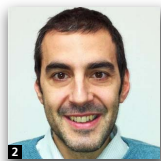


# Assessing the accessibility of the Wolverhampton interchange, UK

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The UK Disability Discrimination Act (DDA) of 2005 requires transport service providers and local authorities to make reasonable infrastructure adjustments to accommodate the needs of disabled transport users. This paper presents the findings of a study that aimed to evaluate the extent to which the recently developed Wolverhampton Transport Interchange project meets the requirements set out in the Disability Discrimination Act. The study involved the implementation of a questionnaire survey of disabled users and semistructured interviews with stakeholders of the project. Site audits on three transport interchanges were undertaken for assessing the services offered and for enabling a comparative study. The paper presents the perceptions of users with various disability types regarding the infrastructure offered and concludes that the legislation had made an impact on improving the accessibility for disabled users, but what is needed is a process of rationalisation. Data from the transport interchange providers showed evidence of reasonable adjustments to meet the needs of the disabled, but obstacles to full compliance remained and further improvements could be made in order to enhance the services offered to the disabled users.

## 1. Introduction

Legislation in the UK with regard to disability has undergone much iteration over the past two decades. In 1995 the Disability Discrimination Act (DDA) was written to protect disabled individuals from the discrimination they often faced on a daily basis and to establish a National Disability Council. The Act was updated in 2005 to include regulations that prohibited discrimination by public officials (i.e. for access to rail cars), private clubs and group insurances. In 2010 the DDA was superseded by the Equality Act 2010, which replaced several sections of the DDA. For the purpose of this paper the definition of disability as per the DDA 2005 was used, as this was the legislation that was in force at the design stages of all interchanges. The DDA defines disability as 'A physical or mental impairment which has a substantial and long term effect on a person's ability to carry out day to day activities'. Research undertaken by the Disability Living Foundation (2011) estimates that there are over 6.9 million disabled people of working age in the UK. Furthermore, the Office of National

Statistics suggested that approximately 10 million disabled adults and 700 000 disabled children, equivalent to around 18% of the population, are covered by the DDA in Great Britain (Bajekal *et al.*, 2004).

A study by the Scottish Executive (2003) identified that 20% of disabled adults perceived public transport as inconvenient. Despite the fact that disabled users express high expectations for future transport services, 60% of them believe that people responsible for the planning and development of transport infrastructure and services place little emphasis on their needs (DPTAC, 2002). In addition, evidence suggests that more than 50% of disabled people feel socially excluded due to the way places are planned and designed (Bromley *et al.*, 2007). The aforementioned perceptions of disabled users influence their level of use of transportation services. Based on a study by the Department for Transport (DfT, 2002), people with disabilities often travel one third less than the general public. In the context of transport interchanges, Grewal *et al.* (2002) argued

that the difficulties most frequently faced by disabled people in the UK were getting to and from bus stops or stations (22%), or on and off buses and trains (24%). In addition, Jensen *et al.* (2002), suggested that approximately 13% of the population experience difficulties in accessing transport at interchanges. The authors further argued that accessibility at interchanges must be assessed based on a number of indicators and not merely on the difficulties related to the physical accessibility of public transport vehicles. Each part of the journey, including information on the service, how to use it and getting into the interchange needs to be fully accessible for interchanges to succeed (Tyler, 2002). Soltani *et al.* (2012) supported that, although a number of studies have been dedicated to the travel needs of disabled users, little emphasis has been placed on intersection designs and use. This point is also reinforced in the government's response (HCTC, 2013), which highlights the need to engage with disability charities and organisations in order to develop new ideas for providing accessible pedestrian infrastructure in the different physical environments around the UK.

In light of the above, this paper presents a study that was implemented for the evaluation of the recently developed Wolverhampton Transport Interchange project. More particularly, the study looked into design issues that could have affected accessibility and other services provided to disabled users. The study focused on the new bus station that formed the main development of phase 1 of the project. The study involved a trifold approach composed of a questionnaire survey with disabled users, collection of empirical data through site visits, and interviews with stakeholders of the project. In terms of scientific outputs, the study aims to address the following research questions.

- RQ1: What are the main barriers that disabled people face when using transport interchanges?
- RQ2: Which of the identified barriers do users with different disability types perceive as most important in their day-to-day activities?

Section 2 of the paper describes the methods that were used for the realisation of the study. The subsequent sections present the main findings of the study (Section 3) together with their discussion (Section 4). Finally, the conclusions from the study and further research directions are provided in Section 5.

## 2. Methodology

The implementation of the study presented in this paper involved three methods for primary data collection. Quantitative data were collected through a questionnaire study with disabled users of the Wolverhampton interchange, empirical data were generated following three site investigations, and qualitative information was elicited through semistructured interviews with the projects' stakeholders.

The questionnaire survey was designed to collect the views and perceptions of disabled users regarding the use of the recently constructed public transport interchange in Wolverhampton. This enabled the authors to understand accessibility issues that disabled people faced while using the infrastructure and allowed the contextualisation of the site investigations that followed.

The site audit approach intended to explore the perceptions of the disabled users and to facilitate a detailed investigation and analysis of the services of the interchange. In order for a comparison to be made two additional site audits, in Sheffield and Barnsley, were implemented. Finally, the findings from the questionnaire study and site audits were used as the basis for the interviews with key project stakeholders.

### 2.1 Questionnaire study

The questionnaire study involved random selection of disabled users of the Wolverhampton interchange. Members from various disability groups in the West Midlands were invited to participate in the study. These included, 'One Voice Action for Disability', 'Disabled Advisory Group on Leisure Activities', 'Beacon Centre for the Blind', 'Acorns Children's Hospice' and disabled students at Wolverhampton University. The main survey was preceded by a pilot study for trialling and refining the questions. The pilot involved members of the 'One Voice Action for Disability' group, who commented and assisted on the development of the questionnaire. As part of the main survey, a total of 42 responses were collected through the use of an online questionnaire. Figure 1 depicts a categorisation of the sample group based on the type of disability.

For the derivation of the primary results, factor analysis was applied on the data collected from the questionnaire study.

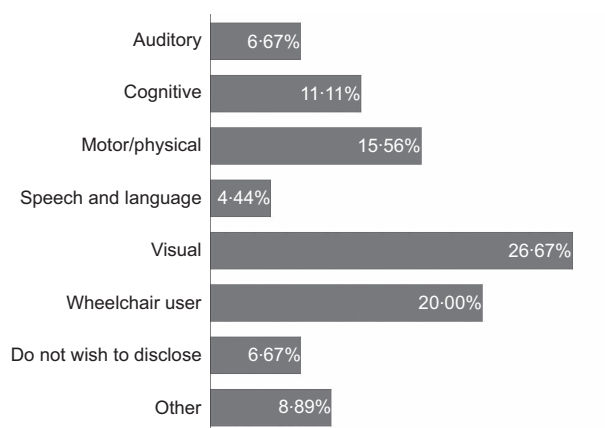


Figure 1. Sample categorisation based on disability type

This exploratory multivariate analysis method has been employed in transportation studies in which numerous ordinal and ratio parameters are investigated as part of different sample groups (Chou *et al.*, 2012; Estupiñán and Rodríguez, 2008; Yeo *et al.*, 2008). The sample sizes used for this past research do not differ significantly from the number of disabled users who participated in the study presented in this paper. A number of variations of factor analysis have been employed for multivariate studies; however, in this study ‘simultaneous R and Q-mode’ analysis, as described by Walden *et al.* (1992) was used for the examination of the data. This particular method of analysis was selected as it allows extraction of common factors by reducing data dimensionality (Davis, 2002). Furthermore, the selected factors are based on maximising the correlations between the principal parameters, rather than maximising the variance of them, as in the case of principal component analysis (Schneeweiss and Mathes, 1995). The application of factor analysis enabled the identification of correlations among the perceptions and attitudes (principal parameters → RQ1) of transport users based on the nature of their disability (sample groups → RQ2).

## 2.2 Site investigations

The site investigations intended to carry out an in-depth analysis of the Wolverhampton transport interchange and attempted to identify any specific difficulties that may be faced by disabled users. The infrastructure audits were undertaken by adopting the structure used by the Sport England access audit (<https://www.sportengland.org/media/30255/Accessible-Sports-Facilities-Audit-Check-List-October-2012.pdf>) checklist, which incorporates the technical requirement in line with the recommendations of BS 8300:2009 and Part-M building regulations (BSI, 2011). The infrastructure audits were complemented by safety evaluation using the Highways Agency’s design manual for roads and bridges document HD 19/03 ‘road safety audit’ (HA, 2003). Wherever possible measurements were taken and photographic evidence was recorded to support the audit findings. For comparative analysis, three site investigations were carried out. These included the Wolverhampton, Sheffield and Barnsley transport interchanges. To ensure that the collection of data was consistent for all audits, a pro forma was developed before the visits started. A scoping visit to Sheffield interchange allowed the refinement and finalisation of the aforementioned pro forma. Barnsley was selected due to it being highlighted on the ‘Disabled and Go’ (<http://www.disabledgo.com/>) website, which inspects facilities for disabled people and was therefore considered as a benchmark for comparison.

## 2.3 Semistructured interviews

Semistructured interviews were conducted with the permission and convenience of participants for a duration of approximately 45 min. The interviewees were selected as a

result of their involvement in designing, constructing and managing the three interchanges. The majority of interviewees were stakeholders of the Wolverhampton interchange as it is the newest and the focus of this study. The interviewees from the Wolverhampton project consisted of senior managers from Centro and Wolverhampton City Council officers. As the interviews were conducted as semistructured, open-ended questions were used. In order to extract meaning from the data obtained the answers from the interviewees were grouped into key themes. Such an approach allowed the portraying of an account of the provisions offered at the interchanges (Naoum, 2007). The themes selected for the systematic summarisation of the interview findings can be seen in Table 1.

## 3. Results

### 3.1 Quantitative results

As part of the analysis of the data collected from the questionnaires, emphasis was given to the perceptions of disabled users in relation to their type of disability (RQ2) and their overall satisfaction (RQ1) towards the intersection meeting their needs. For both analyses eight parameters, which were derived from the questions used, were included. These parameters can be seen in Table 2.

Figure 2 and Table 3 present the results of the analysis undertaken for the investigation of the relationships between the disability type of the users and the selected evaluation parameters. All the parameters used have positive loadings on factor one, while the loadings vary in relation to the second factor. Interestingly, the close approximation of P7 and P8 denotes that accessibility to the interchange is considered as a major factor in deciding whether or not the interchange is meeting the needs of the users. In general, parameters located in close proximity on the graph infer higher correlations. The other two parameters with high correlation are P1 and P2, meaning that the time spent by disabled people in using alternative paths to access the interchange may result in them being late for boarding their planned service. As can be seen, disabled people with visual impairment and wheelchair users were those affected the most by the interchange design. The loadings on factor one for these sample groups are positively greater than the loadings from the other sample groups. The disabled people least affected and most pleased with the current design were those with cognitive, language and speech impairments. For the factor analysis presented in Figure 2, the first two factors extracted explain 75% of the variation in the parameters selected. Therefore, the findings in terms of factor loadings and parameter correlations can be considered to be significant.

Figure 3 portrays the results from the factor analysis when the respondents were divided into those who stated that they face

Themes	Findings
Understanding of the legislation	Interpretation of certain legislation aspects was found to be ambiguous. Particularly the term 'reasonable adjustments' was found to be open to various understandings and subsequent actions.
Medical and social models of disability	It was discovered that most respondents agreed that the social model (sees the social barriers as the problem) of disability should be taken into account when designing transport infrastructure. This should be supported by legislation, which will assist the removal of social barriers and will enforce compliance with standards.
Design issues	The interviews identified difference of opinions between members of disabled groups and designers/engineers involved in the project. Such differences involved the following aspects: Inclusive design may be hampered due to physical constraints that will not permit full compliance with standards; Design choices may advantage certain disabled users, but disadvantage others; Design elements that were assessed as 'positive' in planning stage were found to create problems post implementation.
Funding	The interviews revealed that funding can be a limiting factor and lack of it can invariably affect access work. A number of compromises are being made, in major infrastructure projects, as part of cost-saving exercises. However, in some cases these compromises may lead to some inherent issues such as those identified during the site audits (Table 6).
Consultations and working with each other	There was some uncertainty regarding the type, scope and timing of consultations with disabled users. Although two equality impact assessments were done, certain interviewees were not aware or fully satisfied about the timings and scope of these. That could suggest that further integration among various professionals during the design and implementation stages could have limited the infrastructure shortcomings.
Disability training for engineers	There was a common consensus revealed that inclusive design, which meets the needs of disabled users, should be incorporated into university programmes.
Equality Act 2010	Interviewees claimed that the Equality Act 2010 and the Disability Discrimination Act are not that different and some ambiguities (e.g. the term 'reasonable adjustments') still remain. It was firmly commented that both Acts, together with BS 8300:2009, were consulted and followed for the development of the project.

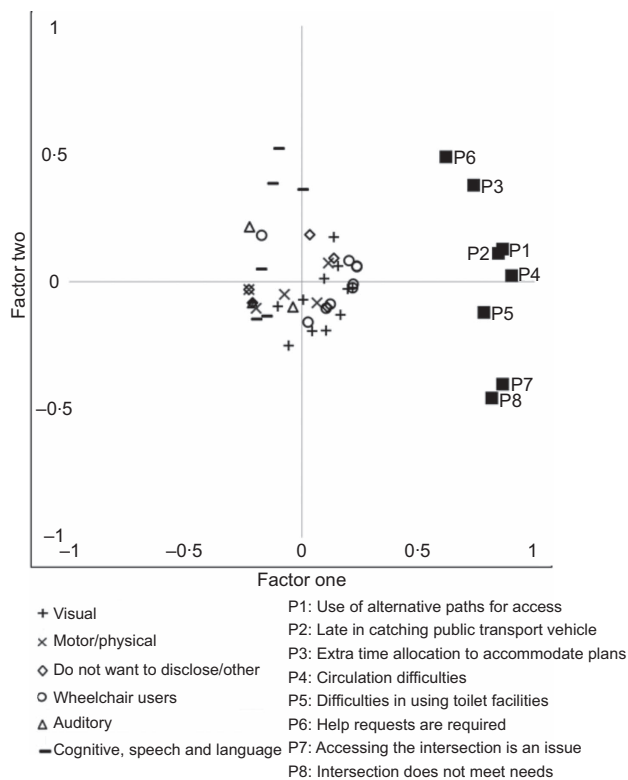
**Table 1.** Key findings from interviews

problems (as an overall awareness) when using the interchange and those who do not. The loadings of the parameters and summary of the results (Table 3) are equivalent to those of the previous analysis due to the fact that the total respondents used were the same in both. The results divulge that the group of disabled users that faces problems perceive accessibility as the major difficulty. Furthermore, as they are using alternative

paths for accessing the interchange they are more prone to delays due to lateness. That fact may result in the consideration of additional time for their journey at the planning stage, which can generate feelings of dissatisfaction towards public transport. No noticeable trends can be observed for the disabled users who were overall satisfied with the provisions of the interchange.

Code	Parameters' question/statement
P1	I have to use alternative or inconvenient paths to access the interchange because of my disability
P2	I am sometimes late in catching my bus, train, metro because of my disability
P3	When I have to use the interchange I have to allow myself extra time so that I am able to get to where I need to be
P4	I have difficulty in moving around the interchange
P5	I have difficulties in using the disabled toilet facilities in the interchange
P6	I have had to ask for help in getting around the interchange
P7	Accessibility in the interchange is an issue for me
P8	I find the interchange does not meet my needs in relation to my disability

**Table 2.** Parameters used in factor analysis



**Figure 2.** Analysis of users' perceptions based on the type of disability

### 3.2 Empirical results

This section presents a summary of the results generated from the empirical site audits that took place in Wolverhampton, Sheffield and Barnsley. The audits were implemented using an access audit template from Sport England and BS 8300:2009 designing for accessibility. The highway audit utilised the Highways Agency's design manual for roads and bridges

document HD 19/03 'road safety audit'. The features of each audit can be seen in Table 4.

Table 5 presents the scoring outcomes, while Table 6 lists the main characteristics and potential shortcomings of each intersection in meeting the DDA's and Part-M building regulations' requirements.

### 3.3 Qualitative results

The interviews undertaken with senior officers from Wolverhampton City Council and Centro revealed a number of interesting patterns. The interviews identified that there are a number of difficulties that may have hindered compliance with standards. It was found that obstacles were created by both internal and external sources, which inherently affected the quality of the level of access within the transport interchanges. Table 1 illustrates the key findings following the compilation of the responses from the interviewees.

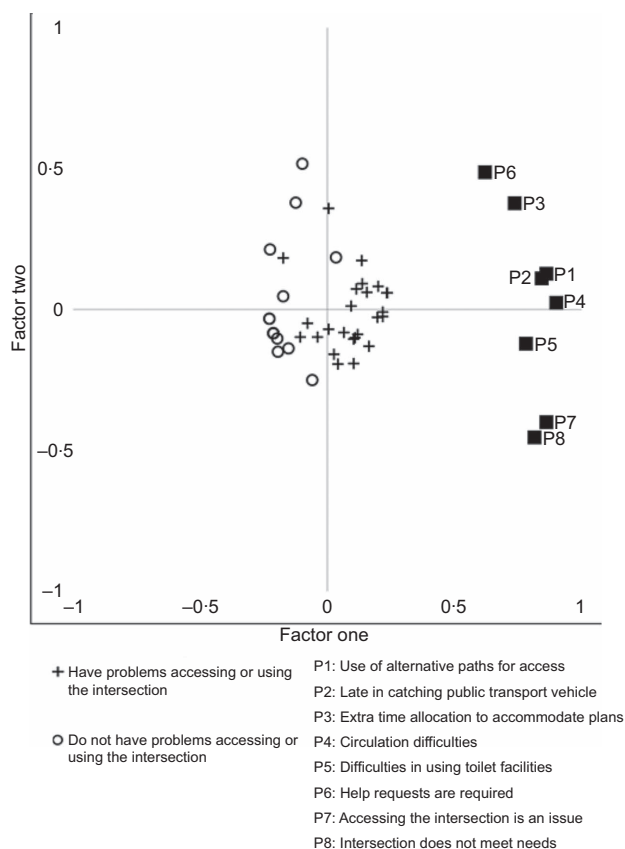
## 4. Discussion

From the results presented above it is evident that the trifold approach for data collection allowed the generation of findings that were corroborated by different sources. The questionnaire study revealed that the majority of the disabled travellers expressed difficulties while using the infrastructure of the interchange. This result supports the research conducted by Jensen *et al.* (2002), who suggested that disabled people experience problems in accessing some or all modes of transport at interchanges in the UK. The disabled groups who expressed greater concerns regarding the access and the use of the interchange were the wheelchair users and the visually impaired. This view is in agreement with literature by Wolverhampton City Council (WCC, 2009) that some of the barriers disabled users face include lack of manoeuvring space for wheelchair users and obstructions for people with visual impairments. A number of design shortcomings, which may have resulted in the above stated users' perceptions, were

Factors	Eigenvalues	Total variance: %	Cumulative eigenvalues	Cumulative total variance: %
1	5.197685	0.649711	5.197685	0.649711
2	0.790972	0.098872	5.988657	0.748582
3	0.691684	0.08646	6.680341	0.835043
4	0.505331	0.063166	7.185672	0.898209
5	0.309467	0.038683	7.495139	0.936892
6	0.219044	0.027381	7.714183	0.964273
7	0.18052	0.022565	7.894703	0.986838
8	0.105297	0.013162	8.0	1.0

**Table 3.** Summary results from the factor analysis of Figure 2, showing the eigenvalues, total variance (%), cumulative eigenvalues and cumulative total variance (%)





**Figure 3.** Analysis of users' perceptions in relation to the difficulties faced when using the intersection

identified during the audit. The most noticeable were the absence of tactile surfaces across the main crossings that lead to the interchange (Figure 4), the spacing between bollards that surround the interchange (Figure 5), and further design issues that hampered the circulation of the disabled users within the infrastructure.

The factor analysis revealed that access to the interchange was the main 'dissatisfier' for users in terms of the infrastructure meeting their needs. Findings from Schmöcker *et al.* (2008) suggest that difficulties in accessing bus stands and stations make public transport an unattractive option for disabled

users. It is therefore important that measures that enhance access to interchanges are in place in order to avoid the exclusion of disabled people from using public transport. On the other hand, users with cognitive, auditory, speech and language disabilities were found to be more satisfied with the provisions offered. Lamont *et al.* (2013) pointed out that lack of traveller information to dyslexic users may result in their exclusion from public transport. Although the audit highlighted the existence of glare on the information screens within the interchange, users with cognitive impairments did not appear to be affected. This could be attributed, as commented by one of the questionnaire respondents, to the knowledge that frequent users have of schedules and timetables. In any case, provisions that facilitate acceptable communication of information to disabled users should be available in such major projects.

The DDA 2005 has had a significant impact on the Wolverhampton transport interchange, and engineers have considered reasonable adjustments so that the needs of disabled transport users are taken into account. The interviews undertaken identified that there was significant variation in the interpretation of the legislation, and in particular with the term 'reasonable adjustments'. The Equality Act 2010 was introduced for the integration and harmonisation of several major pieces of legislation, including the DDA (Hepple, 2010). However, the term 'reasonable adjustments' is still in existence and the following extract from the Equality Act 2010 (GEO, 2010) asserts that a number of factors need to be considered before adaptations can be implemented.

What is reasonable will depend on all the circumstances, including the cost of an adjustment, the potential benefit it might bring to other customers (ramps and automatic doors benefit customers with small children or heavy luggage, for example), the resources an organisation has and how practical the changes are.

This reinforces the point that aspects of the legislation can lead to subjective decisions and supports the view of Male and Spiteri (2005), who stated that the lack of a clear definition of the term 'reasonable adjustments' creates uncertainties in its interpretation. Furthermore, Barnes and Mercer (2006) claim that such uncertainties could be the reason behind the vast variety of poor to excellent provision for disabled access in the

Site audit	Date	Time	Weather conditions
Wolverhampton	23/01/2012	14.00	Clear, dry road surface
Sheffield	13/01/2012	11.00	Dry with sunny spells
Barnsley	03/02/2012	10.00	Clear, road surface was gritted due to overnight frost

**Table 4.** Features of side audits

Interchange	Wolverhampton	Sheffield	Barnsley
Arriving at facility	3 out of 5	3 out of 5	4 out of 5
Car parking	5 out of 7	6 out of 7	6 out of 7
Circulation doors and signage	16 out of 20	15 out of 20	19 out of 20
Stairs and ramps	14 out of 15	12 out of 15	15 out of 15
Toilet provisions	6 out of 10	8 out of 10	6 out of 10
Fire and Safety	5 out of 5	4 out of 5	5 out of 5
Total	79% (49 out of 62)	77% (48 out of 62)	89% (55 out of 62)

**Table 5.** Audits scoring results

built environment. Such variations in the provisions were identified following the audits of the Wolverhampton, Sheffield and Barnsley interchanges. The site audits revealed a number of issues and highlighted that some measures could have been considered for overcoming these at the initial design

stages. The scoring of the intersections ranged from 89% to 77% and this strengthens further the arguments stated above. Although improvements in some areas could be made, the award-winning Barnsley intersection offered more in terms of access, and very minor issues were highlighted during the audit.

	Wolverhampton	Sheffield	Barnsley
Facility access	On Pipers Row (the main access into the interchange) there is an absence of tactile paving and controlled crossing point.	Access to the facility is impeded by no tactile paving. Dropped kerbs have been provided at the interchange end and full height kerbs are located on the other side of the road.	Access to the interchange was good, no obstructions were found; however, a raised speed table could have reduced traffic speeds.
Facility access	The main entrance doors are obstructed with 'A' boards and the manifestation on the doors is incorrect.	Bollards are spaced out incorrectly and are obstructing access for wheelchair users. Cones are left out for no apparent reason.	Eldon Street entrance is problematical; the footway should be re-graded to remove sharp drop.
Circulation	Circulation and signage is inadequate. The information screens are quite high and are barely visible due to the glare. Toilet door signs non-compliant.	Circulation and signage is inadequate. The information screens are quite high and are barely visible due to the glare.	Circulation and signage is good, all areas had adequate widths for disabled people.
Toilet provision	Toilet facility for the size of facility is inadequate. Radar key pad and signs on doors are not Disability Discrimination Act compliant.	Toilet sanitiser was in the incorrect position and obstructions were found in the toilets.	Toilets were of inadequate width and not in accordance with building regulations.
Internal stairs and ramps	No stairs in facility. Internal ramp provided does not fully comply with standards, as it does not have adjacent steps.	The ramp did not have handrails on both sides and no signage to indicate a ramp.	No problems were identified.
General features	Incorrect use of tactiles at bus stands.	No tactiles at present at bus stands.	No tactiles at present at bus stands.
Emergency escapes	Fire escape and refuge points are within limits.	Fire and general safety – there were no signs in the interchange area to identify where the fire exits were.	Fire escape and refuge points are within limits.
Staff training	Staff were trained to assist people.	Staff were trained to assist people.	Staff were trained to assist people.

**Table 6.** Main characteristics and potential shortcomings identified



Figure 4. Absence of tactile paving on Queen Street/Pipers Row

The audit at the Sheffield intersection revealed potential design shortfalls such as missing dropped kerbs and in cases substandard ramp designs (Figures 6 and 7).

The findings from the audit at the Wolverhampton interchange exhibited a number of design issues such as those discussed above. However, the stakeholders involved pointed out that areas of improvements have been identified and plans were in preparation for their realisation. At this point, it has to be noted that the Barnsley interchange was built 5 years earlier than Wolverhampton's, and that a number of improvements had taken place (on its original design) to achieve its present state. The need for such step changes in the design seems to be an inherent aspect of such projects, and as highlighted by the interviewees, design decisions that seemed appropriate at planning and design stages did not function as well post implementation.



Figure 5. Entrance to interchange opposite Berry Street

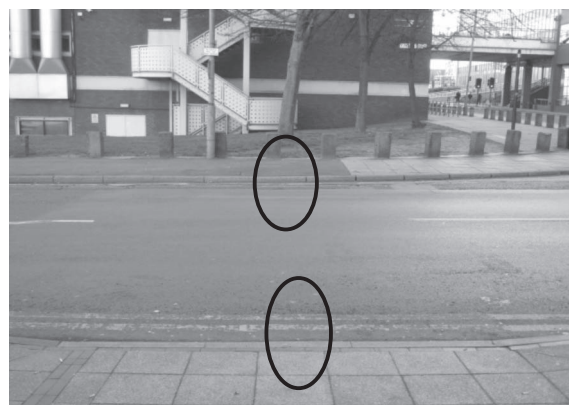


Figure 6. Pond Street entrance – lack of drop kerbs

Public consultation was another important aspect that emerged during this study. Despite the fact that two equality impact assessments were done, statements such as 'Why did nobody ask the people who use the interchange their views?' and 'Why has this been left out, is this going to be sorted?' from the disabled users contribute to the reasoning that they felt left out from the consultation process. The above was supported by an interviewee, who believed that not enough consultations took place, and expressed some uncertainties about the timing and scope of those. On the other hand, it was stated during the interviews that, if time had permitted, further consultations would have taken place. In general, public consultations for transport projects are cumbersome tasks. Despite the fact they can be a driver (London's successfully implemented charging scheme (Banister, 2003)) or a barrier (Edinburgh's failed congestion charging scheme (Rye *et al.*, 2008)) for major transport projects, public consultations raise a number of



Figure 7. Handrails were only provided on one side



difficulties for stakeholders. As Szyliowicz (2003) suggests, public participation poses three main challenges, namely ambiguities on what it actually entails, overcoming of organisation barriers and lack of knowledge by the public. It was identified from the interviews and questionnaire study that the first two may have played a constricting role in the level of accessible design of the Wolverhampton interchange. In contrast, given that the use of the interchange affects the day-to-day life of the particular user group, the latter can be advertently excluded as a possible factor. Concluding on the above, research findings have demonstrated that cooperation between parties in project teams and professionals from wider groups is essential for the resolution of accessibility issues in transport projects (Eltridge-Smith, 1998).

## 5. Conclusion

Despite the identification of a number of design shortfalls, the study concludes that the current legislation did have a positive impact in mitigating the exclusion of disabled people from using the Wolverhampton interchange. In addition, the findings presented in the paper underpinned the importance of wider public consultation exercises for meeting the needs of disabled users. In the past, the government has recognised the fact that 'Too often the needs of disabled people are considered late in the day and separately from the needs of others' (ODPM, 2003). Furthermore, the research highlights that the consultation process remains challenging specifically at the design stage, and this consideration remains one of the most significant implications of this study. As Lucas (2012) points out, the true integration of social exclusion agendas in local policies remains somewhat limited among transport planning authorities. In this context, public consultation with disabled groups was identified to be of vital importance early in the planning and design stages of a project. It was argued by stakeholders that available funding often affects the degree of a project's compliance to standards related to accessibility. This is recognised by the Equality Act 2010 (GEO, 2010), which stipulates that economic factors need to be considered as part of a feasibility assessment for the implementation of 'reasonable adjustments'. When that is the case, careful consideration must take place in order to ensure that available spending optimises the potential provisions. The early inclusion of disabled users in the consultation process may result in the avoidance of costly adjustments post implementation.

In addition to the rationalisation of the existing regulations, the existing planning approaches may require further alignments to accommodate the needs of people with disabilities. Indicators dedicated to the welfare of disabled users must supplement existing ones, such as the reduction of travel times, accident mitigation, minimisation of environmental impacts and others, when transportation investments and policies are decided (Bakker and van Hal, 2007). This will allow for the

provision of attractive public transport services and minimisation of the reliance on private cars, either as driver or passenger, which in the past has been the case (Schmöcker *et al.*, 2008).

Furthermore, isolated contextualisation of disabled needs to access to transport may limit the scope of the potential policy objectives that can be met (Stanley and Stanley, 2007). Past research has highlighted that limited transport accessibility affects the overall wellbeing of disabled individuals (Delbosc and Currie, 2011). Moreover, social exclusion concepts have failed in the past to understand fully the relationships between transport accessibility and policy goals related to health, housing and employment (Stanley and Lucas, 2008). Therefore, a more holistic approach for promoting the wellbeing of disabled people should be formalised.

Further research could aim to identify indicators and prioritise them in order to address the needs of people with disabilities. Methods, such as the use of weightings for each indicator, will allow the formulation of solutions that balance the needs of users with different disabilities. The outcomes of the audits demonstrated that best practice has been part of designs on several occasions. Such best practice could be captured on a national knowledge-base and provide quality benchmarks for future projects. The emergence of building information models in the industry allows the integration of inclusive design data models as part of traditional built environment infrastructure projects.

## Acknowledgements

The authors would like to acknowledge the members of the disabled groups who participated in the study. Furthermore, the authors would like to thank the stakeholders who accepted to be interviewed for the study.

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