanced set of search tools, stable and consistent navigation whilst the user testing trials were ongoing.

The most critical point relates to how a site like AccessAdvisr would actually be used by individuals, and what they would expect when they came to the site. Presently the assumption is that individuals would spend time looking specifically at the accessibility of forms of transport or destinations. However this model of independent information search is challenged by this research undertaken with potential users of the site. Individuals *are* interested in the accessibility of the transport network; however many participants stated that this information is only really useful if it is integrated with journey planning functionality. Accessibility information is primarily useful because it facilitates route planning or destination choice – i.e. it is a means to an end, rather than a purposeful activity itself. It is likely that individuals will approach the site expecting a journey planner with integrated accessibility information, which is not how the current site operates but is a stated aim of the AccessAdvisr team. Their desire from the outset was to embed a database of crowd-sourced accessible transport information, which could be created through AccessAdvisr, into existing journey planning tools in order to maximise the value of such information for people with limited mobility.

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