IMPROVING THE PROVISION OF PUBLIC TRANSPORT INFORMATION FOR PERSONS WITH DISABILITIES IN THE DEVELOPING WORLD

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ABSTRACT

While transport is a significant enabler of sustaining livelihoods among poor communities, it is clearly also increasingly deemed important to deliver the benefits of greater inclusion of persons with disabilities into society, particularly in developing and transition countries. Throughout the developing world, the existing transport systems fail to serve the needs of the majority of persons with disabilities.

Research undertaken on behalf of the United Kingdom's Department for International Development (DFID) indicated that access to information in appropriate formats was a significant barrier to travel for people with sensory and intellectual disabilities. Building on from the previous work, another DFID-funded project, to be completed in August 2005, aims to design and test appropriate low-cost technologies for information provision along the entire travel chain in services provided by public transport vehicles in India and South Africa.

The paper scans the existing practice in both developed and developing countries relating to the provision of public transport information to persons with disabilities and provides an overview of the range of issues and that need to be taken into account in designing robust, easily accessible and practical public transport information for passengers with disabilities and all passengers. It then describes the pilot projects being conducted in South Africa and India.

1 INTRODUCTION

Whilst transport is a significant enabler of sustaining livelihoods among poor communities, it is increasingly deemed important to deliver the benefits of greater inclusion of persons

with disabilities into society, enabling them to participate more fully in every day activities, particularly in developing and transition countries. Intervention strategies (such as employment equity, improved delivery of health care and rehabilitation services, and inclusive education) are typically targeted at specific spatial locations, thus increasing the need and the desire of persons with disabilities to have access to accessible public transport services.

Throughout the developing world, the existing transport systems fail to serve the needs of the majority of persons with disabilities. Research [ref. TRL ORN21, 2004] undertaken on behalf of the United Kingdom's Department for International Development (DFID) indicated that access to information in appropriate formats – whether regarding accessibility, services, or fares - was a significant barrier to travel for people with sensory and intellectual disabilities (Venter *et al*, 2004).

Building on from the previous work, another DFID-funded project (which will be completed in August 2005) aims to design and test appropriate low-cost technologies for information provision in services provided by public transport vehicles in India and South Africa. This project is seeking to address information provision issues along the entire travel chain, including off-road, at stops/terminals, and on the vehicle.

Appropriate technologies are being developed to take account of the specific needs of passengers with disabilities. The project is guided by the principle of universal design, which in the public transport sector for example, is based on the premise that passengers represent a continuum of physical characteristics, and that design should be such that it serves a majority of the passengers most of the time. Thus design that meets the needs of passengers with disabilities should be appropriate for all users.

The paper scans the existing practice in both developed and developing countries relating to the provision of public transport information to persons with disabilities. It also provides an overview of the range of issues, technology features and the general environment that need to be taken into account in designing robust, easily accessible and practical public transport information packages to facilitate ever-increasing and stress-free travel not only for persons with disabilities, but for all passengers. It then describes the pilot projects being conducted in South Africa and India. Although project implementation is advanced, it is still to be monitored and evaluated. The results of the demonstration projects will therefore be reported at a later date.

2   ISSUES IN THE PROVISION OF ACCESSIBLE TRANSPORT INFORMATION

The design of systems for effectively delivering information to public transport travelers with disabilities needs to take a number of issues into account. Both the content and the delivery format needs to be suited to the needs of both user and operator, within the constraints imposed by the general operating environment.

2.1   Information content

Transport information includes information on accessibility features (low steps, ramps, seats, tactile signs, etc.) as well as general transport information. The latter includes routes, ticketing and timetable information that is required by all passengers and which has been produced in an accessible format so that it can be used by passengers with disabilities. Transport information also includes that which enables persons PWD to travel with the assistance of any aid that they use or with a companion if desired.

2.2 Methods of provision

Methods of information provision include the following:
- Information given directly to the disabled traveller (e.g. from speaking signs, a staffed telephone help-line)
- General information, where the person selects relevant information from a public information source (e.g. from timetables, visual signs, public audible announcements)
- Interactive information (e.g. web pages, and public information kiosks).

2.3 Design issues related to user requirements and modes of delivery

Travel information needs to be accessible, useful and useable, and designed so that the traveller can provide adequate information on their requirements to the transport provider. Information delivery is thus a two-way exchange. In designing accessible transport information for PWD it is important to incorporate the following issues and modes, namely, redundancy of information, visual information, audible information, tactile information, non-textual visual information, and travel and staff training (to enable staff to assist disabled passengers through provision of information and enabling passengers with disabilities navigate the public transport system much more easily and readily).

The particular needs of users with specific disabilities place certain requirements on the content and format of transport information provision. Although a finer classification is possible, the specific needs of four groups of disabled public transport users include the following:

Physical disabilities: People with physical disabilities will require information on the physical access to the road transport vehicle.

Sensory disabilities: People with sensory disabilities require information in a format that they can perceive and understand, and the same travel information to be provided in a range of different media. Colour-contrast information, under-foot tactile surfaces and audible beeps may be required.

Cognitive disability: To assist people with cognitive disabilities, there is a need for standardization in the design of information, stops, vehicles and practice. There may also be a requirement for signs to be written in non-text form using pictograms or other visual representations.

Multiple disabilities: People with multiple disabilities may have impairments affecting their ability to receive travel information in a variety of ways. This group includes older adults

with age related multiple minor impairments. Thus, it is important that all information is available in a variety of formats.

It is important to note that in the case of all disabilities, staff trained to be aware of PWD and able to communicate with them, in alternative forms if necessary, would be a necessary requirement.

User needs can also be broken down by the stage of the journey, recognizing that passengers need different types of information when considering the decision to travel, and before and during the journey, for example:

Journey decision: A person with a disability will need to believe that they will be able to undertake it successfully. This will depend on social and cultural factors, and on the information publicized regarding accessibility of public transport modes.

Pre-journey information: This is required to plan a journey and includes information regarding routes, times, facilities, accessibility of vehicles, fares, etc.

Accessible journey information: This includes on-trip information. For PWD, such information should include station or stop location, what to do to get the vehicle to stop, payment information, vehicle accessibility and layout, destination arrival, etc.

Disruption information: PWD are more likely to find it difficult to receive the travel information they require if something goes wrong or a change to normal service takes place. It is important that their needs are considered when any disruption information is made available to passengers.

2.4   Design issues related to the operational environment

Public transport operators work under specific technological, financial and operational constraints, which define the environment within which any technologies for information dissemination/ communication are adopted. The suitability of a potential technology to this environment needs to be an important criterion in its evaluation for adoption. In discussions with local bus operators in South Africa and India, the following five criteria emerged as important requirements:

Affordable: This is important in terms of the initial capital cost and ongoing operating costs. As most operators have not shown a high willingness to invest in passenger-friendly devices - particularly those operating in a competitive environment - affordability constraints will be relatively tight for accessible information technologies.

Reliable: This refers to the technical robustness of the technology. Reliability is determined by the complexity of the technology (the more moving parts it has, the more easily breakable it becomes) its appropriateness to the operating conditions (for example, robust technologies for rural and peri-urban use).

Fixable: Any technology will need checking, maintenance, and repair. An attractive technology is one that can be fixed with relative ease, preferably in the operator's own workshop. Technologies should preferably involve locally sourced components.

Compatible: The technology needs to be compatible with other systems and processes being used by the operator. Technology requiring significant change of other related systems or processes is likely to encounter more problems and less acceptance among management and staff, and thus likely to take longer to implement.

Operable: This refers to compatibility with the level of skill, work load and capability of the operator's staff. New technologies should not put too high extra burdens on staff. If additional training is needed it should be deliverable in a simple and short manner.

2.5 Design issues related to other social constraints

Literacy levels of public transport users in general, and PWD in particular, has a bearing on the design of appropriate information systems. Many passengers experience difficulties in reading and are unable to understand maps. Such people will also benefit from technologies designed for PWD using multiple media and pictograms.

The spectre of crime and vandalism imposes further constraints that need to be addressed. In the context of developing countries, the need to design robust and cost-effective public transport infrastructure such as shelters and travel information technologies cannot be over-emphasized.

3 ANALYSIS OF EXISTING INFORMATION PROVISION PRACTICES

In order to inform the generation of possible demonstration project ideas, a synthesis of existing practices with regard to the provision of accessible information on public transport broken down into two categories, namely, pre-journey and journey was undertaken. The results are tabulated in six tables below (Mashiri *et al*, 2004).

3.1 Analysis of existing information provision in developed countries

Table 1: Existing Accessible Pre-journey Information Practices: Developed Countries			
Devices & Design Requirements	**Audible**	**Visual**	**Tactile**
Devices Used	▪ Telephone help-line ▪ Recorded telephone information ▪ Tape recorded timetables & info ▪ TV or radio broadcast information ▪ Spoken information on the	▪ Printed material such as timetables, leaflets posters, signs ▪ Electronic information: Internet, mobile phones, etc. ▪ Information via text phone	▪ General Braille or Moon information on public road based transport ▪ Tactile maps, including embossed paper maps & diagrams to be taken home by users

Design Requirements for PWD	Audible	Visual	Tactile
	internet via speaking computers		▪ Access web pages for people with Soft Braille attachments to their computers
Design Requirements for PWD	▪ Volume sufficient & able to be increased, especially for hearing impaired users ▪ Background noise volume minimized ▪ Frequency suitable to hearing impaired persons (usually low) ▪ Message short & simple ▪ Language & terminology matching that of travellers ▪ Option for the message to be repeated, especially for hearing impaired & those with cognitive disabilities ▪ Information on accessibility of vehicle for physically disabled persons	▪ Use of a combination of text, pictograms, diagrams, maps & pictures to benefit a range of people with disabilities ▪ Language & terminology matching that of travellers ▪ Clear, non-serif fonts ▪ Large fonts for visually impaired persons ▪ High degree of colour, & good contrast between text & background colour ▪ Layout that is simple and easy to scan through ▪ For sign-language users, textual information may need to be in simple format to accommodate differences in spoken & sign language structure. ▪ Information on accessibility of vehicle for physically disabled persons	▪ Any Braille or Tactile information will need to be produced to the designated standards

Table 2: Existing Accessible Journey Information Practices: Developed Countries			
Devices & Design	**Audible**	**Visual**	**Tactile**

Requirements			
Devices Used	▪ Recorded information broadcast from tannoy or loudspeaker ▪ Induction loops or infrared systems at information points to reduce background noise ▪ Information spoken by staff members ▪ Audible beeps indicating door controls ▪ Speaking signs	▪ Printed material such as timetables, leaflets & posters ▪ Signs ▪ Electronic displays ▪ Electronic information kiosks	▪ Braille information signs ▪ Tactile maps ▪ Underfoot tactile surfaces ▪ Tactile markings
Design Requirements for PWD	▪ Volume sufficient & able to be increased, especially for hearing impaired users ▪ Background noise volume minimized ▪ Frequency suitable to hearing impaired persons (usually low) ▪ Message short & simple ▪ Language & terminology matching that of travellers ▪ Option for the message to be repeated, especially for hearing impaired & those with cognitive disabilities	▪ Use of a combination of text, pictograms, diagrams, maps & pictures to benefit a range of people with disabilities ▪ Language & terminology matching that of travellers ▪ Clear, non-serif fonts ▪ Large fonts for visually impaired persons ▪ High degree of colour, & good contrast between text & background colour ▪ Layout that is simple & easy to scan through ▪ Positioned at a height & in a location accessible to wheelchair users & those with mobility constraints on the vehicle ▪ Visual displays	▪ Any Braille or tactile information must be produced to designated standards. There are numerous Braille standards (relating to size) around the world. For signage, the two preferred standards are Giant Dot (UK) & Jumbo Braille (USA)

| | | that refresh or change should allow sufficient time for PWD to read them | |
| | | ▪ Lighting good | |

3.2 Analysis of existing practices in developing countries: Asia

The main modes of passenger transport in developing countries in Asia are suburban train, bus and other paratransit modes (such as 3-seaters, 6-seaters, taxis, etc.). Except for the publicly owned transport system, there is no definite route network for paratransit modes. In most developing countries, planning the route network, scheduling, etc. for urban public transport are functions devolved to the local level. An informal system exists for the operation of paratransit modes. Hardly any information is available for passengers with disabilities, especially passengers travelling by paratransit modes. Of late, however, there has been a rise in awareness about the problems faced by passengers with disabilities and as a result, most developing countries in Asia are taking steps to improve accessibility to public transport services. Table 3 and 4 below summarize the most pertinent existing accessible pre-journey and within-journey information provision practices.

Table 3: Existing Accessible Pre-journey Information Practices: Asia			
Information requirements & Design	**Audible**	**Visual**	**Tactile**
Existing Information	▪ Public address systems, common at railway stations & major bus terminals	▪ Information boards most common, mostly timetable charts	▪ China & Singapore have some tactile information in rapid transit stations (MRT)
Gaps in & problems with existing Information	▪ Not used at intermediate bus stops	▪ Information boards not updated regularly ▪ Letters on information boards too small for visually impaired to read	▪ Not much been done to date in Asian developing countries
Required Information & Information design	▪ Public enquiry system providing information on routes, timetables, fares, availability of reserved seats etc.	▪ Digital displays at bus stops, bus terminals & railway stations ▪ Signboards, posters & timetable charts should be provided in large font	▪ Tactile maps/instructions at all bus stops, bus terminals & railways stations. ▪ Under-foot surfaces provide tactile information for direction supply

	Public address systems in more locations		The above are cheap & viable options

Table 4: Existing Accessible Journey Information Practices: Asia			
Information requirements & Design	**Audible**	**Visual**	**Tactile**
Existing Information	▪ Conductors requested to announce stop names ▪ Some buses have manually operated bells	▪ Digital display quite common in China & Singapore ▪ Most developing countries: schedule charts	▪ In China, tickets in Braille ▪ For Delhi Metro, tactile flooring is used
Gaps in & problems with existing Information	▪ No formal "in-vehicle" audio information systems	▪ Many developing countries do not have digital visual displays	▪ Other Asian developing countries do not have such provisions for the blind
Required Information & Information Design	▪ Audible messages on all buses, providing information on current stop, next stop & time required to reach that stop	▪ Digital displays are important, & can be operated by the conductor or driver	▪ Tactile maps & flooring needed, for blind as well as those with both hearing & visual impairment

3.3 Analysis of existing practices in developing countries: Africa

3.3.1 Accessibility and transport provision
Disability is a relatively new area of discourse in many developing countries. Figures on the incidence, causes and typology of disability, let alone intervention modalities are rarely available (Mashiri *et al*, 1998; Venter *et al,* 2003; Onasanya, http://www.pwd-u-org/articles/articles_Jun2001A.asp). The discussion that follows below has been informed to a large extent by the work of the Independent Living Institute undertaken in 1996 (http://www.independentliving.org).

Most African countries do not have special transport arrangements for PWD. Only Egypt, Tunisia, Morocco and Ghana had special transport provisions for PWD. In Tunisia, this included special transport for medical treatment and education and in Egypt, special transport was reportedly available for medical treatment, education, employment and

recreational purposes. Morocco purported to providing public transport for whatever purposes needed as well as reduced public transport prices for PWD in urban areas, while Ghana provided free transport on road or rail for all purposes.

In addition, this non-provision of an essential service such as transport is made worse by the lack of legislation, guidelines, regulation and enforcement mechanisms to ensure accessibility of the built environment. In a few cases, government strategies towards the promotion of accessibility of the built environment were reported, including the levelling of pavements, access to public buildings and accessibility of the outdoor environment. It is of interest to note that apart from Tanzania, Chad and Egypt, no other countries reported the incorporation of a disability awareness component in the training of planners, architects and the construction industry in general.

In some countries, such as Eritrea, Namibia, Zambia, Uganda, Benin, Cameroon and Zambia, no laws, regulations and/or guidelines existed to ensure accessibility of the built environment or public transport services. The general impression given in the study conducted by the Independent Living Institute undertaken in 1996 is that of a lack of uniformity in addressing the transport and accessibility needs of PWD in Africa, occasioned by welfare rather than a rights-based approach to issues of disability. This approach is also influenced to some extent by funding considerations as well as the role of stigma around disability especially in the uptake and implementation of policy initiatives.

In view of the foregoing, the analysis of existing practices in Africa will largely revolve around South African experiences (given the relative advances it has made in this regard and the dearth of information from elsewhere on the continent). The three primary public transport modes in South Africa are minibus taxi, bus and rail. The manner in which each of the modes is operated imposes certain constraints on the potential for delivery of passenger information. Buses serve pockets of mostly commuter demand.

Buses serve pockets of mostly commuter demand. Bus routes change more frequently than rail services, and outside the main routes, few routes operate the same service throughout the day. Routes are complex, penetrating residential areas where passengers are picked up and run non-stop along the majority of the route. Passengers cannot rely on getting picked up along a route, as the buses are often full. The way that services currently operate does not encourage occasional users to access the service, and it is these prospective passengers who benefit the most from detailed service information. Comprehensive printed service information on current operations would be expensive due to the sheer volume of routes and the rate of route changes. Detailed network maps would be misleading since most routes run only a very limited service. Thus bus services themselves need to undergo significant change to enable information to be presented on them.

Minibus taxi (paratransit) services have come to claim a significant share of the public transport market in most African countries, and are the primary public transport providers in South Africa. The service is informal, often without formal infrastructure, vehicle routing or operating schedules. This makes local knowledge essential for understanding the available services. Comprehensive service information is not a feasible aim for the minibus taxi mode as it currently operates. Instead, a realistic option would be to produce information relating to main access points, general information about fares and service frequencies offered by the mode between main points along main routes.

Rail operates on a fixed, easily understood network with staff available on many stations to provide some service information. Services are accessed at stations which can be marked on maps. Basic information such as network maps and a timetable booklet are produced without the need for continual changes to the reprints, making it cost-effective. Except for a few countries in Africa (such as South Africa, Tunisia and Egypt) rail is used mostly for long distance travel rather than commuting.

All these systems are financed and operated largely in isolation, for example, tickets must be purchased separately for each mode and little service integration is apparent. Table 5 and 6 summarize the existing accessible pre-journey and in-journey information provision practices in South Africa.

Table 5: Existing Accessible Pre-journey Information Practices: South Africa			
Modes	**Audible**	**Visual**	**Tactile**
Bus	▪ Few audio systems providing pre-journey information e.g. Metro Transport Information (MTI) in Cape Town ▪ PA systems only installed at a few major stations (even here, arrival & departure information is seldom given)	▪ Not all cities & bus services have overall network maps printed ▪ Those that are printed are often not updated regularly ▪ Directional signage generally poor, inhibiting promotion & location of stations & stops	No tactile pre-journey information
Minibus Taxi	▪ Generally, no audio information systems ▪ Very basic information available from MTI for Cape Town services ▪ Most information can only be obtained from taxi marshals & drivers	▪ No printed information to assist trip planning ▪ No visual directional signage for the service	No tactile pre-journey information
Rail	▪ Information available from MTI in Cape Town & some audio announcements in some stations	▪ Metrorail produces & distributes a free weekly publication containing information on upgrades, works carried out, changes to schedules, etc. ▪ Metrorail publishes a timetable booklet ▪ Directional signage to stations from points of attraction (e.g. shopping places) generally poor	No tactile pre-journey information

Table 6: Existing Accessible Journey Information Practices: South Africa			
Modes	**Audible**	**Visual**	**Tactile**
	▪ PA systems only installed at a few major	▪ Fares are not displayed inside or outside the	No tactile information

Bus	• stations (but arrival & departure, & service delay information seldom given) • PA sounds often unclear • There is usually no audible information on the bus	bus, or at stops, & are often handwritten at terminals • Most buses show their destination at the front of the vehicle, but colouring & size make reading it difficult • Most bus stations do not have route diagrams • Timetables focus on terminal arrival & departure time, specifying very few intermediate points • Colour schemes & markings not standardized	systems for public users in SA & other African countries
Minibus Taxi	• At ranks, officials sometimes assist passengers with trip queries • Most information is obtained from the taxi marshals or drivers themselves. The size of taxis renders the sharing of information between drivers & passengers (& also among passengers) relatively easy	• Vehicle permit stickers stating licensed routes are affixed to the front, rear & left side of taxis. However, these offer limited information & are difficult for PWD to read • Vehicles operating illegally provide no information • No printed fare information is available • Network & frequency information is not available in print	No tactile information systems for public users in SA & other African countries
Rail	• Most stations do not make public announcements unless significant delays experienced	• No fare information on trains • There are few maps & diagrams, & they are not standardized • Destination signs are not always displayed on exterior of trains • Platform signs & indicators of services arriving & departing are common, but delay information is lacking or provided late	No tactile information systems for public users in SA & other African countries

4   DEMONSTRATION PROJECTS

4.1   Overview of project

The purpose of the demonstration projects in India and South Africa is to improve the access of PWD in developing countries to livelihood opportunities and participation, by way of improving their access to road-based public transport. Transport is increasingly important to deliver the benefits associated with greater participation of PWD into society, as the access link between interventions (e.g. employment equity) and target groups. The project focuses on developing and disseminating appropriate technologies for information provision in services provided by conventional buses and minibus taxis, based on *universal design* principles. As shown above, technologies in use to provide information to travellers range from high-cost systems such as, for instance, real-time signage in use in developed countries to handwritten destination signs, employed in many African countries. The research focuses on identifying, combining and evaluating simple practices (e.g. colour-coded routes and hand signals), with relatively higher technologies (e.g. audible and light signals to request a stop).

Project outputs include:

❑ A synthesis of existing practice relating to information provision on public transport in both developed and developing countries to inform interventions
❑ Prototypes of universal design information features for large and small buses, fitted to demonstration vehicles in India and South Africa
❑ Detailed design guidelines on the manufacturing specifications, operation and maintenance of the features
❑ Dissemination of the prototypes and guidelines through various media sources
❑ A report that captures the lessons from the demonstration project.

In terms of beneficiary disability groupings, while the India-based demonstration project focuses on the visually impaired, the South African edition is largely directed at the deaf and hard of hearing. However, the training components of both will cover the broader disability sector.

4.2 India Demonstration Project

4.2.1 *Overview of the project*

PWD, like other conventional bus travellers, require certain information before commencing, during and at the end of the journey through easily understandable media of communication, such as for example, audio signals for visually impaired persons and video signals for the hearing-impaired. The information requirements vary from route details of the approaching bus at the bus stop, approaching/required destination while inside the bus, etc, through an easily comprehensible medium.

4.2.2 *Main features of the demonstration project*

Electronic Route-Destination System*:* An Electronic Route-Destination System has been affixed on the front of the demonstration bus. The route number and route destination have been made visible from a distance of about thirty metres. PWD (except visually impaired persons) will thus be able to identify the destination of the incoming bus from a reasonable distance to enable them to prepare for boarding.

Voice Integrated Electronic Route-Destination Display System*:* A Voice Integrated Electronic Route-Destination Display System has been provided near the entrance door of the demonstration project bus at a reasonable height to facilitate ease of visibility/hearing by PWD waiting for the bus at the bus-stop. While the physical display of route number and destination on the bus, in two languages, will help PWD [except those visually impaired] in identifying the route and destination, the voice messages there from (in two languages) will help the visually impaired persons in identifying their desired bus route and destination.

Voice Integrated Electronic Route-Destination Display System*:* For the convenience of PWD inside the bus, a Voice Integrated Electronic Route-Destination Display System has been mounted on the panel behind the driver of the demonstration project bus. The system displays the route numbers, the name of the 'present stop' and the 'next stop', besides other details like driver and conductor names, etc. At this display board, a system of rolling messages, which could be useful for various purposes including those, helpful to PWD and other commuters, is to be incorporated. The 'present' and the 'next' bus-stop names are announced simultaneously through voice messages. An additional sound system is provided at the rear of the bus. These bus stop/ related messages - both in display form as well as in audible form, are repeated at each stop.

Electronic Route Number Board Display*:* An Electronic Route Number Board Display system has been mounted at the rear of the bus for the convenience of the passengers arriving from the rear side of the bus to enable them to identify the bus route and approach the bus at the stop within the available time, where possible.

Integration of the existing and demonstration systems: The system utilizes micro controllers, memory chips and other hardware and provides easy computer interface for feeding the route number, stop names and other details of the intended routes. The present system is able to accommodate the details of 6-10 routes depending upon the number of bus stops en-route. The system provides a control panel on the dashboard in front of the driver to facilitate his periodic intervention for display/message announcement automatically on his pressing a key at the control panel. The driver activates the key when he/she observes a display of the next stop on the small screen provided in front of him on the control panel. The system is such that audio and video messages are repeated periodically about the 'current' and the 'approaching' bus stops, once in English and twice in the regional language, Marathi.

4.3   South African Demonstration Project

4.3.1   Overview of project
The demonstration project in South Africa is aimed at serving the needs of the deaf, hard of hearing, speech impaired and cognitively impaired persons using the minibus taxi mode. Specific problems they encounter include:

❑   Inability to identify the correct vehicle to their destination especially if they are trying to get a minibus taxi in between the origin and the final destination on a busy route
❑   Conveying to the driver that they wish to board that specific vehicle given that they cannot speak

❑ Communicating to the driver or even fellow passengers that they wish to disembark, especially before the final destination

4.3.2 Elements of the demonstration project

Formalization of signals/signs: It is germane to note that the taxi industry (the drivers) and the general public (prospective passengers) across South Africa employ a variety of hand signals to indicate the final destination of vehicles. These signals are mostly intuitive and for most urban dwellers, easy to understand and learn. However, for the un-initiated – infrequent visitors from rural areas, the elderly, international visitors, urbanites who have no ties with "township" (relatively high density residential) areas, some PWD who are unable to make the signs, those who have difficulty understanding African languages – understanding the signs and gestures with a view to communicating with the right minibus taxi driver to make an informed response, can be a frustrating and harrowing experience.

In order to improve the level of service, by for example, providing adequate information before and along the journey thereby reducing anxiety and providing peace of mind, it is deemed important to formalize these signs and gestures to ensure that they mean the same thing all the time (and they are understood as such), no matter where one is, especially in relation to major destinations e.g. city centre; major taxi terminal; major shopping location; major inter-modal facility, hospital, etc.

Formalization also means that the deaf or hard of hearing do not have to rely on other persons to convey their messages to minibus taxi drivers. They therefore become more independent and freer to travel. In other words, they would be able to identify the correct vehicles for their journeys as well as indicate to the driver their wish to board the vehicle. With regard to disembarking, however, a simple device has been developed to enable the deaf and hard of hearing to convey their messages to the driver themselves. As of now:

❑ Chosen signals have been converted into pictograms displayed on minibus taxis as banners. Information is conveyed both to identify the route being operated by a particular vehicle, and to inform the passenger as to which hand signal corresponds to which destination. In addition, the route destination stickers described above will be made from highly retro-reflective materials to make them visible at night or during inclement weather.
❑ Pamphlets bearing these symbols and their meaning in vernacular languages as well as English, will be printed and distributed as part of an awareness campaign.
❑ Persons with cognitive impairments who require a combination of text and pictorial / visual information to aid their understanding will constitute the major beneficiaries of the demonstration project.

Capacity building and training: Quite often PWD especially those with physical disabilities are left behind (ignored, avoided) largely because some drivers believe that it takes too long a time to enable them to board – time they would rather utilize in getting more customers and therefore earning more. This is often the case along a route e.g. between the origin and destination. In many cases, PWD can only get services at off-peak times. To a large extent, this attitude among drivers in the taxi industry has the effect of discouraging PWD from even contemplating to travel/venture outside their immediate environs. The need to dispel through training, the notion that the taxi industry loses considerable potential income when servicing PWD, cannot be over-emphasized. In this

project, it involves both *awareness and sensitivity training* as well as practical and efficient ways of folding and storing wheel chairs so that they do not take up too much space.

The awareness campaign has two benefits i.e. getting the industry to be aware of what the demonstration project seeks to achieve, but also to communicate to PWD who have been shying away from traveling that indeed the taxi industry has begun to improve its level of service supported by a Municipality that is seeking to entrench the ethos of a caring society in its jurisdiction.

The disability a*wareness and sensitivity training* has been targeted at service providers that ply the demonstration project routes. However, general awareness will be heightened by way of press releases from the Mayor's office, the official launch of the project, distribution of pamphlets on the project and the competition to design both the artwork in schools.

Supportive visible device: People who are deaf or hard of hearing have difficulty in communicating with the driver or fellow passengers within the vehicle to indicate, for instance, that they wish the taxi to stop so that they can disembark. To catch the immediate attention of the driver or fellow passengers, a simple "bleeper" activated by a button and simultaneously lighting up a small visual indicator positioned where it is most visible to both the driver and passengers has been developed. The bleeper has also been made audible to enable blind persons to ask a fellow passenger to press the button on their behalf and so hear it.

5   CONCLUDING REMARKS

The literature review has shown that most developed countries have undertaken significant amounts of work to provide accessible information for passengers with or without disabilities. Some of their technologies are unlikely to work in developing countries for various reasons including affordability, supportive infrastructure, and to a lesser extent, differences in culture. However, other interventions can readily be adopted with local variations for developing countries, thus circumventing the spectre of mostly unaffordable development costs.

It is important to note that because the minibus taxi sector transports over sixty percent of public transport passengers in South Africa, interventions of this nature in the sector are likely to have far-reaching impacts in terms of improving the level of service to accommodate all passengers. It could also be said that because most developing countries in Africa have yet to put into place policies and interventions in the public transport sector which are PWD-sensitive, the demonstration effect of this work could be enormous given that paratransit (minibuses) are taking over as the main movers of persons and their goods in metropolitan (and increasingly rural) Africa. Although there are variations, the situation described above is remarkably similar to that in Asia and Latin America.

A strand of thought that filters throughout the paper is that interventions should be based on pragmatism underpinned by *universal design* principles in terms of the choice and hosts of the technologies to be employed in developing countries. In this regard, the demonstration projects chosen for India and South Africa subscribe to this notion. Within the African continent, South Africa has generally been at the forefront in seeking to improve the level of service to accommodate all passengers. For this and other reasons (such as

the unavailability of information), the discussion of the existing practices in Africa largely reflects the work South Africa has been doing over the years. However, it must be noted that the issues are remarkably similar and, as such, solutions to the problems in South Africa could easily be adapted for use in other African (or Asian/Latin American developing countries). In addition, it is likely that interventions in the South African situation may well lead to significant demonstration effects throughout the continent. Meanwhile in India it is hoped that the relatively hi-tech demonstration project and its findings will lead to significant interest throughout the sub-continent and beyond to south east Asia in alleviating access and mobility constraints of disabled passengers.

Lastly, although project implementation in terms of the demonstrations is advanced, there are still some loose ends to be tied together in both countries. Thereafter, full implementation of the demos will occur followed by monitoring and evaluation, country reports drafted, local workshops held before the final report writing commences.

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