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BARRIER-FREE PUBLIC TRANSIT : A STAGE ANALYSIS OF PROGRESS

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INTRODUCTION

In the course of my studies in the field of industrial design, I have developed an awareness of the necessity of designing for all. It can be easy to be conditioned by depersonalised knowledge, to tend to forget that people, everyone, you and I, are at the heart of design. I believe that design establishes a common ground for those committed to an integrated rather than a divided society. I chose the topic of public transportation design for my thesis because, event through my own experience, I realised that all too often it is anything but "public", especially for those members of the public who are infirm or disabled in some way. Transport is one of the most vital components to maintaining one's independence.

The aim of this thesis is to examine the barriers that design inflicts on society, focusing on the accessibility of public bus transportation systems. The initial chapters of this thesis will illustrate how members of the Irish public can effectively be "handicapped" by design. Throughout the thesis, the term "handicapped" will describe the relationship between the person and the environment. I will describe three case studies, documenting the difficulties encountered and the handicaps imposed on three members of the public. The chapters are interested in changing perception about growing old and about disability, and eliminating design discrimination toward all, regardless of age or ability. These initial chapters will present ideas and facts that can penetrate the out-dated mental structures we have built around us, and shatter the false distinctions that limit our perceptions and understanding about what is "young" and what is "old", what is "able" and what is "disabled".

The case studies will lead to a discussion in the fourth chapter on the importance of designing a universally public transport system. I will examine the concept of "barrier-free" design as a



strategy for eliminating design discrimination against any members of the population. The premise behind the "barrier-free" design idea demands that we, as designers, expand the range of product and environmental usability to include all people, be they elderly or youthful, disabled or fully-abled, without penalty to any group.

My fifth chapter will examine different approaches by operators and designers to solving the question of access to public transit and analyse the degree of success achieved in reducing the barriers inflicted by poorly designed buses on society.

The sixth chapter will examine whether or not a universal solution to barrier-free public transit exists and how Ireland could approach the question of access. I plan to determine the effectiveness of anti-discriminatory legislation in eliminating barriers, and investigate the extent to which the frame of discourse about accessibility has shifted from concern for legislation to practical design innovation.

The procedures I used to accomplish my aims included an extensive collection process whereby I gathered examples of contemporary international urban bus designs from books, catalogues, magazines, reports and councils, which I then analysed. Research in libraries provided a historical background, while the study of numerous contemporary articles gave me an up to date account of the progress of barrier-free design.

Regular correspondence was established with European and American designers, theorists, and other active participants working towards a barrier-free environment. Feedback from these discussions with tutors and visiting lecturers, extensive interviews with users and



operators of public bus transit, and my own personal experience, gave me insights into the creative and practical questions raised by public design for all.

It would be fool hardy for me to suggest that this thesis offers more than an overview of this subject. It does not. I will address the issue of design discrimination, offering some observations about the impact of design on society. How many have become victims of discrimination and handicap by design? I will conclude with a description of bus system designs that succeed in accommodating a broad population while, at the same time, maintaining their appeal for all. Together we will explore the challenge of creating a humane environment that appeals to all and discriminates against none.



CHAPTER 1

HUMAN AGEING AND PUBLIC BUS TRANSIT

Using contemporary Irish public bus design, this chapter will consider the barriers and handicaps imposed on elderly users.

Do Bus Éireann buses take into account, in their design and operation, the physiological, psychological, and sociological processes and changes associated with human ageing?

I will conclude b attempting to dismantle our preconceptions of age to introduce the paradox : How young are the old?



For the purposes of an observational experiment, I accompanied Mr. Gerald Fitzgerald on a typical bus trip on a December evening in Dublin city. Mr. Fitzgerald is a mobile 74 year old who had an active military career until his retirement nearly 15 years ago. In 1984, Mr. Fitzgerald became eligible for and received a free bus pass from Bus Éireann, entitling him to limitless bus travel which he utilises in his activities of daily living. In December 1995, I interviewed a group of 28 retired professional people, 11 of whom were male. For the purposes of this study, elderly shall be taken to mean those people eligible for a pensioners bus pass, i.e. over the age of 60. The interviews were conducted on an informal basis, and although the study was not scientific, the results of the interviews and my journey with Mr Fitzgerald, gave me a valuable insight into the very real problems experienced by many elderly people in their use of Irish public bus transit.

The first difficulty encountered by Mr. Fitzgerald was reading the fine print on the bus schedule at the bus stop. This problem was experienced by 88% of those interviewed and in this case was due to the fact that Mr. Fitzgerald is myopic and that the evening was quite dark. However, the route was familiar to him and I was assured that a bus would promptly arrive. Many of those interviewed mentioned the fact that they didn't feel confident about taking a route with which they were unfamiliar, most fearing becoming stranded somewhere unknown. Rather than venturing to take a new route, 93% of those interviewed preferred to wait until "their" bus came along, as they were familiar with the stops and the number of stops encountered on their particular journey. 100% expressed fear of mistaking their stop on a nocturnal trip. 78% of those interviewed said they feared violence on night-time bus excursions, while 43% admitted finding the brightness level uncomfortable. In some cases,









FIG 2: Bus entry neccessitates a stepof 480mm from street level





FIG 3: Mr. Fitzgerald pulls himself onto the bus with the aid of handrails



choice of specific route was influenced to a point by the fact that the "regular" bus was a point of social interaction with acquaintances and friends.

Entering the bus necessitated that Mr. Fitzgerald grasp the rail in the back of the door, 250mm from the ground, in order to pull himself up to the first step. This required an excessively long stride of 480mm. A frequent cause of complaint by the passengers later interviewed was that the bus did not draw up close enough to the pavement. 36% of those interviewed had had a fall on the bus within the two previous years. 87% expressed difficulty in entering and exiting via the steps and many felt conscious of delaying the other passengers by their exit. 91% felt uncomfortable about this, and it influenced the readiness with which 49% of those actually took the bus at all.

Mr. Fitzgerald wore thick sheepskin mittens and the 30mm clearance between the door and the rail was not sufficient for obtaining a true grip. The diameter of the oval rail was 20mm. Mr. Fitzgerald commented that the rail moved slightly, being attached to the hinged door. He also commented that steps are often masked by shadows cast by interior lighting and one is occasionally unsure of their footing. This was confirmed by 67% of those interviewed. A further 78% commented on the lack of grip on the steps and flooring of the bus, a danger of slipping and falling compounded by wet weather conditions and choice of footwear.

Mr. Fitzgerald found the interior lighting in buses, without exception, over-bright at 250 watts. It tended to glare on his cataracts, producing confusing shafts of light. At this stage, we were required to stall for a number of seconds as his eyes adjusted from the dark exterior from whence we had just come. The bus had by now begun to pull away from the stop,





FIG 4:Negotiating a seat





FIG 5: Stumbling towards seat as bus accelerates



causing us to effectively stumble toward our seats. The icy pavements had coated our shoe soles, making the gangway treacherous, and we both sought handrails to steady ourselves.

Although Mr. Fitzgerald does not suffer from any form of arthritis in his hands, he found the highly polished chrome handrails slippery and uncomfortable, and unnecessarily hard. He claimed that it was especially difficult to get a grip when his hands were very cold or, as in this instance, when wearing mittens or gloves. 42% of those interviewed claimed that the clearance between handrail and wall, or surface, was insufficient when wearing rings or with swollen digital joints. 80% complained of the position of the handrails, and suggested that their quantity be increased. A number of these users commented on the need for rails at about 800mm to be situated continuously or intermittently along the vehicle.

There was a choice of seating on the bus in which I travelled with Mr. Fitzgerald, and a rear-facing seat was refused. He commented when queried that that choice would necessitate regular swivelling to check the bus's location as he was uneasy, especially in the dark, of mistaking his stop. He did say, however, that they were preferable to forward facing ones in that one didn't lurch forward in the seat when the bus stopped abruptly. During the interviews I conducted, all users with stiff limbs shared a preference for those layouts where two seats were placed facing each other, forwards and backwards to provide space for them to swivel their legs around when seated. Centre facing seats were avoided, as were those on a raised plinth. The narrowing effect produced between seats by sloping seat backs was disliked, as indeed was the sloping back itself. Any obstructions (e.g. seat pedestals) which were close to the aisle drew adverse comments. Passengers with sticks or special footwear were nervous about balancing themselves and also about not having space around them to move their feet









FIG 9: Demonstration of how one of smaller stature might have to reach to operate bellpush




FIG 6: Mr.Fitzgerald prepares to exit while the bus is still in motion. Note minimal head clearance.



easily. Almost a quarter of those interviewed claimed they disliked taking the bus after shopping as the difficulty with which they could enter and move within the bus was further increased. They worried about thieves and expressed difficulty in holding onto their packages when seated.

To alleviate Mr. Fitzgerald's fears of missing his stop, we prepared to dismount in order to give us sufficient time to gather belongings and struggle toward the exit. Although Mr. Fitzgerald is almost 5ft 11", he claimed that the seats were high at 350mm from the floor and necessitated reaching down with the foot to secure a grip on the floor. Swivelling out from the seat was a source of considerable discomfiture on his hip, which is arthritic. Mr. Fitzgerald operated the palm-operated bell-push without difficulty - he claimed it would necessitate stretching for one of smaller stature. This was mentioned during the interview - it is located at a height of 2200mm above floor level.

We prepared to exit while the bus was in motion, again requiring us both to stumble and slip, though not fall. The bus had a slight gradient in the saloon floor for a distance of 203cm. The rise is only 5cm but this drew negative comments during the interviews. 71% of the elderly users interviewed declared having problems getting up and moving towards the exit before the bus has stopped.

There were no handrails on the exterior of the bus, necessitating Mr. Fitzgerald having to twist, again on his hip, to descent, and execute a 55cm stride to the pavement. This required quite considerable undue effort. When questioned about their performance, the arthritic amongst those interviewed had the severest problems both in boarding and alighting. 68% of







those interviewed stated that they could alight and board the bus unaided, but only 23% claimed they did so with complete dignity.

This was not a scientific observation and it would be a huge generalisation to assume that all elderly people have these problems. Some elderly people are more agile than others. Although older people have more functional limitations, many impairments often attributed to "elderly" conditions are commonly experienced by younger people.

Poor eyesight is not an inevitable result of age, although eyesight does deteriorate somewhat over time. Only 3% of all Europeans age 65 and over are totally blind, with 13% having some vision impairment. Most maintain good eyesight well into their seventies and eighties (Pirkl, 1994, p66). All of us, however, will experience some decline in our ability of focus on nearby objects and to see objects clearly in dim light. This occurs sooner for some than others.

The ability to move about is critical to one's independence. Dysmobility begins to affect us as young as age 40 when some form of joint distortion limits the dexterity and bodily movements of 90% of European adults. Arthritis is a generic term used to describe a number of degenerative and inflammatory joint changes. Although not considered part of the ageing process, it interferes with the daily activities of 4% of all young adults, 50% of those in middle age, and about 80% of those in their seventies (Pirkl, 1994, p67).

Almost 3 million persons in Europe have Parkinson's disease, which affects both sexes, and appears most frequently in those between ages 50 and 79. About 70% of those with Parkinson's disease display tremor affecting the upper extremities. As the disease progresses,



walking becomes increasingly difficult, body posture becomes more stooped, and the gait is reduced to a shuffle.

Falls occur when environmental demands exceed our postural competence - for example, a wet, slippy floor of a bus. Chronic disease related disorders affecting the central processing system, such as senile dementia, parkinsonism, and stroke, interfere with postural competence and increase one's chance of falling. Hip-fractures lead the list of all common fall-related injuries leading to hospitalisation. About 1,500 falls occurred last year in Dublin's buses (Fitzgerald, 12th December 1995, Dublin), with 16% occurring in persons younger than age 65.

Alzheimer's disease is the most critical and challenging disease facing older people. Commonly called dementia, this degenerative neurological disease affects memory and other thought processes such as reasoning and identification. It also affects movement, producing falls, stiffness, rigidity, and difficulty in walking. While not part of the normal ageing process, it usually occurs among those aged 50 to 65. In old people, a pretibial laceration may be aggravated by "periferal neuropathy" - impaired sensory perception. The level of the step in the bus can catch a passenger's skin and lift a flap of skin from the mid-shin. Because of periferal neuropathy, affecting not only the elderly but also some young people with diabetes, this accident is commonly presented late to the Accident and Emergency staff in hospitals, by which time infection will ensure irreversible effects. This affliction, which is recognised by medical staff as being purely a result of the step level, can only surgically be debraided (Fitzgerald, Interview with Dr. Kate Fitzgerald, 1996).





Pretibial lacerations:the shin, particularly if elderly,has a poor blood supply. It is vulnerable to flap wounds, eg. those caused by steps of buses. (source:Fitzgerald,Interview with Dr. Kate Fitzgerald, 1996)



	1985	2000	1985	2000		1985	2000	1985	2000
	over 50s	(millions)	as a %a	ige of		65+as a	%age	75+ as a	a %age
			adults (adults (18+)		of 18-64s		of 18-64s	
	÷.								
EC Member St	ates								
Belgium	3.1	3.4	41	43		22	26	10	11
Denmark	1.6	1.8	40	44		24	24	10	11
France	16.2	18.4 -	40	41		21	25	10	11
Germany E	5.0	.5.4 -	39	41		22	22	10	8
Germany W	19.5	22.1	40	45		23	26	10	11
Greece	3.1	3.5	42	44		22	27	8	10
Ireland	0.8	.0.9	35	32		19	16	7	7
Italy	17.5	20.2	. 41	43		20	26	8	11
Luxembourg	0.1	0.1	39	43		20	24	8	9
Netherlands	3.9	4.9	36	41		19	22	8	10
Portugal	2.9	3.2	39	39		20	23	8	9
Spain	11.1	12.5	40	39		20	24	8	10
UK	17.8	19.0	41	43		25	25	11	11
Total EC	102.5	115.4							
			•						
Applied to join	n EC								
Austria	2.3	2.5	40	43	•	23	25	10	11
Czechoslovakia	4.2	4.6	38	38		18	19	8	7
Finland	1.4	1.7	- 37	43		20	22	8	9
Hungary	3.2	3.4	41	42		20	23	 8	9
Poland .	9.2	10.7.	35	36		15	19	6	7
Sweden	2.8	3.1	13	47		· 30	28	13	14
Switzerland	2.0	2.4	39	46		23	27	10	12
Turkey	6.9	10.1		24		8	10	3	3
Total applied	32.2	38.7	ter and te						
		· · · · · · · · · · · · · · · · · · ·							
Non-EC		-					-		
Canada	6.2	8.4	33	38		16	20	6	9
Japan	32.7	47.1	37	46		16	25	6	9
USA	67.4	86.5	35	37		19	20	8	10
India	91.4	140.0	35	37		19	20	8	10
Australia	3.8	5.1	34	36		17	19	6	8
Mexico	8.4	13.9	21	23		6	7	1	2
Philippines	5.7	9.0	20	20		7	6	2	2
China	165.0	239.7	25	27		9	11	3	4
	1 100 ⁻⁰⁰								

Ageing of Europe (source:Syracuse University, 1988, p. 32)



Demographic trends (see figure 1) (Pirkl, 1994, p59), indicate that most people can expect to live longer than did past generations. As we do so, more of us will acquire one or more functional limitations that will interfere with our activities of daily living. Such limitations need not, however, rob us of our dignity, independence, or our self-respect. As designers, we now have great responsibility to "design for our future selves" (Royal College of Art, 1993, p15).



CHAPTER 2

DISABILITY DISCRIMINATION

This chapter will document the experience of the difficulties encountered by the physically disabled in their use of the Irish public bus system.

I will also look at the issue of segregation/integration of disabled people into society via bus transit in Ireland.



In order to establish handicaps imposed on those with physical disabilities in their use of public transit, I embarked on a series of interviews with disabled users of urban bus transport (Fitzgerald, Dublin, Jan 1996). At Dublin's National Rehabilitation Board, I interviewed 32 ambulatory disabled people, 28 of whom were permanently confined to wheelchairs. Two of the remainder had been blind since birth, and two needed crutches in order to retain mobility.

It became evident to me during the course of those interviews the difficulty of describing the feelings experienced when one attempts to struggle onto a bus without the use of a limb or limbs, under the scrutiny of many eyes, without actually experiencing it oneself.

Therefore, I decided to conduct a "User Trip", a termed coined by Patricia Moore in the 1960s when she simulated the physical conditions of an 85 year old on her own body and travelled around cities to experience life as experienced by an elderly woman (Busch, 1992, p40). In order to get even a small insight into what it must be like to be disable, I chose to temporarily, primitively, disable my legs by tying wooden slats to the insides of my trouser legs, so that I could not effectively bend, flex or use them during my bus trip. I borrowed a manual wheelchair from an elderly relative, as walking was out of the question. I arranged to be accompanied to the bus stop and throughout the trip by my sister, Marianne, as I felt terribly self-conscious with my legs sticking out in front, and hardly knew what to anticipate physically. Marianne also acted as a secondary observer - I wanted as much feedback as possible.





A physically disabled person entering a Dublin bus. (source:Bus Eireann, 1995, pl1)







We left our home in Limerick city at 10a.m. on a wet Saturday morning. Luckily, a bus stop is positioned approximately 200m from my hall door and I experienced no barriers en route. I can account for a distinct feeling of relief when I saw that the bus stop was deserted. Due to the height of the bus timetable, the upper section of the schedule was illegible to me. It was positioned 1.25m above pavement level. At this stage, a queue was beginning to form behind and I began to feel absurd. I am not an unduly self-conscious person but I imagined them all to be staring at my ridiculously propped legs. By the time the bus was approaching, I had several times declared my intention of returning home immediately.

The bus pulled in, but, being a market morning close to Christmas, the queue quickly piled into the packed bus, filling it. I gladly, perhaps somewhat cowardly, accepted the drivers suggestion that I wait for the next one, which could surely offer me a seat and "not be so busy".

I felt more encouraged now, imagining that the driver had done me an immense kindness. But what if I had had an appointment? Wasn't it his duty to collect all the passengers at the stop? But my confidence was improving, as I waited almost impatiently for what I hoped would be this empty next bus.

Eventually, it arrived, 15 minutes late according to Marianne, and not as empty as I had hoped. Marianne set her watch and helped me out of the chair and onto the bottom step, where I sat unceremoniously as she folded the wheelchair. She called to the driver for assistance and he immediately jumped down and pulled the chair into the baggage compartment. I had my back to the driver and was pulling myself up the steps, still in a seated





Bus steps in a Dublin bus





Seating in a Dublin bus





Position of handrails in a Dublin bus



position due to my taped, useless legs. I grasped the handrail and hauled myself upwards, in full view of a crowd of laughing young boys who were shouting impatiently, and to whom, according to Marianne, an elderly lady later gave a talking to. The driver and Marianne now came to my assistance and pulled me into the bus. The steps were terribly hard and jagged, with their draining provision. My right leg was tugged and scraped against this. I had luckily worn dark clothes as the floor was mucky and messy from passengers wet foot steps. The driver had to ask a young shopper to give up her seat to me. From under the arms, the driver lifted me and I was placed seated sideways as I could not bend my legs. Marianne later mentioned that I ought to have sat in the seats facing one another, where I could have propped my legs. Her watch told me that the ordeal had delayed the bus 3 minutes and 43 seconds.

The bus continued on its journey, pausing at stops when alighting passengers often scowled at me as it seemed I was taking up two seats with my legs. I felt incredibly humiliated and undescribably self-conscious. My leg was throbbing from its scrape and my whole body was trembling. I remember wishing I was at home, wondering why I had taken on this dreadful task. I had planned to do a similar trial on Dublin buses but dismissed that plan there and then. I could still hear the boys snickering - perhaps not at me at all. I believed myself to be the recipient of many (probably completely innocent) hostile looks, (or worse, pitying ones, being such an imposter). Marianne hadn't been able to obtain a seat beside me - I wasn't sure where she was; she appeared to have been swallowed by the crowd in the bus, and I now had to think about how to get off! I began to panic, imagining a big crowd would gather to stare and laugh. Luckily, Marianne reappeared beside me at this stage, telling me I looked "on the very of hysterical wailing". I was eager to begin preparations for dismounting so she lugged the 19kg chair out of the luggage pen with some considerable difficulty - it was very bulky and



heavy and its removal necessitated lifting it 200mm out of the pen into the gangway. The stop at which we'd planned to dismount wasn't the last stop on the bus's route so not everyone would be disembarking. The driver pulled in, but not close to the kerb as a parked car took up most of the bus stop. Marianne rolled the folded chair down the steps and the driver kindly helped me from my seat. If I could have used my legs there and then I would have bounded down the steps and run for miles. The driver helped me to the steps, where grabbing a rail, I had to twist in order to descent. Marianne noted many stares and much impatient clicking of tongues and watch checking. Someone shouted from within the bus to hurry up and get out. Would that I could! I had to sit on the steps and, again with the aid of a handrail (with which I had no trouble with apart form their slipperiness), pulled myself down the steps. However, the lower step was now positioned 55cm above the surface of the roadway. Marianne wheeled the chair up to the side and I fell or almost jumped into it. Marianne thanked the driver heartily for his great assistance, I'm afraid I just wanted to get away. I was already conscious of people on the street, pedestrians and drivers, staring at our performance. I had arranged with my mother to collect us in the car and it was toward this that we now headed, my face burning in embarrassment. The ordeal, however, was finally over.

I cannot imagine getting accustomed to doing this regularly. I know that if I was a permanently physically disabled person, I certainly would not or could not use such a bus as my mode of transport. If I couldn't afford a car and nothing else was available, I can easily imagine just not going out. The hassle of being totally dependent on the goodwill of the driver, the embarrassment of having to crawl up the steps of the bus, trying to negotiate a seat near the front, feeling a helpless nuisance. What would have happened had I been alone? What if the driver had been uncooperative? Who would have helped me with my wheelchair?


In the 19th Century, John Stuart Mill wrote

There are many truths of which the full meaning cannot be realised until personal experience has brought home

(Pinkl, 1994, p274)

My account may seem melodramatic and excessively emotional, but this is how I felt to be a disabled person using a bus. Considering comments made and excursions described in subsequent interviews both with disabled people and bus operators, this is an accurate account. This is what really happens when a person, disabled without the use of their limbs, attempts to utilise public bus transport (Fitzgerald, Dublin, Jan 1996).

Why are the disabled marginalised? Why is it that only 2 people out of 32 ambulatory disabled people interviewed by me can utilise Irish public buses? These people are potential passengers like everyone else; 22% of the Irish public have permanent disabilities. When those temporarily disabled, by broken limbs for example, are included, the figure is even higher.

During the course of my research, Dublin Bus withdrew its first wheelchair accessible bus service, Omnilink, from its trial public service. The provision of the service had become extremely expensive. Although its operation was restricted (again by cost) to a fixed route limited to the main shopping district and it could accommodate only two wheelchairs, its provision was a positive step toward reducing barriers in our public transport sector. Disabled members of the community were being integrated into society.

Now the Irish disabled, especially wheelchair users, unable to use public bus transit, are segregated once again, and dependent on door-to-door minibus services ("Paratransit"), often



run at a great cost by voluntary or private operators. However, such a system necessitates the users plan their trips in advance. But what of spontaneity? Disabled people travel and they like to travel, much like most others. Their needs, wants and desires are the same as everyone elses in this regard. It is extremely intrusive - because one has a disability and is dependent on the transport system, it is considered acceptable to effectively impose restrictions and intrude on life! These separate systems delay the introduction of a fully accessible system for all. They are more of a token effort by operators and their existence conceals the real need for a universally accessible system.

"Dial-a-Ride" wheelchair-accessible systems were introduced in a number of continental countries. One telephones the Dial-a-Ride agency and books a lift in a minibus which will collect the passenger at his own home. Needless to say, this is an incredibly costly program. Buses are seldom available as they may be ferrying three individuals to three separate destinations in three buses. One must still book in advance and there is no guarantee of a lift back from your destination (Frye, 1995, p18).

During a conversation with Niamh O'Doherty of the Irish National Rehabilitation Board, I asked her opinion of these specialised services, as a tool to an integrated society. She expressed concern that as they are a secondary service they are vulnerable to any economic cuts, much more so than the regular bus services as operated by Dublin Bus. She believed that they were an invaluable source of transport for those who, without the system, could not travel any distance from their home. They also had a social function, in that many people got to know others on their route. However, she admitted that they were discriminatory in that the primary bus service should be "universally public" (accessible to all), regardless of ability,



age or handicap. She agreed that integration of people with disabilities into society was terribly important and of benefit to all. A special transport system is stigmatised. It under scores the maladaptive quality of the disability and gnaws at one's self-image. Although many people like to have a schedule, if spontaneity is dispensed with, limitations are likely to limit a person's level of activity. It is difficult to feel independent and free when tied to somebody else's schedule. What of younger people with disabilities? It is at our youth that we are at our most spontaneous and energetic. Ms. O'Doherty agreed it was "of vital importance to be able to share the experiences of your peers and not feel always limited by and reminded of your disability" (Fitzgerald, Dublin, 8/1/96).

The best solution to broadening the accessibility of public transport is to choose a solution that benefits all users and discriminates against none.



CHAPTER 3

HOW PUBLIC IS IRISH PUBLIC TRANSIT?

During the course of this chapter, I will describe an observation, conducted by me, of a member of the public in their use of Irish public bus transport and how they are effectively handicapped by that system.

I will conclude by examining the question of "How public is public bus transport?" in Ireland.



In order to establish the barriers imposed on a very typical member of the public, I conducted a second observation. On a Friday afternoon in January 1996, I accompanied Mrs Monica Carlin, a 27 year old mother, on her return bus journey from Dublin's shopping district, where she had completed her daily errands, accompanied by her three year old son Edward who travelled in a pushchair.

I arranged to meet Mrs Carlin at her chosen bus stop at 4.30p.m. She arrived with Edward in his pushchair, the base of which was laden down with three shopping bags. Her own handbag was tied to the handles of the chair. Mrs Carlin had been in the city since 11.30a.m. and she told me that Edward was tired. As we awaited the bus, she demonstrated how the shopping had to be removed from the base, her own handbag uncoiled from the handles, Edward removed from his chair, and the chair then folded. Her pushchair was an aluminium one which folded without any difficulty. It weighed, folded, only 8kg. Luckily, Edward did not wander at this stage. Such a process would however, prohibit one from catching a bus at the last minute : it took Mrs Carlin 1 minute 48 seconds to empty and fold the pushchair.

As the bus approached, Mrs Carlin gathered her shopping, the pushchair, and Edward towards the kerb, holding tightly onto Edward's hand. The bus pulled in and the other passengers filed in. She waited until last and then called to the driver to take her buggy from her. He told her he could not leave is cabin due to security reasons. A passenger came forward and stowed the buggy, much to the relief of Mrs Carlin. She then lifted the three bags to the top step, a distance of 900mm, and with Edward in one arm who weighed 8.9kg and grasping the rail with the other, completed a 600mm stride onto the first step. I must note here that had Mrs Carlin been wearing a narrow skirt, or high heels, this would have been out of the question.





Mother and child entering a Dublin bus, hampered by a buggy





Assistance required from other passengers to lift buggy and child onto bus





Stairs to upper saloon





Passenger negotiating stairs to upper saloon



She now had to put Edward down and pay the fare from her purse. (Many of Dublin's buses still function on coin fare, although all have the provision of an auto-card fare teller.) She picked up her bags and surveyed the lower saloon for a seat. The bus now pulled away from the kerb and she lurched forward as it accelerated. A vertical stanchion narrowly missed her forehead as she did so. No seats were free and as none were offered, she began to ascend the staircase to the upper saloon, taking Edward and her shopping in hand. My assistance was refused here in the interests of observation. The bus continued to accelerate as we made our way up the winding staircase, resulting in our being jostled and thrown against the side en route. Mrs Carlins' bags swayed and banged into her stomach. We all held onto the handrails.

We succeeded in securing only two seats, one of which was offered to me by Mrs Carlin. When finally seated, she expressed her concern about the safety of her new buggy downstairs but her relief that we had got seats. Had she had to stand while minding Edward and keeping a check on her bags, the trip would have been even less enjoyable. She mentioned that the handrails when grasped tended to pinch at her fingers where she wore rings and the fact that the floor was always slippery and dangerous in wet weather. A very interesting comment made was that when entering the bus and climbing those initial steps, she couldn't see down as she held Edward; she could not see where she put her feet. She told me of how she often stumbled on the lips of the stairs - she found it difficult to differentiate between the edges and the front of the steps as she could only peek at intervals or when Edward shifted. When we sat, Mrs Carlin had placed her groceries at her feet as there was no overhead baggage rack. Edward sat on her knee. However, during the journey's course, a jar of mayonnaise had escaped from one of her bags and rolled toward the rear of the bus. It did not break but she had some difficulty in retrieving it. The messages had to picked up from the floor and placed





The hazards of tripping on steps



on my lap. Mrs Carlin was losing her patience at this stage and she sat tight-lipped. Edward joggled up and down on her lap until she told him to be still.

We prepared to dismount early as Mrs Carlin was concerned about the buggy being stolen. She took the messages from me and tucked her handbag inside her coat. She was forced to stand up to reach the bell-push which necessitated a 500mm vertical stretch as it was located on the ceiling. She commended that she "didn't believe these bell-pushes really worked at all" as she never heard any ringing sound. She then began to rush down the steps, Edward leading, fearing they would miss the stop and have to walk some distance home - it was becoming dark at this time. The descent was even more treacherous than the ascent as Mrs Carlin was hurrying and her shopping dragged her arms forward. She reminded Edward to take care several times and told me she always feared he'd tumble down those stairs. The bus was still moving when the lower saloon was reached, luckily without injury. Mrs Carlin asked Edward to stand in the doorway and guard the shopping while she unloaded the buggy. It had caught on a fellow-passengers travel bag and she was forced to tug at it and pull it with some frustration. With Edward leading, she took two bags in one hand, and the folded buggy on which she balanced the third bag, in the other. The driver now slowed and pulled into the stop, not moving to help. The bus was approximately 1 meter from the kerb. Edward sat on the bottom step and jumped down. His mother lowered her messages to street level and then herself descended, holding the folded buggy in front and gripping the handrail. She then executed a 550mm stride to the roadway, turned to the bus and lifted out her messages. The bus pulled off before Mrs Carlin had moved her belongings and son to the pavement.





Overhead bell push



When I asked, Mrs Carlin told me that that had been very much a typical daily journey for her. She liked to bring Edward, to have him with her as much as possible - why should Bus Éireann dictate whether or not she spent the day with her son? The most humdrum of tasks, like going shopping, was always and expedition. Although not the case that day, the drivers were usually most helpful. However, it is not their responsibility to assist passengers. She had previously had an older pushchair which was considerably heavier and added to her ordeal. The daily bus voyages had necessitated in the purchase of as light and wielding a model as possible. She said she was very fortunate in the fact that Edward was very obedient and a quiet child. When he was much younger, she could not travel on the bus with him unaccompanied and do any shopping as she "hadn't enough of hands". She didn't like the way he was constantly in danger of being jostled or hurt. She described how she had "honestly dreaded" taking the bus during the latter months of her pregnancy. Her husband begged her not to use it but as the family do not have a car she felt it was her only way of escaping the confines of the house for a few hours.

Only a small part of humanity is catered for by Irish public bus design, the so-called "normals": a minuscule fragment of the population who are between eighteen and twenty-eight, in perfect health and physical condition. All the rest of us, some 95% of humanity, are handicapped, or will be handicapped in some way in our lives (Society of Designers in Ireland, 1995, p6) when we carry bulky parcels, injure a limb or become frail through the effects of ageing.

A "locomotive handicap" is an inability to perform one or more of the actions required by existing transportation systems at a comfortable level of proficiency. Public transport is not designed to be a form of universal public conveyance in that there are many sectors of the





Buses suitable for wheelchair users are better for all



public which it does not accommodate. Badly designed systems work because we adjust to them. But one of the purposes of design surely is to make the built environment fit us. Instead, we squirm to fit in. We accommodate; we compensate.

Far from being a minority, the disabled and handicapped gathered together represent the majority of any given community. Designing for the public should by definition involve designing with the handicapped in mind.



CHAPTER 4

PUBLIC DESIGN FOR ALL

This fourth chapter will describe the conclusions drawn from the case studies.

It will document how being able to work together with the users in the course of developing designs for the transport of the public can further our understanding of different impairments, which is beneficial in designing for all.



One of the most precious and fragile human freedoms we enjoy is freedom of choice. Indeed our independence depends on choice; only when we are free to choose can we be truly independent. That said, it also follows that the quality of life we experience as we perform the activities of our daily living relates directly to the number and types of choices available.

When the environmental context offers the freedom to choose from a variety of options, we maintain our independence, and the quality of our life is positive. On the other hand, when faced with unyielding environmental conditions that limit choices, frustrating encounters with hostile physical environments reduce our pleasure, independence, and quality of life.

People, according to Chapanis (1992, p58) differ in every conceivable way. Certainly our anthropometric dimensions vary - "in height, sitting height, arm reach, and in hundreds of different ways in which bodies can be measured", as well as sensory abilities, motor abilities, mental abilities, personalities, and attitudes. Chapanis (1992, p59) states that the challenge for industrial designers is to "design for organisms no one of which is exactly like any other".

The quality of any public environment depends on the collective decisions by those who plan, finance, design and specify. But these decisions are often made, as my case studies have illustrated, on the basis of myths and erroneous preconceptions with little or no understanding of the pressing needs of those who depend on the outcome.

A handicap is not a characteristic that some people have and others don't have, nor is it a diagnosis. The previous case studies have shown that the term "handicapped" refers to persons, who due to a disability, experience difficulties in their daily lives. A handicap is thus




Persons encountering difficulties when using public bus transit (source: European Commission of Ministers for Transport, 1987, p. 43)



not a characteristic of a person with a disability. It rather describes a relationship between the person and the environment. This relationship is not static. A person with physical limitations may be handicapped in certain situations but not in others. "If all stairs were one metre high we would all be handicapped" (Society of Designers in Ireland, 1989, p4).

This approach shifts the handicap from individuals to their environment, which places a responsibility on the organisers of public transport to see that the services they supply are accessible to all, including people with disabilities, thus preventing a disability from becoming a handicap.

To design for people with disabilities means that the functional requirements of the user determine which design constraints must be met in the final bus design and the transport environment. The objective is to develop a design that will make maximum use of a person's functional abilities.

My intensive collaboration with the users of public bus transit and research and analysis of existing solutions provided the basis for the following solutions to problems experienced by the public in their use of bus transit.

INFORMATION POINTS

It is established that people from their mid-twenties on experience a specific decrease in the ability to focus on nearby objects or read fine print (Syracuse University, 1988, p17). I described in my case studies the difficulties that can be encountered when one's sight is impaired, or their height reduced as a consequence of sitting in a wheelchair. In the case of



bus design, this would necessitate that legible typography be provided as essential for information purposes. The ideal would be to have multi-sensory information points.

LIGHTING

I have indicated in my case studies the importance of passengers having a clear view of the steps during entry or exit and that this view not be masked by shadows. The best way of achieving this seems to be the provision of lighting in the step well at or below knee height, supplement by downwards shining lights above the entrance (Department of Transport, 1988, p128). It is necessary to check at the layout stage that the lighting arrangements do not cause pools of shadow that can mislead a passenger. This is particularly important if the steps are cut away at all to allow clearance for folding doors. Lights in the entry or exit must be linked to the doors so that they are extinguished when the bus is in motion.

South Yorkshire Public Transport Enterprise (PTE) have found it helpful for partially sighted passengers to provide a high level of internal lighting within buses (European Commission, 1994, p88). The Swedish Transport Board calls for an intensity of illumination in a bus of at least 100 Watts measured at reading level 1 metre above the floor (Vodahl, 1981, p32). Of equal importance, however, is the need to reduce excessive illumination, especially relevant in the case of those suffering from cataracts. A lower intensity of illumination is permitted in the front part of the bus. Bus Éireann has commented that for buses operating in rural areas it is important not to have too high a level of illumination in the exit area as passengers are then unable to see their surroundings after alighting at unlit rural bus stops (Bus Éireann, 1995, p17). This is equally applicable in the city at winter time. Not all areas are sufficiently illuminated.





Entrance handrail requirements and wheelchair space (source:Bonk, 1995, p.8)



HANDRAILS

To help partially sighted passengers, handrails should be in a colour and tone that contrasts with their surroundings. The most clearly visible is alternate black and yellow stripes (Fitzgerald, Interview with Steve Chan, 1995). However, a more practical alternative is to colour the complete rail orange or yellow, provided the bulkhead on which the rail is mounted is not also painted yellow (Department of Transport, 1988, p133). Within wide limits, any colour and tone that contrasts with its background is satisfactory. some combinations, such as blue and green or dull red and green, do not provide contrast to colour-blind people. Colouring can be coated in plastic or sheathing with adurable and coloured plastic surround. In selecting the colouring for handrails especially near the front of the bus, it is important to avoid creating reflections from the windscreen that will distract the driver (European Commission of Ministers for Transport, 1987, p94).

The ageing process affects the sense of touch at different stages in individuals. Diminished tactile sensitivity results in impaired ability to locate and identify textures and surfaces, and the ability to retain a hold on small, smooth objects is impaired. This can also apply to small children, or those with a weak grip. Cold weather can numb all hands and gloves, as indicated in the case study, diminish sensitivity to texture. Thus very distinctive textures on handrails and grab bars is important.

The provision of satisfactory handrails each side of each entry and exit stream is one of the most important features that help to make buses easy to use (Rudolf Bonk, 1995, p3). The rails should combine three separate elements. The first is a vertical rail as near as possible to the outside of the vehicle. This is used by passengers to pull themselves onto the first step of





Higher and lower horizontal handrails in a South Yorkshire bus (source: Department of Transport, 1988, p. 68)



the entrance. The second element is a sloping rail approximately following the slope of the steps. This supports passengers as they climb the steps. The third element is a vertical rail some distance into the bus beyond the edge of the top step. This is to steady the passengers as they reach the main areas of the saloon.

Many of the people interviewed by me suggested it would be helpful for handrails to be extended beyond the outer skin of the bus at the exits (Fitzgerald, Dublin, Dec 1995). This would avoid the passenger needing to twist his body to descend from the final step to the ground. However, according to Mr. Collins of Bus Éireann, retractable handrails may not be practical on urban buses (Fitzgerald, Dublin, Dec 1995).

It is important that the slopes of the sloping portions of the rails on each side of the entrance are as parallel as possible. It is important also, as Mr. Fitzgerald pointed out, that the rails mounted on a door move only a little, if at all, when pulled by the passenger (Fitzgerald, Dublin, Dec 1995). This has implications for door activating mechanisms, but is important in giving passengers confidence in the handrails they are using.

People with frail or arthritic hands have difficulty in gripping objects (Syracuse University, 1988, p42). Those with cold, numb, gloved or particularly small or large hands do also. It is now well established that the cross section of handrails should either be circular, with a diameter of at least 30mm, or oval with a larger diameter of not less than 40mm (Rudolf Bonk, 1995, p12). Some rail materials, such as chrome plate, are found by passengers to be slippery and uncomfortable (Fitzgerald, Dublin, Dec 1995). More acceptable surfaces are matt stainless steel, plastic covered tube, or "rigidised" tube which may or may not be plastic



covered. The functional requirement is for passengers to be able to slide their hands along the rail when they are gripping it tightly. All handrails should provide knuckle clearance of ideally 50mm from the surface on which they are mounted (Davey, 1994, p109).

Oxley and Benwell conducted a study in 1985 which revealed that it was desirable to provide horizontal handrails at approximately waist height, leading from the entrance of the bus to the point of payment. This horizontal railing needed to be 800 - 900mm above floor level (Oxley et al, 1979, p17). Tests by South Yorkshire PTE, (European Commission, 1994, p240), have subsequently shown that in double decker buses with a staircase behind the driver and a luggage bin opposite the staircase, there is benefit in having a higher horizontal rail on the staircase side of the gangway and a waist level rail by the bin.

SEATING

Studies conducted by both Brooks (1974) and Oxley and Benwell (1979) found that sideways facing seats were disliked by many members of the public, in particular elderly and physically disabled people. Brooks found that 9% of their sample preferred forward facing seats as their first choice, but that with the exception of disabled elderly people, subjects did not mind sitting in a seat facing the rear of the bus (Brooks et al, 1974, p148). They found that 91% considered a 680mm seat spacing compared to 57% for a 609mm spacing. Oxley and Benwell (1979, p64) found that disabled people preferred layouts within buses where two seats were facing each other, forwards and backwards, providing double the normal space into which they could swing their legs. However, service trials by South Yorkshire PTE of this arrangement at the front of the saloon have not proved wholly successful. This is because some people do not like using rear facing seats at the front of the saloon which made them





A palm operated bell push on a plastic covered rigidised stanchion in a South Yorkshire bus. (source: Department of Transport, 1988, p. 75)







face many rows of passengers. Rearward facing seats towards the rear of the saloon were most popular. These could conveniently be positioned over the rear wheelarch (European Commission, 1994, p248).

BELL PUSH

The need to stand up while the bus is in motion to operate a bell push is a source of considerable inconvenience to many members of the public. Bell pushes should be operable by a passenger while seated. The Greater London Association of the Disabled (1986, p17) have found that passengers prefer a design of bell push which can be operated with the palm of the hand, rather that a small button which has to be pushed accurately in a jerking, accelerating bus. This "bell bar" should be mounted on a vertical stanchion and positioned to face outboard, away from the gangway, to avoid inadvertent use.

Feedback from passengers of all ages suggested that it would be helpful to fit the bus with a sign which becomes illuminated to announce "bus stopping" when the bell push is operated. This makes it clear to subsequent passengers that there is no need to operate the bell push again for their stop, and can be arranged to stop the bell ringing near the driver, if the bell push is operated after the sign is illuminated. This would encourage elderly passengers to remain seated until the bus has stopped, which in turn could markedly reduce injuries to passengers due to falls within the bus (Fitzgerald, Dublin, Dec 1995).

STEPS

Studies of the comfort of standing passengers in moving vehicles show that ramping floors increases the forces that passengers have to exert on stanchions to remain upright and reduces



their comfort. The study by Oxley and Benwell (1979, p19) found that a 1.5° ramp in the floor of a bus was noticed and criticised by elderly passengers moving within the bus. While these two reports should not be considered conclusive, they suggest strongly that floors of the buses should be as level as possible and be covered in a non-slip material. However, this does not suggest that changes of height be achieved by steps. Throughout my case studies, it was encounters with steps that caused most discomfort. People over thirty can be affected by decreased flexibility and strength in the hips, spine and torso, caused by factors such as decrements of the respiratory system, inflammation of joints and cartilage thinning. This can make step climbing a painful process. I described the difficulty a disabled person can have and the indignity and handicaps caused by stairs. You read the account of Mrs Carlin and her son, struggling up stairs with shipping, completing long strides over steps; the barriers faced by me as a disabled person trying to crawl onto the bus.

Examining these difficulties leads one to the conclusion that if steps were removed from the design of public buses, then the barriers associated therewith would consequently be removed. However, whereas the application of the other solutions mentioned is feasible as it would involve merely retrofitting existing Bus Éireann vehicles, that of the removal of steps as a barrier to the public is, in Ireland, a more complex issue. It now becomes necessary to examine the varied approaches of our European and Transatlantic neighbours in order to fully analyse and promote a solution to accessible public bus transit in Ireland.



CHAPTER 5

APPROACHING ACCESSIBLE TRANSPORT

This chapter will examine four different approaches by operators and designers to solving the question of access in public transport design.

Using examples of these theories applied in practice in various locations in Europe and America, I will attempt to assess the degree of success achieved in reducing the barriers inflicted by poorly designed buses on society.



In the past number of years, people have become more aware of the barriers that design inflicts on society worldwide. The public have become internationally more vociferous, moving away from the acceptance of a passive role in society towards being agents of change. My research has revealed that this shift in attitude has resulted in four different approaches to providing transport for people with disabilities.

The first of these approaches I will term the "medical approach". A second approach is the "disability approach". The "physical access" approach is the third of these approaches and the final, most worthwhile approach, is the "mobility approach".

People involved in the "medical approach" regard the people with disabilities as being not just disabled, but "sick". It is an unenlightened approach which makes indefensible value judgements, assuming that the people in need of the service only need to visit doctors or hospitals for treatment, or chemists for medicine. Journey purposes (e.g. visiting a bar) are seen as an unreasonable expectation.

This approach has, however, been operated with not inconsiderable success in Sweden, where it is called the Service Route. These carry rather small buses (about 20 passengers) and go on a more or less timetabled basis from residential zones to hospitals. Not only is the bus accessible, but so is the entire service. It caters especially for cider people with reduced mobility, who can be picked up at or near their home for the price of a normal bus fare. The driver is specially trained to help passengers. The timetable is flexible enough to allow for people to take all the time they need to get on and off the bus, and reach their seat safely before the vehicle moves at all (National Transport Board, Stockholm, 1983, p104).



In the "disability approach", the accent is to classify people according to their disability, or severity of disability. However, disability is not unique in being static, like everything, it is dynamic and is often due to compound impairments. Therefore, there is a need for constant reassessment which is extremely demanding of resources.

This is Canada's approach to the transportation of the handicapped. The aim of the Canadian Urban Transit Association (CUTA) is to give disabled or elderly persons an equal level of accessibility which Canadians normally take for granted. By examining the specific problems within the mode of bus travel, they have developed standards, necessary because they recognise safety technology, economics as well as basic human dignity must be considered in determining the extent to which disabled persons can be accommodated on each mode. It is from this study that a level of "reasonable accommodation" has been determined that claims to be acceptable to the travelling public, the carriers, unions and regulatory bodies. CUTA have adopted the view that an across the board solution would not be acceptable, not only from the point of view of users. CUTA have shown that in terms of the actual mobility provided to the wheelchair bound patrons, a specialised demand responsive system can provide much better access to the community than major modifications to the existing service could, especially where relative costs and their specific climatic conditions are considered.

Retrofitting major transit systems to accommodate wheelchairs is considered inappropriate and ineffective by CUTA. Severe climatic conditions prevent access to buses and rail systems by passengers in wheelchairs. Door-to-door services with lifts equipped to raise a wheelchair or pushchair into the vehicle are believed to be more productive and cost-effective. Although



they realise that the users of these services are in effect segregated from other users of public transportation, they believe strongly that this approach provides mobility for a greater number of Canadians, "allowing more disabled people to achieve access to jobs, education, medical and recreational facilities, at a reasonable price" (European Commission, 1987, p51).

The "physical access approach" is the third of these approaches and the first of the four that I will document with direct relevance to public bus design. In this approach, the only cause of immobility is seen as a lack of physical access. The emphasis is to reconstruct, or replace, the vehicles in current use, so that they are physically accessible.

This approach has considerable appeal for bus operators who see the opportunity to make public transport more accessible without the expense of a new system. One such operator is the South Yorkshire Passenger Transport Executive (PTE) in Great Britain. They see the solution to accessibility as the reduction of bus entrance step heights, seeing the most obvious solution to this as building lower buses. That however conflicts with the need to ensure the maximum possible ground clearance below the front of the bus and the road when the vehicle is moving, to prevent scraping of the chassis upon braking. They conclude that any solution must be a compromise between providing an entry step low enough for elderly, handicapped and disabled people to mount at a bus stop whilst maintaining a calculated ground clearance when the vehicle is moving and braking.

Their solution utilises a low cost/low technology solution to redesign, not the bus, but the standard bus entrance doorway. This doorway is usually wide enough to permit two streams of passengers to board at the same time and the engineers at the PTE decided to split the





Split step entrance (source: Davey, 1994, p. 45)





Split entry step (source: Department of Transport, 1988, p. 82)


entrance in two with two sets of entry steps at different heights. The forward half retains what could be termed the conventional layout and step heights which maintain the desired ground clearance at the front of the bus. However, the ground clearance at the rear half of the entrance was reduced to only 9¹/₂" which enabled a step to be constructed which is 7" high when the bus is alongside a kerb. Two more steps of 6¹/₂" each produced an access to the bus with which it is believed most elderly and disabled passengers can cope (see Fig) (European Commission, 1987, p257). A study conducted in 1989 has shown that a significantly high proportion of elderly handicapped and encumbered passengers used the lower part of the split step in comparison with the number using the equivalent rearward half of the straight unmodified step (European Community, Luxembourg, 1991, p18).

This solution is commendable for its very simple unintrusive solution. It would not carry with it any of the stigma of a "special" system and its subtlety would eliminate any self-consciousness on the part of the user, be they physically handicapped or fully able. However, it has not eliminated steps and thus is inaccessible to the wheelchair user. Canada's system was discriminatory in that it was for the specific use of those in wheelchairs. Yorkshire's system is equally guilty, but here of discrimination against wheelchair users. People with disabilities confining them to a wheelchair or parents with pushchairs could call this "Access without Mobility" the relevance of public transport services to the patterns of movement of people who are immobile, whether temporarily or permanently, are not considered. Thus neither of these approaches are suited to universally public transit design.

The fourth approach is the "Mobility Approach", a functional and pragmatic approach which seeks meaningful terms to describe the mobility problems encountered by people who,





Entry to low floor bus (Department of Transport, 1995, p.24)











Example of a German low-floor bus (source: Bonk, 1995, p. 7)



permanently or temporarily, have problems with mobility, or are immobile, through physical, mental, or sensory impairments. It recognises that mobility is dependent upon a dynamic range of personal, environmental, and trip related factors. Understanding these factors enables the designers of services to "design out" barriers to movement. The approach also considers the potential patterns of movement of the immobile and seeks to develop a cost effective mix of new and modified services to satisfy the needs of all people with mobility problems.

It is this "mobility approach" that has proven most successful in ensuring access for all to public transit, and the approach has widest application in mainland Europe. The interpretation of accessibility by the Transport Research board and the Municipal Transit Authority of the Netherlands has resulted in a practical, ingenuous solution. They realised that not only the profitability but also the psychological attractiveness of public transport is increased by short boarding periods. It was their observation of the subway system in Amsterdam that presented them with the perfect, and obvious, solution : the shortest boarding time is achieved by a practically level and unimpeded entrance. Thus a feature of public transport which is necessary for the wheelchair bound passenger appears to be equally desirable for the parent with the pushchair, passengers with heavy or bulky baggage, shopping, sports equipment, or people with a limb in plaster, and also for the profits of the bus company.

A horizontal entrance also means the absence of entry sections with steps. The effective floor surface and in consequence the capacity of the bus is increased. However, subway systems use platforms : platforms decrease the flexibility of the bus line to that of a tram or subway line. If the bus, however, during the stop "kneels" so the floor almost reaches the ground, and stops alongside a pavement of normal height (in Holland 10-18cm), the advantages of the





Kneeling mechanism in raised position (Department of Transport, 1995, p.32)





Kneeling mechanism in lowered position (Department, 1995, p. 33)



horizontal boarding and the flexibility inherent in a bus operation are combined - always supposing that the lowering and raising are carried out quickly. The Dutch design uses a combined hydraulic spring and raise/lower system. Independent front wheel and rear wheel suspension is used. The engine has been mounted on the roof and the rear wheels are driven hydraulically. In city transport the efficiency of this transmission is equal to that of an automatic gear box. An extra benefit is that hydraulic transmission offers unique possibilities for the recuperation of brake energy and for savings on the pollution by exhaust gases of the engine. Engine breakdown accounts for about 50% of all bus malfunctions. An engine linked to this type of hydraulic transmission can be changed in a relatively short time especially if the engine has been mounted on the roof of the bus. As far as initial expense and spare parts are concerned, this bus will cost about 25% more than a conventional bus. The resulting additional operating cost will be recovered, according to studies of the high revenues as a result of increased capacity (Department of Transport, 1988, p78).

Such a solution has had successful application in many European countries, particularly in Germany, Switzerland and Denmark. The most recent development has been in Bremen where low-floor stepless buses were produced that cost only 10% extra. In addition, because they are so much quicker and better to operate (they have no step to get on or off the bus, and no step inside the bus), the transport company needs 10% less vehicles. In any case, only 5% of bus operating costs arise from bus purchases. Moreover, the amount of extra cost is decreasing with larger-scale production, now that an initial trial phase is coming to an end.

The "mobility approach" would thus seem to be a universally valid solution, meeting not only the needs on non-handicapped and younger people, as well as handicapped, disabled and





Demonstration of a ramp on a German low-floor bus (source: Frye, 1995, p. 42)



elderly passengers, but has also gained the approval of operators and drivers. This has led to the realisation that all types of bus as a form of public transit have to fulfil fundamental requirements of comfort and accessibility (Department of Transport, 1988, p84).

Yet this leads me to ask that if the mobility approach <u>is</u> the solution to increasing accessibility, if it <u>does</u> answer all of the criteria for barrier-free public design in accommodating all and discriminating against none, why then has it not found universal application?



CHAPTER 6

THE UNIVERSAL SOLUTION

Ireland is currently lagging behind some of the most disadvantaged societies of the world in that it has yet to make its public transport accessible to all; can this exclusivity by justified?

Is there a universal solution to barrier free design and, if so, is the public served better as a result?

Should the civil rights or market oriented approach be adopted in Irelands quest for a universally accessible system?



The best solution to broadening the accessibility of public transport is to choose a solution that benefits all users and discriminates against none. Design has got to be for everyone.

However, public transport must also, in this capitalist age, benefit the operator. The ethos of Bus Eireann is profits net public transport. The subsidy received by them from the government for Pensioners and Disability Bus Passes is a pittance. Their profit levels are thus dictated by the quantity of passengers who will pay the maximum fare. The disabled are seen as a lower income group: Most have a bus pass and thus are not a source of profit. To Bus Eireann, they are not a valuable market sector, and so there is little commercial incentive in investing in improvements for them, which although they might benefit the general public, would certainly be slow to show profits.

During the early Eighties, Bus Eireann purchased a number of "Bombardier" buses to increase their fleet. These had not extensively been tried for suitability elsewhere in Europe and their use brought disastrous financial consequences to Bus Eireann. Now the company's very cautious nature forbids them from experimenting with any new system or vehicle which has not had lengthy successful operation elsewhere. (Fitzgerald, Interview with Ms Niamh O'Doherty, 1996).

During an interview with Mr Joe Collins of Bus Eireann in 1995, I mentioned the success of low floor buses in many European situations. Mr Collins explained that Dublin's urban environment is unsuited to such buses, being too undulating and the roads having a surface of generally poor quality. He brought my attention to the fact that many environments pose



problems for turning low floor buses, which are 12 metres longer than the buses currently being used by the company. He described how turning a low floor bus on any of the canal bridges, for example, in Dublin, would result in "their chassis being left behind" (Fitzgerald, Interview with Mr J Collins, December 1995)

But the areas cited by Mr Collins as providing an unsuitable environment for these buses is a relatively small portion of the city; these buses have already found successful application in London, a city of not dissimilar geographical layout to Dublin. However, the fact remains that an urban bus system must have unlimited application in that city.

Ireland is unique in its lack of subsidy for public transport. Whereas in most European countries, 87% of fares are government subsidised in Ireland only 13% of the bus company's income comes from subsidies. This introduces another deterrent to the introduction of low floor and kneeling buses to Ireland: their capacity is smaller. Although the length of these buses has already been increased to provide an acceptable seating capacity, the design is restricted to single deck buses. Experiments with double deck vehicles have not been successful to date - the pull of gravity when the bus tilts, in the case of the kneeling bus, increased the danger of the vehicle toppling. A second deck on a low floor bus increases the weight to such an extent that the vehicle must be higher off the ground to compensate.

One could conclude from this that the central government are to blame, to a certain extent, for the inaccessibility of the Irish transport system. Out of existing resources, it really would be impossible to expect Bus Eireann to change their fleet, however gradually. Their subsidy is





Example of a low-floor bus in London (source: Greater London Association for Disabled People, 1986, p. 23)



constantly reduced and demands on it rise continuously. The initial changeover to accessible transport has very real cost (Frye, 1995, p26).

The introduction of accessibility has thus become a question of political will. Although the cabinet are in favour of legislation to eliminate discrimination against any members of the public sector in their use of public facilities, they are reluctant to provide the sizeable funding necessary. The huge cost will prohibit an overnight change. The changeover to a fully accessible system will have to be very gradual, beginning with 4 or 5 buses, allowing 15 or 20 years for complete introduction to eliminate the prohibitive cost. It is this timescale that diminishes political will - politicians won't see a return in their office.

However, my research has suggested that legislation is not in itself the answer. Apart from the fact that such a lot of time is wasted in waiting for it to be introduced, its implementation in practice can lead to many adverse consequences; the United States is a case in fact. In 1990 the American Congress ratified civil rights legislation that makes it illegal to discriminate against people with physical disabilities with the Americans with Disabilities Act. Failure to provide for integrated transport is considered discriminatory. The legislation in effect offers the operator an ultimatum: to make their transit service totally accessible within a specified timescale of six years, or to be sued for discrimination and face a substantial fine or imprisonment or both. Public bus service in the US is largely run by the private sector, thus the emphasis in on profit; the maximum number of passengers paying the maximum fare, minimum boarding time, and minimum maintenance costs. Complete accessibility adaptations within the timescale will involve enormous initial expense to these privatised operators. The approach opted for by the majority has been the "physical access" approach, as it would





Powered lift in bus functions as steps and platforms (Frye, 1995, p.5)



involve the least expense and is somewhat more feasible within the timescale to purchasing a new fleet of buses.

Legislators have interpreted accessibility as wheelchair accessibility; the fitting of hydraulic lifts to existing buses to raise wheelchairs from the pavement to the level of the existing stepless bus design.

However, this fitting of lifts has proven to be neither a workable nor cost effective solution. Their use has resulted in enormous costs, constant mechanical failure and an inability to meet the transport needs of wheelchair users (Frye, 1995, p28)

The first generation of bus lifts were extremely unreliable and potentially dangerous, being particularly vulnerable to corrosion problems. They frequently broke down, often immobilising the bus. Operators, having invested in the equipment, became disheartened and worried and removed them, in many cases from service, fearing litigation from injured users and the high cost of maintenance (Vodahl, 1981, p89). In the early '90s a project funded by the US Federal Government resulted in the design of a more efficient lift. However, their operation is still quite slow, requiring the bus to stall for 1.3 minutes every time it is used, frequently drawing complaints from impatient passengers. The rush to implement legislation to "get it out of the way", has resulted in many shabby and unreliable solutions. Inferior lifts and hasty installation did little to lessen the incidence of litigation, or increase the comfort of the passengers, and nothing to enhance the cause of universal design. Indeed, many operators put up with the fine and didn't buy new buses, or waited for the courts to discover them, in order to avoid the expense. Albany, for example, is being sued because its officials refuse to





Wheelchair lift: boarding steps fold out to form a platform which lifts the wheelchair or pram to the level of the vehicle floor (source: United States General Accounting Office, 1994, p. 96)



provide or pay for such a bus system (Fitzgerald, Interview with Ms Niamh O'Doherty, January 1996)

America has a considerably larger proportion of wheelchair users than Europe. 43 million of the population are wheelchair bound as opposed to 1.6 million in Europe. Perhaps this is why such an emphasis was placed on specifically wheelchair access. In order to attempt to gain a small sample of users reactions to the system, I contacted a number of them, via organisations and personal contacts, by sending questionnaires.

Of those I sent to organisations having direct contact with people with disabilities, I received replies from Ms Evelyn Kennedy of the PRIDE Foundation (Promote Real Independence for the Disabled and the Elderly) in Groton, and Mr Paul Spencer, President of the National Association for Independent Living in Brocklon. The information which they had gathered from a number of bus users revealed that many wheelchair users disliked having to use the wheelchair lifts at the bus entrance. Most perceived the system as stigmatising, feeling self conscious, and nervous in some cases, as they were lifted into the bus. Although the system was progressive in that the buses were if effect accessible to them and they were not required to leave their chair, all those questioned commented that there was much room for improvement. Some revealed that they felt as if they were delaying the bus and that fellow able-bodied passengers felt hostile toward them as a result. Other remarks were that although the system was accessible, it was in effect discriminatory - not everyone had to be lifted in the bus. Although these comments cannot be said to represent the opinions of the wheelchair using population en masse, but a small proportion, chosen at random by my correspondents, I found the insight interesting. It would imply that the approach has not been successful.


Although the needs of the passenger in a wheelchair have been catered for, their wants have been neglected.

To gain feedback from a broader passenger group, I sent a number of short questionnaires to Ms Dianne Pilgrim (incidentally, herself a wheelchair user) of the Cooper Hewitt National Museum of Design at the Smithsonian Institution in New York. She had agreed to distribute them to visitors of the museum of which she is the Director. Those questionnaires returned confirmed that a proportion of able-bodied passengers do indeed feel impatient at the delay caused in operating the lift involved in the admission of disabled and handicapped passengers into the bus. None of those questioned admitted to ever experiencing a hostile feeling as a result, but 20% had switched to an alternative method of transport as a result of delays (Pilgrim, Dianne, letter Jan 9, 1995)

A telephone conversation with Mr Joey Sternstein of the Travel Industry Exchange in Tarzana, California, intimated some of the frustrations of bus drivers with this system. He cited continuous maintenance demands and chronically slow operating times as being to blame for a drop off in business and profits. He told me that the fitting of a wheelchair lift of reasonable quality onto one of his fleet of 70 buses cost \$840. In addition to this, he had to have his entire staff trained in the operation of the lifts further increasing the expense (Fitzgerald, February 1996)

Hydraulic lifts are not an effective way of introducing accessibility in a service that's quality relies to a great extent on its speed. Design in this case has reinforced the users handicap. I dont believe that legislation is the answer to making public transport more accessible - in the



case of the United States, it has served to create many wealthy lawyers as people have become now more litigious than ever. Many accused the Americans with Disabilities Act of being excessively detailed and limiting (A. Busch, 1992, p42).

There are estimated to be 1.6 million permanent users of wheelchairs in the European Community, 39% of whom are housebound. Nearly all the rest either drive an adapted car or take door-to-door transport. Only 9% are able to reach a bus stop. That means only 144,000 potential users of wheelchair lifts fitted to buses. And yet, modern European buses are designed to be wheelchair accessible. There are two reasons for this. Firstly, the extra cost of low-floor vehicles is decreasing all the time with demand (Penn, 1995, p3). Secondly, wheelchair accessibility equals pushchair accessibility, and already in 1989 there were nearly 16 million children aged three or under in Europe. Parents with pushchairs are potential passengers!

I believe that this market-oriented approach is preferable to a legislative one. In February 1991 when the European Commission proposed a directive on safe, accessible transport for disabled workers, it thought in terms of civil rights, as in Title II of the ADA (Americans with Disabilities Act of 1990). The Social Questions Group of the Council of European Ministers is unconvinced that legislation to help disabled people should be restricted to workers. Therefore, the draft directive of February 1991 has still not been adopted by the Council. And yet, it has had a very positive effect on the accessibility of public transport because, in order to avoid compulsory fitting of very expensive wheelchair lifts to their existing bus fleet, many transport operators and authorities speeded up their bus purchase programme and bus

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manufacturers speeded up their research into accessibility "standard" features (such as low-floor buses) (Penn, 1995, p9).

Leaving aside the issue of federalism, America's legal and constitutional system is broadly similar to Irelands. The law and policy of that country thus represents the most current thinking on the situation of individuals with disabilities in a system similar to ours. In conclusion, by uncovering the underlying philosophy of the legislation enacted there and by examining the enforcement mechanisms and effectiveness of the law in that country, I have concluded that legislation dealing with the situation of individuals with disabilities in this country would have similar, manifold repercussions. I believe that the role of the law should be secondary in bringing about meaningful change and that a broader market oriented approach is preferable toward the creation of a universal public transportation system.



CONCLUSION

The comparative and investigative analysis contained in the previous chapters has led to the conclusions documented in this chapter on accessible public transport for Ireland.



Public transport plays a vital role in maintaining our independence. However, if we are restricted in any way by that system, if it dictates what skirt we must wear, what physical condition we are in, what quantity of groceries we can buy or the fact that we may need an escort to assist us, then as members of the public, we are effectively handicapped by that system.

Most public transport today is not universally accessible. More often than not, its use required undue physical effort and stress filled excursions to broad sectors of society. In the European Community today, some 60 to 80 million people are disabled or elderly and form part of the population which has reduced mobility (Commission of the European Communities, 1993, p2).

The concept of "designing for all" including the impaired means nothing more than including the needs of the impaired people as well as those of the non-disabled in the design of public and private environments. The solution to the introduction of an accessible system to Ireland is straight forward: all new buses purchased must be accessible. Certainly cost is a huge factor. However, more and more bus manufacturers are producing accessible buses as standard. Thus they are no longer a specialised product - their cost is steadily decreasing. And of course, if a bus is easier to use for everyone, the usage will increase: those who have avoided travelling or commuting by bus due to the physical difficulties encountered with the vehicle itself, will now be free to use the system, increasing the number of paying passengers. The market oriented approach shifts the handicap from individuals to their environment, which places a responsibility on all organisers of public transport to see that the system they run is

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accessible to all, including people with disabilities, thus preventing a disability from becoming a handicap.

This thesis has reinforced the importance of designing with the users and having an extensive understanding of their needs, and to an extent, there wants. If we, as designers, look at the question of access as one of great social exchange and integration, we can prepare ourselves to address the bigger questions; the ones about our sense of humanity. Who we are and what we value.



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