INTERMODE: Innovations in Demand Responsive Transport

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Dr Marcus Enoch,
Dr Stephen Potter,
Dr Graham Parkhurst
Dr Mark Smith

Dr Marcus Enoch,
Department of Civil and Building Engineering,
Loughborough University
Leicestershire LE11 3TU
United Kingdom.
Tel: +44 (0)1509 223408.
Fax: +44 (0)1509 223981.
Email: m.p.enoch@lboro.ac.uk.

Dr Stephen Potter
Design and Innovation Department
The Open University
Milton Keynes MK7 6AA
United Kingdom
Tel: +44 (0)1908 652634.
Fax: +44 (0)1908 858407.
Email: s.potter@open.ac.uk.

Dr Graham Parkhurst,
Faculty of the Built Environment
University of the West of England
Frenchay Campus
Bristol BS16 1QY
United Kingdom
Tel: +44 (0)117 344 2133
Fax: +44 (0)117 344 3002
Email: graham.parkhurst@uwe.ac.uk.

Dr Mark Smith,
7, Chepstow Close,
Stratford-upon-Avon,
Warwickshire, CV37 9JF
United Kingdom
Tel/Fax: +44 (0)1789 268291
Email: susdevsmith@aol.com.

Additional research by Mr Ross Macgregor, Dr Bruce Howard, Mr Petros Ieromonachou, Ms Nurul Leksmono, and Mr Michel Prats.

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Executive Summary

The Intermode Study

Increasingly, conventional bus services do not meet the needs of a large section of the population. This is due to increasing incomes and car ownership levels and the resulting dispersal of activity centres and trip patterns. One possible solution is public transport systems that can operate effectively with lower and more dispersed patterns of demand than the bus, i.e. Demand Responsive Transport (DRT[1]). DRT has featured in a number of UK Government reports suggesting it could be used to tackle a number of policy objectives, and recently the use of Rural and Urban Bus Challenge funding has encouraged the take up of DRT. Existing research on DRT has tended to focus on the means of delivery – i.e. what type of vehicle is most appropriate, how might the technology work, and should a service be fully or semi-flexible? However, there are a number of additional regulatory, fiscal, institutional and cultural barriers at government, local authority, operator and user levels that have not yet been comprehensively investigated. These appear to be as important as the technical issues involved.

In 2002, the Department for Transport (DfT) and the Greater Manchester Passenger Transport Executive (GMPTE) commissioned the Open University (in collaboration with the University of West of England and Loughborough University) to determine the market potential for DRT systems in the UK. The project set out to examine examples of 'good practice' DRT systems already in operation and identify any regulatory or institutional barriers hampering the development of DRT schemes.

In essence, the purpose of this study was to look at the potential for DRT as an alternative public transport system in terms of market or demand niches, and from the viewpoint of the public authority and the commercial operator. It aims to determine how DRT might be developed to serve journeys that are not currently well served by public transport and explores why DRT has so far failed to make much impact, and how government and other public authorities might rectify this.

Composite Cases

To analyse the material, the case studies were aggregated to create a series of composite case studies, each of which was described firstly by the nature of the DRT service it represents and the market it serves and secondly by whether it is driven primarily by public policy or by commercial objectives. There are four function-based composite case types:

INTERCHANGE DRT providing feeder links to conventional public transport. Typically this would be a DRT service providing an interchange at a rail station or into a bus route.

NETWORK DRT enhances public transport either by providing additional services, or by replacing uneconomic services in a particular place or at certain times. Typically, this substitution happens at times of the day or week when demand for conventional public transport is low or dispersed, so making it hard to offer an attractive service. However there are also *places* where DRT may be more appropriate, such as town and city cross-suburban trips. Funding from the Government's Rural Bus Challenge has led to the development of a number of such services, many in areas where conventional bus services had previously been withdrawn.

DESTINATION-SPECIFIC DRT is a specialist form of network DRT that serves particular destinations such as airports or employment locations. A key element of many of these schemes is the

[1] Bakker (1999) defines paratransit [DRT] as describing *'transportation options that fall between private car and conventional public bus services. It is usually considered to be an option only for less developed countries and for niches like elderly and disabled people.'*

presence of a partnership between a local authority and the 'destination' (e.g. a company, airport operator or whatever).

SUBSTITUTE DRT occurs where, instead of complementing conventional bus services, a DRT system totally (or substantially) replaces them. This represents a reinvention of public transport.

Interchange DRT Composite Case

Except where trunk and DRT services operate at a high frequency, integrated timetabling with connecting services and ideally guaranteed connections are advisable, and it is desirable to encourage flexibility in service design to ensure connections are achieved *in both directions*, i.e. DRT to trunk and trunk to DRT. Driver training is of crucial importance. Vehicle interior should be to a high specification, and ideally as close to a taxi environment as possible. This is particularly important for 'choice' users such as commuters.

There is an issue regarding fares. Most systems operate fares that are the same or comparable to local bus fares, and may even use normal bus tickets. Some, however, have fares that are higher than bus fares, but considerably lower than normal taxis. If modal shift from car is desired fares need to be competitive with perceived motoring costs (including parking costs at stations). Through fares and tickets onto interconnecting service might be more attractive to users.

In the UK context, where a DRT service is introduced to connect with fixed-route public transport, it could be appropriate to have fares moderately above bus fare rates, but with concessions for key groups and discounts for pre-booked pickups/drop-offs at fixed stops.

Financially, Interchange DRT tends to occupy a space that spans subsidised and commercial operations. Overseas examples, like many local bus services, require continued subsidy, although it is notable that for the rural services in particular this is less than for conventional buses. In the UK, the subsidy rate of £1.80–4.00 per trip tends to be above the typical maximum of around £2 for tendered services. However, initial funding can lead to a level of subsidy no higher than conventional buses. And this is with a higher quality of service, coverage and patronage.

Network DRT Composite Case

Many of the key design elements of the interchange DRT services apply to network services as well.

For network services, unlike with interchange DRT projects, integrated fares, although desirable, are not an essential requirement. Some schemes do have fares that are integrated with the parallel public transport system and use the same zones, but passengers still pay a premium to use such schemes. If modal shift from car is desired, fares need to be competitive with perceived motoring costs (including parking costs at stations and/or destinations).

DRT schemes are typically more expensive to provide per passenger trip than conventional bus (although probably cheaper to operate in the particular circumstances than a conventional bus would be). Therefore public policy driven network schemes that provide additional service levels may be vulnerable in the longer term to funding being cut unless it can be convincingly demonstrated that they are delivering their objectives. Conversely, being more flexible, DRT can very usefully perform as a pilot bus service in an area until demand levels on particular routes or at particular stops can be fully ascertained and resources allocated to a fixed route service.

Destination-specific DRT Composite Case

The destination-specific composite case is a subset of the network DRT case, and hence many of the conditions that applied for the network composite mode will apply here too. Destination-specific services tend to be targeted at particular markets. Often therefore, either the users are perhaps valued in some way (e.g. where companies are happy to subsidise the commuter trips of their employees), or else the users see such a journey as a one-off and are therefore happy to pay a premium (e.g. airport shuttle passengers). Timetables can be geared specifically to meet the particular needs of the site(s) served, rather than designed to co-ordinate with the rest of the public transport network.

Destination-specific schemes do not tend to involve trip chains, and therefore the fares systems, tickets and/or timetables can be self-contained

Destination-specific DRT services have a good potential for commercial partnership funding between an operator, local authority and/or a site owner, tenant or developer. This is because in addition to 'self-interest' reasons for establishing a DRT service (congestion, lack of sufficient parking places, improving access for staff and visitors), there may also be regulatory reasons. For example, where a developer wishes to build a factory or supermarket, planning permission for this will be required from the local council. Often, this process results in a planning agreement whereby the developer agrees to run a scheduled bus to the site for a couple of years. This usually runs virtually empty and is then discontinued. A more positive use of such a planning gain agreement might be to enter into a partnership with the council and bus operator to pump-prime a DRT service.

Substitute DRT Composite Case

Social inclusion concerns have played a major part in many DRT schemes. However, there is a danger of too narrow a market base, and it is notable that a number of these DRT schemes have sought to consolidate a number of specialist DRT services, such as those for people with disabilities, into a general DRT service. Indeed, several of these schemes have merged three or four previous services in order to capture resource efficiency gains, cut costs and improve services to customers.

Most of the above lessons also apply to the more radical substitute DRT services. However, from this analysis one issue to emerge is whether it is better to go for the incremental development of DRT, or if the benefits are only achieved as the result of a radical restructuring. Experience suggests that a total evaluation of an areas bus service is needed, rather than a piecemeal approach.

Markets for DRT

Most DRT schemes have been driven by social policy objectives and hence focused upon captive users, who by definition have restricted transport choices, and in particular have low levels of access to cars. By way of contrast a number of DRT schemes have targeted choice users, many of whom could have made the trip by car. This latter group is of particular interest where the role of DRT in transport and environmental policy is concerned.

One finding to emerge from the analysis of the composite cases is that there are key differences in the user requirements of the 'choice' and 'captive' markets. One factor that is rated highly across all trip types for both captive and choice users is certainty of arrival time. The availability of door-to-door travel, a key attribute of DRT, achieves an interesting mix. For shopping and health trips it is rated strongly for both captive and choice groups, though the rating is higher for choice than captive. Door-to-door travel is also rated higher by choice groups for commuting and leisure trips. It should be noted that door-to-door is a more valuable attribute for women than men, due mainly to the perception of enhanced personal security. These observations are indicative of a more general pattern of difference between choice and captive users. Times of operation appear to be of importance for commuter and leisure trips, with choice commuters scoring higher. This probably relates to leisure trips being in the evenings, possibly after conventional bus services stop. On the important issue of price there is a major contrast between choice and captive users. Price is a very important issue for captive users, but less so for choice users. By way of contrast, comfort and image is far more important for choice than captive users (although comfort understandably scores more highly for health trips and also for leisure trips).

Recommendation: This analysis can be used and developed to target the design of a DRT service to the markets it is planned to serve. For example, a DRT scheme geared mainly to shopping, health and leisure trips by captive users should combine a different set of attributes than one aimed at car commuters. A key distinction is that what captive users most want is a bus or minicab, whereas the last thing choice users want is a bus. Captive users value bus-like attributes. Choice users value taxi/hirecar type attributes.

Financial performance of DRT

An important part of this research has been to explore the interface between commercial and subsidised DRT services – particularly factors that allow a service to make the transition towards commercial viability. However, this research has indicated a more detail financial consideration than a simple commercial/subsidised split. There are four key levels of financial performance:

1) **Commercially viable DRT**. These are services that are either profitable, or operate within a commercial context (e.g. temporary losses are accepted as a service is built up or a loss-making service is compensated by its positive financial effects on a service network as a whole).

2) **Acceptable subsidy DRT**. This is where DRT requires only the same (or less) subsidy than other comparable tendered services (a subsidy of £2 per trip or less appears to be the crucial threshold).

3) **Justifiable higher subsidy DRT**. This is where a subsidy above that comparable to tendered services can be justified. This may be due to the operational area (e.g. deep rural areas cost more anyway), that DRT is replacing inherently even more expensive transport, or because it is yielding significant cross-sector benefits.

4) **Financially unsustainable DRT**. This may be demonstration and trial projects or other services whose losses remain very high.

There will be movement between these categories, ideally upwards. Realistically, a DRT service cannot remain in category four beyond a short-term demonstration/set-up project (e.g. two years' funding).

Currently there are very few commercially profitable DRT schemes operating in the UK. Perhaps the closest scheme to profitability is the newly launched Yellow Taxibus that operates between Dunfermline in Fife and central Edinburgh. However, this is not expected to make a profit for at least two years. Once the set up costs have been taken into account this scheme is also aiming to operate as cheaply as possible. Only the minimum level of technology is involved and the drivers employed are new to the public transport industry – they are non-unionised, and only require an ordinary driving licence, not a Passenger Carrying Vehicle licence.

The next level in terms of 'commercial viability' refers to the low-tech shared taxi schemes, e.g. Lovedean Carshare in Hampshire. Average subsidy per passenger trip here is roughly £1. However, a more rural scheme of a similar type, the Fare Car in Devon costs rather more than that – £10 per trip. Once again the routes operate in relatively compact communities and the technology, staff and vehicle costs are minimal.

Commercial DRT operations are not common anywhere in the developed world, but that is not to say they do not exist. In the USA in particular there are several examples. Again they tend to occupy a market niche where a more customised service is valued, but which can be operated in a low-cost manner (simple systems where manual scheduling is adequate and low-cost labour). One of the more widespread is the airport shuttle. The pricing of shuttles at below taxi fares (but not that much lower) is combined with a market that presents a steady (and predictable) demand without particular peaks. Shuttle services seek choice users by addressing their 'hire car' needs and are priced accordingly. Jitneys too serve specialist niche markets, and show that it is possible to have commercial DRT occupying a more downmarket position than the premium product airport shuttle.

In the UK, the DRT industry has historically been driven by the social exclusion agenda, and features schemes that are cumbersome, expensive, bespoke and cost heavy. In general, the systems have tended to have their own call centres, sometimes combining other local authority functions to save replication and thus reduce costs. They are not set up specifically from a commercial perspective. The subsidy levels of the infrastructure (call centres, software, vehicles, etc.) are enormous burdens for councils but so are the operational cost elements. It is debatable that current systems can be made more effective to provide good value for money.

There are major structural problems inherent in the bus industry at present, a key problem being that in the years since deregulation there have been major cuts in the management of local bus services, notably

in the product development and service quality areas. This has left the industry with delivery problems even for conventional services, without adding the complexity of DRT. It is questionable whether either a bus company or a local authority would be prepared to put the resources required into ensuring the success of DRT in more than a limited number of areas in the current climate. They face the challenge of retaining premium fare-paying passengers.

Recommendation: When introducing a DRT scheme it is important to clarify the market it is intended to serve, and to identify the classification of the expected financial performance, i.e. whether it is expected to operate commercially, at acceptable subsidy or at a higher justifiable subsidy.

Recommendation: The key lessons of the commercial and near-commercial DRT schemes appear to be as follows. Many of these points apply also to other types of DRT, particularly the *acceptable subsidy* category.

- ***Services should be simple to understand***.
- ***The use of simple, manual, developments of taxi or hire car systems tend to have an associated low cost base***.
- ***In planning commercial DRT services it should be recognised that they are often a premium product***.
- ***Commercial or near-commercial DRT occupies small niche markets***.
- ***Commercial or near-commercial DRT needs sufficient and evenly spread demand***.

The exploration of commercial DRT indicates a number of lessons for the expansion of DRT in the UK. A few UK schemes are within the *acceptable subsidy* category while most are really in the high subsidy demonstration project stage, but may be seeking to maintain a justifiably higher subsidy. This raises an important issue. The distinction between the last two categories is not clear. What constitutes a *justifiable subsidy* may depend on what the alternative public costs may be or whether a financial arrangement can be put into place to recognise a cross-sector benefit. For example, money from a local authority's education budget might part-subsidise a DRT service or purchase student passes instead. This is a rather grey area and further clarity in justifying DRT funding beyond an initial demonstration project is needed.

Many current DRT schemes in the UK operate at passenger subsidies ranging from less than £1 to around £10, while one or two schemes have far higher per trip subsidy costs where subsidy per passenger trip is closer to £30. The majority of these schemes feature high quality state-of-the-art minibus vehicles and new and relatively complex call centre and routeing/scheduling equipment and software. Is there any likelihood that such subsidies could fall to an *acceptable subsidy* level (around £2 per passenger trip), or even achieve commercial viability? The first thing to consider is, may costs fall? As with many new technologies, it appears that as DRT develops then the costs will fall as technology becomes more affordable and savings are made from the consolidation of call centres. The proliferation of demonstration projects with high start-up costs and under-utilised IT infrastructure could give (and has already given) way to more cost-effective systems, and there is evidence that costs have been cut as schemes mature. In the UK, some of the best practice schemes look like they could deliver a cost per passenger trip close to the *acceptable subsidy* level of £2, but this does require very good operating conditions and good market conditions. In other words, some DRT schemes in the UK might well hit the £2 target, but this should not be expected of all.

Costs are one part of whether DRT has the potential to achieve either *commercial viability* or an *acceptable subsidy* level. The other key factor is, of course, revenue. Behind this is a major issue of the market position of DRT services. With some notable exceptions (like the Jitney), many of the commercial or low-subsidy DRT services are premium products. They seek to deliver a near-taxi level of service for fares that are closer to taxi fares than bus fares. Commercial DRT addresses upmarket niches – such as air travellers or long-distance, middle-class rail commuters, and while DRT subscription bus pools can be costly due to amenities like comfortable padded seats and air-conditioning, full costs are recovered because customers are prepared to pay for premium quality.

These are not the markets that public policy DRT schemes have so far sought to serve. Instead, they have aimed at a totally different market position that reflects a social inclusion agenda. Thus fares are usually comparable to that of bus services, and in some cases considerably lower. This social inclusion basis of the design of the DRT product is reinforced by the fact that, in the UK, general public DRT has drawn upon the established experience of the dial-a-ride service for people with disabilities. The systems that have been developed to support dial-a-ride have (understandably) been rooted in a social inclusion ethos.

For many DRT schemes, the continuing need for subsidy focuses upon a longstanding rationale for DRT services. This is that, on a per trip basis, DRT is still often far cheaper for public authorities to provide than conventional specialist health, education, or social service transport services. This is the *justifiable higher subsidy* rationale. DRT may be expensive (£5–10 per trip), but for the markets it serves it is cheaper than the alternatives (for example, non-emergency ambulances or taxis at £10–20 per trip). This is how DRT became established as a public transport service for people with disabilities – dial-a-ride and ring-and-ride.

This rationale has now developed to where a public DRT service is more cost effective than running a set of parallel services for people with disabilities, non-emergency ambulances, Social Services and schools transport. If (as in the case of many US and mainland European towns and cities) the ordinary bus service also needs heavy subsidy, then rolling the whole lot into a single DRT service can both improve the quality of the service to users, increase utilisation of resources and cut costs. The larger service will certainly need call and control centres, probably with computer scheduling, but in most cases these exist anyway (and are frequently duplicated and under utilised). The big issue here for the UK is one of cost and revenue allocation among a network of providers and institutional users. Schools transport alone costs £700m a year for just 10–15% of school trips. This could be incorporated into DRT and other bus developments, which would arguably create a greater transport impact than the current plans to expand an institutionally separate schools transport service.

In mainland Europe and the USA, with city authorities being the end funders, the issue of cost and revenue allocation seems to be of less concern. In the UK, with each branch of the public sector having its own budget and increasingly being required to act in a market way, such simplifications are not possible. Thus cost and revenue allocation software is needed along side the vehicle management and trip allocation systems.

Perhaps there needs to be recognition that social inclusion-led DRT services will inevitably require higher long term subsidy than normal supported bus services. Such DRT services will not only need start-up funding, but a high permanent revenue subsidy as well. In some countries, particularly the USA, the need for continuing subsidy has led to new financial arrangements, such as local hypothecated taxes and charges, rather than a dependence on traditional central government grants. An expansion of social inclusion-led DRT services in the UK could well require different funding structures to those that are currently in place, but would only be of significance if they were additional to the funding already provided by government to local authorities and Passenger Transport Executives (PTEs).

Recommendation: Although some bus fare-type DRT services have achieved a subsidy level of around £2 per passenger, these tend to be the simple, small low-cost shared taxi arrangements. For the more costly DRT bus, with supporting call centres etc., it may be unrealistic to expect much better than a £3.50–4.00 subsidy cost per passenger trip if passengers are to pay fares on a par with conventional bus fares. This is roughly double the *acceptable subsidy* level, and so an additional rationale is needed for this further public funding. This observation raises the issue of fares. There does appear to be a lack of clarity in the fares policies of DRT services and a serious long-term problem of getting subsidies down to a politically fundable level (even if financial reforms do provide new sources of subsidy). DRT seems to be targeted at the wrong sector – a legacy of a culture from dial-a-ride background, with pricing far too low for what is a premium product. DRT needs to identify stronger markets for DRT rather than the captive user one that is central at the moment.

Such arguments raise a number of possibilities. One key issue to explore is whether the service as a whole needs to be designed for low fares or whether social inclusion measures are built in to reduce fares for *particular users* of the service. For example, it would be possible to have a DRT service that has premium fares for the premium service it is, but with clear concessionary fares targeted upon social inclusion groups. This would make funding for social inclusion more transparent, while increasing fare yield from

groups able to pay. Overall it would enhance the financial viability of DRT and could crucially lower the average subsidy of well-designed UK schemes to approximately the level for conventional bus services. However, asking some groups to carry the cost is not an easy issue to address.

Recommendation: In the UK context, the mechanism for delivering *justifiable subsidy* may need to be different than the general subsidy used for DRT in other countries. A funding partnership based upon paying for client groups may be appropriate. For example, NHS Trusts might be persuaded to contribute to DRT services that reduce the number of missed appointments, or a school might pay for improved attendance.

Recommendation: There appear to be three general market niches where DRT can be seen to fit. First, low-tech, low-quality, small-scale simple DRT systems can be applied in areas where captive users are happy to use any form of public transport but are only willing (or able) to pay low fares. Second, there are niches (e.g. employer shuttles, airport shuttles) where commercial operators can target choice users who appreciate luxury and are prepared to pay a premium for a service that is as far away from a bus or a minicab as possible with small-scale, simple to operate systems. Finally, large-scale, complex network DRT systems require high-tech equipment if they are to operate efficiently. As a result they will be relatively expensive to operate. However, providing that savings can be made (usually by substituting them for even more expensive specialist transport trips) there is scope for these services to be cost effective – assuming the benefiting bodies actually pay for those benefits. It is also advisable that services should be of high quality and that fares be raised above those of a comparable bus service as it will be important to attract a proportion of choice users.

Marketing DRT

DRT market research has proved deceptive. It is therefore very important that schemes should be designed to be flexible – i.e. they should be able to be adjusted easily to better serve the actual rather than the predicted market.

In addition, key factors that satisfy existing users are different from those that attract the car use. Typically, regular passengers say they want cheaper fares, while those who DRT operators want to attract onto their services generally put reliability and effective frequency to the top of the list. Five key barriers preventing motorists using public transport were inadequate networks, a lack of information, longer journey time, access difficulties, and general concerns that public transport is unusable. A DRT operator that majors on the things that existing users value would miss out on these additional factors that would be needed to effect modal shift.

In defining DRT, operators have a major problem in that the term can be taken to mean a large number of different things e.g. a whole range of combinations of different schedule and route flexibility types. More broadly, as with the bus, to satisfy both existing customers and to increase modal share requires: a pleasant waiting environment; good reliability; an easy to understand network; an easy to understand ticketing structure; easily accessible vehicles to those with heavy shopping, prams and pushchairs, and wheelchairs; a direct service with easy interchange; a frequent service; good value for money; friendly and helpful staff; and comfortable, clean, well heated and ventilated vehicles.

Key operational decisions

There are a number of DRT-specific operational characteristics. These include: type and size of DRT vehicle; degree of route flexibility; degree of timetable flexibility; whether to interchange or not; level of technology; mode of booking; and call centre technology. There are also a number of regulatory and financial issues with licensing the operators, vehicles, drivers and routes that need to be balanced, and there are mandatory requirements if the vehicles are to be used for special needs type work, e.g. space for wheelchairs or low floor access. Image is also crucial. For instance, women are often uncomfortable sharing vehicles with only four or five seats, while larger vehicles are often perceived to give off an institutionalised aura. Finally, there is an issue to do with the DRT journey times becoming more elongated as the number of passengers increases. Perhaps the ideal solution to the vehicle size issue is to

offer a range of different-sized vehicles, which the DRT operator calls on as and when a particular type of vehicle is required.

The degree of route flexibility is also affected by the level of demand, and crucially by its distribution (i.e. the land use and road network patterns). In general, fully flexible routes can be very inefficient because of the first-come-first-served nature. More efficient is where a loop/zone system can be introduced with deviations (ideally with two buses travelling in opposite directions) so that more people can be picked up, because the first-come-first-served nature of the service is diluted slightly. Reducing the flexibility also has the effect of making the service easier for passengers to understand, as it is difficult to explain that it is a bus service that behaves like a taxi. A second way of achieving flexibility is to vary the scheduling. Here services only run on demand – i.e. when requested by a passenger. Such services range from extremely high frequency operations, to very low demand scenarios. Current regulations suggest that no timetable is required for services registered to run at a minimum five minute frequency, and so theoretically very high frequency jitney-style services could be run under a these rules.

Advances in software, computers, digital maps, expert systems, remote communications, in-vehicle computers and GPS technologies have suddenly made DRT viable. But, while the costs of high tech schemes may or may not continue to fall, they are still relatively expensive to introduce, and there remain occasional problems installing and using the equipment. When selecting the level of technology required, the scale and complexity of the operation envisaged should determine whether a high-tech set up is necessary or not. Similarly, is a new call centre needed or could the work be contracted out? Technology also allows operators to monitor and analyse service patterns, potentially allowing the system to evolve more effectively, and this may be reason to adopt a high-tech approach. Finally, technology offers almost close to ‘real-time’ demand responsiveness even on complex networks, to a level far in advance of manual systems. Interestingly, so far the few commercial operators have looked to low-tech solutions based on technology for conventional taxi operation, which are deliberately limited in what they can achieve.

There are several modes of booking DRT, including boarding at the terminus, ‘hail-and-ride’ along the route (by hand or sometimes by pressing a button at a stop so the next bus will deviate to pick up at that stop, as in some schemes in Italy, such as in Bologna), via the Internet and by telephone. Of these methods, the telephone offers the most high-tech and flexible approaches to be adopted, but there is the cost of the call involved and the need for a call centre, possibly routeing software, and therefore additional staff. Pre-booking using a telephone has become far more viable with the widespread take up of mobile phone technology.

For the future, Internet technology is now being mooted as being the way forward with the advantage of possibly offering automated (and thus far cheaper) booking.

Implementation issues

DRT systems tend to require a more complex network than conventional bus or taxi services. At the very least this involves operators, call centres and local authorities. It is also clear that good relations need to be established with the local community, rival transport operators (particularly minicab and taxi firms who may see a subsidised service as a threat), and local trip generators such as employers, retail outlets, etc., that could encourage their staff and visitors to use the service, or even potentially sponsor or contribute towards the costs of providing the service. There can be problems involving taxi and private hire operators, as moving into DRT and being expected to work in partnership with the local authority and others is not their normal mode of operation. Finally, clear communication channels with the various licensing, regulatory and financing authorities can smooth the path of implementation enormously.

Politically, there is widespread political enthusiasm for DRT, but it is the support of the operators, not the politicians, that is the biggest problem. One approach to dealing with this operator reticence has been for local authorities to bear all the revenue risk by issuing gross cost contracts. In practice, this has meant that the local authority buys/leases and brands the vehicles, plans the routes and then invites operators to bid to run the services for a fixed fee which they will receive no matter how many people use the service. Currently DRT is still limited to niche markets and limited areas of the country, and considered experimental. It is almost as though DRT has to reach a ‘critical mass’ and be more widely accepted

before the conservative bus industry accepts it as a viable proposition. Thus far, DRT is seen as providing a less certain revenue stream than conventional public transport.

Directly related to this and a serious operational problem that has afflicted DRT projects in the UK and elsewhere, is active opposition from rival transport operators. However, the research conducted for this study suggests that the fear of competition from DRT expressed by taxi operators is ungrounded, and DRT is in reality an opportunity. There is considerable, guaranteed profit to be gained. In essence, more needs to be made of the positive incentives for communities to encourage small, local taxi operators to participate in DRT.

Issues facing Government

Institutional, legal and regulatory

While it could be argued that the plethora of existing and potential regulatory regimes allows operators flexibility in the type of schemes they devise, in practice the complexity facing operators has hindered rather than facilitated the development of not only DRT, but other innovative transport options such as car club, lift share or vanpooling schemes.

Currently DRT is neither 'fish nor fowl' – it is neither taxi, nor minicab nor bus, meaning that it is extremely complicated to set up a DRT scheme and that DRT is not seen as a mainstream public transport solution by all players. Further, registration, licensing and financing principles and procedures continue to be conducted on an ad hoc basis – an undesirable situation for all concerned because DRT scheme promoters are thus forced to negotiate from scratch every time they register a service or try and claim financial support. To be successful DRT needs a strong identity.

Recommendation: The current institutional arrangements facing DRT scheme promoters are too complicated. Ideally, over the longer term the operating, licensing and financing regimes of all the road-based passenger public transport sectors need to be re-visited and completely replaced with a new integrated system governed by common principles, based on safety and the needs of the passenger, and controlled by a single governing authority. Ad hoc and piecemeal alterations to the various regimes would seem to be counterproductive. On the other hand, it is recognised that such a wholesale change in the current political climate is very unlikely to happen for a variety of reasons and that some specific changes would benefit DRT operations (see Chapter 6). As a minimum, in the short term, the DfT needs to further clarify the institutional framework for ALL potential types of DRT scheme. Also, as DRT has no natural constituency to draw from for political support, unlike the established bus and taxi lobbies, one possible remedy could be to set up a new DRT forum.

For the cases studied, there was also some comment that more information about how to set up, plan, run and market DRT would be helpful to local authorities and bus operators.

Recommendation: Government should improve the dissemination of public transport planning, operating and marketing techniques, possibly through the publication of a good practice guide.

With DRT there are many different variations in the degree of route and timetable flexibility. This is combined with uncertainty in the legislation, which has led to a non-uniformity of how the legislation is applied among the six Traffic Commissioners found in eight regions.

The second major concern to emerge from the research was to do with the related issue of timing points. Timing points are seen as being problematic because buses are required to run to them even if there are no bookings, and because they limit the flexibility of how the service is operated.

Monitoring whether services run (or are available to run) or not currently determines the limit of how flexible a service can be. There is therefore a need to look at alternative approaches to the current 'catch all' timing-point method, which, while appropriate to fixed timetable services, is clearly useless for on-demand style service patterns. Instead, the 'mystery shopper' approach might be an alternative way for

Traffic Commissioners to monitor actual service compliance, for example with a sample of services being booked by telephone to see if they are then operated as per the published standard.

Recommendation: New monitoring methods need to be devised by the Traffic Commissioners (or subsequent registration body). This would allow a more comprehensive range of flexible public transport service options to be registered.

In theory, the deregulation of bus services due to the 1985 Transport Act should have encouraged bus and taxi operators to bid for operations, and stimulate competition. In practice, this has rarely happened. In summary, taxis are being under utilised.

Recommendation: As a minimum, stronger guidance and/or regulation needs to be issued to taxi and Private Hire Vehicle (PHV) licensing authorities extolling the virtues of shared taxi-type operations. More beneficial would be to standardise private hire and taxi licensing rules while shifting these licensing responsibilities from the district authority tier to that of the highway authority (where the authority is not a unitary one) or to a PTE (where one is present).

A very specific regulatory barrier relating to the potential for DRT services to substitute for specialist services such as education, social service and disabled transport, was due to Section 60(5) of the 1985 Transport Act, preventing PTEs from 'owning and loaning' vehicles, thus making it far more complex for them to act as a vehicle broker. This brokerage system would theoretically enable a council or a PTE to provide a vehicle pool, from which private and community transport operators, council departments and Primary Health Care Trusts could lease vehicles as required for a few hours a day – perhaps significantly reducing costs.

Recommendation: The regulations in the 1985 Transport Act preventing PTEs from 'owning and loaning' vehicles should be rescinded[2].

Financial issues

An important consequence of the institutional arrangement is whether a service is eligible for particular types of funding or not. Public subsidy accounts for 30% of bus operator revenue for services outside London, which comes from Bus Service Operators Grant (BSOG), payments for tendered services, and concessionary fares compensation. For DRT, as with licensing, the situation is rather less clear.

Essentially, the current position is that private hire vehicles are never eligible for BSOG, while taxis are only eligible when operating as a registered Taxibuses under Section 12 of the 1985 Transport Act. Regulations were introduced from May 2002 to extend the BSOG scheme to a wider range of Community Transport services, i.e. those which are provided by a non-profit making body under a Section 19 permit. Local bus services are only eligible for BSOG providing that services are available to the general public and that members of the public can make single journeys between any two stopping places.

Recommendation: BSOG should be extended to cover all mileage on services registered with the Traffic Commissioners as 'shared use' public transport services, whether they be operated by bus or taxi. Ideally, it should also be possible for DRT schemes registered with and monitored by local authorities to be eligible for BSOG too[3].

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[2] As of November 2003, it is understood that the DfT has already pledged to allow PTEs to lease vehicles and is in the process of drawing up a Regulatory Reform Order to effect this.

[3] Since this recommendation was made, the regulations of February 2004 do enable a whole new raft of DRT services to be registered with the Traffic Commissioners which are thus also eligible for BSOG. Nevertheless, local authority-registered schemes remain ineligible (see http://www.dft.gov.uk/stellent/groups/dft_localtrans/documents/page/dft_localtrans_027309.hcsp for further details.

The UK Government recently decided to extend the Rural Bus Subsidy Grant (RBSG) for a further two years (to 2005/6) and to allow it to be used for funding a wider range of services, possibly including DRT, although final decisions are still to be taken on exactly what services will be covered. As of November 2003, the DfT is consulting interested organisations on the details of the changes to the rules of the grant.

Recommendation: Rural Bus Subsidy Grant should be extended to cover all mileage on services registered with the Traffic Commissioners as 'shared use' public transport services, whether they be operated by bus or taxi, should they comply with the 'rurality' criteria. Similarly, rural local authority registered DRT schemes would also ideally be eligible.

One major area of DRT funding in the UK has been Rural, and more recently, Urban Bus Challenge funding. RBC and UBC has had a very positive effect on the DRT industry. However, there are problems in that it is overly complex, encourages innovative schemes rather than potentially cost effective schemes, and requires time to be spent on bidding for resources with no guarantee that any money will be forthcoming.

Recommendation: The Challenge funding mechanisms have served their purpose, and there is now a need for a more predictable source of money to support DRT schemes as they strive to become a financially viable form of public transport. This could be offered through BSOG or RBSG, or perhaps through a 'pump priming' fund (such as the Kickstart initiative), whereby the subsidy gap between DRT and conventional bus routes might be covered for the first two or three years. In any event, a decision as to the long-term future of the Challenge funding scheme (and about any replacement money) would be appreciated as soon as possible.

While vehicles of ten seats (including the driver) or more qualify to be zero rated for VAT on costs on fares, private hire vehicles and taxis do not. This inconsistency with the VAT treatment of costs and fares does have an impact on the take up of shared taxi schemes. Once again though, the issues of monitoring and enforcement are crucial.

Recommendation: Ideally, subject to an appropriate monitoring and enforcement regime being established, taxis and PHVs should be eligible for zero-rated VAT on costs and fares whenever they are operated as a public transport system, as opposed to exclusive-use.

Political

In some ways, DRT already has a strong political backing as it is perceived to help address the 'social inclusion' policy area and it could be developed to meet 'resource efficiency', 'integration', 'environment' and 'congestion' objectives too. However, there are a number of areas where DRT could be embedded further into such policy processes. One way is through accessibility planning. Previously, there has been a tendency to consider access to public transport services in terms of distance from a bus stop and frequency of service. A subtle alteration to these accessibility planning indicators, e.g. by suggesting that people be offered at least an hourly *opportunity* to travel would mean that DRT would become the most efficient way of meeting the standard in many places.

Recommendation: Government needs to set a framework from which to set legislation concerning how often the public should have access to transport. An hourly opportunity to travel would be a good standard. A national accessibility standard for rural areas would promote DRT, as it would be the only efficient way of meeting the standard in many places.

Land use is a significant shaping factor in the effectiveness and efficiency of public transport systems, and in recent years low-density out-of-town developments have been allowed to proliferate. Such developments are car-friendly and bus-unfriendly, and so DRT may be more appropriate than a bus in these areas. However, this should not mean that developers should be allowed to carry on in a similar vein, using DRT as a as a solution for poor planning, and planning rules need to be altered accordingly.

Recommendation: Planning guidance should recognise that low-density out-of-town developments are not conducive to public transport operation and should be discouraged. However, where such developments already exist, DRT may be a possible solution to poor public transport accessibility.

A further issue of importance is in the calculation of costs and benefits relating to DRT (and to public transport as a whole). For instance, enabling older people to access social networks through public transport delivers significant benefits, but these are not 'reclaimed' by the transport sector.

Recommendation: Government ought to sponsor more research into the wider environmental, social and economic benefits of transport in order to help justify higher public transport subsidies.

Very much related to this is the question of subsidies to other forms of transport. It is important to note that the costs of using public transport relative to the marginal cost to the user of using a car due have risen significantly over recent years, and any future widening of the cost gap between public transport and the car will undermine the viability of DRT.

Recommendation: Government needs to consider policies aimed at reversing the trends whereby car use is becoming cheaper and public transport use more expensive.

On a more prosaic level, while DRT is typically more expensive than conventional fixed-route bus services per passenger trip, it is also usually far less expensive than specialist education, social service and health transport services. Allowing DRT to take on these trips may well provide a more cost effective option for a local authority currently subsidising these services separately (providing the fixed costs of providing DRT services are also reduced). However, significant institutional and cultural barriers need to be overcome before any meaningful integration can take place. In particular, it is vital that financing streams are properly established.

Recommendation: Government ought to examine ways and means of encouraging the establishing of vehicle brokerage operations.

Other barriers

The proliferation of call centres is also seen as a problem. While scheme-by-scheme centres may be desirable from an operational viewpoint, (local knowledge of an area is valued by customers), the set-up and operational costs involved are typically high, and many current UK DRT schemes are simply far too small to justify the level of investment required. Regional level call centres therefore probably offer the best balance between cost and operational requirements.

Recommendation: Government needs to look at ways of developing a more rational network of DRT call centres.

Other technological barriers are that there is still no mobile telephone coverage in some very remote areas of the country, such as parts of Cornwall and the north west of Scotland (arguably where DRT might be most effective), making high tech DRT schemes very difficult to introduce.

Chapter 1 – Conventional public transport in the UK

Introduction

Increasingly, conventional road-based public transport, i.e. the bus, does not meet the needs of a large section of the population. This is because as income levels and hence car ownership rise, as activity centres become more dispersed, and as trip patterns reflect this new distribution, buses become less effective and less efficient as movers of people. In turn, this leads to a reduction in use as services are rationalised, thereby persuading more people to buy cars in order to maintain their mobility levels. This removes yet more public transport users, so public transport services become less viable and so on – i.e., the so-called vicious circle of public transport decline. On top of this, there are issues to do with rising costs in providing bus services, while the increasing population of elderly people is adding to the pressure on specialist dial-a-ride and hospital transport services. These services are extremely expensive to provide, and so increased demand adds to the pressures on public budgets. Finally, public transport is now charged with contributing to a whole range of policy goals, which had largely been unarticulated from deregulation in 1985 up until the 1997 election. These involve social inclusion (with particular respect to the rural, poor and disabled), congestion reduction and environmental objectives while still meeting 'best value' targets.

One way of addressing these issues appears to be public transport systems that can operate effectively at lower levels and serving more dispersed demand than the bus. Such systems include shared taxis and demand responsive minibuses, which are collectively known as Demand Responsive Transport (DRT)[4].

This approach has been examined closely in recent years to identify whether it could meet the wide range of transport and economic, environmental and social objectives. For instance, at a national level, in the UK alone, there have been a number of Government reports which have referred to DRT as being a key instrument in tackling a particular policy objective. These have included reports from the Social Exclusion Unit at the Cabinet Office, the Countryside Agency and the Department for Transport. In addition, the use of Rural and Urban Bus Challenge funding has encouraged the take up of DRT. Further afield, DRT has been a key element of transport systems in many less developed countries and is now being looked at in a number of European studies and by governments and local authorities in such countries as Sweden, Finland, the USA, Canada and the Netherlands.

Despite these developments, though, DRT is still very much a novelty option in the UK, and not particularly widespread. There are a number of reasons for this, but so far the bulk of the research and experience has tended to focus on the means of delivery – i.e. what type of vehicle is most appropriate, or how might the technology work, and should a service be fully or semi-flexible? Obviously, these are important questions, and the combination of a whole host of factors such as cheaper communications and computing technology, coupled with the advance in software development has meant that far more flexible DRT operations can now be conducted. However, there are a number of additional regulatory, fiscal, institutional and cultural barriers at government, local authority, operator and user levels that have not yet been so comprehensively investigated. These appear to be as important as the technical issues involved.

The purpose of this study, therefore, was to look at the potential for DRT as an alternative public transport system in terms of market or demand niches, and from the points of view of the public authority and the commercial operator. In essence, it aims to determine how DRT might be developed to serve journeys that are not currently well served by public transport. It then asks why DRT has so far failed to make much impact, and how government and other public authorities might rectify this.

[4] In the USA these modes are known as 'paratransit'.

The role of public transport

The textbook definition of public transport is *'any transport available for hire and reward'*. Politically, public transport is seen as being important for a number of reasons. First, on well-trafficked routes, public transport is a more efficient mover of people and causes less congestion, air pollution and carbon dioxide per person per trip than private cars, i.e., it can be economically and environmentally desirable. Second, it potentially allows those without access to a car at any particular time – a majority of the population (which is disproportionately female, elderly, from an ethnic minority, poor or disabled) – to function in society. Hence, it is socially desirable. In short, despite the relatively small size of the actual public-transport user constituency, public transport has a particularly broad political appeal as a result of it being a 'policy for all perspectives' on the urban transport problem. This can be summed up as follows:

'Whether one's concern was the economic vitality of cities, protecting the environment, stopping highways, energy conservation, assisting the elderly, handicapped and poor, or simply getting other people off the road so as to be able to drive faster, transit was a policy that could be embraced. This is not to say that transit was an effective way of serving all these objectives, but simply that it was widely believed to be so.'

Altshuler, Womack and Pucher (1979)

Clearly, there are several types of public transport. However, rail-based systems tend only to be implemented on corridors of high demand – i.e. the opposite end of the spectrum to that envisaged for DRT. The following section will therefore briefly outline the nature of the systems of more direct relevance to DRT niches, namely the bus, taxi and Private Hire Vehicles (PHVs). Reference will also be made to the position of Community Transport and of Specialist Transport services within the range of possible DRT implementations.

The Bus

The role of the bus is crucial in the public transport mix. Worldwide, there are 8,000–10,000 towns and cities with populations between 10,000 and 200,000 in which there is a system of organised public transport. As rail-based systems do not generally operate in urban areas with less than 300,000 inhabitants, these can therefore be assumed to be mainly bus-only operations. Larger scale cities, meanwhile, number less than 10,000. Even if not the major public transport mode in these, buses usually provide as a minimum an important supplementary role for personal transport (Giannopoulos, 1989).

In the UK, two-thirds of all public transport journeys (or 4.4bn trips) are by bus, with most of the remainder made by rail-based modes – on the national Network Rail system, London Underground and city Tram/Light Rail Transit (LRT) systems. But, whereas in the 1950s the bus was the dominant passenger mode, now it accounts for only 6% of all passenger-kilometres. Today the car accounts for 78% of all passenger journeys over one mile, with many of those being less than a mile in length being made on foot (DETR, 1999). The reasons behind this reversal of fortune were eloquently stated in a report from the House of Commons Select Committee on Transport, Local Government and the Regions.

'The principal reasons for the decline in bus use are rising incomes and increased car ownership. The greater freedom provided by the car has contributed to increased suburbanisation and more complex journey patterns which cannot always be served efficiently by buses. A household with access to one or more cars makes just 3% of its journeys by bus: this compares to 20% of journeys for households without a car.'

House of Commons Select Committee on Transport, Local Government and the Regions (2002)

On top of this, there are issues about rising costs in providing bus services coupled with increasing pressures on public budgets. Once again from the Select Committee Report:

'The cost to local authorities and passenger transport executives of providing supported bus services is rising well above the rate of inflation. The Association of Transport Co-ordinating Officers found that, on average, tender costs for supported bus services were rising at a rate of 7% per year. The principal

reasons behind the rises were increases in fuel and insurance costs, and rising staff costs due to driver shortages. The Transport and General Workers Union pointed out that bus workers' salaries are 13% below average male earnings and that above-inflation wage increases are likely to continue for at least five years. Cost increases also impact on the commercial viability of some services and may be contributing to the increase in service withdrawals.'

House of Commons Select Committee on Transport, Local Government and the Regions (2002)

These trends are obviously extremely worrying, and some of the implications will be examined later. First though, it is necessary to explain how the bus sector is organised.

Regulatory structure

The regulation of Britain's buses is of two fundamentally different types: one applying in London and the other in the rest of the country. However, nearly all bus companies are privately owned[5].

Transport for London (TfL) manages bus services in London under legislation enacted under the Greater London Authority Act 1999. London Buses, now a division of TfL, plans routes, specifies service levels and monitors service quality. It is also responsible for bus stations and stops and other support services. The bus services are operated under franchise arrangements by private operators, these franchises being subject to re-tendering at intervals (TfL, 2003).

Outside the capital, since the 1985 Transport Act became law, bus operations have been 'deregulated', with any bus operator wanting to provide a service being able to register that route with the regional Traffic Commissioner. Except when eligible for a 'restricted' licence[6], provided the operator qualifies for an operator's licence (an 'O' licence), which requires demonstration of good repute, adequate financial support, professional competence and satisfactory maintenance facilities, a service may be registered as soon as a licence has been granted. Operation can then commence eight weeks (56 days) later, regardless of whether any other company serves the same route. Similarly, if an operator wishes to vary or withdraw a service, that company is only required to provide 56 days notice to the Traffic Commissioner. Currently, around 83% of services are operated commercially without local authority subsidy[7], on the operator's own initiative. Unfair competition is dealt with by the Office of Fair Trading and/or the Competition Commission as appropriate. The remainder of services – generally unprofitable but 'socially necessary' – includes a large number of rural services and many urban evening and Sunday services. These are subsidised by a local council exercising its powers as a local transport authority, or in the case of the seven metropolitan areas by Passenger Transport Authorities (PTA) designated as local transport authorities in their own right, through the relevant Passenger Transport Executive (PTE). Here, the local authority or PTA/PTE decides what level of 'missing' service it would like to be provided and then invites the bus operators in the area to tender for the provision of that service, taking into account criteria such as the maximum level of fares to be charged. The authority then selects the bid that represents the best value for money. These services also have to be registered with the Traffic Commissioner by the operator who wins the tender.

Vehicles for hire or reward are classified as Public Service Vehicles. Those with nine or more passenger seats can only be operated by a company in possession of a PSV Operator's Licence (an 'O' Licence),

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[5] In a few cases, bus companies are owned by local authorities. However, even here the companies are operated as separate entities at 'arms length' from public control, with the local authorities standing as a shareholder.

[6] A restricted licence is available only where the operator's main business is not carrying passengers and is limited to no more than two vehicles per operator. This is distinct from the 'special restricted' licence available to allow licensed taxi operators to run bus services.

[7] Although Bus Service Operators Grant (BSOG) is a nationally administered subsidy which is available to local bus services, whether commercial or not. Currently this is paid by refunding most of the fuel duty paid by bus operators, but this mechanism is currently under review.

unless they operate as a minibus or community bus under the permit systems (discussed further below). Vehicles with fewer than nine passenger seats are also classified as PSVs (and need to be covered by an 'O' licence) if they are used for hire or reward *at separate fares*[8]. However, while drivers of vehicles carrying nine or more passengers are required to hold a Passenger Carrying Vehicle driver's licence, issued following a specialised driving test and medical examination[9],drivers of the smaller vehicles do not require a PCV licence.

The 2000 Transport Act introduced the legal framework for the establishment of Statutory Quality Bus Partnerships and Quality Contracts. Statutory Quality Bus Partnerships differ from the voluntary arrangements that have been in existence for many years prior to the Act in that undertakings by operators regarding the quality of services are enforceable by the Traffic Commissioners through financial or licensing sanctions. Where Quality Partnerships are not offering sufficient improvements, Quality Contracts allow local authorities to grant exclusive rights to particular operators to run defined routes within an area, but only where this is the only practicable way of delivering a local bus strategy and is economic, efficient, effective and in the public interest. Quality Contracts Schemes (unlike Quality Partnerships) must be approved by the Secretary of State (or in Wales, the National Assembly).

Funding[10]

Public subsidy accounts for 30% of bus operator revenue for services outside London. This comes from Bus Service Operators Grant (BSOG, formerly Fuel Duty Rebate (FDR)), which reimburses bus operators 80% of the fuel duty they pay and payments for tendered services. In 2000/1, the UK Government paid £362m in FDR or 13.7p per bus km. Without FDR the average cost per bus km would have been 113p, and thus FDR reduces the cost of running bus services by roughly 12%. Local authorities paid £312m in total for tendered bus services in 2000/1, which comprised 16% of services run.

In London, total bus revenue in 2000/1 amounted to £674m, of which only £10m was in additional support. However, Transport for London expects to have to make a very substantial increase in this figure over subsequent years, due to bus fare initiatives and increased service levels. Subsidy estimates were for £314m in 2002/3, rising to £453m in 2003/4 and £512m in 2004/5.

One further important aspect of financial support to the bus industry is that public transport fares are zero-rated for Value Added Tax (usually set at 17.5%) (HM Customs and Excise, 2002a).

Journeys not well served by the bus

Buses are most effective and efficient when operating along corridors. The bus is not ideally suited to serving dispersed areas with correspondingly low demand for public transport. A low level of patronage is likely to result in an infrequent service level being offered, sufficient only to attract 'non-discretionary' users, or those without an alternative. Whilst at least maintaining a transport 'safety net', such services do little to contribute to the goals of minimising energy consumption and pollution, and the vehicles used may not be well suited to some rural road specifications and their environs.

Furthermore, ongoing suburbanisation, rising car ownership and the associated increasing dispersal in travel and land use patterns, taken together suggest a growing share of the population is becoming harder to provide for with conventional bus services. Currently, around 28% of households do not have a car. On average, non-car owning households make roughly 20% of all their trips by bus (151 trips per year),

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[8] If used for hire or reward otherwise than at separate fares they are classified as taxis or private hire vehicles.

[9] An exception exists here in respect of 'permitted' vehicles (in the sense of the 1985 Act) which allows a limited derogation for voluntary (unpaid) drivers of non-profit transport: a standard car driving licence is acceptable, provided it was first held prior to 1997.

[10] This section is based on data reported by the House of Commons Select Committee on Transport, Local Government and the Regions (2002).

while, for car owning households the figure is only 3% (33 trips). As a result the bus industry has become ever more reliant on the ever-diminishing number of non-car owning households (House of Commons, 2002).

These influences together with increased tender costs caused by a buoyant labour market, and higher fuel and insurance costs have led to roughly 2% of commercial routes being withdrawn between 1999 and 2002. Further, as these services tend to be supported by local authorities (but overall subsidy budgets remain similar), some authorities have been forced to re-examine and rationalise their subsidised route networks.

Such a situation (increased dispersion of trips, car ownership and pressure on public budgets) is also present in many other industrialised states, but it is in the United States where conventional public transport faces perhaps the greatest need to evolve, a position graphically illustrated by the following quotation:

'Today's most pressing and troubling transportation-related problems – traffic congestion, air pollution and inaccessible neighbourhoods – demand that bold and creative approaches to reducing reliance on the private automobile and improving efficiency in urban travel be introduced. In America's mobility market place, the automobile has reigned supreme because it is best suited to serving contemporary travel patterns – suburb to suburb journeys, multi-leg trips, spontaneous travel demand, and so on – in addition, according to some studies, of being substantially under priced. Public transport's falling fortunes – declining market shares, soaring operating costs, diminishing productivity – stem, to a large degree, from the fact that traditional fixed-route, fixed-schedule, large-vehicle transportation is unable to effectively compete with the private car given today's settlement and travel patterns. We have experimented with publicly owned, operated and subsidised traditional transit services in this country [the USA] for three decades now, and tens of billions of dollars later, the results have not been terribly impressive. Nationwide, ridership has remained fairly flat and services practices have remained more or less the same.'

Cervero (1997)

In summary, buses are limited in what they can deliver, particularly where traditional 'corridor' operations are being eroded or have ceased to be present. In terms of time, this scenario is particularly the case in the evenings and on Sundays, while in terms of space, in some suburban or rural areas bus services may hardly ever be viable. In response to this, Cervero and Beutler (1999) report how, in the United States, a number of public transport operators have adapted public transport to better serve suburban markets, rather than relying on reshaping urban and living environments. 'Adaptive Transit' aims to minimise and marginalise switching routes or vehicles by taking on one or more of the following service features:

- flexibility in routing and scheduling
- demand-responsiveness
- near kerb-to-kerb delivery
- comparatively fast operating speeds
- real-time information for operators and passengers
- comfortable, convenient and safe access and waiting environments.

In other words, in situations not ideally suited to the bus, some form of demand responsive service may be more appropriate.

Taxis and Private Hire Vehicles[11]

Taxis (Hackney Carriages) and Private Hire Vehicles (PHVs or minicabs) are often considered as being somehow different to other forms of public transport, but in reality they represent the ultimate form of demand responsive transport. Together, PHVs and taxis account for just over 1% of all journeys per person per year, amounting to 700 million journeys or 3.5 billion passenger miles a year. This represents almost a doubling in use since the mid-1980s. As of December 2001, there were 20,500 licensed taxis in London and 63,063 taxis (compared with 79,637 PHVs) in the rest of England and Wales.

In policy terms though, taxis and PHVs appear to have limited potential. Price is a major issue. Fares are relatively expensive when compared to the bus (the average recorded taxi fare was £3.78 in 1999/2001), reflecting the higher quality of the service they provide: on-demand, door-to-door, and exclusive use. This makes them very expensive for poorer people to afford. (Despite this, people in low-income groups tend to make the most taxi trips.) Further, because the services are exclusive use, and serving a wide range of origins and destinations, the vehicles are run without any passengers for roughly 50% of the time (Black, 1995) and so are therefore relatively inefficient in wider economic, congestion and environmental terms. Nevertheless they do perform a valuable function as a public transport mode where providing a bus would not be a viable alternative.

Legally, taxis and PHVs are public transport vehicles with fewer than nine passenger seats. They are privately owned and operated and, outside of London (see Chapter 6), are licensed by district-tier authorities or unitary authorities. Taxis are able to wait for passengers at specified taxi ranks – usually found in town centres and at railway stations – can pick up passengers who flag them down, and can be booked for certain trips. Licensing requirements can be stringent, and taxi drivers might be required to take special tests (e.g. knowledge of the area, language tests), while their vehicles might be made to conform to additional mechanical tests and may well need to be fitted with particular features (e.g. special meters, or transponders to activate bollards to access certain areas). PHVs must be booked through a licensed operator, although 'plate fees' are less expensive and the requirements less stringent. Finally, the laws governing hiring across district-area boundaries are extremely complex; taxis may ply for hire only within their own licensing area, but they can pick up pre-booked hirings outside their area. PHVs can pick up passengers outside their area provided the booking was accepted in the area – known legislatively as the 'controlled district' – where the operator, driver and vehicle are all licensed.

The situation in London is slightly different. There, Hackney Carriages (or Black Cabs) are licensed by the Public Carriage Office (now part of TfL), while PHVs are only now in the process of being regulated. Taxis may charge separate fares when they are pre-booked, or when a sharing scheme is in operation. They can also operate as a bus under a special Public Service Vehicle (PSV) licence. PHV operators may also charge passengers separately if they share a journey.

Taxis and PHVs largely operate on a commercial basis, although local authorities also often contract local firms to carry school children or people with special needs. Taxis operating as taxibuses, as defined under Section 12 of the 1985 Transport Act (see Table 6.4), are allowed to claim Bus Service Operating Grant. PHVs are not, however, permitted to operate as taxibuses under the 1985 Act. Further, both taxis and Private Hire Vehicles are liable for the standard rate of VAT, even if providing registered 'bus' services, as they possess less than ten seats (HM Customs and Excise, 2002b).

Community Transport Services

Community Transport Services are perhaps considered even less often than taxis and PHVs as a form of public transport, yet every year over 10 million passengers are served by more than 100,000 vehicles. These are operated for the benefit of voluntary and community groups, schools, colleges and local authorities, or to provide door-to-door transport for people who are unable to use other public transport (CTA, 2003). By their nature, these operations serve niche groups of people usually with very particular needs. The drivers may need to be trained to load and unload wheelchairs and the vehicles are likely to

[11] The following section is based on DfT (2003a) and DfT (2003b).

follow particular specifications, such as having a low floor or to be equipped with a lift. In addition, users of these services may be unevenly spread throughout an area. These factors mean that the cost per passenger trip of providing these services is typically very high.

Section 22 of the 1985 Transport Act provides a legal basis by which Community Transport Services can be established. These can only be operated by a not-for-profit body under a permit (not operator's licence) granted by the Traffic Commissioners. The services, which are available to the general public, must also be registered with the Commissioners, in the same way as a mainstream bus service. Vehicles must have between nine and sixteen passenger seats, and be driven by unpaid volunteer drivers[12]. Section 19 Community Transport permits are similarly restricted to voluntary non-profit bodies, but only enable the holder to carry passengers from a particular group (e.g. disabled persons, pupils at a school, or members of a scheme or club). In this case it is not necessary to register a particular route, although a permit is still required. In addition to the Traffic Commissioners, however, these may be issued by certain designated bodies, including local authorities, PTEs, and certain voluntary organisations (such as the Scouts) (DfT, 2002).

As of May 2002, certain Community Transport Services are eligible for BSOG. In addition, Community Transport Vehicles of ten seats or more (including the driver) are zero-rated for VAT (HM Customs and Excise, 2002a).

Specialist Transport

While not strictly speaking 'public transport', 'specialist transport' encompasses a whole range of services generally provided by public authorities, including Social Services transport, hospital patient transport, dial-a-ride (for disabled users), and education transport. These services are important because such trips are currently far more expensive to provide than DRT, which in turn is often more expensive to subsidise than conventional bus. However, unlike conventional bus, DRT can often serve such specialist transport uses alongside conventional public transport markets. This means that there may be some scope for a form of cross subsidy that may allow DRT services to become more financially viable.

Demand Responsive Transport

Overall a picture is emerging of a continuing pressure on the viability of conventional bus services away from the main urban and inter-urban routes, with the implication that current public subsidy budgets are likely to prove inadequate to maintain the existing networks. This potential subsidy shortfall will be even more significant if bus services are to be developed to address the wider transport and environmental policy problems, with the contemporary imperatives. Although for major 'corridor' flows in larger towns and cities conventional bus services will remain optimal, they are increasingly inappropriate for the increasing proportion of trips that are far more dispersed in space and time. This does not only involve rural travel, but transport in and around small and medium-sized towns, city fringes and even cross-suburban trips of the major cities.

As with any hybrid system, Demand Responsive Transport services seek to combine the modal specific advantages of the bus or taxi discussed above while trying to avoid the modal specific disadvantages. Thus, DRT services seek to combine the social, economic and environmental policy benefits of the bus, with the high quality service of the taxi/minicab in areas of low public transport demand. The development of such services would appear to have great potential for addressing many current transport policy issues.

However, there are a number of issues about how far DRT should be developed and how it can be explored and introduced. The current situation in the UK is that the existing modes of public transport

[12] Drivers are able to receive reasonable expenses and payments for loss of earnings as a result of driving the community transport vehicle in exceptional circumstances (such as emergencies caused by non-availability or sickness of the roster driver).

have their established industries, financing and regulatory structures. The users of existing public transport (and, indeed, non-users) also know and understand what is, and how to use, a bus, taxi, hire car, train, metro, etc.

A key difficulty derives from a DRT operational strength, in that it is a hybrid system. This means that DRT does not relate well to the existing industry players or the statutory and regulatory structure that has been designed with conventional buses, taxis, and private hire cars in mind. DRT has been accommodated on the margins as an exception to the norm for discrete minority groups. Shifting DRT to bring it within the realm of the 'norm' would require the realignment of the overall public transport industry, its finances and regulation. It would also requires passengers to become familiar with a new form of transport, with procedures and semantics for use that may be very different to those of buses, taxis or trains.

Added to all this are a variety of planning and implementation issues. What might be the appropriate blend of DRT with other forms of public transport? When (or perhaps only where) should DRT replace buses? Or might, in some circumstances, it be better to have DRT as a service to support demand for conventional buses? Crucially, what are the long-term costs of DRT and comparable conventional bus services – and which provides a better service to the user and is more effective for policy objectives?

In terms of implementation, there remain a whole host of questions as to how DRT services can be effectively introduced and marketed. There have been a number of DRT trials, but moving on from these to widespread adoption requires a different order of response by the transport sector. Managing the transition from 'conventional' to DRT is a process that needs detailed examination.

It is this sort of strategic question that this report seeks to address.

Chapter 2 – Demand Responsive Transport

Bakker (1999) defines Demand Responsive Transport (DRT) or paratransit as:

'transportation options that fall between private car and conventional public bus services. It is usually considered to be an option only for less developed countries and for niches like elderly and disabled people.'

Bakker (1999)

A second definition is:

'DRT is an intermediate form of transport, somewhere between the bus and taxi and covers a wide range of transport services ranging from less formal community transport through to area-wide service networks.'

Grosso et al. (2002)

DRT therefore encompasses, *inter alia*, such modes as jitneys, shared taxis, and dial-a-ride minibuses. For the purpose of this study, the term DRT will apply to services that are shared as opposed to exclusive use and are available to the general public.

Types of DRT[13]

In operational terms, there are a number of ways that DRT can be categorised.

Table 2.1: An operational categorisation of DRT

Characteristic	*Alternatives*
Scheduling type	Fixed-schedule
	Demand-responsive
	Unscheduled
Route type	Fixed-route
	Route-deviation
	Flexible-route
Vehicle type	Minicab
	Taxi
	Minibus
	Midibus
Origin and destination relationship	One-to-one
	One-to-many
	Many-to-one
	Many-to-many
Origin and destination service	Door-to-door
	Checkpoint[14]

Scheduling type – Bus services tend to be scheduled, but the car is not, and hence is more attractive. This is also true of some DRT in large cities in developing countries. The problem is that the shared-ride aspect makes such scheduling very complicated, especially if real-time requests are allowed: since each vehicle could potentially service such a request, it is subject to all the constraints of the passengers currently on board, plus those of all the passengers who are to be subsequently picked up.

Route type – Fixed-route services involve scheduled arrivals at given points along pre-defined routes, as offered by buses. Route-deviation or semi-flexible services extend fixed-route services by permitting a

[13] The following section is based on Round and Cervero (1996).

[14] 'Checkpoint' services occur whereby the vehicle might stop at a pub or post office, or at the end of a street, rather than provide a door-to-door service.

certain amount of deviation from the fixed route. This deviation can be measured in time or by distance, and may be subject to other constraints. For example, a vehicle may be required to deviate from its route and yet pass through all its checkpoints, making it 'late' on the section of route beyond the deviation. Flexible routing is a further extension of route-deviation, in which the vehicle goes wherever it is required, as with taxis. Public transport does not usually operate in this manner due to its shared-ride nature, which adds a whole new set of constraints to the routing adopted.

Vehicle type – Vehicle type is important. Firstly, the size of vehicle is determined by the likely levels of demand, and secondly by the cost. In the UK, each type of operation requires a different type of operating licence issued by entirely separate agencies. Some PSVs are able to claim several types of subsidy, rebates and exemptions not available to PHVs or taxis. Drivers too need different licences depending on which particular vehicles they drive. Fares are only eligible for zero VAT rating if the vehicle used has nine or more passenger seats.

Origin and destination relationship – A one-to-one service operates strictly between two points, although with the potential for access and egress at intermediate points. A one-to-many service delivers passengers from multiple origins to a single destination or vice versa. A many-to-many service transports passengers between any reasonably accessible points in the service region.

Origin and destination of service – Door-to-door DRT services in low-density suburban areas have tended to be very expensive. Running 'checkpoint' services along heavily trafficked routes increases the likelihood of filling vehicles but decreases the proportion of the metropolitan area that is covered by the service.

In theory, it is possible to form a DRT service from any combination of the above categories. In practice, some types are well established. For example:

- Jitneys operate along a fixed route, usually a major street, and sometimes have regular stopping places. There is no regular schedule and passengers share the vehicle. There is a fixed fare which is low (Black, 1995). Jitneys were commonplace in the USA during the early 20th century and are still found in cities such as Atlantic City and San Diego (where they are legal) and New York and Miami (where they are not). Schemes roughly following the Jitney model include the Black Taxibuses in Belfast, the taxi-train in Mauritius, and the Dolmus services found throughout Turkey.

- Airport shuttles are a typical form of one-to-many operation. Passengers 'turn-up-and-go' from the airport and the shuttle is then routed to drop them off as efficiently as possible. Once empty, the shuttle is then directed to collect pre-booked passengers going to the airport in a many-to-one pattern. Such services have developed as airports attract large volumes of people who either do not have access to a car, or would prefer to avoid car use due to very expensive, limited parking opportunities (perhaps requiring shuttle bus access in any case to the terminals). At the same time, the journeys to and from the airport may begin and end in population centres that are not large enough to justify conventional public transport services to the airport. Airport shuttles are common across the United States, and there are also examples in Singapore and New Zealand. A slightly different scheme operates at Charles de Gaulle Airport in Paris. Here, the timetable is fixed but the service still deviates to collect people and drop others off. This service is targeted more at airport employees than travellers, although it is available to everyone. Similar shuttle services also operate to employment sites (e.g. the Deeside Shuttle in Flintshire, North Wales), and to rail or bus interchanges (e.g. the First Great Western Truro Plus Bus in Cornwall).

- Semi-flexible services such as the Wigglybus in Wiltshire operate on a fixed route basis, but deviate (or 'wiggle') when pre-booked to do so or when a deviation is requested by passengers already on board. Semi-flexible services tend to operate as closely as possible to a fixed timetable.

History of DRT in UK

Describing the history of the wide range of services that make up DRT is not easy, but there are two main strands.

First, buses or shared taxis operating as jitneys have probably been in place as long or longer as scheduled services in the UK – this is certainly the case in the USA. Of the modern schemes of this type, the (strictly speaking illegal) Black Taxibus services in Belfast and Londonderry, Northern Ireland, that emerged during the late 1960s and early 1970s as a result of the Troubles were the first. Since then, the 1985 Act has legalised the approach, but this has only been applied in a few towns and cities, such as Blackpool and Plymouth. A shared taxi scheme also now operates from Paddington Station for trips into and around central London at peak times (White, 2003).

The second strand in the UK was that of dial-a-ride. Dial-a-ride has been operating for more than thirty years, but has usually only been associated with serving specialist groups, such as disabled people. (Nelson and Wright, 2003). This was largely as a result of technological difficulties caused by flexible routing, many-to-many routing and real time information acquisition. Typically, the vehicle allocation process has been labour intensive and required specialist scheduling and local knowledge, making the cost of providing the service prohibitive for a general public service (Round and Cervero, 1996; Duffell, 2003). These limitations were proved in practice by the failure of such a service in Milton Keynes during the 1970s (Potter, 2003).

However, a series of practical research demonstrations over the last decade (e.g. SAMPO, SAMPLUS, FAMS, INVETE, etc. – see Appendix B for further information) have substantially solved technical problems with routing and scheduling software. These advances, combined with other factors – notably that communication and computing equipment has become more powerful and less expensive – has made dial-a-ride a feasible, albeit still expensive, form of public transport.

Government actions

As for buses, the prevailing legislation for DRT is the 1985 Transport Act. In addition to Sections 19 and 22 on establishing Community Transport Services (discussed in the previous chapter), Section 10 allows councils to set up taxi sharing schemes from designated places (usually ranks) where passengers who would not normally travel together but are going in roughly the same direction can choose to share the same taxi and pay separately. Section 10 applications are dealt with by local authorities in their roles as taxi and private hire licensing authorities. Meanwhile Section 11 enables taxi and private hire operators to allow sharing by passengers booking in advance. The initiative here lies with the operator, although passengers can ask if there is anyone else willing to share a trip. Finally, Section 12 allows the development of 'taxibus' services – whereby licensed taxi operators may run a taxi along a route registered with the Traffic Commissioners collecting separate fares like a local bus service (DfT, 2002).

However, despite this legal framework (and despite strong aspirations on the part of the politicians who promoted the Act) relatively few schemes have been implemented. One scheme, which was implemented, under Section 10, occurred in Ipswich. This began operating from the railway station in June 1988 on a 12-month trial basis, but did not, ultimately, continue. Balcombe *et al*. (1990) found this failed largely due to lack of understanding about the scheme amongst the public; there was resistance to the psychological barrier of requesting shared rides to be arranged and by the perceived low probability of finding other passengers with whom to share. Meanwhile taxi operators in a large town in the Thames Valley aimed to set up a taxibus scheme from the railway station in the town to one of the suburbs in order to supplement their income during 'slow periods', when they can be waiting for up to an hour for a fare. However, on approaching the local authority, they were put off from establishing a scheme due to a whole raft of charges. For example, the local authority suggested the taxi drivers would need to pay £250 for a roof sign[15]. Ironically, the drivers did not in fact need to inform the local authority at all, as a Section 12 taxibus service needs permission only from the Traffic Commissioner. Such a case illustrates the

[15] Conversation with a taxi driver in large Thames Valley town, November 2003.

confusion generated by the current regulatory and licensing regimes (see Chapter 6), as well as the sometimes unhelpful behaviour of the regulatory authorities.

More successful has been the single-vehicle St Budeaux Taxibus service, which has operated in Plymouth under Section 12 of the 1985 Act since it came into effect in 1986. The St Budeaux service provides public transport links into areas otherwise completely inaccessible to public transport. While this was operated on a commercial basis until 1995, a decline in the Royal Navy's residential requirements saw the transfer of the route into the City Council's subsidised portfolio. However, the service has always been in the Council's concessionary fares scheme. The route provides a link to two health centres and operates five days a week. The local taxi trade has not expressed interest in operating a similar service elsewhere in the city (Plymouth City Council, 2001).

The next major piece of primary transport legislation, the 2000 Transport Act, did not influence the potential for DRT. However, DRT has increasingly been seen as a potential solution for a whole range of policy problems, as rehearsed in reports from the Social Exclusion Unit at the Office of the Deputy Prime Minister, the Countryside Agency and the Department for Transport.

The issues surrounding flexible transport services were addressed by a Parliamentary Select Committee, which reported in 2002. This recommended that:

'It is currently too difficult for local authorities to put in place all of the innovative public transport improvements that they desire. A maze of regulations exist, dating from a time when many of these new schemes were not in place and they require simplification. Local authorities should not have to find ways around existing legislation to enable them to introduce new schemes that will benefit the public. We recommend that the Department undertake a full review of the regulations and legislation surrounding flexible transport services to remove these barriers.'

(House of Commons, 2002)

Specifically, the Select Committee noted that:

1. Taxi operators and [public service vehicle] operators can both apply to run taxibus type vehicles with less than nine seats. However, the mechanisms for doing so are different dependent on the licence held. Few operators have therefore been sufficiently encouraged to take up this option.

2. Demand-responsive services are constrained under the Transport Act 1985 because they do not operate to a fixed timetable. The 1985 Act did not anticipate the need for flexibly routed services.

3. There is a lack of volunteer drivers for community transport. However, the rules under which drivers of community transport schemes can be paid are complex and this is restricting the expansion of schemes.

At the time of this report, the Fuel Duty Rebate (now Bus Service Operators Grant, or BSOG) which is given to bus services was not available for demand-responsive services driven by paid drivers. Lincolnshire County Council estimated that this added an extra £1 to the cost of every passenger carried. Subsequent to this, and following up a proposal in the Rural White Paper, the Government consulted on proposals to facilitate flexible bus services within the current framework of primary legislation. As a result, two Statutory Instruments came into force on 23 February 2004. One amends the regulations on bus registration to allow fully flexible-routed bus services to be registered[16], while the other makes flexible services in England eligible for bus service operators' grant if other normal grant criteria, e.g.

[16] The Public Service Vehicles (Registration of Local Services) (Amendment) (England and Wales) Regulations 2004 (SI 2004 No 10).

availability to the general public, are met[17]. It is expected that similar regulations applying to Wales will follow.

The future of DRT in the UK

The future of DRT in the UK is at this moment uncertain. To address this uncertainty, Chapters 3 and 4 draw on a whole range of case examples to determine the market niches that DRT may be best placed to exploit. Following this, the report will seek to identify a number of issues that will need to be tackled if the potential of DRT is to be fully realised. These can be divided into those issues that need to be dealt with at the local level by the operators and local authorities (see Chapter 5), and those which should be addressed at the national level by central government (see Chapter 6).

[17] The Bus Service Operators Grant (Amendment) (England) Regulations 2004 (SI 2004 No 9).

Chapter 3 – Constructing the Composite Cases

To analyse the material looked at for this study, the various case studies can be aggregated to create a series of composite case studies. Each composite case type is described firstly by the nature of the DRT service it represents and the market it serves and secondly by whether it is driven primarily by public policy or by commercial objectives.

Classification of Composite Cases

There are four function-based composite case types. In principle, each of these can have public policy-supported or commercial applications, although particular combinations of function and objective will be more or less likely. The classification by function begins with a consideration of whether the DRT systems provide additional capacity to a public transport system or substitute existing public transport capacity.

Interchange DRT

The first main category is where DRT is additional capacity in order to provide feeder links to conventional public transport. Typically this would be a DRT service providing an interchange at a rail station or into a bus route. This is termed *interchange DRT*.

Network DRT

The second category is where DRT enhances public transport either by providing additional services, or by replacing uneconomic services in a particular place or at certain times. Rather than simply being a feeder into conventional public transport, DRT services can be used to provide additional capacity to conventional public transport by serving new markets or to expanding an existing market.

Network DRT services occur where, as part of an overall network of public transport provision, DRT services operate at particular places or at particular times. Typically, this substitution happens at times of the day or week when demand for conventional public transport is low or dispersed, so making it hard to offer an attractive service. Night services are an obvious example, when issues like personal security can also come into play. However there are also *places* where DRT may be more appropriate, such as town and city cross-suburban trips. A major potential application of DRT services is to provide public transport for rural areas that cannot be served by conventional services. Funding from the Government's Rural Bus Challenge has led to the development of a number of such services, many in areas where conventional bus services had previously been withdrawn.

In these situations, DRT services are not primarily acting as a feeder to conventional bus, train or metro services, but are instead providing part of a comprehensive public transport service to a town, city or rural area. They may perform a feeder function, but this is just part of a more integrative public transport function.

Destination-specific DRT

Destination-specific DRT is closely related to the above category of network DRT. Here, DRT modes have been developed to serve particular destinations such as airports or employment locations. Once again, in many cases providing conventional public transport would not be economically feasible. A key element of many of these schemes is the presence of a partnership between a local authority and the 'destination' (e.g. a company, airport operator or whatever).

Substitute DRT

Substitute DRT occurs where a DRT system totally (or substantially) replaces conventional public transport services. This represents a reinvention of public transport. In the UK this appears to be an

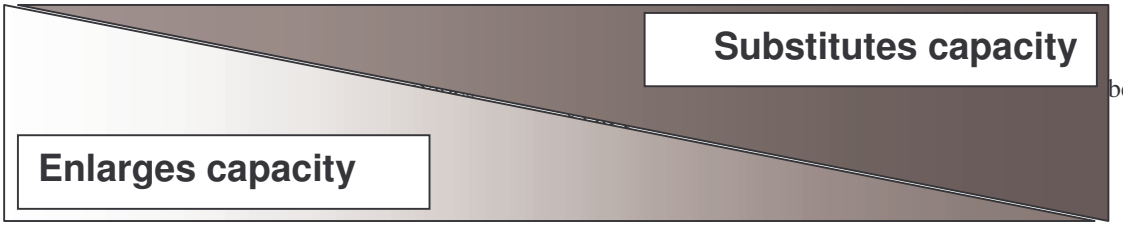
essentially rural public transport option, but there are some overseas urban examples where DRT has entirely replaced conventional buses. With long-term changes towards more dispersed settlements, well suited to travel by car, that have travel demands fragmented physically and in time, there may be locations in the UK where total replacement of buses by DRT could well appropriate.

A subcategory under this heading would be where one sort of DRT substitutes for other, less efficient *specialist* forms of demand responsive transport services. The resource efficiency of separate small service operations can be poor, both in terms of cost to public bodies providing these services and also to the end users. However, inter-institutional co-ordination can involve issues of complex allocation of costs and revenues, as well as management difficulties. Despite this, general public DRT services can substitute for other fragmented DRT provision and in so doing can create something more akin to a DRT service that enhances the overall public transport system.

The Intermode typology of DRT services is shown in Table 1.

Table 3.1: Classification of Intermode DRT systems

CLASSIFICATION			
Additional capacity/part substitution types			**Substitutes capacity**
Interchange DRT (DRT provides a link to conventional public transport)	**Complementary types (additional but separate)**		**Substitute DRT (DRT replaces conventional public transport and/or specialist capacity)**
	Network DRT (DRT replaces conventional public transport in certain place/times)	**Destination-specific DRT**	
Public Policy Driven Examples: Corlink, Cornwall, UK; InterConnect, Lincolnshire, UK; Village Link, Gloucestershire, UK; Dengie Village Link, Essex, UK; Siilinjarvi Service Line, Finland.	**Public Policy Driven Examples:** Regiotaxi KAN, Arnhem-Nijmegen, the Netherlands; Wigglybus, Wiltshire, UK; Cango, Hampshire, UK; RUF-BUS, Wunstorf, Germany; Flexi Project and Fare Car, Devon, UK; The Belbus midibus, Flanders, Belgium	**Public Policy Driven Examples:** Deeside Shuttle, Flintshire, UK; King County Vanpool, Washington State, USA; Vipre Vanpools, the Netherlands; Travelink Maxi Taxis, Shropshire, UK; JAUNT, Virginia, USA.	**Public Policy Driven Examples:** Lovedean Carshare, Hampshire, UK; Rimouski TAXIBUS, Quebec, Canada; Wisconsin Shared Taxi, Wisconsin, USA; Gaberlunzie Bus, East Lothian, UK; TaxiTub, Douai, France; Community Shuttle, Vancouver, Canada.
Commercially Driven Examples: Treintaxi, the Netherlands; Bicester Taxi-Bus, Oxfordshire, UK; Truro Plus Bus, Cornwall, UK.	**Commercially Driven Examples:** Taxi-train, Mauritius; Public Light Bus, Hong Kong; Yellow Taxibus, Fife, UK; Belfast Black Taxibus (current), Northern Ireland, UK.	**Commercially Driven Examples:** Vodafone Commuter DRT, Oxfordshire UK; SuperShuttle, Los Angeles Airport, USA.	**Commercially Driven Examples:** Belfast Black Taxibus (1969), Northern Ireland, UK; Taxi Collectifs, Réunion, (Departement of France).



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It should be noted that the DRT Intermode case study examples often serve several markets and functions. Thus one case study could feature in more than one of our composite cases or subcategories, as they serve a function that crosses between our categories. It is also a fact that some cases examples can shift from one category to another over time (for example, the Belfast Black Taxibuses were originally a substitute mode but are now a network mode). Given the nature of reality, this is an inevitable feature of any conceivable approach to classification. It is nonetheless a phenomenon of which the reader should remain aware.

Interchange DRT

Interchange DRT examples occur where some form of demand responsive transport is used to provide an additional link into existing public transport services at a bus or rail station for example – i.e. at a public transport 'interchange'. This is perhaps the most common use of general public DRT in the UK and is the one most readily understood.

Interchange DRT systems can be a cost-effective way of increasing the availability or 'penetration' of the public transport system as a whole. Such schemes are typically associated with railways, with examples including shared taxis operating as rail stations feeders in Bicester, UK and in Cornwall, UK and across the Netherlands. There are also several schemes providing interchange with bus operations (such as InterConnect and the Dengie Village Link in the UK, and the Siilinjarvi Service Line DRT system in Finland). The main rationale of interchange DRT services is to complement operationally conventional public transport services, rather than replace them, although in some cases such interchange DRT services have replaced poorly used or expensive conventional feeder bus services to stations.

Interchange DRT services are particularly useful where there is an existing public transport corridor serving a series of destinations, but where outside the corridor there are populations or destinations that are currently not linked in to this. An Interchange DRT service is therefore used to extend the network and coverage of the existing train or bus service.

Bus links to rail or metro stations have been commonplace for many years, and this experience has revealed that there are three conditions for such feeders to be effective:

1. Interchange is usually only worthwhile for longer trips or where the mode being changed to has a significant speed advantage (e.g. transferring to a fast metro service to get into a city centre).

2. Demand has to be sufficient to produce a high frequency on the feeder service. For places where demand is low and/or dispersed, a fixed-route feeder is not viable.

3. Reliability of connections is important, although less so where the DRT is feeding into a high frequency operation, e.g. a bus, light rail or metro service with an average wait of less than ten minutes as might be the case in large towns and cities. For less transport intensive areas, a dedicated service with a specially arranged timetable and IT links to the rail/metro station – with possibly a guarantee of a refund or an alternative option (such as a taxi) should connections fail – is the sort of service that instils confidence. Dedicated liveries may serve the latter aim. In contrast, a bus service that just happens to pass a rail station would not be adequate.

Obviously, even if the above conditions are met, DRT may not be the most suitable mode to act as the feeder. For instance, if flows are high and concentrated along a major road, or a single off-route destination is involved, then a fixed-route bus service feeder may be more appropriate (e.g. the 'Eden Branch Line' in Cornwall, or the Luton Parkway/Airport shuttle). On the other hand, if settlement patterns are dispersed and potential demand is low, then some form of DRT mode may be a viable answer. This can most obviously apply to:

- Inter-urban trips where interchange is worthwhile.

- Cross-suburban city trips, where the higher speeds of public transport (through priority measures or segregated track) can make interchange worthwhile.

A number of the cases of DRT systems that have been researched in this project include links to conventional public transport services in their service design. However, interchange is usually only one of a number of markets served. This is an issue that needs to be explored carefully as there is a danger of the interchange becoming a minority function that may not be implemented very efficiently.

There are though, several cases where interchange is a major function of the DRT service. A number of these are commercial[18] DRT and shared taxi services run by rail operators (e.g. the Chiltern Line and First Great Western schemes in Bicester, Oxfordshire, and Truro, Cornwall, respectively), while others have been identified as being driven by public policy goals. That these interchange services are found occupying a space that spans subsidised and commercial operations is of note. This issue is probably represented most clearly by Lincolnshire's InterConnect, where the subsidised element was planned as a two-year pump-priming start-up project, after which the service was expected to be either commercially viable or require only a 'conventional' level of subsidy. The scheme is slightly different from many of the other schemes that were financed by the UK Government's Rural and Urban Bus Challenge initiatives, because it is specifically geared to the needs of passengers who need access to other modes of transport.

In other cases, interchange is a less important element. For example, the Corlink DRT system in south-west Devon and north-east Cornwall is mainly used for local shopping, social trips and trips to medical facilities, even though the service was originally geared towards fostering the ability to travel further on other modes through links with the rail and bus networks.

Well-designed interchange DRT schemes can be very successful. Several schemes worldwide are run by commercial operators who see the feeders as adding value to their core markets. Furthermore, some of the public-policy led examples are close to commercial viability. This is therefore one area where pump-priming start-up projects could be of particular benefit.

Examples of interchange DRT

InterConnect, Lincolnshire, UK

Lincolnshire's InterConnect system is one of the best known UK examples of an integrated network of bus, semi-demand responsive and demand responsive services. The networks act as feeders into primary transport corridors with frequent and high-quality services, connecting destinations such as Lincoln and Skegness, Lincoln and Boston, Lincoln and Grantham, and Spalding and Kings Lynn. Crucially, the DRT services offer guaranteed connections to other InterConnect services, and information, ticketing and marketing are all conducted under the InterConnect brand. This is quite a coup, as there are several operators, together with the County Council, involved in the scheme. The service has resulted in an increase of 150,000 passengers a year, while the two-year pump-priming exercise cost £2.4m. However, the expectation is that after this period the DRT feeder services will require normal levels of bus subsidy – particularly if flexible bus services do become eligible for BSOG.

Direct Access Response Transit (DART), Bay Area, San Francisco, California, USA

Livermore Amador Valley Transit Authority (LAVTA) is in the Bay Area of California, to the south-east of San Francisco. Many BART (Bay Area Rapid Transit) stations have fixed-route connection buses (as well as large free car parks). At the Dublin Pleasanton BART station demand responsive vehicles known as DART operate at off-peak times, 09.00–14.00 and 19.30–21.30. They replace previously under-utilised buses (that carried only 2.7 passengers per hour per bus). The vans leave the BART station every hour on the hour and serve various zones in the area. The booking system is set so that passengers arrive at the BART station five minutes before the scheduled departure time. Phone bookings for dial-a-ride services need to be two or more hours before travel. Patronage is 50–60 users on weekdays and about 85 on

[18] Strictly speaking 'commercial' here means 'operated as a result of a predominantly private-sector initiative' rather than that a profit is made. Commercial organisations may choose to operate such services at a loss for promotional reasons, or using cross-subsidy, in order to generate patronage on the rail service.

Saturdays (when minibus services operate throughout the day). This appears to be a service for captive users, i.e. the elderly, those on low incomes and children and young people.

Taxi-Bus, Chiltern Railways, Bicester, Oxfordshire, UK

The Bicester Taxibus was set up by private train operating company Chiltern Railways, although financial support is also provided from a government and local authority grants. Two sets of services (one urban and one rural) act as feeders for the trains to and from London from Bicester North station. While the urban routes have steadily growing passenger numbers, the rural services are not a success. Institutional barriers mean that the vehicles must be registered both as taxis with the relevant district authorities for off-peak services, and as buses with the Traffic Commissioners for peak services (so as to be allowed to operate as a taxibus as defined by Section 12 of the 1985 Transport Act).

Treintaxi, the Netherlands

Introduced in 1990, the Dutch Treintaxi is probably the best known shared taxi system for rail connections. Now available at 111 Dutch stations, local taxi firms are contracted to operate the service, which is subsidised largely by Dutch Railways (plus some municipalities). The subsidy covers about 35% of costs, but at only £2m a year, this is relatively low. The passengers pay a fixed fare of €3.80 per person per ride (the tickets cost less purchased in advance at stations), regardless of the distance they travel within the defined area of approximately 8 km around the Treintaxi station. Taxis wait for up to twelve minutes for other passengers to join (up to a maximum of four), and the driver sorts out the best route to drop people off. Around 80% of Treintaxi users use the service to get from a station to a final destination rather than to a station. This is probably because users need only pick up a taxi from a dedicated rank at the station (or by pushing a button on a stand if there are no Treintaxis waiting), while for return trips they need to call the Treintaxi call-centre at least half an hour prior to being collected.

Shared Taxi Scheme, Paddington, London, UK

Because taxi demand was so high following the opening of the Heathrow Express service, a shared taxi service to central London was introduced to cope with demand. There is a separate shared taxi queue and waiting customers are grouped according to their destination.

Villagelink, Dengie, Essex, UK

The Dengie Village Link is a rural DRT taxibus service that links with conventional bus services. It was implemented as part of a reorganisation of the existing commercial and tendered conventional bus services. The ‘Flexibus’ taxibus service provides an hourly run to connect people from villages with towns and with rail stations and bus services on main radial routes, thus providing a ‘hub and spoke’ network.

Siilinjarvi Service Line, Finland

Dial-a-ride and shared taxis in low demand rural areas around Siilinjarvi in Sweden link to day centres for four hours a day but are available to the general public at other times, and also act as a feeder to the local bus station. The service uses 16-seater minibuses with additional room for two wheelchair users as well as taxis with between four and eight seats.

Ride Connection’s U-Shuttle public transportation program, Washington Country, Oregon, USA

The U-Shuttle provides access for residents in rural Washington County to employment and training in Portland, Oregon, and was specifically designed to meet the needs of late night shift workers. Shuttles and demand responsive services feed into existing fixed-route bus and light rail services. Begun in May 2000, the system is a generally low-demand rural service and carries about 150 people a day.

Analysis of interchange Intermode DRT schemes

Previous discussion papers have considered the roles of the inception, perpetuation and transfer phases and the roles of 'moving' and 'shaping' factors in the emergence of DRT schemes in particular market or public policy niches. The following section categorises the inception phase in terms of mover and shaper factors and the initial scheme performance. There is also an analysis of perpetuation factors, although, with many schemes being relatively new, this is sometimes limited.

There is an analysis of key niches, and consequent service design and financing factors for the intermode DRT schemes that seek to provide interchange with conventional public transport services, and are motivated by public policy support. This to identify where there is consensus on key factors for the composite case or where there are important design options.

Inception phase

The following table of initial mover factors provides a basic analysis of the initiators behind the scheme, the policy objectives to be addressed and the market niche(s) targeted in the inception phase.

Table 3.2: Initial Mover Factors

SCHEME NAME	INITIATING BODY		DRIVER		TARGET MARKET SOUGHT		
	PRIMARY	SECONDARY	PRIMARY POLICY OBJECTIVE	SECONDARY OBJECTIVES	CORE JOURNEY PURPOSES	CORE USERS	OTHER LIKELY USERS
InterConnect, Lincolnshire, UK	Lincolnshire County Council	Lincolnshire Road Car	Social inclusion for rural communities		Unsuitable for commuting – used for shopping and health trips	Persons without access to a car	
DART, Bay Area, San Francisco, USA	Livermore Amador Valley Transit Authority (LAVTA)		Serve 'Wheels' members better		Shopping and leisure	Schools, senior citizens and children during holidays	
Bicester Taxi-Bus, Oxfordshire, UK	Chiltern Railways		Increase rail patronage		Commuting and rail use	Employees going to London	Social rail users and those who cannot afford taxis
Treintaxi, the Netherlands	Dutch State Railways	Transvision	Increase train patronage		Train users	Everyone	

There is a significant difference in the level of interchange trips. While 40% of DART scheme users transfer, in the Lincolnshire InterConnect example the figure is 2–3%, while in other UK schemes it is even less. Indeed, in one case where a scheme was set up so that commuters could be taken to and from a rail station by DRT and then use the train to ride into and out of a nearby large town it is believed that no one has ever actually used the DRT feeder for that purpose.

By contrast, the one-to-many nature of the Bicester Taxi-Bus and Dutch Treintaxi schemes would seem to indicate a far higher proportion of transfers, even more so than in the DART example. This is possibly a both a weakness and a strength. For instance, during the day at Bicester North station it was clear that the Taxi-Bus was not being well utilised, while at the peak times there is sometimes a need for PHVs to be used to carry 'overflow' passengers.

A further point of note is the influence of settlement patterns on service design. Here, the Lincolnshire InterConnect scheme is a classic demonstration of how to capitalise on the land use pattern, with the core bus routes linking strings of smaller settlements to bigger towns (Lincoln, Skegness, Grantham, etc.). From these smaller settlements, either semi-demand responsive or fully demand responsive services are then used to serve the tiny villages and hamlets away from the trunk roads, *according to what the road network allows*.

The following table establishes how the Interchange DRT schemes were actually set up.

Table 3.3: Initial Shaper Factors

SCHEME NAME	POLICY CONTEXT		AREA FACTORS		
	FINANCIAL SITUATION	REGULATORY AND OWNERSHIP STRUCTURE	POPULATION OF AREA COVERED	LAND USE PATTERN	TRIP DESTINATION ATTRACTIVENESS
InterConnect, Lincolnshire, UK	£2.4m for 2 years (1999–2001)	Local authority tenders operations to private bus companies	310,880	Core route of medium sized towns surrounded by very small scattered settlements	Medium sized towns with adequate amenities. High quality link to larger towns
DART, Bay Area, San Francisco, USA	Subsidy costs for dial-a-ride = $28.49, DART = $4.51 and fixed route bus = $3.85 per passenger hour	Local authority (Livermore Amador Valley Transit Authority)		3 zones – East and West Pleasant plus Dublin	40% transfer at the terminal to other services
Bicester Taxi-Bus, Oxfordshire, UK	Rural Bus Challenge grant obtained	Vehicles owned by Oxfordshire County Council		Serves 4 main housing estates and 4 rural villages	Home-to-railway station and railway station-to-home
Treintaxi, the Netherlands	Costs of £5.83m per year to operate, 65% recovered from fares and 35% given by State Railway	Regulated	60% of Dutch population	Medium density	Railway station and homes

The key interchange elements described in the table above are to do with the degree of timetable flexibility, with the level of service and with the fare structure.

In survey after survey of 'reasons not to use public transport in the UK', unreliability tops the list. Given that interchanging magnifies the importance of unreliability, the issue of timetable flexibility is the crucial issue when it comes to designing such schemes. To be of any use to the passenger, the feeder must deliver its passengers to the long distance mode in time for the transfer to be made, and should arrive just after (or ideally be waiting) for the main mode to drop off the passenger for the return journey. Ironically, experience revealed during the review of UK schemes showed that while the DRT interchange schemes were generally extremely reliable at getting their passengers to the rail or bus station, the rail operators in particular were not as good at getting their passengers to the DRT in time. One scheme therefore lost a significant proportion of its interchange passengers because while it allowed for the train to be delayed for 15 minutes before leaving the stop, the train was often far later than that, and thus the DRT passengers were left stranded at the rail station when they arrived. This reliability problem is less of an issue for dedicated feeder services, because their *raison d'être* is to serve the main mode. This means that it is far less likely that there will be passengers waiting to be collected further along the route. The fear of unreliability appears to be far less of an issue outside the UK.

One way of reducing the impact of unreliability is to have a high frequency of service (on both the feeder and main route sections), whereby a second vehicle turns up shortly after the first one was supposed to. This though, is only really helpful when frequencies are of 10 minutes or more – less likely where DRT is being used as a feeder. Related to this, are the times of operation. Feeders should ideally be operated to meet every rail or bus departure/arrival throughout the day. More commonly (for trains in particular), DRT feeders tend to take passengers to trains in the morning peak, and take passengers from the station

during the evening peak. One further point is that interchange with light rail would likely be more acceptable to people than interchange with bus (not seen as being reliable in itself), or even heavy rail (frequencies are low and trains are perceived as being unreliable in the UK at least).

The fare structure is also important when feeders are a major function of a DRT service, particularly in the UK where the organisation of public transport is so fragmented. Bluntly, the less obvious the link between two services (in terms of information, fares and branding), even if the timetabling is integrated, the less confidence the passenger will have in being able to transfer between two modes. Thus, Lincolnshire InterConnect (with its co-ordinated timetables, information, branding and through tickets) does at least have some customers who use it to interchange, whereas this is not the case for many other ostensibly integrated UK schemes. Some non-DRT feeder services provide good examples of integrated ticketing and branding (e.g. the Eden Branch Line in Cornwall in the UK, which not only has integrated timetables and ticketing, but provides users with a discounted 'fast-track' entry to the Eden Project).

The next table explores how well the scheme performs against key criteria. These are outlined below.

Table 3.4: Resultant Scheme Performance

SCHEME NAME	PATRONAGE	FINANCIAL	TRANSPORT USE	ENVIRONMENT	SOCIAL	BARRIERS ENCOUNTERED	DOES IT MEET OBJECTIVES?
InterConnect, Lincolnshire, UK	Increase of 165,000 passengers on main bus network and 25% growth on DRT network	Subsidy is £4.00 per passenger			Hard to engage with the young but used by adults	Subsidy needed to increase frequency.	Yes – both Governmental targets for social inclusion and access to a bus system, and operator revenue targets
DART, Bay Area, San Francisco, USA	60 per day	DART costs $4.51 per passenger hour whilst fixed route costs $3.85. Some routes have failed to be profitable and so have had to be abandoned				Trying to explain how the system works to the public	Yes – it increases the utilisation of the vans at off-peak times
Bicester Taxi-Bus, Oxfordshire, UK	1260 per week	Urban service fares cover 50% of the costs, while for the rural routes it is 15–20%	Nearly 100% shift between rail and minibus	9% increase in rail use and 60% less people driving to the station freeing up 30 car parking spaces		Licensing was a major problem for Chiltern Railways. The council granted special licences to operate the system	Yes – it increases rail use
Treintaxi, the Netherlands	Unknown	Costs £5.83m per year. Increase in subsidy from State Rail			Average of 2.2 passengers per trip	Shortage in funding – Failed to raise finance from regional governments	Yes – it has increased the number of people using the train by as much as 16%

Perpetuation phase

The perpetuation phase begins once the scheme is up and running, and refers to the influence of a whole range of factors which may evolve over time and which impact on the implemented scheme. It should be noted that for a scheme operating in a continually changing policy and/or physical environment there may well be a number of perpetuation phases.

Table 3.5: New Policy Movers

SCHEME NAME	CHANGE IN INITIATING BODY	CHANGE IN DRIVER	CHANGE IN TARGET MARKET SOUGHT	
	PRIMARY	CHANGE IN PRIMARY POLICY OBJECTIVE	CHANGE IN CORE JOURNEY PURPOSES	CHANGE IN CORE USERS
InterConnect, Lincolnshire, UK	No change	Still an emphasis placed on social inclusion	Change away from commuters to local amenity users	The core customers are still those without access to a car
DART, Bay Area, San Francisco, USA	No change	A broadening of customer base is hoping to increase much needed revenue	A broadening of customer type will inevitably result in a broadening of journey purpose	Trying to attract seniors to use the service and special attention has been given to children in the summer
Bicester Taxi-Bus, Oxfordshire, UK	No change	Emphasis still placed on rail commuter use	Trying to create interchange between air, rail and bus	An increase in leisure passengers using the service has been seen
Treintaxi, the Netherlands	No change	Continue to increase rail patronage	None	Elderly and wealthy (first class passengers)

In the cases examined, the initial policy movers have not really changed, and initiators, goals, motivations and target markets remain the same. However there are some indications of market difficulties. In particular many services are shifting away from commuting as a market. Another market problem is that the services are having difficulties attracting younger users.

The main changes in policy shapers concern availability of finance for the DRT service. Other factors, like population, demographics, land use, etc., registered no change. In general, modifications to the scheme design have been low-key marginal developments, involving incremental developments like the addition of new routes, frequency improvements and longer operating hours, etc.

Table 3.6: Consequent Modifications to Scheme Design

SCHEME NAME	CHANGES IN TYPE OF SERVICE				CHANGES IN LEVEL OF SERVIC		EVOLUTION OF FARE LEVEL AND STRUCTURE
	TYPE AND SIZE OF VEHICLE	CHANGES IN DEGREE OF ROUTE FLEXIBILITY	CHANGES IN DEGREE OF TIMETABLE FLEXIBILITY	CHANGES IN MODE OF BOOKING	CHANGES IN FREQUENCY	CHANGES IN OPERATING HOURS	
InterConnect, Lincolnshire, UK	Still minibuses but occasional taxis if delays occur in the network	Everyone within operating areas now has access to an hourly service	With the help of the Eastern England Traffic Commissioner, bus registration has become easier	No changes made to booking system	Retained hourly frequency	Extended hours of service from 07.00–19.00 Monday–Sunday	Discount of 20% given to tickets that interconnect with other bus service
DART, Bay Area, San Francisco, USA	A move away from buses to van only operations, except on exceptionally busy routes	The vans have enabled a great flexibility in route choice		Move towards computerised reservation schemes	Additional services have been tried and withdrawn	Demand is outstripping supply at peak times (10.30 am) so pure DRT timings are being reduced	
Bicester	More	4 new rural	The DRT	No change	A new	Now operates	

Taxi-Bus, Oxfordshire, UK	vehicles purchased to cover new routes	routes added to the existing 4 urban routes	system changes timetable whenever the train operator does		weekend service operates to Bicester Village shopping centre	at weekends	
Treintaxi, the Netherlands	No change in vehicle type	No change	No change	Increase in number of request stops with push buttons	Reduced service during day time when conventional public transport could be used	No change	

Interchange DRT Composite Case

The following represents the composite case, taking the best practice experience from the cases above (together with some others in the case study list).

Where trunk services are not high frequency operations, there is a trade-off issue between interchange time and reliability of interchange (ideally a reliable connection to the conventional public transport service, but with a short wait between modes). There is also a related issue whereby if the interchange function is only one of several that the service provides, then there is a danger that interchange is not prioritised. Yet it will frequently be necessary to combine interchange with other trip purposes in order to make the service viable. An enlightening example of how reliable interchange can be achieved (although strictly speaking illegal) comes from a scheme in the south west of England. Although not a DRT service, the service does contain many of the key aspects that an interchange DRT should possess (integrated ticketing, timetabling, etc.). Despite its 'branch line' branding, most passengers on the service are travelling between the towns for other purposes, and not to the local station. To serve these, when it arrives in the town, the bus loops around the shopping area, serving other destinations, before going to the station. However, if the bus is running late, it is common practice for the drivers to ask passengers if they are connecting with a particular train, before reversing the town centre loop to serve the station first. A combination of including flexibility in the schedule and driver alertness to the needs of interchanging passengers thus balances out the need to serve other markets than interchange, without jeopardising the interchange function. At the same time it ensures reliability of connection without needlessly long interchange times. Similarly on the return leg, flexibility may be required. For example, at Bicester North station in Oxfordshire, the Taxi-Buses operated by Chiltern Railways will wait until the London train arrives at the station before setting off, even if it is late. If the delay is significant then passengers arriving from the north may well be taken home either by the taxibus making an additional trip or by a minicab operated by the local taxi firm (which operates the Taxi-Bus on behalf of Chiltern Railways) at the Taxi-Bus fare.

The Finnish Siilinjarvi Service Line system illustrates the problems of trying to get an Intermode service to fulfil several functions. Because the system is designed to get elderly people and people with disabilities to day centres and utilise the vehicles for a general rural service at other times, the operating times are rather odd, and thus it cannot really provide an effective interchange service.

Key issues and recommended good practice

Timetabling

- Except where trunk and DRT services operate at a high frequency, integrated timetabling with connecting services and, ideally, guaranteed connections are advisable, and it is desirable to encourage flexibility in service design to ensure connections are achieved – *in both directions*, i.e. DRT-to-trunk and trunk-to-DRT. Driver training is of crucial importance.

- Consideration needs to be given as to what happens to the user during the homebound trip should the trunk route service fail – e.g. guaranteed trip home back-up.

Fares and ticketing

- There is an issue regarding fares. Most systems operate fares that are the same or comparable to local bus fares, and may even use normal bus tickets. Some, however, have fares that are higher than bus fares, but considerably lower than normal taxis.

- If modal shift from car is desired fares need to be competitive with perceived motoring costs (including parking costs at stations).

- Through fares and tickets onto interconnecting service might be more attractive to users.

In the UK context, where an Intermode service is introduced to connect with fixed-route public transport, it could be appropriate to have fares moderately above bus fare rates, but with concessions for key groups and discounts for pre-booked pickups/drop-offs at fixed stops.

Vehicle type

- As noted, if operated under taxi regulations, a limit of eight seats applies. If operating under PSV regulations, a minibus with between nine and twelve seats is appropriate for an interconnection Intermode service. Carrying large numbers of people on a demand responsive interchange service can lead to elongated journey times and unreliability of connections. However, if commuting is involved, there can be significant peak loadings, so probably a 16-seater bus would be most appropriate.

- Interior should be to a high specification, and ideally as close to a taxi environment as possible. This is particularly important for 'choice' users such as commuters.

- Provision for wheelchair users is now required by regulation, but there needs to be a general sensitivity to mobility impairment and the needs of others with travel difficulties (e.g. passengers with young children and luggage).

Passenger numbers

This will clearly vary according to the size and nature of the area served. However it appears that in all cases a substantial increase should be anticipated.

Funding

DRT services where interchange with existing services form a major scheme objective tend to occupy a space that spans subsidised and commercial operations. Overseas examples, like many local bus services, require continued subsidy, although it is notable that for the rural services in particular this is less than for conventional buses. The subsidy rate of £1.80–4.00 per trip tends to be above the typical maximum of around £2 for tendered services in the UK. Significantly, experience from some cases (InterConnect in Lincolnshire in particular) suggests that an initial funding to set up an interconnecting Intermode DRT service can lead to commercial viability – or at least contracted services at levels of subsidy no higher than conventional buses. And this is with a higher quality of service, coverage and patronage.

Partnerships

This is a big issue for the UK. Well-designed partnerships are needed between the main mode provider, e.g. a rail, light rail or bus company, and local authorities, bus and taxi operators and technology providers. One approach might be to use a Quality Bus Partnership agreement as a model.

Network DRT

The second composite mode category occurs where DRT enhances conventional public transport not by feeding into it, but either by providing additional services or by replacing services at particular places or times (time of day, day of week, time of year).

Behind this network role is the recognition that different forms of public transport have different strengths and weaknesses and will thus be better suited to serve different market segments. For example, fixed track systems effectively serve heavily trafficked corridors, while buses are appropriate for less heavily trafficked corridors, and DRT is better suited to areas with more dispersed public transport demand. A mix of these public transport modes could therefore provide an efficient and comprehensive network by matching the form of public transport to the market need. Thus, typically, a large city may have heavy rail corridors linking the city centre to the outer suburbs and nearby towns, a light rail system serving radial trips to and from the city centre, and buses providing cross-suburban trips. A DRT service could be appropriately fitted into such a public transport hierarchy to serve markets which other forms of public transport find difficult (financially, operationally or in terms of service quality).

The nature of public transport demand is such that there are not only places better served by a DRT service, but also times when DRT is appropriate. For example, there could be a city suburb that supports several bus services and a light rail route in the day, with a DRT service operating at night.

There are also circumstances in which conventional public transport has difficulties in providing sufficient capacity, particularly during peak hours when providing extra capacity can be extremely expensive. In such a situation, it may be that DRT services (normally used to provide low capacity services in areas of low demand) could provide additional capacity. This could apply to existing dial-a-ride, health and social service DRT services, which largely cater for off-peak non-work trips. It could also apply if a DRT service could divert trips away from a congested corridor served by conventional public transport. For example, if people need to travel into a city centre and out again to make a cross-suburban trip, a direct DRT service could free up capacity on the congested route.

One key element of such a DRT system is marketing, i.e. selling the DRT product to the public – effectively. This is notoriously difficult to do because the operational efficiency argument might suggest that a complex arrangement of services be adopted, while successful marketing requires as simple a message as possible so that the public is able to grasp exactly what the system is for.

Examples of Network DRT

Regiotaxi KAN, Arnhem-Nijmegen, the Netherlands

A regional shared taxi system serving Arnhem and Nijmegen and surrounding municipalities in the Netherlands, Regiotaxi KAN started as a service for people with disabilities in 1997, before becoming a service for the general public in 1998. Services are provided by a consortium of private taxi companies, with trip requests made by phone to dispatch centres. Connections to bus and rail services are guaranteed when reservations are made at least 50 minutes in advance. While the national StrippenKarrt zones are used, fares are higher at €1.40 per zone. Door-to-door fares are €0.82 per kilometre and €0.36 per kilometre from door-to-station or station-to-bus stop. Vehicles are a mix of larger and smaller taxis, but generally have less than ten seats. The scheme is highly subsidised (55–60% subsidy), but even so it is planned to convert a number of poorly patronised feeder bus routes to Regiotaxi operations as the overall subsidy cost needed to provide the same or improved level of accessibility is estimated to be lower.

Wigglybus, Wiltshire, UK

Wigglybus is one of the better known rural DRT schemes, and provides public transport services to a series of small communities around Pewsey and Devizes that had no extant bus service. The buses operate along a core route, but ‘wiggle’ off it to pick up and drop off passengers. Booking is via a central call centre.

Public Light Bus, Hong Kong, China

Public Light Buses (PLBs) in Hong Kong are of two types, one of which (with the red roofs and known as 'Maxi Taxis') operates as a demand responsive service. These are privately owned and operated minibuses, which fill in the gaps in the extensive public transport network. Services are 'turn-up-and-go' and 'hail-and-ride'. Fares and routes are deregulated.

Yellow Taxibus, Dunfermline, Fife, Scotland, UK

The Yellow Taxibus began operating in August 2003, and links a number of newly built housing estates in Dunfermline that were previously without a bus service to the town centre and to Edinburgh. Eight-seater, high-quality vehicles are used and the service is registered (and operates) as a bus between Edinburgh City Centre and the edge of the housing estates (where it operates on demand).

Cango: Flexible Route Network, Hampshire, UK

In Hampshire, a whole range of DRT services operating under the Cango brand have been established. These have both increased the level of public transport service offered in an area previously served by a very limited fixed-route bus service, and have replaced previously separate public, community health, social service and education transport. Other conventional bus services were also changed in a minor way to ensure that Cango is integrated into the overall bus network. The buses serve a number of 'roam zones' and journeys can be pre-booked to guarantee a seat, which is of particular use to commuters connecting with train services. The first Cango service was launched in 2002.

TaxiTub, Douai, France

The TaxiTub service began operating in 1992, and connects dispersed former mining communities and the town of Douai, which previously had a very poor conventional bus service. This was replaced by 12 shared taxi services that run half-hourly. Trip sharing is scheduled by a call centre. The users pay the normal bus fare and the taxi operators receive the normal taxi fare for any trips undertaken, minus a small commission. The subsidy is about €6.5 per passenger, which is significantly less than a comparable bus subsidy for a less frequent service.

Shared Night Taxi, Linz, Oberösterreich, Austria

Introduced in 1987, the shared taxi service runs only from 20.00 to 03.30, with half hourly departures until 00.00 and hourly departures thereafter. The idea behind the service is that it serves a market that values security and comfort rather than high frequency and low cost. Taxis depart from five designated stops in the town centre and will drop passengers at their door.

The Belbus midibus, Flanders, Belgium

This is a DRT midibus in the largely rural west of Belgium. It is booked by telephone. Services started in 1997 to replace a poor, peak hour only, conventional bus service and to integrate with other existing bus services in the area. It operates between recognised stops (there is no door-to-door service) but routes are flexible, with there being up to 13 services per day.

Villagelink, Dengie, Essex, UK

This case study has already been noted as it provides a feeder service with rail stations and bus services on main radial routes. However, a major function is also to provide a service into towns from areas that cannot be served well by conventional public transport. This involved a comprehensive re-organisation of existing commercial and tendered conventional bus services combined with DRT taxibuses. DRT thus complements conventional services, filling in gaps in the service network that are unsuited to conventional bus operations.

Direct Access Response Transit (DART), Bay Area, San Francisco, California, USA

This was detailed in the interchange DRT section. DART provides DRT station feeder services at off-peak times, 09.00–14.00 and 19.30–21.30, replacing previously under-utilised buses.

Analysis of Network Intermode DRT Schemes

Inception phase

The following table provides a basic analysis of the initiators behind the scheme, the policy objectives to be addressed and the market niche(s) targeted in the inception phase.

Table 3.7: Mover Factors

SCHEME NAME	INITIATING BODY		DRIVER		TARGET MARKET SOUGHT		
	PRIMARY	SECONDARY	PRIMARY POLICY OBJECTIVE	SECONDARY OBJECTIVES	CORE JOURNEY PURPOSES	CORE USERS	OTHER LIKELY USERS
Regiotaxi KAN, Arnhem-Nijmegen, the Netherlands	Region KAN	Dutch Government	Cut cost of local transport	Improve disabled access	Health and social in and around Arnhem and Nijmegen	Registered disabled and the elderly	School children
Wigglybus, Wiltshire, UK	Local authority tender to third party operator		Social inclusion in rural areas	Support local economies	Work, school and shopping	Commuters and school children	
Public Light Bus, Hong Kong, China	Hong Kong Government		Regulate illegal minibuses		Commuting and social	Employed and poor	
Yellow Taxibus, Dunfermline, Fife, UK	Stagecoach		Social inclusion and commuter satisfaction		Commuters and those wanting to travel to the capital, Edinburgh	Serve 3 housing estates on one side of the Fife bridge	

As with the interchange DRT mode, the initiators of the public policy schemes were public authorities, while the commercial schemes were implemented by private transport companies (although in the Hong Kong example it was the government that imposed a new regulatory regime to give some form of control).

The main drivers of the public policy schemes were once again to do with social policy. One reason Regiotaxi KAN was devised was to maintain levels of public transport access for less money, by reducing the costs of providing specialist disabled transport – and possibly in the future by replacing evening and weekend bus routes. However, the service has proved more popular than imagined and as subsidy levels per trip are relatively high when compared to the bus, there is a risk that the regional government may be forced to review how the system is operated. The Wigglybus simply provides a regular public transport service to an area that was previously not served. This was done for social inclusion reasons. In Hong Kong, a new mode was created by the government in order to regulate an existing DRT market. On an individual level, Public Light Buses are a commercially driven market niche – i.e. they would disappear overnight if there was no profit to be made. Finally, transport operator Stagecoach launched the Yellow Taxibus in August 2003, based on the premise that a new housing estate in Dunfermline was not suitable to be served by conventional public transport.

The split in the type of core market targeted is evident here too, with the public policy driven schemes aiming at the socially disadvantaged needing access to local shops and health facilities, while the commercial schemes are more geared to carrying commuters, with shoppers and other users more of a secondary market. Having said that, the initial experiences of the Yellow Taxibus are that commuters are not yet using the service as much as was predicted, while the number of shopping and leisure trips is more than expected.

Table 3.8: Initial Shaper Factors

SCHEME NAME	POLICY CONTEXT		AREA FACTORS				
	FINANCIAL SITUATION	REGULATORY AND OWNERSHIP STRUCTURE	POPULATION	SOCIO-ECONOMIC DETAILS	DEMOGRAPHIC DETAILS	LAND USE PATTERN	TRIP DESTINATION ATTRACTIVE-NESS
Regiotaxi KAN, Arnhem-Nijmegen, the Netherlands	Subsidy of £5.5m per year	Local authority tender to private taxi and bus companies				Two large towns and 19 municipalities	School and local amenities
Wigglybus, Wiltshire, UK	£135,000 from local authority grant	Wiltshire county council				Low density rural areas	Work, shopping and school
Public Light Bus, Hong Kong, China	No real financial help	De-regulated market				High density population	Work and social
Yellow Taxibus, Dunfermline, Fife, UK	Privately funded	Owned and operated by Stagecoach PLC				Spans the Forth Road Bridge separates Fife and Edinburgh	Predominately work and shopping

From a financial perspective, only the Hong Kong Public Light Bus scheme can be described as profitable, although the Stagecoach Yellow Taxibus scheme may well become profitable in time. The Regiotaxi KAN project is particularly vulnerable, ironically due to the tremendous success of the scheme. Essentially, the subsidy per trip which the Region is expected to cover is higher than for bus (although less than for specialist transport trips which the scheme also caters for). Normally national government cash then reimburses the region twelve months later, but with such a rapid growth in the system this year-long time lag has meant that a funding gap has been created which is becoming too large for the region to support. Consequently, advertising of the scheme is non-existent as the regional authority seeks to limit the size if its budget deficit. Wigglybus has so far relied on central and local government grants to keep afloat.

On the regulatory front, Wigglybus and Regiotaxi are services that are franchised out by the local transport authority to transport operators, while both the commercial cases, the PLBs and Yellow Taxibus, are regulated on a quality-only basis – i.e. they are deregulated, meaning that the routes are open to on-street competition. All the vehicles are privately owned.

Looking at the area factors, the Hong Kong scheme is clearly the odd one out, with the PLBs operating in a city boasting some of the highest population densities of anywhere in the world. This may seem almost counter-intuitive – after all conventional public transport systems operate very effectively in such circumstances. But while trains, the MTR (underground metro), light rail, huge double deck and large single deck buses all operate on corridors where there is sufficient demand, even in Hong Kong there remain gaps in the network best fitted to the PLBs. Further, given that these are operated at a profit, these gaps must be fairly significant.

The Stagecoach Yellow Taxibus scheme is targeted at residential estates in Dunfermline, Fife, housing 'Edinburgh overspill'. It is thus aimed mainly at serving interurban trips to and from the Scottish capital. The regions of Arnhem and Nijmegen (Regiotaxi) and of Pewsey and Devizes (Wigglybus) meanwhile are both fairly rural areas with reasonable sized towns acting as a focus for trips.

The following table establishes how the schemes actually operate.

Table 3.9: Resultant Scheme Design

SCHEME NAME	TYPE OF SERVICE				LEVEL OF SERVICE		FARE LEVEL AND STRUCTURE
	TYPE AND SIZE OF VEHICLE	DEGREE OF ROUTE FLEXIBILITY	DEGREE OF TIMETABLE FLEXIBILITY	MODE OF BOOKING	FREQUENCY	OPERATING HOURS	
Regiotaxi KAN, Arnhem-Nijmegen, the Netherlands	200 taxis and 100 small buses	Zonal ticketing system, fully flexible	Fully demand responsive; taxis sent as and when to collection points	Pre-book telephone similar to regular taxi service, door-to-door service	24 hours a day as demand is fulfilled	No fixed timing	€1.40 per zone (registered disabled 0.24), between bus and taxi fares
Wigglybus, Wiltshire, UK	Small bus, unique design	Flexible service to deviate from core route	Fully demand responsive; places not visited unless requested	Telephone request	Hourly service	07.30–18.00	
Public Light Bus, Hong Kong, China	1,835 (red roofed) public light buses	Peak and off-peak system. Off-peak far more flexible than peak	Non-scheduled	Hail and ride stops	High frequency	24 hour service	
Yellow Taxibus, Dunfermline, Fife, UK	13 Mercedes Vito minibuses			Telephone reservations needed for bus to be flexible in its route	10 minute frequency		£8 return to Edinburgh

Predictably, given the vast difference in motivational and shaping factors, the types of services provided are dissimilar. A DRT option instead of a conventional bus service was tried in the Dunfermline Yellow TaxiBus experiment, mainly because of the residential areas not being designed for bus operation. The flexibility of the Regiotaxi project, in terms of the range in availability of different sized vehicles, is an important element in its success, with some trips only requiring small vehicles and others needing larger ones, particularly in areas of and during times of peak usage. In the Wiltshire Wigglybus case, the settlement pattern and road network were such that a semi-flexible pattern of operation was the most suitable. And in Hong Kong, once away from the major thoroughfares the narrow streets are unsuitable for big bus operations, especially given the level of traffic throughout the day. There is also an argument that providing sufficient public transport capacity for the peak with additional bus and rail vehicles would be far more inefficient and expensive than using Public Light Buses to mop up the extra demand.

The level of technology employed is once again far more complex for the public policy driven schemes than for the commercially driven, with those in the Netherlands and Wiltshire requiring call centres and routing software. The Yellow Taxibus only requires a minicab-style telephone operator and uses a paper-based system to direct its drivers, although such a system would not be economic should a larger and more comprehensive service be envisaged. Having said this, by far the largest example, the red roofed PLBs in Hong Kong do not even need this – they merely pick passengers up off the street and alter their routes according to the needs of those on board.

In terms of scale, the two overseas schemes are far larger than those operated in the UK, with the former being area-wide systems and the latter route-based operations.

For network DRT services there is less scope for higher fares than in the case of an interchange DRT. Most operate as part of an area/regional system and use standardised bus fares, although unlike with interchange DRT projects, integrated fares are not an essential requirement. On the one hand it could be argued that integrated fares are desirable to make it easier for the passenger. On the other hand, there is a view that DRT does offer a superior product to, for example, the bus, and thus the pricing should reflect that. Interestingly, the Regiotaxi example does both – its fares are integrated with the parallel public transport system and use the same zones, but passengers still pay a premium to use it. The two commercial schemes both set their fares according to what the market is expected to bear, with the Scottish scheme's fares being set between the competing bus fare and the cost of driving a car to and

from, and parking in, Edinburgh. Wigglybus fares are set at a low level, as its operators see the project as competing against the car.

The Linz shared night taxi service in Austria also charges a premium. This service complements the lower fares found on the trams. The market is for those willing to pay a premium for security and convenience, but not willing to pay for the cost of a solo-occupancy taxi. This is a good example of market segmentation and a DRT product designed for that segment.

The table below sets out how well the schemes perform against various criteria.

Table 3.10: Resultant Scheme Performance

SCHEME NAME	PATRONAGE	FINANCIAL	TRANSPORT	ENVIRONMENT	SOCIAL	BARRIERS ENCOUNTERED	DOES IT MEET OBJECTIVES?
Regiotaxi KAN, Arnhem-Nijmegen, the Netherlands	113,000 passengers from 90,000 services	Novio Express provide subsidy of 1.24–1.58 per passenger per zone and the region gives £1.32 per passenger per zone			Mainly the disabled and school run contracts	Initially part of a national trial	Yes – it reduces local transport costs as less bus services need to run, and costs are also reduced by the tender process focusing on price
Wigglybus, Wiltshire, UK	Peak of 150 per day but now at about 140 (c.50,000 p.a.)	Subsidy in year 1 was £7.22 reducing to £4.22 by year 3 (per trip) (target is reduction to £3.50)			49% for shopping, 15% for school and 13% for work	Until February 2004 regulations, BSOG only received for core route and not for 'wiggles'	Failed to attract enough customers
Public Light Bus, Hong Kong, China	1,058,000 passengers per day					Lack of subsidy support	Fills in the gaps of other public transport systems
Yellow Taxibus, Dunfermline, Fife, UK	Unknown	Will cost £200,000–300,000 in the first year			Serving 3 lower-income housing estates		Reduces congestion in Edinburgh

All the schemes appear to be fairly popular with the users, although there have been problems. For example, problems with the call centre and with the vehicles badly affected the reliability of the Wigglybus, and only now are patronage levels catching up again with the peak usage figures.

Financially, with the exception again of the Public Light Buses where lots of independent owners presumably either make money or else withdraw their services, the position is less clear-cut. As noted earlier, the Regiotaxi and to a lesser extent the Wigglybus are financially vulnerable, while Stagecoach is waiting to see whether its gamble on the Yellow Taxibus is worth sustaining.

Perpetuation phase

Overall the changes have been marginal in terms of underlying drivers and the target market. As in the case of interchange DRT, there seems to be a shift in most schemes to have less emphasis on commuting trips, coupled with a desire to broaden the market base.

Table 3.11: New Policy Movers

SCHEME NAME	CHANGE IN INITIATING BODY	CHANGE IN DRIVER	CHANGE IN TARGET MARKET SOUGHT		
	PRIMARY	CHANGE IN PRIMARY POLICY OBJECTIVE	CHANGE IN CORE JOURNEY PURPOSES	CHANGE IN CORE USERS	CHANGE IN OTHER LIKELY USERS
Regiotaxi KAN, Arnhem-Nijmegen, the	None	Emphasis placed on further reducing cost and improving service through a tender process		The core customers are still the disabled, who make	New customers such as insurance companies

Netherlands				up 30%, and the elderly	are using the service to transport patients, up to 150 journeys a day
Wigglybus, Wiltshire, UK	No change in bodies	A need to reduce costs to gain further grants	Increase in shoppers to 49% of all passengers and a loss in workers using the service		No intermode users
Public Light Bus, Hong Kong, China		Attempts to fill areas where public transport is poor			
Yellow Taxibus, Dunfermline, Fife, UK	Hoped to franchise out to owner operator drivers				

As to policy shapers, area factors have not changed at all, with changes in the policy context largely concerning continuing finance issues. In some cases a cut in subsidy per trip has been achieved, but growing demand has led to overall subsidy levels being higher.

Changes to scheme design reflect an incremental learning process. Some service modifications are being introduced, but financial constraints are also leading to changes intended to yield resource efficiencies.

Table 3.12: Consequent Modifications to Scheme Design

SCHEME NAME	CHANGES IN TYPE OF SERVICE				CHANGES IN LEVEL OF SERVICE		EVOLUTION OF FARE LEVEL AND STRUCTURE
	CHANGES IN TYPE AND SIZE OF VEHICLE	CHANGES IN DEGREE OF ROUTE FLEXIBILITY	CHANGES IN DEGREE OF TIMETABLE FLEXIBILITY	CHANGES IN MODE OF BOOKING	CHANGES IN FREQUENCY	CHANGES IN OPERATING HOURS	
Regiotaxi KAN, Arnhem-Nijmegen, the Netherlands	No change in type of vehicle	Now able to work in collaboration with Taxihopper (another DRT service) creating greater efficiency especially in the outlying service areas	Still a fully flexible demand responsive service	No change in telephone demand system		Increase in evening and weekend operations	Fares are kept between those charged on buses and taxis
Wigglybus, Wiltshire, UK	Same unique bus design	Still fully flexible in route deviation	Fully demand responsive now the new call centre is up and running		Some services have seen a reduction in the daily frequency	Now operates in the evenings	Increase in areas served from 1 to 3
Public Light Bus,, Hong Kong, China	Move towards cleaner vehicle types that pollute less		No change in flexibility		Increase in service levels as more buses are used.	Increase in operating times to fit social needs	
Yellow Taxibus, Dunfermline, Fife, UK	Too early to change		Too early to change	May move to more automation should the scheme succeed	If the scheme succeeds, an increase in frequency might occur		Too early to alter

Network DRT Composite Case

Many of the key design elements of the interchange DRT services apply to network services as well.

Key issues and recommended good practice

Fares, ticketing and timetabling

- For network services, unlike with interchange DRT projects, integrated fares are not an essential requirement, although on the one hand it could be argued that integrated fares are desirable to make it easier for the passenger. On the other hand, there is a view that DRT does offer a superior product to, for example, the bus, and thus the pricing should reflect that. The Regiotaxi example does both – its fares are integrated with the parallel public transport system and use the same zones, but passengers still pay a premium to use it. One method may be charge passengers a supplement for door-to-door pick ups and drop offs. Another may be to provide door-to-door pick ups and drop offs during off-peak periods and checkpoint-to-checkpoint services during the peaks.

- If modal shift from car is desired, fares need to be competitive with perceived motoring costs (including parking costs at stations and/or destinations).

- For network DRT schemes, timetabling should be determined according to the needs of the market.

- Where appropriate, the same fare zones should be used as for conventional public transport.

Funding

DRT schemes are typically more expensive to provide per passenger trip than conventional bus (although probably cheaper to operate in the particular circumstances than a conventional bus would be). Therefore public policy driven network schemes that provide additional service levels may be vulnerable to funding being cut in the longer term unless it can be convincingly demonstrated that they are delivering their objectives. Conversely, being more flexible, DRT can very usefully perform as a pilot bus service in an area before resources are allocated to a fixed route service, until demand levels on particular routes or at particular stops can be fully ascertained.

Destination-Specific DRT

The destination-specific DRT composite mode is closely related to network DRT, but, rather than a genuine network, the route or routes converge on a specific traffic generator, such as a specific employment centre or an airport.

Examples of Destination-Specific DRT

Deeside Shuttle, Deeside Industrial Park, Flintshire, North Wales, UK

Flintshire Council in North Wales was concerned that companies at an out of the way industrial estate were unhappy about the difficulties of attracting staff to work for them, due to problems getting to the site. It thus began operating a DRT shuttle to facilitate staff getting to work and to persuade the companies to remain at the industrial estate.

Public Vanpool, King County Metro, Washington State, USA

In the case of the Public Vanpool, the publicly owned public transport operator realised that it was unable to serve a large proportion of the population travelling to and from work due to the dispersed nature of the trips. It therefore established a public vanpool system, whereby employees that had previously driven private cars to work could share a van with others in a similar position.

Vodafone Commuter DRT, Banbury, Oxfordshire, UK

Telecommunications firm Vodafone has a number of sites throughout the country where it is prevented from providing additional car parking spaces by planning regulations. Further, the company wishes to be able to attract as wide a range of staff as possible to work at its offices and call centres. In addition, the company wishes to promote itself as a 'socially and environmentally responsible company' with a brand to protect. Thus, at Banbury where there was no bus to its site at particular times of the week, the company set up a DRT service to ensure its staff were able to get to work.

U-Call, West Denton, Newcastle-upon-Tyne, UK

The U-Call DRT service operated by Stagecoach on behalf of Nexus, Tyne and Wear's Passenger Transport Executive, serves airport staff (baggage handlers, security staff, etc.) working at Newcastle Airport overnight. The airport service only operates on demand, but during the rest of the working day the service is driven around its set timing points even if no-one has booked it (although this may change in the near future).

Allobus Roissy, Charles de Gaulle Airport, Paris, France

The Roissy Allobus operates 24 hours a day, 7 days a week and is a demand responsive bus that follows four routes, linking Paris Charles de Gaulle airport with various localities to the north of Paris. The service is particularly aimed at employees of the airport who work shifts, but is also available to airport users. It is financed by STP (33%), the region of the Ile de France, Department of the Val d'Oise, Paris Airports, the community of Tremblay-en-France, the European Social Fund and passenger revenue.

DRT, Langage Business Park, Plymouth, Devon, UK

This service includes a DRT element, partially sponsored by the telecommunications company Orange. It enables employees who work shifts, and are unable to drive, to access the business park outside conventional working hours. It could prove to be more effective if more employers on the site join the scheme, which would have the effect of reducing costs, increasing efficiency and spreading risk. The infrastructure costs include a dedicated call centre to organise ridership.

Supershuttle, Los Angeles International Airport, California, USA

Supershuttle services operate at airports throughout the USA but began in Los Angeles in 1980. Services are commercially operated and serve a market niche between taxis and often extremely limited conventional public transport services.

Analysis of Destination-Specific Intermode DRT Schemes

Inception phase

The mover factors behind four destination-specific examples are illustrated in the following table.

Table 3.13: Mover Factors

SCHEME NAME	INITIATING BODY		DRIVER		TARGET MARKET SOUGHT	
	PRIMARY	SECONDARY	PRIMARY POLICY OBJECTIVE	SECONDARY OBJECTIVES	CORE JOURNEY PURPOSES	CORE USERS
Deeside Shuttle, Deeside Industrial Park, Flintshire, UK	Flintshire County Council	National Assembly of Wales	Social inclusion	Lack of public transport	Exclusively for commuters	Employees
King County Vanpool, Washington State, USA	King County Metro	Seattle City	Provide fixed route transit for commuters	Reduce number of cars on the road	Commuting to major company sites	Commuters

Vodafone Commuter DRT, Banbury, Oxfordshire and Newbury, Berkshire, UK	Vodafone	Thrifty Car Rental	Reduce car use	Improve staff morale	Commuters	Vodafone employees only
SuperShuttle, Los Angeles Airport, California, USA	Super Shuttle	Los Angeles Airport	Reduce car use to and from the airport		Air travel	All, but aimed at air travellers but not airport workers

Once again public policy driven schemes tend to be initiated by local authorities, but for the commercially driven schemes there is a new type of organisation– the 'destination' e.g. a company, airport or hospital – and these have their own reasons for instigating a DRT system. Employers, hospital sites, airports, etc., are increasingly being prevented from building car parking spaces when they move or expand, and thus parking is becoming a problem. In addition, in a buoyant labour market there is a need to increase the catchment area of a site and a DRT service can do that.

The primary motives for both public and private bodies in these cases are to get people (staff, visitors, etc.) to and from the site. Environmental reasons are also important to both groups – preventing congestion (on and just off-site in the case of the Deeside Shuttle and on the road network as a whole in the case of the King County Vanpool), and cutting emissions and car use generally – as are commercial factors such as staff retention and the cost of car parking.

Very specific markets are targeted within destination-specific examples – usually commuters, but also customers (including airline passengers).

Table 3.14: Initial Shaper Factors

SCHEME NAME	POLICY CONTEXT		AREA FACTORS				
	FINANCIAL SITUATION	REGULATORY AND OWNERSHIP STRUCTURE	POPULATION	SOCIO-ECONOMIC DETAILS	DEMOGRAPHIC DETAILS	LAND USE PATTERN	TRIP DESTINATION ATTRACTIVENESS
Deeside Shuttle, Deeside Industrial Park, Flintshire, UK	£1.4m grant from the National Assembly of Wales	Local authority run	10,000 Deeside industrial employees of which 10% live in DRT service area	Low income area		Low density	Employment
King County Vanpool, Washington State, USA	£550,000 public subsidy used for administration costs only	Private company					Commuters to work
Vodafone Commuter DRT, Banbury, Oxfordshire and Newbury, Berkshire, UK	Costs Vodafone £560 a week to operate	Private venture	600 employees living in Banbury				Work
SuperShuttle, Los Angeles Airport, California, USA	Unknown	Deregulated		High level of income		High density	Airport

Due to the targeting, such schemes are often seen as being financially sustainable. The most common regulatory/ownership model is for a company or local authority to contract out a service – which may or may not be available to the general public. Area factors are not particularly important in this case – works

buses, vanpools and airport shuttles operate in extremely high density cities like New York and Hong Kong and also in very dispersed low density areas such as from Denver International Airport into the Rocky Mountains. The attractiveness of the destination is generally high to the user, especially if it is where s/he works.

The schemes operate as follows.

Table 3.15: Resultant Scheme Design

SCHEME NAME	TYPE OF SERVICE				LEVEL OF SERVICE		FARE LEVEL AND STRUCTURE
	TYPE AND SIZE OF VEHICLE	DEGREE OF ROUTE FLEXIBILITY	DEGREE OF TIMETABLE FLEXIBILITY	MODE OF BOOKING	FREQUENCY	OPERATING HOURS	
Deeside Shuttle, Deeside Industrial Park, Flintshire, UK	3 buses	Flexible in a zone	Semi-demand responsive	Registered users only	Operates to shift patterns		Fixed weekly charge
King County Vanpool, Washington State, USA	minibuses (15 seats or less)	Fixed routes from pick-up point to company site	Semi-scheduled but mainly fixed timing	Pre-booking with van driver	To and from work	Whenever required to fit in with shift patterns	Voluntary driver goes free. Rest pay average £37 per month although this is £24 including tax breaks.
Vodafone Commuter DRT, Banbury, Oxfordshire, UK	8-seater minibuses	Fully flexible		Resister on staff intranet site	Frequency in line with shifts	Whenever Vodafone is operational	Free to staff members
SuperShuttle, Los Angeles Airport, California, USA	10-seater van	Flexible within a zone	Semi-demand responsive	Telephone booking for outbound flights, turn up and go for in-bound flights	As and when required	As and when required	Fixed price

Designing such schemes is a relatively simple business when compared with setting up the other types of DRT scheme. First, the set up is generally a many-to-one structure, which is far simpler than a many-to-many operation. Second, the users are often the same for every journey, meaning that there is a regular client base and that optimum routes and schedules can be worked out well in advance. Both these characteristics mean that the high-tech approach is probably redundant in many cases, making the service cheaper to provide. Where users are not known, such as for airport shuttles, at the airport end the passenger will hail-and-ride and so tell the driver where to take them. And on the return trip a minicab-style call centre is probably sufficient because calls will be made at least an hour in advance and then a single van will only cover a relatively small section of the city and collect no more than five or six pick ups before the journey back to the airport.

As for fare policy, Vodafone provides its DRT service to its staff for free, while the Deeside Shuttle is offered at a fare of only £5 a week – the aim in both schemes being to persuade people to use it to get to work. The King County Vanpool fares are relatively low for users – vanpool fares need to be less than the cost of a single occupancy car, despite the often long distances covered, in order to attract users. The situation is different though for airport shuttles such as the Los Angeles SuperShuttle. This is because airport shuttles occupy a market segment between the solo-occupancy taxi and cheaper buses. This

example may be of particular interest to this project as it represents a market that is not usually associated with bus operations.

The performance criteria are outlined below.

Table 3.16: Resultant Scheme Performance

SCHEME NAME	PATRONAGE	FINANCIAL	TRANSPORT	ENVIRONMENT	SOCIAL	BARRIERS ENCOUNTERED	DOES IT MEET OBJECTIVES ?
Deeside Shuttle, Deeside Industrial Park, Flintshire, UK	Over 750 registered users	£5 fare per week			Industrial park workers only	Problems over licensing	Yes – increased number of employees are using public transport
King County Vanpool, Washington State, USA	3 million passengers per year	Tax-based subsidy of £13 per person per month		Reduction of 4.9 tonnes of air pollutants and 6,666 gallons of petrol per year		Finding voluntary drivers and getting the companies to buy in to the scheme	Yes – reduces the number of miles by 104,160 per year
Vodafone Commuter DRT, Banbury, Oxfordshire, UK	Increase in patronage by 50%	Reduction in cost per trip by 50%				Tax barrier with regard to benefits to staff members	Yes – it improves staff travel to the Vodafone site
SuperShuttle, Los Angeles Airport, California, USA	Approximately 8 million passengers per year	Between taxi and conventional bus	Interchange with air transport	Saved over 65 tonnes of vehicle emissions per year		Fighting amongst operators reduced the level of service	Yes – it reduces the number of car journeys to the airport

The schemes described in the table have performed well. Indeed, the Deeside Shuttle is almost performing too well, and during peak hours is often operating at full capacity. Should the service become much more popular with commuters, Flintshire Council is looking at the possibility of replacing some of the DRT services with fixed route services.

Vodafone has found that the DRT option is less expensive for it to provide than a fixed route shuttle, as it only runs when requested. However, it does face a tax barrier – travel to and from work paid for by the company is a taxable benefit-in-kind.

Perpetuation phase

There has been little change in the policy movers of this group of DRT schemes. The only real factor is that there are increasing policy pressures upon transport-generating organisations that could lead to additional schemes being started. For policy shapers, again there has been little change (although some tax benefits in the USA have been increased, which helps).

Many of the destination-specific DRT schemes cater only for commuters and they continue to concentrate on this market. It is the rationale for their existence. Some minor changes have been made to scheme designs – some in response to regulatory change (permitted size of vanpools in the USA has been increased), with others being general minor changes to operations as the scheme matures.

In terms of scheme performance, the issue of flexibility for staff remains an issue. For the Vodafone case there is an issue of treatment of DRT as a tax benefit.

Destination-Specific DRT Composite Case

The destination-specific composite case is a subset of the network DRT case, and hence many of the conditions that applied for that composite mode will apply here too. Perhaps less usefully, it should also

be pointed out that the interchange DRT composite mode could be classed as being a subset of the destination-specific category had the schemes being classified differently.

From the research, it is clear that DRT for business parks may become more attractive in the future if access can be legally linked to either restrictions on car use, or incentives for car sharing or other DRT systems. The legal implications can be important; changes in company taxation should remove the penalties for providing benefits in kind, such as dedicated staff buses.

Airports are another 'destination' where DRT has been applied successfully in many parts of the world.

In order to operate successfully as destination-specific DRT, smaller scale shared taxi schemes may only need to overcome local taxi regulations, such as those governing the number of passengers allowed. This is important for vanpooling, as in the King County Vanpool example in the USA, or to a lesser extent, in the Vipre Vanpool example in the Netherlands. Tax incentives and other regulations make vanpooling an attractive proposition. It remains to be seen whether such experience can be transferred to the UK.

Key issues and recommended good practice

Fares, ticketing and timetabling

- Operators of destination-specific services have the advantage of 'knowing' at least the origin or destination of the trip, and often employer shuttle services will also serve the same people and hence make the same trip on a regular basis.

- Destination-specific services tend to be targeted at particular markets. Often therefore, either the users are perhaps valued in some way (e.g. where companies are happy to subsidise the commuter trips of their employees), or else the users see such a journey as a one-off and are therefore happy to pay a premium (e.g. airport shuttle passengers).

- Timetables can be geared specifically to meet the particular needs of the site(s) served, rather than designed to co-ordinate with the rest of the public transport network.

- With the exception of the Interchange DRT scheme subset then, destination-specific schemes do not tend to involve trip chains, and therefore there is no real need for fares, tickets and/or timetables to be integrated, unless the service also serves a subsidiary purpose.

Technology

- The often relatively simple route structures combined with 'knowing' the users means that schemes can generally be relatively low tech.

Partnerships

Destination-specific DRT services have a good potential for commercial partnership funding between an operator, local authority and/or a site owner, tenant or developer. This is because in addition to 'self-interest' reasons for establishing a DRT service (congestion, lack of sufficient parking places, improving access for staff and visitors), there may also be regulatory reasons. For example, where a developer wishes to build a factory or supermarket, planning permission for this will be required from the local council. Often, this process results in a Section 106 planning agreement whereby the developer agrees to run a scheduled bus to the site for a couple of years. This usually runs virtually empty and is then discontinued. A more positive use of such a planning gain agreement might be to enter into a partnership with the council and bus operator to pump-prime a DRT service.

Substitute DRT

Substitute DRT is located at the opposite end of the same spectrum, where there is a substantial or total replacement of conventional public transport services with a DRT system. This effectively represents a

'reinvention' of public transport. In the UK, substitute DRT appears to be an essentially rural public transport option, but there are some overseas urban examples of where DRT has entirely replaced conventional buses. With long-term changes to more dispersed settlements, well suited to travel by car, travel demands are increasingly fragmented physically and in time. As such there may be locations in the UK where total replacement of buses by DRT could well be appropriate. Low-density towns like Milton Keynes or urban fringe developments might be such locations.

The key driver behind substitute DRT is resource efficiency. The availability of public funds (particularly revenue as opposed to capital funding) is becoming increasingly stretched around the world, and public transport has become particularly vulnerable to budget cuts. Furthermore, rising levels of car ownership are continuing to reduce the demand for public transport in some areas and hence the commercial viability of some bus routes, resulting in the available monies being spread ever more thinly. Yet at the same time there are counter pressures to develop public transport systems to meet social inclusion, economic and environmental policy goals. Thus the search is on to find more cost-effective ways of delivering public transport, while at the same time maintaining – or even improving – the quality and level of service offered.

In the UK context this could be seen as relating to the current debate of the relative roles of reform and increased funding for public services. A key government argument is that without reform in the way that public services are delivered, there will be little or no benefit from increased funding. The experience of substitute DRT is thus of direct relevance to a key debate in UK public services as a whole.

Another issue is that DRT can also substitute for less efficient forms of specialist transport. DRT developed from the 1970s in Community Transport, dial-a-ride, Council, Social Services and other services for discrete markets of people with restricted mobility. The resource efficiency of separate small service operations can be poor, both in terms of cost to public bodies providing these services and also to the end users. However, inter-institutional co-ordination can involve issues of complex allocation of costs and revenues, as well as management difficulties. In such cases, a general public DRT service could substitute for other fragmented DRT provision and in so doing create a something more akin to a DRT service that is complementary to the overall public transport system.

The integration of previously specialist DRT services into a general public transport service has played an important part in a number of the cases studied. For example, the Ringbuss service in Sweden, saw school buses and specialist services for people with disabilities subsumed into a single generalised DRT service that was designed to meet the needs of these markets as well as providing an 'open' public transport service. Trips increased from 550 a week in 1990 to 1,600 in 1998. Revenue only covers 20% of cost – but the average cost per trip has been cut from €7.40 to €5.90 (£4.90 to £3.90). The co-ordination of parallel services and opening this up to the general public has cut the service cost. Regiotaxi KAN in the Arnhem-Nijmegen region of the Netherlands also does this (registered disabled customers make up 30% of its customers).

TaxiBus in Ludinghausen in Germany is another example. Previously, the provision of school buses and support to a separate scheduled bus service cost the local authority €800,000 (£530,000) a year. Instead, the two systems were replaced by eight-seat shared taxi DRT vehicles that covered both markets, and the subsidy has been cut to €540,000 (£360,000). Similar problems were dealt with in the same way in Hampshire in the UK, where the Cango scheme has integrated public, community health, social service and education transport.

Co-ordination of parallel and duplicated services with a generic, accessible DRT can produce substantial cost savings to the public purse. The main issues and barriers in such cases are institutional. Public bus, school, health, social service, and dial-a-ride transport services are provided by separate agencies and funded by separate council departments. Co-ordination savings and enhancement of services to users are possible, but it is necessary to ensure the benefits flow to the various parties involved. Finally, it is important to note that simply diverting some customers from specialist transport services to less expensive DRT services will not significantly impact on the cost of providing those specialist services unless the fixed costs are reduced as a result.

Examples of Substitute DRT

Lovedean Carshare, Cowplain, Hampshire, UK

The Lovedean Carshare scheme is a taxi sharing arrangement set up to serve a small community in the south of Hampshire. Previously served by a bus service that was not very frequent or reliable, the service now operates only when booked up to five times a day. Users need to be registered before they can travel. The contract for operating the service was won by a local taxi firm which gains as it is able to rely on the extra revenue gained to cross subsidise the rest of its business. However, the County Council found that persuading taxi operators to bid for such a contract was not easy – an initial mail shot of 40 tender documents to taxi and minicab firms did not result in a single bid being made.

TAXIBUS, Rimouski, Quebec, Canada

Rimouski is a town of 32,000 people near the Gulf of St. Lawrence in Quebec, Canada, that was previously served by a commercial bus system that went out of business in the 1980s. As a result, Rimouski and neighbouring towns commissioned a study looking at various public-transportation options. This concluded that a conventional bus service would run at a deficit of several hundred thousand dollars, well beyond Rimouski's means. In September 1993 the City Council initiated a demand responsive public transportation service that solely uses taxis. A comparison with other transit services in Quebec cities of similar size showed that costs associated with TAXIBUS are an average of £5.36 less per capita. The service is available Monday to Friday and serves 300 stops by predetermined schedules. Trips are between these stops, so the service is not completely door-to-door, but the density of stops is high. In 2000, 42 taxis made 22,000 trips and carried close to 63,000 passengers. A service also now connects with neighbouring towns. Users have to be registered with the service at a minimal charge (45p). Each trip costs the user £1.07 and monthly passes are available at a discount. Reservations are made via a call centre. The drivers are paid according to the readings of the taxi meter, from the time the first passenger is picked up to the time the last passenger is dropped off, subtracting the amount paid in cash by the passengers. After four years of operation, TAXIBUS patronage grew by 37% but cost increases were kept down to a 6% increase by higher taxi loadings – the number of passengers per ride rose from 1.6 during the first few months of operation to 2.8 by 1996. The service cost per ride has dropped from £2.32 to £1.94 per passenger.

Black Taxibus, Belfast Northern Ireland, UK (1969)

The Belfast Black Cabs (which also emerged in Londonderry as a result of very similar circumstances) were devised by two opposing communities in response to buses being withdrawn from the streets when the Troubles began in 1969, after they became targets for rioting mobs. While the buses eventually returned, the Black Cabs retained their popularity partly because of their symbolism in having served the community during the difficult times. In short, the Black Cabs are seen as being an integral part of both communities. It is also the case that whereas other taxi sharing schemes have been bedevilled by women not feeling safe sharing a taxi with strangers (as occurred in a pilot in Dublin in the Republic of Ireland), in Belfast the tight community nature of the scheme along with the 'unofficial enforcement regime' of the areas operated in has meant that this is not seen as a problem.

Taxi Collectifs, Réunion, Indian Ocean (Department of France)

The Taxi Collectifs were established roughly twenty years ago when local taxi operators approached local authorities and asked to be allowed to operate as taxibuses to supplement falling taxi revenue. Initially they generally operated alongside buses, but with bus services being cut back in recent years they have increasingly began to act in a substitution role. Moreover, while initially the taxibus services were provided on a commercial basis, many local authorities on the island (a Department of France) have begun to subsidise Taxi Collectif operations as they would a bus service.

Hereford Night Hopper, Herefordshire, UK

This is a rural taxibus from the main interchange points in Hereford and Leominster. It runs to surrounding villages after conventional buses have stopped, from 18.30 to 22.30 (23.30 on Saturdays).

Community Shuttle, Vancouver, British Columbia, Canada

This is a service that operates minibuses in a more conventional form during the day, but after 18.30 provides a flexible drop-off. Upon request, the shuttle will deviate from its regular route to let passengers off closer to their destination.

RUF-BUS (Rapid Urban Flexible), Flexible Operations Command and Control System, Wunstorf, Hanover, Germany

This service varies between fixed or flexible routes depending on demand and the time of day, with three bus sizes of between eight and fifty seats used as appropriate. Either type of service is used to deliver passengers between desired origins and destinations. Although services are integrated to the timetable of express trains from Wunstorf station to Hanover, this is not the main purpose of this service

Cango: Flexible Route Network, Hampshire, UK

Cango replaced existing public transport, community health, social services and education transport with seven demand responsive services, including links to other bus services and commuter link to two stations. It has 700 registered users and ridership has increased with time.

Analysis of Substitute Intermode DRT Schemes

Inception phase

The following table provides a basic analysis of the initiators behind the scheme, the policy objectives to be addressed and the market niche(s) targeted in the inception phase.

Table 3.17: Mover Factors

SCHEME NAME	INITIATING BODY		DRIVER		TARGET MARKET SOUGHT		
	PRIMARY	SECONDARY	PRIMARY POLICY OBJECTIVE	SECONDARY OBJECTIVES	CORE JOURNEY PURPOSES	CORE USERS	OTHER LIKELY USERS
Lovedean Carshare, Cowplain, Hampshire, UK	Hampshire County Council	Cowplain cars	Social inclusion to replace current bus system		Social and health	Poor, elderly and parents	
Rimouski TAXIBUS, Quebec, Canada	Quebec City Council	TAXIBUS	Provide local transport in Rimouski at reasonable cost	Economic reasons	All	Anyone able to get to and from the predetermined pick-up points	
Belfast Black Taxibus (1969), Northern Ireland, UK	Belfast City Council	Black Taxi Association	Social inclusion and social harmony		All journey purposes	All residents in areas served	
Taxi Collectifs, St Andre, Réunion, Indian Ocean (France)	Local taxi owners who wanted to operate like a bus		Cost reduction		All journey purposes	All residents	Poorest members of society

Improved resource efficiency is the major driving force behind the policy driven schemes, with the local authorities again the initiators. The Lovedean Carshare scheme is a typical small-scale example where a

bus service has been replaced by a demand responsive shared minicab service. It is mainly used by the target groups – the poor and the elderly. The Rimouski TAXIBUS scheme is similar but on a larger scale, and resulted from the withdrawal of a commercial bus operation. The council stepped in and devised a shared taxi scheme to serve the population at a lower cost than an equivalent bus system.

Commercial schemes of this type are thin on the ground, and generally happen only in extreme circumstances. This was the case in parts of west and north Belfast during the Troubles in the late 1960s and early 1970s. Buses were seen as targets by paramilitaries of both denominations during rioting and so were attacked and forced off the roads. As a result, entrepreneurs from within the beleaguered communities established taxibus schemes (Belfast Black Taxibus) independent of each other, whereby residents could travel to and from Belfast city centre. These schemes continued to operate with the re-emergence of the bus service, and thus would now be classified as a network scheme. Slightly different is the Réunion Taxi Collectifs scheme. Here, private operators felt they were losing business as car ownership increased, and so they approached local authorities to request they be allowed to operate as a bus as well as a taxi. While originally these generally operated alongside bus services, more recently the bus services have been rationalised and so the Taxi Collectifs have been substituted for the bus. The target markets of both schemes were passengers that had previously used the bus.

Table 3.18: Initial Shaper Factors

SCHEME NAME	POLICY CONTEXT		AREA FACTORS				
	FINANCIAL SITUATION	REGULATORY AND OWNERSHIP STRUCTURE	POPULATION	SOCIO-ECONOMIC DETAILS	DEMOGRAPHIC DETAILS	LAND USE PATTERN	TRIP DESTINATION ATTRACTIVENESS
Lovedean Carshare, Cowplain, Hampshire, UK	£370–490 subsidy per month	Taxi regulation				Sparsely populated	Shopping and local town facilities
Rimouski TAXIBUS, Quebec, Canada	£218,000 subsidy in 2000	Private taxi firms who respond to demand	32,000				Mainly social and leisure destinations
Belfast Black Taxibus (1969), Northern Ireland, UK	Regular bus subsidy given to the taxi driver	Taxi owners and operators				Paramilitary areas in Belfast	Any trip destination within Belfast
Taxi Collectifs, St Andre, Réunion, Indian Ocean (France)	Some local authority subsidy	Privately owned but operated in syndicates					Mixed trip destinations

The policy context for the first two schemes was that existing public transport services provided by buses were deemed as being too expensive to continue. Cheaper public transport provision was needed. Vehicles from all four schemes are registered as taxis/private hire vehicles. However, the Belfast situation is far more complex. Strictly speaking, the Black Taxibus operations were illegal from their inception, although they were tolerated as they provided a service. In recent years the operators from the nationalist areas of Belfast have been negotiating with the licensing authorities to address this.

All four schemes serve very different areas, ranging from village/suburb to market town routes (Taxi Collectifs, Lovedean Carshare), to a small town (Rimouski TAXIBUS), to segments of a large city (Black Taxibuses in north and west Belfast). However, the routes serve quite similar demographic profiles – namely poor, former bus users.

Table 3.19: Resultant Scheme Design

SCHEME NAME	TYPE OF SERVICE				LEVEL OF SERVICE		FARE LEVEL AND STRUCTURE
	TYPE AND SIZE OF VEHICLE	DEGREE OF ROUTE FLEXIBILITY	DEGREE OF TIMETABLE FLEXIBILITY	MODE OF BOOKING	FREQUENCY	OPERATING HOURS	
Lovedean	Taxi cars	Complete	Fully	Telephone	Between	9 am–	£0.40–1.20 per

Carshare, Cowplain, Hampshire, UK		flexibility	demand responsive	reservation; if none are made the service does not run	3 and 5 trips per day	5 pm, Monday–Friday	trip. Fare revenue equates to 35% of overall costs
Rimouski TAXIBUS, Quebec, Canada	Strictly only taxis	300 fixed-origin and destination spots	Timetable determined by the demand from potential passengers	45p to make a compulsory advance telephone booking for origin and destination points	As often as is required but does not run if no demand	Monday–Friday	£1.07 per trip plus £0.45 booking fee. Monthly passes available for unlimited travel at £31.54
Belfast Black Taxibus (current), Northern Ireland, UK	Black taxi	Follows regular bus route	Semi-demand responsive	Fill up and go	As and when required	24 hours, 7 days a week	Fare level at bus rate
Taxi Collectifs, St Andre, Réunion, Indian Ocean (France)	250–300 Taxi Collectifs. Some use 10-seater vans	Operate along fixed route	Fully demand responsive	Turn up and go	As often as required	08.00–17.00	Zonal

Given that the four schemes were developed to use resources more cost effectively than a bus, it is unsurprising that all are low tech, with the public policy driven schemes operating from minicab/taxi offices and the commercial schemes operating mainly on fixed routes on a turn up and go basis. The services also only run on demand.

Table3. 20: Resultant Scheme Performance

SCHEME NAME	PATRONAGE	FINANCIAL	TRANSPORT	ENVIRONMENT	SOCIAL	BARRIERS ENCOUNTERED	DOES IT MEET OBJECTIVES?
Lovedean Carshare, Cowplain, Hampshire, UK	Between 2.5 and 3 passengers per trip	No subsidy required if 4 passengers use each vehicle at any one time	No modal shift			Taxi regulation barriers	
Rimouski TAXIBUS, Quebec, Canada	63,000 per year	Service cost has fallen from £2.32 to £1.94 per trip. Total cost is £151,039 pa	Involves no transfer			Getting local taxi companies to offer the TAXIBUS service	Yes – it provides a local transport network
Belfast Black Taxibus (1969), Northern Ireland, UK	Unknown but frequently used	Subsidy equal to that of conventional bus per passenger	Some cross modal use to conventional bus or train	Increase in emissions as more vehicles used for same demand	Used only by those in one community, no cross community taxi sharing	Taxi driver had to own PSV license	Yes – it maintained public transport services to all areas of Belfast
Taxi Collectifs, St Andre, Réunion, Indian Ocean (France)	The service is very popular	Same as bus fare				Unknown	Yes – provides affordable local transport

Subsidy levels for both public policy driven schemes are relatively low, as they were designed to be. Taxi Collectif trips are sometimes subsidised by local authorities in Réunion, with some even offering per kilometre subsidies – as used for buses. Further subsidy is provided by the vehicles also operating as conventional private or public hire vehicles – in other words, the shared taxi element is usually an add-on to the normal taxi function.

Perpetuation phase

Some of these schemes have been running for a number of years and it is remarkable that the core policy movers have not really altered. In most cases there have only been very small changes in the markets sought. Again, as in the other categories, changes in policy shapers have not been in area factors (such as demographics, new destinations or land use patterns) but in the policy context of availability of finance or changes in regulation. For example, in Rimouski, there has been an increase in the number of taxi companies participating in the TAXIBUS scheme, an increase in operational efficiency and a consequent cut in subsidy; a virtuous circle. In the Réunion Taxi Collectifs scheme there has been an increased use of syndicates and a more sophisticated subsidy has been regime introduced in some areas.

Changes to scheme design and scheme performance (see tables below) have generally been positive, suggesting that this type of DRT can secure a long-term stable or growing market.

Table 3.21: Consequent Modifications to Scheme Design

SCHEME NAME	CHANGES IN TYPE OF SERVICE				CHANGES IN LEVEL OF SERVICE		EVOLUTION OF FARE LEVEL AND STRUCTURE
	CHANGES IN TYPE AND SIZE OF VEHICLE	CHANGES IN DEGREE OF ROUTE FLEXIBILITY	CHANGES IN DEGREE OF TIMETABLE FLEXIBILITY	CHANGES IN MODE OF BOOKING	CHANGES IN FREQUENCY	CHANGES IN OPERATING HOURS	
Lovedean Carshare, Cowplain, Hampshire, UK	Too early to change	Too early to change	Too early to change	Too early to change	Too early to change	Too early to change	Fare expected to remain constant
Rimouski TAXIBUS, Quebec, Canada	No change in policy from using only taxis	Now connects with neighbouring towns			Strictly only Monday to Friday		Fare has remained constant at £1.07
Belfast Black Taxibus (1969), Northern Ireland, UK	Second-hand black Austin London taxis always used	Became more flexible	Unofficial taxi ranks developed	Driver could choose when to depart		Still operated 24 hours a day 7 days a week	Fixed pricing
Taxi Collectifs, St Andre, Réunion, Indian Ocean (France)	Move towards larger 10-seater vehicles	Increase in regulation meaning a less flexible transport system	Becoming less demand responsive	Still turn up and go	Greater inter-modal timetabling		

Table 3.22: Consequent Scheme Performance

SCHEME NAME	CHANGES IN PATRONAGE	CHANGES IN FINANCIAL PERFORMANCE	CHANGES IN TRANSPORT PERFORMANCE	CHANGES IN ENVIRONMENT PERFORMANCE	CHANGES IN SOCIAL PERFORMANCE	BARRIERS OVERCOME AND REMAINING	DOES IT MEET OBJECTIVES NOW?
Lovedean Carshare, Cowplain, Hampshire, UK	Increase in number of users	Too early to change		Too early to change			
Rimouski TAXIBUS, Quebec,	Grew at 37% over 4 years	Service cost per ride has		Increase in productivity of 6%		Barriers remain over getting to	Yes, it enables a small

Canada		reduced from £2.32 to £1.94 per passenger per trip				the predetermined stops and only operates Monday–Friday	community to use public transport
Belfast Black Taxibus (1969), Northern Ireland, UK	Increase in patronage as the troubles worsened				Increased segregation within Belfast	Financial pressure due to little change in fares	
Taxi Collectifs, St Andre, Réunion, Indian Ocean (France)	Unknown		Increase in interchange activity			Unknown	Unknown

Substitute DRT Composite Case

Social inclusion concerns have played a major part in many of these schemes. However, there is a danger of too narrow a market base, and it is notable that a number of these DRT schemes have sought to consolidate a number of specialist DRT services, such as those for people with disabilities into a general DRT service. Indeed, several of these schemes have merged three or four previous services in order to capture resource efficiency gains, cut costs and improve services to customers. This is an issue that is developed later in this chapter.

The Rimouski TAXIBUS and the RUF-BUS cases are of particular interest. These represent a total replacement of conventional bus services (whereas Cango, although it has replaced some bus services is more of a hybrid). By serving a range of trip purposes and categories of people, RUF-BUS in Wunstorf in Germany and Rimouski's TAXIBUS have developed a level of demand that sustains a high-frequency service. This produces a better quality of service to the users than could otherwise be provided. For RUF-BUS, the larger of the two schemes, average waiting time is 6–8 minutes, which for a medium-sized town (40,000 people) is very good (in the UK such a settlement would probably have a conventional bus service of no better than a 30 minutes frequency. The ridership, at 20,000 trips a month is also healthy. This shows the quality of service that can be achieved with a relatively low-demand system.

Key issues and recommended good practice

Most of the above lessons also apply to the more radical substitute DRT services. However, from this analysis one issue to emerge is whether it is better to go for the incremental development of DRT, or if the benefits are only achieved as the result of a radical restructuring. The experience cases like the Rimouski TAXIBUS and the RUF-BUS suggest that a total evaluation of an areas bus service is needed, rather than a piecemeal approach. Although RUF-BUS operates a hybrid system of conventional and DRT services, this emerged from a total redesign of the area's bus services.

This relates to the additional/substitution issue. The easiest way to introduce DRT is in addition to existing services, but, with the exception of feeder (interchange) services, this tends to produce wasteful duplication. An evolution of public transport could be envisaged, whereby the first stage may be the development of interchange, network and destination-specific DRT services, all of which support and enhance conventional public transport services. Interchange and destination-specific DRT may eventually come to be largely replaced by network DRT services. For rural areas and in smaller settlements, the transition to substitute DRT systems seems likely.

Overall, a possible pattern is emerging of the type of places and times when DRT or DRT/conventional bus blends could be appropriate (Table 3.23). This suggests that, as in the larger overseas examples of DRT systems, a DRT/conventional bus hybrid system is often appropriate. This has major implications for planning and regulating public transport. In particular, in the UK regulatory and grant-giving regulations are not geared to the provision of such flexible, mixed-mode operations.

Table 3.23: Times and Places for DRT

TIME	PLACE				
	CITY RADIAL	TOWN RADIAL	CITY CROSS-SUBURB	FRINGE URBAN	RURAL
Monday–Friday, 06.00–19.00	Conventional bus.	Conventional bus	Conventional bus/DRT	Conventional bus/DRT	DRT
Monday–Friday, 19.00–23.00	Conventional bus	Conventional bus/DRT	DRT	DRT	DRT
Monday–Friday, 23.00–06.00	Conventional bus/DRT	DRT	DRT	DRT	DRT
Sundays	Conventional bus	Conventional bus /DRT	DRT	DRT	DRT

Failed demand responsive transport projects

The project has identified a number of examples of operating DRT systems. Some of these are still in their early stages and it is too early to judge whether they will be permanent. Others have been running for a number of years and have become a part of mainstream public transport. Success may be measured in many ways, not purely financial indicators. Some of the cases highlight the social and environmental benefits realised from their programmes, possibly to justify tax subsidies or other funding mechanism objectives. This is particularly the case where tackling the problem of social exclusion is a primary objective (as is true for many of the UK DRT schemes). However, some DRT projects never progressed beyond a trial period. Such failures offer lessons to ensure that future DRT schemes do not go the same way.

Cases to illustrate reasons for failure

Several cases emerged from the research where the projects failed to develop beyond the initial stages, or were fundamentally compromised. The first two indicate how poor service design can lead to problems. The Milton Keynes case reveals how land use planning can influence the performance of DRT.

Translink, Shellharbour, New South Wales, Australia

Shellharbour is located near Wollongong, south of Sydney, New South Wales. The Shellharbour council conducted a trial of a DRT from 1992 to 1993. This service operated on a fixed base-route with deviations on request. The scheme serviced a population of 47,000 with both full-sized and 29-seater buses. The service was provided on week days with no night service. The service was designed so that 95% of the population was within 200 metres of a bus stop. The exercise was designed to test state-of-the-art technology. This included automated traffic light activation, real-time information, digital stop announcement systems and guaranteed transfers between services. A phoned request for a bus to deviate from routes could be made up to ten minutes before the bus reached the deviation point. A window of five minutes was then allowed for arrival. It proved that fixed, demand-determined route deviations from a base route can provide a convenient service with no loss of overall journey time.

The service and the reasons for failure were researched by Smogbusters, an Australian consultancy (Schwartz, 2000). The original Shellharbour plan had intended to use a fully automated booking system. Technical difficulties, however, prevented the system coming on line before the end of the project, so a low-tech demand response control system was substituted. Shellharbour ended up as a good case of the minimum effort and investment required when establishing a DRT service. In this instance the system was run using existing buses (later adding midibuses) and established line-haul routes.

Demand loops were added to each route that would only be used if a customer made a booking to be picked up or set down on that loop. Loop bus stops were placed in areas not adequately serviced by the line-haul operation. Modified timetabling enabled the bus to divert on to 60% of the loops on a run without being late. When the midibuses were introduced, frequencies could be increased due to lower operating costs. Without the use of the automated booking and control system, passengers simply rang into the transport operator's office and placed their booking with a customer service officer. These details

were then relayed to the bus driver using hand-held radio equipment. The system, as run, enabled bookings to be made up to one hour prior to the intended trip. Although real-time passenger information was not available with this type of system, its cost was approximately one quarter that of the high-tech option.

However, when the trial reached its scheduled end date it was not continued. Instead, the service reverted to being a conventional line-haul service with some small modifications as a result of information gained from the trial.

Lessons:

- There were technical problems. First, an over reliance on untested technology and secondly the lack of planning due to the haste in which the scheme was implemented. This led to disenchantment of local operators resulting in many features not being incorporated.
- The disenchantment and lack of enthusiasm of the operator resulted in them reverting to a normal service, with which they felt more comfortable.
- As often happens in bus operations, a lack of marketing resulted in disappointing patronage.
- On the positive side, Shellharbour does demonstrate how a low-risk trial can be undertaken to explore the viability of adapting an existing line-haul service by offering demand responsive deviations. That Shellharbour failed for other reasons does not invalidate this important lesson.

Dial-a-bus, Adelaide, South Australia, Australia

The second case is of a many-to-many system over the Adelaide metropolitan area in South Australia. It was intended that such a system would compensate for the lack of public transport on cross-suburban services. The system was subject to the conditions that the central business zone was not served and that hailing was not permitted. This may be a critical weakness, and presumably was an operational restriction imposed to avoid competition with existing bus services and taxi operators.

Fares were set on a straight-line distance basis and the operating characteristics were such that there was no route or timetable. Considering the type of operation, service area, population served and fleet size, the Adelaide service could not cope with the demand. As a result the service only lasted for six days, by which time it had become obvious that the productivity of each bus could never provide a realistic service.

Lessons:

- This was almost the opposite of the Shellharbour trial, offering an un-timetabled ‘many-to-many’ service within a particular area. The removal of the constraints of timetables and routes also removed the efficiency of public transport and the ability to group trips. The system offered was simply too flexible to be practical.
- Unlike in Shellharbour, the technology installed was too crude to cope with the pattern of demand. Information was recorded manually and radioed to the operator.
- The service seems to have retained the institutional characteristics of many of the dial-a-ride schemes, which tend to have their origins in community transport. Systems developed in the restricted market of dial-a-ride were not capable of delivering a high volume general public transport service.

Dial-a-Bus, Milton Keynes, UK

An early experiment in DRT was done in the UK. This links with the theme that DRT is a response to long term changes in travel patterns and land use changes that result in settlements being difficult or expensive to serve using conventional public transport. The transport and land use design of Milton

Keynes took place at a time when the major challenge was seen as accommodating the free use of the car for all possible trip purposes. The land use design was, in the words of Richard Llewellyn-Davies, the chief partner in the consultancy who planned Milton Keynes, a 'modified Los Angeles system'. This involved a one-kilometre grid of 70 mph dual carriageway roads, with development being highly dispersed and at a low density to spread traffic loads evenly over the grid network.

This produced a key problem. Such a dispersed land use design is very hostile to conventional bus operations. Unwilling to compromise the town's design to provide better bus operating conditions (as had been sought by Arthur Ling's Runcorn design), the team at Milton Keynes sought for a new bus system that could operate within an uncompromisingly car-oriented urban structure. The plan for Milton Keynes looked to the use of 25–30 seat minibuses with 'the possible introduction of a more personalized public transport such as demand-actuated minibus' (Llewelyn Davies and Partners, 1970). It was upon little more this undeveloped idea that the planners of Milton Keynes felt they could dismiss any land use design considerations for bus operations. Indeed, even within the Transportation Technical Supplement of the plan for Milton Keynes, it was noted that:

'The cost of providing such a (DRT) service would exceed the alternative of people driving to work by car. Thus in the context of the remainder of the goals established for Milton Keynes and in the light of the selected land use plan, the provision of a competitive form of public transport does not make practical sense. This consideration of maximisation of freedom of choice has therefore been discounted.'

Also:

'The cost of providing a good quality public transport service will not be offset even in part by consequential reductions in the need for highways. As such, the appropriateness of providing a public transport service beyond the minimum level necessary to transport those by car is solely a matter of policy.'

Llewelwyn Davies and Partners (1970).

The concept of 'freedom of choice' was paramount in the design of Milton Keynes. In abandoning this for public transport, it was an implicit admission that Milton Keynes would be, forever, a highly car dependant town with effectively no transport alternative unless 'policy' decided that a highly subsidised alternative be provided. Given that the planning philosophy of Milton Keynes was to design a town to accommodate an ultra affluent future, behind this may have been the assumption that there would consequently be more than adequate public funds to subsidise bus services. High public spending would resolve the problem.

Early in the development of Milton Keynes, an attempt was made to follow up the hope that a well-funded 'demand-actuated minibus' might be the means to provide something other than the 'minimum level necessary' public transport. In 1973, Milton Keynes Development Corporation (MKDC) set up a working party to 'formulate the objectives for a public transport service in Milton Keynes.' The terms of reference, however, excluded any change to the town's land use/transport design. In the meantime a series of subsidised low frequency conventional bus services were gradually introduced.

The report of the working party (MKDC, 1974) stressed the need for a high quality public transport service in Milton Keynes, but noted the problem's of the town's low density and dispersed design:

> *'Within such a framework it is difficult to visualize public transport as being competitive with the private car in terms of total journey time'*
>
> *MKDC (1974)*

This led to the suggestion for a 'Dial-a-Bus' system to compensate for the deficiency in the design of Milton Keynes. However, it was clear that such a system would make a substantial loss, particularly as it would initially operate in areas in early stages of urban development. Although the working party were unable to 'present with any confidence a cost comparison that is either relatively correct between alternative systems or factually correct for a particular system', 'crude estimates' suggested that Dial-a-Bus would cost 'substantially less' than a stage carriage system of a comparable standard (MKDC 1974, p 31).

Not only was the service to be innovative, but so too was the organisation to deliver it. The Dial-a-Bus service was to be operated not by the existing bus operator, but by a 'new operating unit, completely separate from the existing regional operator'[19]. In practice a compromise had to be reached, which Bendixson and Platt (1992, p160) felt was unfortunate:

> *'The United Counties Omnibus Company, a subsidiary of the National Bus Company, was the problem. United Counties was country-minded. Restrictive practices gave it the flexibility of a ramrod … A special Dial-a-Bus unit was set up, not with the local operator, but with the National Bus Company in London. It was a pyrrhic victory. United Counties not only gained responsibility for the unit's administration and maintenance but, being a high-cost operation, they paid the minibus drivers big-bus wages, plus a supplement for operating a radio. The [MKDC] board made one last stand. United Counties must not handle complaints.'*

Despite this 'Pyrrhic victory', the battle for the recognition that a different operating organisation may be needed for a DRT system was key. This is a lesson that a different operating organisation may be needed for a DRT system. This is a lesson that, thirty years later, is not always appreciated.

The Woughton Dial-a-Bus service began in March 1975 in the southern development area of Milton Keynes. The service used 16-seater minibuses that operated in a 'service area' in which door-to-door trips could be made. There were also ten 'stopping places' outside the service area (e.g. the railway station, the main shops in Bletchley and some key employment areas). Free street phones were provided, to supplement bookings by ordinary telephones from home and workplaces. In common with most subsequent DRT systems, bookings were received at a dedicated call centre, with radio-telephone links to the buses. Trip requests could be accommodated up to 30 minutes in advance, but buses could also be hailed on the street (a practice which was not encouraged as wide use could wreck scheduling). When Dial-a-Bus started the Woughton area had a population of 4,300, but this had risen to 10,000 one year later.

Public acceptance of Dial-a-Bus was high and it rapidly established popularity. Indeed, even today longstanding residents of Milton Keynes will refer to it as the only time that the town has a decent bus service. But the problem of Milton Keynes' hostile design remained. Even in detail, the widespread use of cul-de-sacs and curvaceous estate roads elongated Dial-a-Bus journeys. But the main problem was of the dispersed design of Milton Keynes coupled with the patchy, partial development inside the service area. This led to long journeys to service the spread-out patterns of demand, and a large amount of bus and driver resources for each trip. The average journey speed, even among totally uncongested roads, was only 5 mph, varying between 2 mph and 25 mph depending on trip requests and loadings.

The two-year funding for the initial service had estimated a subsidy of £16,250 per annum, but after one year, Dial-a-Bus was making considerably higher losses. The service area was reduced and the service pattern altered to be fixed routes in peak periods, only being demand responsive off-peak. This was in an attempt to get fares revenue to cover 'a little over one quarter of cost'[20]. In the period March–July 1976, revenue from Dial-a-Bus fares managed to cover 27–32% of costs.

Unfortunately, by this stage the Dial-a-Bus service had become part of a wider funding issue between United Counties, Milton Keynes Council and the Development Corporation. As noted by Bendixson and Platt (1992, p160), United Counties had threatened to withdraw all conventional bus services in Milton Keynes unless subsidies were substantially increased. They quote Wayne Perdue, who headed the Corporation's Transport Unit:

> *'What killed the small buses was economics. It was not politically acceptable that fares on the small buses should be higher than on the big ones' – even though their operating costs were greater.'*

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[19] MKDC (1974) p. 25.

[20] Milton Keynes Gazette, 18 June 1976.

After the two-year trial, Dial-a-Bus shifted to be a fixed route minibus service and was amalgamated with conventional bus services. A different strategy was adopted of heavily subsidised conventional bus services. Interestingly this included a substantial contribution from the local authority that provided a general fares subsidy under concessionary fares legislation. This was brought to a halt by bus deregulation in 1986, when a network of daytime commercial services and subsidised evening/Sunday bus services came into being. This is essentially the situation that pertains today. Milton Keynes has possibly the worst bus services of any town of its size (approaching a quarter of a million people). Core bus routes managing, at best, a 20–30 minute frequency, dropping to hourly after 6 pm and ceasing altogether around 9 pm. Possibly it is time for Milton Keynes to revisit its DRT experiment of thirty years ago.

Lessons:

The Milton Keynes Dial-a-Bus almost succeeded. It was well-designed and well marketed, with good on-bus branding and literature that was exceptional for its time, yet it failed due to a combination of:

- A high-cost, inflexible and unsympathetic operator.
- Somewhat too flexible a service (not as great a problem as in Adelaide, but tending that way).
- Fares that were too low to reflect the quality of DRT.
- Underestimate of costs and insufficient political commitment to keep it going. Higher than budgeted cost was the main factor in the demise of the Milton Keynes Dial-a-Bus. After cutbacks to off-peak DRT only, it managed to cover approaching a third of costs from revenue. Before it was probably on only about 15–20%. Data on the cost of dial-a-rides was available at the time. In 1973 the Ann Arbor system was running. With a population of 100,000, Ann Arbor's 45 dial-a-bus and 15 fixed-route system cost $1.5m per annum to subsidise (Potter, 1976). This would have suggested a need for an annual subsidy of about £100,000 p.a. for the initial Woughton area system in Milton Keynes. The actual subsidy budgeted was very low (£16,250), and even though there were cost over-runs, it is remarkable that Milton Keynes managed to run its Dial-a-Bus at a funding level of this order.
- Application in a partly developed area which exacerbated the hostile land use design of Milton Keynes.

Overall this case suggests that DRT could work in a place like Milton Keynes, but the other negative factors were too great when it was attempted. Indeed, if a fares differential and a truly separate operating unit with greater control over costs could have been established, it is likely that the Milton Keynes Dial-a-Bus would have succeeded.

Shared taxi schemes, Blackpool and Swindon, UK

In 1991, taxi operators in Blackpool established a taxi sharing scheme serving tourist routes in the town. A fare of 60p per person was registered with the local authority and dedicated shared taxi bays were established. The service attracted enough custom to be fully commercially viable, with operators getting four to six passengers per trip. In 1996 fares were increased to 80p, which further enhanced commercial viability and the service continued to prosper. However the local authority then changed their attitude towards shared taxis and viewed them as a threat to the town's buses. They refused to grant any further fare increases and the dedicated shared taxi bays were removed. With no fare rises and a diminished street presence, the combination of lower custom and a gradually lessening income meant that the service petered out.

Another taxi operator initiative was proposed in Swindon, where they aimed to set up a taxibus scheme from the railway station in the town to one of the suburbs in order to supplement their income during 'slow periods', where they can be waiting for up to an hour for a fare. However, on approaching the local authority, they were put off from establishing the scheme due to a whole raft of charges. For example, the

local authority suggested the taxi drivers would need to pay £250 for a roof sign[21]. Ironically, the drivers did not need to inform the local authority at all, as a Section 12 Taxibus service needs permission only from the Traffic Commissioner. Such a case well illustrates the confusion generated by the current regulatory and licensing regimes (see later), as well as the sometimes unhelpful behaviour of the regulatory authorities.

Lessons:

- Small-scale taxi operator-led initiatives can be vulnerable to hostile local officialdom.
- Local authority approval of shared taxi fares can be used to kill a commercial DRT service.
- There is some confusion as to regulatory and licensing requirements.

Shared station taxis, Marylebone and Kings Cross, London, and Ipswich, UK

A similar shared taxi scheme to that successfully introduced at Paddington Station was tried at both Marylebone and Kings Cross Stations, but there was insufficient volume to be able to match up sharers to destinations in central London and both schemes ceased to operate.

An earlier scheme serving Ipswich station also failed for similar reasons. This began operating from the railway station in June 1988 on a 12-month trial basis, but did not, ultimately, continue. Balcombe *et al.* (1990) found this failed largely due to lack of understanding about the scheme amongst the public; there was resistance arising from the psychological barrier of requesting shared rides to be arranged and by the perceived low probability of finding other passengers with whom to share.

Lessons:

- Commercial, on-demand shared taxis (as opposed to pre-booked) appear to need a high volume of demand to work. A less flexible service (pre-booked, fixed running times etc) could work at lower levels of demand.
- The Ipswich scheme also showed a resistance to ride sharing

Lessons of failure

- **Effective partnerships (a):** For public policy-led DRT, a lack of enthusiasm and support by a contracted operator can be fatal. Ensuring the operator believes in DRT and will have something to gain from its success is crucial.
- **Effective partnerships (b):** The problem of commercially led taxi sharing being very vulnerable to a hostile local authority illustrates the crucial factor that DRT services usually require an effective partnership between several actors. The absence or hostility of one or more can be the core reason for failure.
- The desire for a separate operating unit is a positive lesson from the Milton Keynes experience, which unfortunately could not be fully developed in this case. However it does show the importance of identifying appropriate partners. The result was that it set up the service well and rapidly won user confidence. It also brought to bus operations a culture of **effective marketing**, which is still woefully absent in the bus sector. Conveying the idea of DRT is a complex task, and requires considerable skill, usually by the local authority partner as part of Challenge funding. There is only one UK example where a private operator (Stagecoach) has been willing to invest effort in marketing a new service.

[21] Conversation with a taxi driver in Swindon, November 2003.

- There can be a danger of introducing **too much flexibility**. The Adelaide service did this with an un-timetabled 'many-to-many' service. At a smaller scale the Marylebone, Ipswich and Kings Cross shared taxis couldn't reach enough volume for a totally flexible service. A less flexible service (pre-booked, fixed running times, etc.) can work at lower levels of demand.

- The Shellharbour case provides a positive example of how **a low-risk experiment** with DRT can be undertaken (but failure seemed to be associated with a lack of operator commitment).

- **Realistic costing** and a strategy of **long-term finance** is an important issue. It is relatively easy to get trial project money, but **the transition from a trial to a permanent scheme** is often not adequately considered.

- There is a danger of transferring the institutional characteristics of dial-a-ride schemes into the wider public transport market.

- DRT can overcome some but not all of the problems produced by a **land use pattern** hostile to conventional bus operations. The general land use design and, at a local level, street layout, was almost as hostile to Dial-a-Bus as for conventional services. DRT does not resolve the land use conflict with car-oriented patterns of development. One conclusion of Potter's 1976 study was that a different form of land-use planning is appropriate to produce a 'good operating territory' for DRT.

- **Resistance to ride sharing** is an intriguing barrier, as it appears a crucial failure factor in some cases and totally irrelevant in others. **Good marketing** and presentation to inform **users' expectations** seems crucial.

Chapter 4 – DRT Drivers and Markets

Having presented the composite cases, the following sections identify and analyse a series of key issues in evaluating the appropriateness of DRT and in designing a DRT system.

Drivers for DRT

Initiating bodies

The majority of the UK schemes investigated were initiated by local authorities in partnership with local transport operators – typically bus but sometimes taxi or minicab. They have tended to be stimulated by Bus Challenge funds from central government, and are often aimed at addressing social inclusion issues, such as rural, poor, and disabled people.

Some schemes involved companies using DRT to solve site access issues, for example business parks with limited car parking facilities. These ranged from being local authority led, for example Flintshire Deeside Shuttle (Stones, 2003), through to those that adopted a partnership approach, for example Orange (Ellis, 2003) in Plymouth, to purely commercial concerns such as Vodafone in Banbury (Hopkins, 2003).

Occasional schemes have been developed by rail operators aiming to use DRT as feeder services to add value to their rail services, e.g. Chiltern Railways with the Bicester Taxi-Bus and First Great Western with the Truro Plus Bus (Yeatman, 2002; Crossfield, 2003).

Some commercial operators are now seriously investigating the potential of DRT. Interestingly, while initially it was thought that such projects were unlikely to be commercial in the near future (Bunting, 2003), with the relative success of the Stagecoach Yellow Taxibus which has been running in Fife as of December 2003, there is far more optimism (Andrews, 2003).

The commercial case

Until now, there has not been a convincing commercial case for DRT. One problem is the image and stigma of dial-a-ride services, which have traditionally had a very institutional nature. For instance, so far Yellow Taxibus project initiated by Stagecoach in Fife running along the Dunfermline to Edinburgh corridor has not been repeated elsewhere.

The DRT industry has so far been driven by the social inclusion agenda, and features schemes that are cumbersome, expensive, bespoke and cost heavy. In general, the systems have tended to have their own call centres, sometimes combining other local authority functions to save replication and thus reduce costs and thus are most certainly not set up specifically from a commercial perspective (Bunting, 2003).

The subsidy levels of the infrastructure (call centres, software, vehicles, etc.) are enormous burdens for councils but so are the operational cost elements. It is debatable that current systems can be made more effective and provide good value for money and have a viable long-term future (Vane, 2003a). This issue is explored in more depth below.

Different objectives

There are major structural problems inherent in the bus industry at present, a key problem being that in recent years there have been major cuts in the management of local bus services, notably in the product development and service quality areas. This has left the industry with delivery problems even for conventional services, without adding the complexity of DRT (Davies, 2003b). Major operators have drastically cut back on their business development capacity, and are continuing to cut costs wherever possible. It is questionable whether either local authority or operator would be prepared to put the resources required into ensuring the success of DRT in more than a limited number of areas in the current climate. They face the challenge of retaining premium fare-paying passengers (Davies, 2003b).

Different processes

Two of the commercially driven cases reported were initiated by the personal intervention of the Managing Directors of the companies concerned, following their exposure to such systems elsewhere in the world. For example, the Yellow Taxibus was a direct result of Stagecoach boss Brian Souter witnessing such a scheme in the USA (Bunting, 2003). The Truro Plus Bus was initiated by a Director of First Great Western, who was keen to see a system similar to the Dutch Treintaxi system demonstrating the company's commitment to the 'integration' agenda (Crossfield, 2003). By contrast the public policy driven schemes tend to be made in response to the availability of grants, or the threatened or actual withdrawal of conventional bus services.

Different drivers

Innovation is key for far-sighted operators who desire growth in the public transport market, as many in the industry are realising that the current high profit margins in the bus sector are unsustainable in the long-term (Bunting, 2003). For Stagecoach it was this realisation, combined with the perceived risk of re-regulation of the bus industry and the influence of one of the company's founders, Brian Souter, that pushed it to look at new, and innovative modes of transport such as DRT.

Markets for DRT

Many of the recent innovations in DRT have been driven by social policy objectives and hence the market focus has been upon captive users. The captive users have restricted transport choices, and in particular have low levels of access to cars. By way of contrast our study has also identified a number of DRT schemes that have targeted choice users, many of whom could have made the trip by car. This latter group are of particular interest when the role of DRT in transport and environmental policy is concerned.

Diverse user attributes

One finding to emerge from the analysis of the composite cases is that there are key differences in the user requirements of the 'choice' and 'captive' markets. Table 4.1 shows the results of a scoring analysis of key user preferences for a public transport service. This was based upon the results from cases examined in the project. The scoring system was a simple three point one in order to highlight any differences. This was:

1= not important; 2= quite important; 3= very important

The results indicate some important differences between the choice and captive markets, and also how these vary with trip type.

Table 4.1: Score of DRT user preferences and trip type

TRIP TYPE Œ	USER ATTRIBUTES ➨	JOURNEY TIME	CERTAINTY OF DEPARTURE TIME	CERTAINTY OF ARRIVAL TIME	FREQUENCY	TIMES OF OPERATION	PRICE	DOOR-TO-DOOR	LUGGAGE SPACE	COMFORT/IMAGE	MINIMUM BOOKING TIME BEFORE TRIP	LOW FLOOR
Commuter	Choice	3	2	3	2	2	1	2	1	3	3	1
	Captive	2	2	3	2	3	3	1	1	1	1	1
Education	Choice	2	2	3	1	1	2	1	1	3	1	1
	Captive	1	3	3	1	1	3	1	1	1	1	1
Shopping	Choice	2	2	1	3	2	2	3	3	3	2	3
	Captive	1	1	1	1	1	3	2	3	1	1	3

Health	Choice	2	2	3	2	2	2	3	1	3	1	3
	Captive	1	1	3	1	1	3	2	1	2	1	3
Leisure and other personal	Choice	2	2	3	2	3	1	2	1	3	3	1
	Captive	1	1	3	2	3	2	1	1	2	2	1

Scoring: 1= not important; 2= quite important; 3= very important

This analysis shows some key groupings. One factor that scores highly across all trip types for both captive and choice users is certainty of arrival time. The exception to this is shopping. Departure times are generally quite important, but it is arrival time that is a common concern. However, this is the only factor on which there is a general unity.

For some trip purposes, there is an agreement between captive and choice users. On the issue of low floor, easy access buses, this is very important for shopping and health trips, but not important for others. Luggage space is very important for shopping trips for both groups but not for any other purpose (although it would also be for the niche of airport/rail shuttles). The availability of door-to-door travel, a key attribute of DRT, achieves an interesting mix. For shopping and health it scores strongly for both captive and choice groups. The scoring is higher for choice than captive – and higher for choice groups for commuting and leisure. It should be noted that door-to-door is a more valuable attribute for women than men, due mainly to the perception of enhanced personal security.

The latter observation begins a more general pattern of difference between choice and captive users. Times of operation appear to be of importance for commuter and leisure trips, with choice commuters scoring higher. This probably relates to leisure trips being in the evenings, possibly after services stop.

On the important issue of price there is a major contrast between choice and captive users. Price is a very important issue for captive users, but less so for choice users. By way of contrast, comfort and image is far more important for choice than captive users (although comfort understandably scores more highly for health trips and also for leisure trips).

In the USA context, Round and Cervero (1996) note that choice users tended to use modes that were pre-arranged, routine forms of DRT like subscription vanpools and feeder shuttles.

Recommendation: This analysis can be used and developed to target the design of a DRT service to the markets it is planned to serve. For example, a DRT scheme geared mainly to shopping, health and leisure trips by captive users should combine a different set of attributes than one aimed at car commuters. A key distinction is that what captive users most want is a bus or minicab, whereas the last thing choice users want is a bus. Captive users value bus-like attributes. Choice users value taxi/hirecar type attributes.

Operator attributes

In setting up a DRT scheme, almost the first operational question is whether the demand is at the right level to maintain suitable loadings (i.e. not too high or else it should be served by a bus – or not too low). Assuming it is, the next issue is whether the demand is spread evenly throughout the day. If not, there are a number of ways to try and achieve as balanced a demand level as possible. For instance, commercial schemes operated by taxi or minicab firms may decide to operate taxibus schemes as a way of working when exclusive use passengers are few and far between – its is not uncommon for taxis to wait an hour or more for a fare at some railway stations for example. Conversely, at Paddington Station in London, the high volume of passengers at particular times of day means that there is a shortage of taxis and so the obvious answer is for taxis to take multiple passengers to similar destinations. A second relatively simple idea is put forward by Crossfield (2003), who suggests that one way for DRT feeders to rail stations to be more cost effective outside of peak periods is for DRT vehicles to double up as rail replacements services or driver ferrying vehicles as and when required. Yet another potential way for DRT services to be better utilised is perhaps to develop business-to-business services for use during the day, an option that Stagecoach may examine for its Dunfermline to Edinburgh Yellow Taxibus scheme. Finally, many public

policy driven schemes have turned to operating commuter trips, education, shopping and leisure trips as and when required throughout the day, and to offset some of their costs through winning the corresponding schools, social service and dial-a-ride contracts. Schemes that have successfully conducted this type of cross-subsidy model include the Northumberland Phone and Go, Nexus U-Call, Wiltshire Wigglybus and Hampshire Cango (Stoner, 2003; Usher, 2003; Buchan, 2003; Armstrong, 2003).

While straightforward in principle, in practice this type of vehicle brokerage can be complex. To help examine this, therefore, it is worthwhile comparing user requirements with the needs and preferences of operators (Table 4.2). This table categorises key operational aspects by the type of DRT provider. The first group of attributes concerns the markets served. One thing that becomes clear from this analysis is that the sectors in which DRT has developed (Community Transport, dial-a-ride, taxis and PHVs, etc.) focus upon a different set of journey types than conventional bus services. Traditional DRT has a focus upon shopping, health and leisure trips, whereas conventional buses have a major emphasis upon commuting, education and other bulk travel. Shopping is an overlap area between the two. This perhaps reflects the observation that, although many new DRT systems have sought to serve a general range of trip purposes, they have ended up retreating into those traditionally served by DRT in the past.

This perhaps relates to the culture of how DRT has been organised. As the table notes, the new DRT areas (towards the top of the table) are seeking to be general public transport, whereas the established DRT operations, lower down in the table, serve a restricted market. The latter have membership criteria that are reflected in their booking systems (you need to join and be vetted to qualify) and also in their operating systems.

This operational legacy of DRT services is noted by Cross (2003) and Usher (2003). They both observe that while DRT systems do not target one particular socio-economic group, the operating period and booking system often renders it unsuitable for commuters, and it has proved difficult to attract younger people. Instead they see DRT services based around a subset of certain captive community needs with a definite niche for urban and rural villages, particularly for services geared around local surgeries. Evenings are also good for picking up people from pubs, clubs and bingo, and there is room in this market for taxi, bus and Community Transport operators. This sort of view represents an entrenchment of DRT into the easily served market of shuttling the elderly and infirm to shops, clubs and their doctor.

Table 4.2: Scores for Operator Needs

SERVICE/ OPERATOR TYPE Œ	COMMUTER	EDUCATION	SHOPPING	HEALTH	LEISURE	MARKET SERVED	OPERATING HOURS	URBAN/ RURAL	TECHNOLOGY	NUMBER OF SEATS	SPECIAL VEHICLE	DRIVER TRAINING	PUBLIC SUBSIDY PER TRIP	PRIVATE SUBSIDY PER TRIP
Commercial bus operator	3	2	3	1	2	General public	06.30–18.30 (Mon–Sat)	Urban	1	8–40	2	2	none	low
Local authority (public transport section)	2	2	1	1	1	General public	18.30–23.00 (M–F), Sundays	Both	2	8–40	2	2	low	none
Commercial taxi operator	1	1	3	2	3	General public	24 hours (all week)	Urban	1	4–8	2	1	medium	none
Commercial minicab operator	1	2	3	2	3	General public	24 hours (all week)	Urban	1	4–8	1	1	low	none
Transport operator (feeder services)	3	1	2	1	2	General public	06.30–18.30 (Mon–Sat)	Both	2	8–40	1	1	medium	medium
Commercial company (commuter shuttle)	3	1	1	1	1	Staff and visitors	07.00–09.30, 16.30–19.00 (Mon–Fri/Sat)	Urban	1	8–30	1	1	low	medium
Commercial company (anti-social hours)	3	1	1	1	1	Staff	19.00–07.00, Sundays	Both	2	8–16	1	1	medium	high
Local authority (social services section)	1	1	2	3	2	Registered users	09.30–16.00	Both	1	8–16	3	3	high	none

section)														
Local authority (education department)	1	3	1	1	1	Eligible children	07.30–09.00, 15.00–17.00	Rural	1	4–80	2	3	medium	none
Primary Care Trust (hospital patient transport)	1	1	1	3	1	Eligible patients	09.30–16.00	Both	1	4–12	3	3	Very high	none
Community Transport	1	1	3	2	2	Registered users	09.30–22.00	Rural	1	8–16	3	2	medium	none

Scoring: 1= not important; 2= quite important; 3= very important

What the above table also illustrates (albeit crudely) is the typical markets served by each DRT operator type and the operator times and locations, and the subsidy levels in order to try and determine which service types might complement each other. For example, hospital patient transport services tend to operate between the peaks and have high subsidy requirements, so it might be argued that these patterns might complement commuter trips which are most used during peak periods and have low subsidy requirements. Meanwhile commercial bus services tend to serve a whole range of journey purposes throughout the day from Monday to Saturday, whereas a company call centre may wish to operate an employer shuttle service to and from its site in the evening and on Sundays. This type of mapping exercise is the reasoning behind vehicle brokering, which Davies (2003b) claims saved his (Devon) County Council around 15% in efficiency gains when all its education, social service and dial-a-ride transport services were planned by a single co-ordinating team.

Market analysis

The National Travel Survey (NTS) contains some basic information that, at a national level, shows the sort of journey types and times that are currently fulfilled by bus, taxi/minicabs and other forms of transport. The 1999/2001 NTS recorded that the average annual number of trips per year was 1,019 per person, covering a total of 6,815 miles (this is within the UK and excludes travel to places outside Britain). An average of 407 trips per person are by car driver (covering 3,381 miles) and another 231 by car passenger (covering 1,971 miles). An average of 57 bus trips are made per person per year, covering 245 miles and 12 taxi/minicab trips, covering 61 miles.

With there being so many car trips, if a DRT development won only a small diversion from car driver or passenger, it would result in a proportionately large rise in bus and taxi/minicab demand. A 1% shift from car driver trips would be 5 trips. Were this added to the existing taxi/minicab total it would produce more than a 40% rise in demand. For bus the proportionate increase is less – a 9% increase. These sort of figures indicate what might be expected if a DRT service were introduced that was seriously intended to win car users. Particularly the taxi/minicab figure indicates why taxi operators, although initially resistant to DRT, are often won round by the resultant increase in trade. A more detailed market analysis looking at bus, taxi/minicab and overall demand throughout a day for example, would see the typical sharp morning peak and wider evening peak for all travel. However, for bus the peaks are higher and the drop off in demand towards the evening is more rapid. This shows that by using DRT, off-peak markets could be addressed that would help even out this very ‘peaky’ operating regime. For taxis/minicabs demand is more widely spread with ‘mini-peaks’ are at different times. This is the sort of pattern of demand that might be expected of a DRT service that is able to address wider markets.

Financial performance of DRT

An important part of this research has been to explore the interface between commercial and subsidised DRT services – particularly factors that allow a service to make the transition towards commercial viability. However, this research has indicated a more detailed financial consideration than a simple commercial/subsidised split. There are four key levels of financial performance:

1. **Commercially viable DRT**. These are services that are either profitable, or operate within a commercial context (e.g. temporary losses are accepted as a service is built up or a loss-making service is compensated by its positive financial effects on a service network as a whole).

2. **Acceptable subsidy DRT**. This is where DRT requires only the same (or less) subsidy than other comparable tendered services (a subsidy of £2 per trip or less appears to be the crucial threshold).

3. **Justifiable higher subsidy DRT**. This is where a subsidy above that comparable to tendered services can be justified. This may be due to the operational area (e.g. deep rural areas cost more anyway), that DRT is replacing inherently even more expensive transport, or because it is yielding significant cross-sector benefits.

4. **Financially unsustainable DRT**. These may be demonstration and trial projects or other services whose losses remain very high.

There will be movement between these categories, ideally upwards. Realistically, a DRT service cannot remain in category four beyond a short-term demonstration/set-up project (e.g. two-years funding).

Currently there are very few commercially profitable DRT schemes operating in the UK, and those that do exist (the Black Taxibus in Belfast and Londonderry) developed in a unique operating environment (buses were removed from the streets for a period of time during 'The Troubles') and are not readily transferable. These schemes grew up when local communities were very closely bonded together and so have generated a very loyal customer base. Further, the services are run very much on a shoestring, using very old vehicles. Currently the legal status of these schemes is uncertain.

Otherwise, perhaps the closest scheme to profitability is the newly launched Yellow Taxibus that operates between Dunfermline in Fife and central Edinburgh. However, this is not expected to make a profit for at least two years. Once the set up costs have been taken into account this scheme is also aiming to operate as cheaply as possible. Only the minimum level of technology is involved and the drivers employed are new to the public transport industry – they are non-unionised, with only an ordinary driving licence and not a Passenger Carrying Vehicle licence required.

The next level in terms of 'commercial viability' refers to the low-tech shared taxi schemes, e.g. Lovedean Carshare in Hampshire. Average subsidy per passenger trip here is roughly £1. But, a more rural scheme of a similar type, the Fare Car in Devon costs rather more than that – £10 per trip. Once again the routes operate in relatively compact communities and the technology, staff and vehicle costs are minimal.

Commercial DRT operations are not common anywhere in the developed world, but that is not to say they do not exist. In the USA in particular there are several examples. Again they tend to occupy a market niche where a more customised service is valued, but which can be operated in a low-cost manner (simple systems where manual scheduling is adequate and low-cost labour).

One of the more widespread is the airport shuttle. Airport shuttles were first introduced in 1976 in Los Angeles and in the Bay Area of San Francisco, when SuperShuttle pioneered the market[22]. By 1994 there were 50 operators in the USA and airport shuttles are now a feature of many US airports. The market is one that is well suited to DRT. Airports are often located in isolated areas and, with the exception of serving city centres, conventional public transport systems are not well suited to the diffuse travel patterns of passengers. Arrivals who are not being met by family or friends are therefore faced with a choice of renting a car, taking a taxi or using an airport shuttle. The pricing of shuttles at below taxi fares (but not that much lower), is combined with a market that presents a steady (and predictable) demand without particular peaks.

As noted in the analysis of DRT markets and user preferences, the airport shuttles attract choice users by addressing their 'hire car' needs and are priced accordingly. Surprisingly the airport shuttle industry has

[22] Cervero et al (1995).

not really branched out into other sectors, apart from in Los Angeles where some shuttles to other transportation hubs such as the Catalina Ferry have developed. In their study of the Californian Bay Area shuttles, Cervero *et al.* (1995) noted that there are no real barriers within the legislation framed by the Passenger Stage Code, but economic and other regulatory realities seem to have constrained operators. Commercial shuttles operate under the jurisdiction of the state Public Utilities Commission (PUC), specifically the Passenger Stage Code. In the Bay Area, Passenger Stage Corporations (PSCs) consist primarily of airport shuttles, mostly vans and minibuses carrying up to twelve passengers that ferry customers between airports and other points in the region.

Jitneys too serve specialist niche markets, and show that it is possible to have commercial DRT occupying a more downmarket position than the premium product airport shuttle. A legalised system in Atlantic City serves commuters and visitors in the Downtown with a cheap high-frequency service, which Atlantic City Jitney Association (undated) claims is 'the only non-subsidised, profit making mass transportation system in the U.S.'. Meanwhile illegal jitney networks in New York City and Miami (presumably also profitable), primarily serve the Latino and African American communities.

Care needs to be taken when making comparisons with developing countries, but there are some lessons to be drawn. Again, these tend to be low-tech, low cost, and also low quality vehicle operations serving specific jitney-type market niches in areas of transport under supply. Significantly, car ownership is often low (particularly in poorer areas), public transport regulation tends to be very limited and subsidies for conventional public transport are inadequate or non-existent – meaning that services are correspondingly of low quality and/or fares are relatively high.

Accordingly, the majority of DRT services in developing countries appear to be commercially led enterprises that provide the necessary additional public transport capacity. Typical examples include the marshrutka in Russia, the matatu in Kenya, and the jeepney in the Philippines. A slightly different process was behind the Taxi Collectif system on the Indian Ocean island of Réunion (a French Department). Here the commercial taxi operators found they were losing market share and so approached local councils and requested that they be allowed to run shared taxi services as a way of supplementing their income.

An almost parallel service, on the neighbouring island of Mauritius, emerged differently. Here it was the government that initiated the expansion of the 'taxi-train' network as a way of providing additional public transport capacity. Again though, taxi-train operations are not subsidised by the government, although taxi drivers are given significant tax breaks when buying and registering their vehicles. Instead, taxi drivers carry taxi-train passengers (generally local passengers) when they are unable to take more lucrative individual fares (generally tourists), and so the taxi-train services are effectively cross-subsidised.

It is important to note that commercial viability of DRT should not necessarily equate to the service itself being commercially viable. As noted in the Bicester Taxi-Bus service, a key impact was that the Taxi-Bus resulted in increased revenue for Chiltern's rail services. Thus, because of the positive revenue impact on rail revenues, Chiltern can commercially justify a level of loss on the Taxi-Bus. Equally, the introduction of a loss-making DRT service can cut costs elsewhere on a commercial bus network. For instance, upon the introduction of Corlink, Transport Group First Western National withdrew 20–30 key bus routes that were heavily losing money in Devon and Cornwall and had suffered very negative publicity (Crossfield, 2003).

Recommendation: In all these cases it is important to identify the *network effects* of any new DRT service. The danger is that, with Britain's fragmented bus operations, costs and benefits are likely to fall upon different organisations. This is also true within the public sector, as will be noted in discussing the *justifiable subsidy* category below.

Recommendation: When introducing a DRT scheme it is important to clarify the market it is intended to serve, and to identify the classification of the expected financial performance i.e. whether it is expected to operate commercially, at acceptable subsidy or at a higher justifiable subsidy.

Recommendation: The key lessons of the commercial and near commercial DRT schemes appear to be as follows. Many of these points apply also to other types of DRT, particularly the *acceptable subsidy* category:

Services should be simple to understand. Airport shuttles, such as those in New Zealand, Finland and the USA, act as a taxi when leaving the airport and as a minicab on the return trip. Using a vanpool, as in the King County Vanpool case, is like being given a lift to and from work. Jitneys, the Mauritian taxi-train and the Belfast Black Taxibus essentially operate as a bus does. Technology costs are therefore minimal. The commercial services have low start-up costs, which minimises risk and are geared to the lower staff costs structures found in the taxi and hire car industry. Jitneys, Black Taxibus and taxi-train operations are often owner-drivers or members of co-operatives, and airport shuttle drivers are not normally unionised. Vanpool drivers only collect expenses from their fellow passengers – they would be driving to work anyway.

The use of simple, manual, developments of taxi or hire car systems tend to have an associated low cost base. Like many local taxi operators, the commercial DRT schemes are small with a good 'tacit knowledge' of their customers.

In planning commercial DRT services it should be recognised that they are often a premium product. Most seek a market where they can charge a fare pitched at between those of a bus and a taxi.

Commercial or near-commercial DRT occupies small niche markets. In many cases the DRT service is designed around a market segment that constitutes a distinct community. This can be for positive or negative reasons. The Black Taxibus users in Northern Ireland have supported the service because it took them to work and to the shops when the buses were withdrawn. Particular ethnic groups in New York and Miami use the jitneys because that is the type of service they would use in their native countries. The area served by the Lovedean Carshare scheme is relatively small while the operator is a local taxi form and so the majority of drivers and users know each other.

Commercial or near-commercial DRT needs sufficient and evenly spread demand. Despite tending to be small and occupying a niche market, commercial DRT does need to achieve a minimum critical mass of users. The Belfast Black Taxibuses were created when the bus service was withdrawn due to The Troubles, while airport shuttles are able to thrive because there are often no buses and they are cheaper than taxis. The niche for taxi-train services in Mauritius is there because of the relatively low level of car ownership and the shortage of buses at peak times. Vanpools exist because trip patterns are too diffuse in parts of the USA (see the King County Vanpool case study) to support public transport and because of the high quality in-vehicle environment. It will also vary by the time of day, week or year. Cervero (1997) points out the importance of current market distortions in restricting the growth of DRT, through subsidies for conventional buses and on car parking provision, for example. If any of these criteria is not met, then one or more secondary functions is needed, be it as a conventional taxi, schools, health or social services contractor or conventional bus service.

DRT and market position

The exploration of commercial DRT indicates a number of lessons for the expansion of DRT in the UK. The majority of UK DRT schemes are nowhere near commercial viability. A few are within the *acceptable subsidy* category while most are really in the high subsidy demonstration project stage, but may be seeking to maintain a justifiably higher subsidy. This raises an important issue. The distinction between the last two categories is not clear. What constitutes a *justifiable subsidy* may depend on what the alternative public costs may be or whether a financial arrangement can be put into place to recognise a cross-sector benefit. For example, money from a local authority's education budget might part-subsidise a DRT service or purchase student passes instead. This is a rather grey area and further clarity in justifying DRT funding beyond an initial demonstration project is needed.

Many current DRT schemes in the UK operate at passenger subsidies ranging from less than £1 to around £10, and some have far higher per trip subsidy costs, e.g. Corlink in Plymouth and Cornwall, where subsidy per passenger trip is closer to £30. The majority of these schemes feature high quality state-of-the-art minibus vehicles and new and relatively complex call centre and routeing/scheduling equipment and software. Is there any likelihood that such subsidies could fall to an *acceptable subsidy* level (around £2 per passenger trip), or even achieve commercial viability?

Firstly, may costs fall? As with many new technologies, it appears that as DRT develops then the costs will fall as technology becomes more affordable and savings are made from the consolidation of call

centres. The proliferation of demonstration projects with high start up costs and under-utilised IT infrastructure could give (and has already given) way to more cost-effective systems. There is evidence that costs have been cut as schemes mature. In three years the Wigglybus cut the subsidy per trip from £7 to £4, but the potential for reduction seems to be lessening and £3.50 is now the aim. The radical replacement Rimouski TAXIBUS initially cost £2.32 a trip and is now down to £1.94.

In the USA context, Round and Cervero (1996) noted an important issue. This was that some DRT modes, e.g. jitneys and shared-taxis, cost 20–70% less per rider than bus, due mainly to lower-priced labour, but also because of high productivity in terms of high average loads and rapid seat turnover. He also notes that other pre-arranged services, like employer-sponsored vanpools economise on costs through free labour – specifically spreading driving chores among co-workers.

The issue of labour costs may be different in the UK to USA, but is a relevant issue with potential political sensitivities. The productivity benefit is one that may not initially be achieved, but would come over time as operational experience mounts.

In the UK, some of the best practice schemes look like they could deliver a cost per passenger trip close to the *acceptable subsidy* level of £2 per passenger trip, but this does require very good operating conditions and good market conditions. In other words, some DRT schemes in the UK might well hit the £2 target, but this should not be expected of all.

Costs are one part of whether DRT has the potential to achieve either *commercial viability* or an *acceptable subsidy* level. The other key factor is, of course, revenue. Behind this is a major issue of the market position of DRT services. With some notable exceptions (like the Jitney), many of the commercial or low-subsidy DRT are premium products. They seek to deliver a near-taxi level of service for fares that are closer to taxi fares than bus fares. Commercial DRT addresses upmarket niches – such as air travellers or long distance, middle class rail commuters. This is a point that Round and Cervero (1996) make, noting that DRT subscription bus pools can be costly due to amenities like comfortable padded sears and air-conditioning, but full costs are recovered because customers are prepared to pay for premium quality.

These are not the markets that public policy DRT schemes have so far sought to serve. Instead, they have aimed at a totally different market position that reflects a social inclusion agenda. Thus fares are usually comparable to that of bus services, and in some cases considerably lower. This social inclusion basis of the design of the DRT product is reinforced by the fact that, in the UK, general public DRT has drawn upon established experience of dial-a-ride for people with disabilities. The systems that have been developed to support dial-a-ride have (understandably) been rooted in a social inclusion ethos.

For many DRT schemes, the continuing need for subsidy focuses upon a longstanding rationale for DRT services. This is that, on a per trip basis, DRT is still often far cheaper for public authorities to provide than conventional specialist health, education, or social service transport services. This is the *justifiable higher subsidy* rationale. DRT may be expensive (£5–10 per trip), but for the markets it serves it is cheaper than the alternatives (for example, non-emergency ambulances or taxis at £10–20 per trip). This is how DRT became established as a public transport service for people with disabilities – dial-a-ride and ring-and-ride.

This rationale has now developed, as noted in many of the cases examined, to where a public DRT service is more cost effective than running a set of parallel services for people with disabilities, non-emergency ambulances, social services and schools transport. If (as in the case of many US and mainland European towns and cities) the ordinary bus service also needs heavy subsidy, then rolling the whole lot into a single DRT service can both improve the quality of the service to users, increase utilisation of resources and cut costs. The larger service will certainly need call and control centres, probably with computer scheduling, but in most cases these exist anyway (and are frequently duplicated and under utilised). The big issue here for the UK is one of cost and revenue allocation among a network of providers and institutional users. Schools transport alone costs £700m a year for just 10–15% of school trips (Duffell, 2003). This could be incorporated into DRT and other bus developments, which would arguably create a greater transport impact than the current plans to expand an institutionally separate schools transport service.

In mainland Europe and the USA, with city authorities being the end funders, the issue of cost and revenue allocation seems to be of less concern. In the UK, with each branch of the public sector having its

own budget and increasingly being required to act in a market way, such simplifications are not possible. Thus cost and revenue allocation software is needed along side the vehicle management and trip allocation systems.

Perhaps there needs to be recognition that social inclusion-led DRT services will inevitably require higher long term subsidy than normal supported bus services. Such DRT services will not only need start up funding, but a high permanent revenue subsidy as well. In some countries, particularly the USA, the need for continuing subsidy has led to new financial arrangements, such as local hypothecated taxes and charges, rather than a dependence on traditional central government grants. An expansion of social inclusion-led DRT services in the UK could well require different funding structures to those that are currently in place, but would only be of significance if they were additional to the funding already provided by government to local authorities and PTEs.

Recommendation: Although some bus fare-type DRT services have achieved a subsidy level of around £2 per passenger, these tend to be the simple, small low-cost shared taxi arrangements (like in the Lovedean Carshare case). For the more costly DRT bus with supporting call centres etc., it may be unrealistic to expect much better than a £3.50–4.00 subsidy cost per passenger trip if passengers are to pay fares on a par with conventional bus fares. This is roughly double the *acceptable subsidy* level, and so an additional rationale is needed for this further public funding. This observation raises the issue of fares. There does appear to be a lack of clarity in the fares policies of DRT services and a serious long term problem of getting subsidies down to a politically-fundable level (even if financial reforms do provide new sources of subsidy). This issue was raised by participants at the Intermode project's Bristol seminar. The view expressed was that DRT is targeted at the wrong sector – a legacy of a culture from dial-a-ride background, with pricing far too low for what is a premium product. DRT needs to identify stronger markets for DRT rather than the captive user one that is central at the moment.

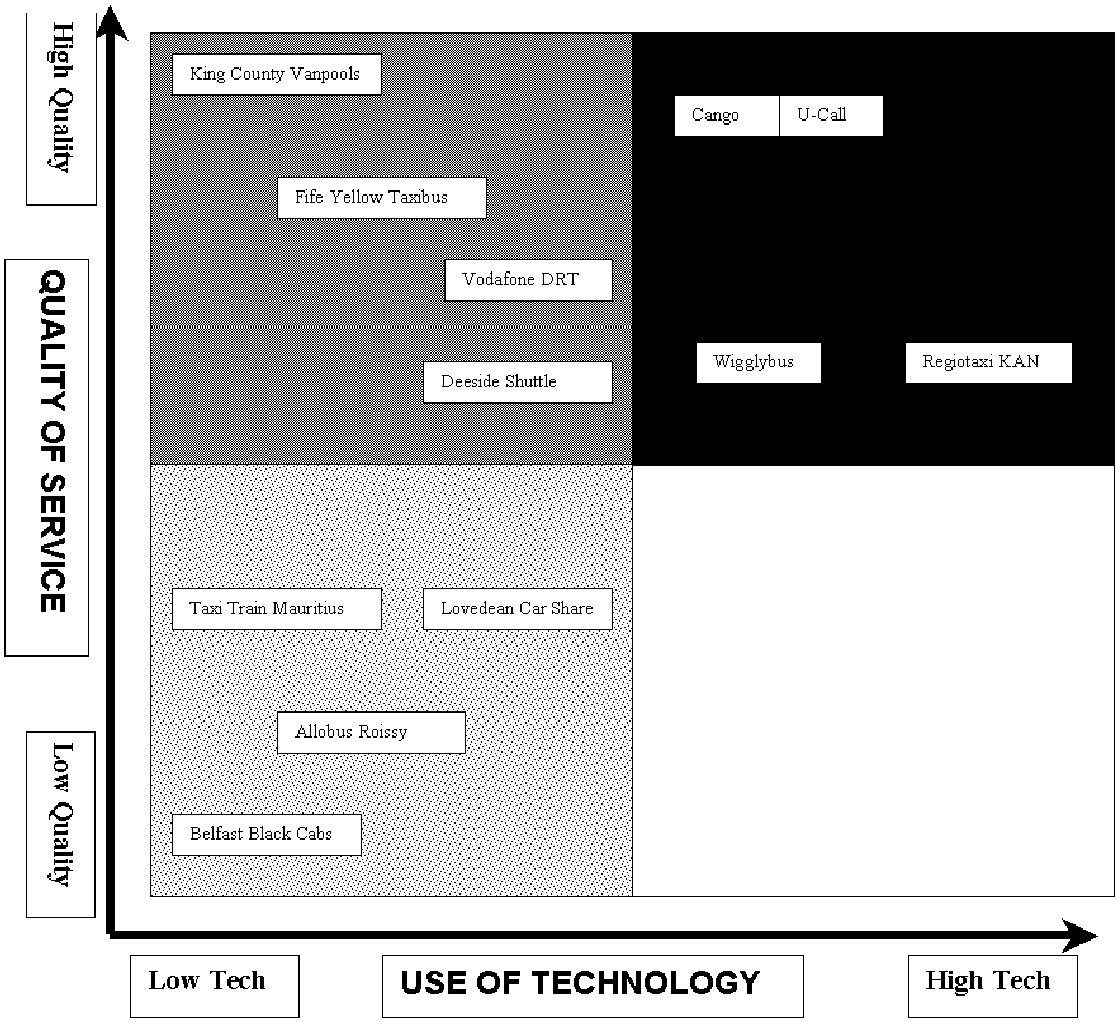
Such arguments raise a number of possibilities. One key issue to explore is whether the service as a whole needs to be designed for low fares or whether social inclusion measures are built in to reduce fares for *particular users* of the service. To move beyond the *acceptable subsidy* could be achieved by more targeted support. For example, it would be possible to have a DRT service that has premium fares for the premium service it is, but with clear concessionary fares targeted upon social inclusion groups. This would make funding for social inclusion more transparent, while increasing fare yield from groups willing to pay. Overall it would enhance the financial viability of DRT and could crucially lower the average subsidy of well designed UK schemes to the approximate level for conventional bus services, providing those beneficiaries actually pay for those cost reductions arising from DRT – not an easy issue to address.

Recommendation: In the UK context, the mechanism for delivering *justifiable subsidy* may need to be different than the rather blunt general subsidy used for DRT in other countries. A funding partnership based upon paying for client groups may be appropriate. For example, NHS Trusts might be persuaded to contribute to DRT services that reduce the number of missed appointments or a school might pay for improved attendance[23]. Even in the USA context, Round and Cervero (1996) argue that user-side subsidies would be a more efficient way to address social inclusion issues.

In summary, the key points relating to market niche can be illustrated by the following two figures. The first of these plots a range of the DRT cases studied according to their levels of quality of service and use of technology.

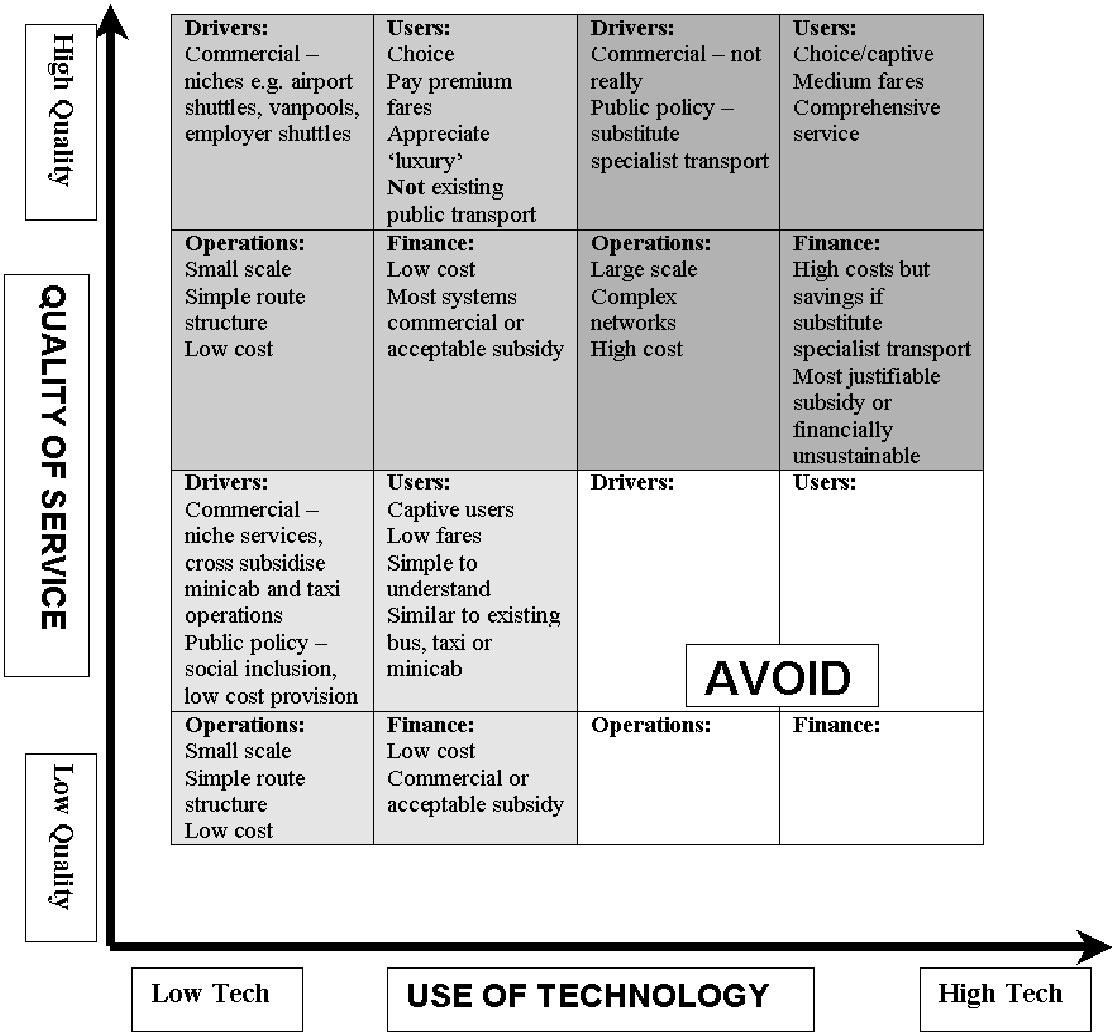
[23] It should be noted that informal agreements have been known to break down with no recourse available for recovering any outstanding costs. Securing a legal agreement perhaps akin to a Section 106 planning agreement may be one way of ensuring that this does not happen.

Figure 4.1: DRT schemes by Quality and Technology Levels



From this, the following generalisations regarding the market positions can be mapped (see Figure 4.2).

Figure 4.2: Market positions for DRT



What this figure does not show is that the majority of schemes in the two low tech boxes tend to be classified as being commercially viable or acceptable subsidy DRT, with premium fares meeting the extra cost involved in providing the higher quality services. Meanwhile the high tech schemes tend to be those that are justifiable higher subsidy DRT (thanks to efficiencies gained from substituting expensive to provide specialist transport services) or financially unsustainable. Interestingly, all four types of scheme (interchange, network, etc.) can be low tech, but this especially applies to interchange and destination-specific DRT. For network and substitution DRT the scale and complexity of schemes tend to increase the usefulness of higher-tech options.

Recommendation: There appear to be three general market niches where DRT can be seen to fit. First, low-tech, low-quality, small-scale simple DRT systems can be applied in areas where captive users are happy to use any form of public transport but are only willing (or able) to pay low fares. Second, there are niches (e.g. employer shuttles, airport shuttles) where commercial operators can target choice users who appreciate luxury and are prepared to pay a premium for a service that is as far away from a bus or a minicab as possible with small–scale, simple to operate systems. Finally, large-scale, complex network DRT systems require high tech equipment if they are to operate efficiently. As a result they will be relatively expensive to operate. However, providing that savings can be made (usually by substituting them for even more expensive specialist transport trips) there is scope for these services to be cost effective – assuming the benefiting bodies actually pay for those benefits. It is also advisable that services should be of high quality and that fares be raised above those of a comparable bus service as it will be important to attract a proportion of choice users.

Overall the composite cases have provided a wealth of detailed information and insights into the potential for DRT services in the UK. They have also raised a number of key planning, financial and operational

issues. These will be developed in Chapters 5 and 6, which will pull together these and other issues and put forward recommendations for DRT development from the viewpoints of operators and local authorities and of national government.

Chapter 5 – Marketing and Operating DRT

An in-depth analysis of a range of potential DRT market niches was presented in the previous two chapters. The purpose of this chapter is to draw further on the case study data used in that analysis, to make recommendations as to how transport operators and local authorities might best implement DRT to serve those niches as effectively as possible. Accordingly, the chapter will first examine how these market niches should be exploited, i.e. how DRT should be marketed to the user. It will then look at the resulting operational issues.

Marketing public transport

In the public transport field, marketing is concerned with the selling of public transport services or journeys (AMA *et al.*, 1994). This can be achieved by service design, promotion, branding, signage and information. However, it would seem that most bus and taxi company managers to not see such aspects as worthy of much attention. Historically, both public transport companies and local authorities have proved to be very poor at marketing. Unfortunately, while things are slowly improving thanks to the major groups investing in new bus marketing teams, progress thus far has been slow.

The reason for this has long been blamed on the peculiarities of public transport operations – in particular because transport is a 'derived demand', services have a largely 'captive' market and because as a product travel is 'instantly perishable'. It is also often claimed that as passengers will catch the first service (which may be old and dirty), it would be a waste of time and commercially disadvantageous to invest in a newer, cleaner vehicle or in training drivers to be more courteous. While some such factors may create particular difficulties, they cannot really justify poor quality public transport services. This is because the success of companies such as Trent and Barton Buses and Brighton and Hove Bus and Coach Company has proved that where even some marketing lessons are applied, significant improvements in service quality – and in passenger numbers and revenue – have all occurred. Unfortunately, such examples of promotion, branding, information and service simplifications have been the exception rather than the rule.

The more successful schemes have countered this criticism through extensive pre-service introduction publicity campaigns, often accomplished through extensive leafleting to individual houses in towns and villages (Blackett and Jackson, 2003; Cross, 2003). Typically, elderly people are the first to respond to new transport systems such as DRT, and 'word of mouth' recommendations from early adopters is very important, as this creates a climate of credibility which leads to 'clusters' of users, who then recommend the service to their acquaintances. Very few schemes have been targeted specifically at younger people, particularly children. Devon County Council initially used the Farecar DRT to give the public access to rail-heads but they have been surprised at the number of young people using the service, especially at the weekend (Davies, 2003). It can prove to be a slow process to build up services, which often increase steadily over the initial period of operation, and then ridership reaches a plateau (Cross, 2003).

Kevill (2000) suggests that bus companies tend to operate within a public service/local government culture, and are almost run along military lines – being very hierarchical, and with staff strictly controlled and not really trusted. Most onboard information is about what passengers are not permitted to do and the punishments if they do it. This is summed up as an 'if you're 10p short, you're dead' type of attitude. He also detects a 'bus spotter' mentality, with bus managers more fixated with the operational kit than the customer – i.e. bus operators tend to be product rather than market driven. Overall, he feels the industry sees the customer as a nuisance. Kevill finds that the term 'marketing' is widely misunderstood, and taken to mean advertising and promotion rather than the whole concept of providing goods or services to meet consumer needs. Finally, the basic failing of the bus product is that it 'doesn't do what it says on the tin'. Put simply, the main problem is that the product doesn't work properly.

It can be enlightening to use a classic marketing approach used universally in business and explore its consequences for bus (and by extension DRT) services. This is the 'marketing mix', which is divided into four parts or the four 'P's: product, price, place, and promotion. To that can be added a fifth 'P' – people.

The product

The DRT product is the service that delivers people from where they are to where they want to go. It is not merely a journey or a transaction. Ideally, public transport needs to be as simple to use as possible, and that means removing as many barriers as can be that currently dissuade people from using it. One key factor behind good practice DRT operations is that they have a good idea of what their customers want – i.e. they research their market. And they continue to carry out research exercises to see if and why the service offered has worked or not.

In the bus sector, before implementing its Gold Service routes, First Aberdeen found that the key factors that customers wanted were reliable services, quality vehicles, and quality staff, at affordable prices (Mair, 1998). Trent and Barton Buses is another bus company that frequently asks its passengers what they want through independent market research exercises, and aims to achieve this through a stringent quality control regime backed up by a Customer Charter that includes a 'money back for any reason' guarantee (BIA, 1999).

The research demonstrated that there has been relatively little market research conducted for DRT operations. This is partly because in planning DRT operations, there is a perception that there is very little experience to draw on, meaning that it is very difficult to determine realistic cost and patronage estimates. For instance, the bid that Northamptonshire County Council submitted to the Rural Bus Challenge (Corby DRT) was based on costs estimated from other Community Transport operations, and so proved to be inaccurate. The funding therefore did not fit the original model, and had to be revised to match the operational needs (Drummond *et al.*, 2003). A second reason is that the bidding process for Challenge funds does not allow any time or encourage any resources to be spent on researching where the most appropriate places were for implementing DRT schemes (Usher, 2003; Howcroft, 2003). One example of where market research may have helped is the Corlink project serving Plymouth and south-east Cornwall. Here the scheme was designed to be used by commuters who would board the DRT in the villages and then interchange onto a rail service into the city. In practice though, monitoring has revealed that the service is mostly used by elderly people for social trips, and that the 'target market' has actually never used the service!

The main barrier identified, therefore, is that it is extremely difficult to conduct such market research due to the novelty of the concept being tested and to the nature of public transport generally. This is because when asked if they would ever use a service, the majority of respondents would probably say that they would (and may even believe it). In reality though, the majority never would. Nevertheless, even a basic understanding of the area and individuals living there and thus the needs of an area may well help to avoid the Corlink scenario re-occurring.

A further lesson from the bus industry is that a major point to bear in mind is that key factors that satisfy existing users are different from those that attract the car use. Typically, regular passengers say they want cheaper fares for riding on buses, while those who bus operators want to attract onto their services generally put reliability and effective frequency to the top of the list (Kevill, 2000; TAS Partnership, 1998). Work by Steer Davies Gleave for Transport 2000 identified five key barriers preventing motorists using buses: inadequate networks, a lack of information, longer journey time, access difficulties, and general concerns that public transport is unusable (SDG, 1997). A DRT operator that majors on the things that existing users value would miss out on these additional factors that would be needed to effect modal shift.

According to Mark Fowles of Nottingham City Transport (Fowles, 1998), 'Effective marketing is about defining needs, wants, desires and barriers, and about targeting the market'. The public transport industry has become entrenched in the 'if we provide a service people will use it' attitude. Public transport services are no different to any other product: they must be sold by the most appropriate means. Effective marketing is about giving comfort and allaying the fears a new customer may have of the service. He emphasises that to the non-user even the most basic aspects of the system can appear as a barrier.

In summary, there are no methods to predict demand while market research has proved deceptive. It is therefore very important that schemes should be designed to be flexible – i.e. they should be able to be adjusted easily to better serve the actual rather than the predicted market.

Defining the product

In defining the DRT product, operators have a major problem in that the term can be taken to mean a large number of different things e.g. a whole range of combinations of different schedule and route flexibility types (see Chapter 1). Worse, most transport planners and operators still do not understand what DRT is and does, never mind politicians or the general public. There is therefore much work to be done in trying to come up with a name or names that can be applied to DRT and/or specific types of DRT. But, there is far more meant when 'defining the product' than coming up with a name. To satisfy both existing customers and growing by modal shift requires:

- a pleasant waiting environment
- good reliability
- an easy to understand network
- an easy to understand ticketing structure
- easily accessible vehicles to those with heavy shopping, prams and pushchairs, and wheelchairs
- a direct service with easy interchange
- a frequent service
- good value for money
- friendly and helpful staff
- comfortable, clean, well heated and ventilated vehicles.

While many of the above criteria are self-evident (though not always to public transport managers it would seem), others are worthy of further comment. These particularly apply to the 'modal shifter' factors.

Reliability

Like all public transport, reliability for DRT operations is the top concern of the majority of users. Compared with buses though, DRT faces two disadvantages. First, DRT is more complicated than a bus, with many more links in the chain where things could go wrong. For instance, a bus service has two key components – the driver and vehicle – which might fail, whereas DRT has the driver and vehicle plus a call centre and routeing software – twice as many technical and human interfaces where mistakes can be made or things may not work properly. Second, because DRT is new, people have no expectations on delays or reliability, and so expect the service to turn up. If it does not, they will likely abandon it far quicker than they would a bus, because people are already expecting a bus to be late. 'Passengers need extra reassurance where DRT services are operated' (Crossfield, 2003).

Good practice in this respect is often offered through the concept of a 'guaranteed ride home'. For the case of the Worcester FlexiLink scheme, Radbourne (2003) notes 'there is access to a taxi company in the event of a bus not picking up passengers, for which the bus operator has to pay'. Similarly the Cango scheme in Hampshire 'takes responsibility for the trip as soon as it is booked' and so if the bus fails to arrive then a minicab or taxi will cover the journey. This is done as soon as possible, with the responsible party (be it the operator or the council-run call centre) paying out for the minicab. Crucial here is the close relationship between the call centre, the operator and the drivers (Armstrong, 2003).

An easy to understand network

One particular area of concern, especially since the 'deregulation' and privatisation of the bus industry in the 1980s, has been the lack of good quality passenger information – i.e. an easy to understand network. Passenger information is not promotion – it is a part of the product. On most other products, such basic information explaining how it should be used would appear as instructions. If people are to use public transport, they need to be able to obtain and understand information on what journeys or routes are available, where and when services are operated, and where and how they pay to use it.

In the provision of bus services, this is often not the case. Instead, bus operators typically say that, as 80% of their passengers are regular users and know the information they need, any extra information would not really be worth providing. There are two reasons why this is worrying. Firstly, the 80% figure typically refers to passengers *on any given bus load*. This means that the 20% of passengers who are not regular passengers *change each bus load*. The actual number of infrequent users is high, but they do not use buses much. Indeed, there could easily be more irregular users over the course of a week or so than regular users. The irregular fringe user, who is the crucial target group for growth, is thus disadvantaged.

Not surprisingly given the novel nature of DRT, the lack of user understanding appears to be a common problem (Blackett and Jackson, 2003; Armstrong, 2003). In nearly all cases there are issues about passengers needing to learn how to use DRT. This particularly applies to systems requiring registration and use of user ID numbers to speed up booking, as well as others where the users are expected to adjust to the operational needs of the new service. This is particularly noticeable in the USA.

Good information cannot, of course, compensate for bad network design. Networks need to be understandable, with simple routes, simple timetables, and simple fares. They should also be consistent. To do this, from planning to arrival, people need to be helped to consider DRT, helped to plan in advance and helped at the stop. Essentially, information everywhere should be available, informative, comprehensible, attractive and up-to-date (Smith, 1998).

Simplifying the product

Of course many of these criteria are strongly linked. Simplifying the service for example, tends to make it easier to understand, while passenger information becomes less complicated. This is especially important for a new type of service such as DRT where there is a very low level of public knowledge about the product and where many of the schemes are actually more complicated due to the need for pre-booking and/or the potential variation in route and/or timetable.

In terms of simplifying the DRT product, services in developing countries lead the way. Jitneys offer a turn-up-and-go combined with hail-and-ride elements and fares are generally fixed. Similarly the Mauritian taxi-train service operates much as a bus would, with the same fare along the same route (although with no regular timetable and with passengers able to hail-and-ride at other points en route). Most high-tech systems on the other hand, tend to require users to phone up and negotiate a pick up at a particular time and at some checkpoint that may or may not be immediately obvious. The route too may not be particularly clear, particularly if deviations are permitted. Further, where services perform a range of different functions (serving rail stations, schools traffic, shoppers and social for example), perhaps in different areas on different days or at different times of day as is desirable from a financial justification perspective, then it is understandable that potential users may be confused.

Clearly, as Peter Huntley of consultant The TAS Partnership points out (LTT, 1997), 'If you make the system simple and easy to use, run often enough to just 'turn up' for, and maintain stability, you don't need publicity.' 'Car users are not interested in local authority 'telephone books' listing every obscure and little bus service,' he continues. 'Get the product right – simple, regular, direct, stable – and you can forget about publicity.' Huntley cites Manchester Metrolink as the most successful example of public transport attracting car users despite very little service information. However, for bus services (and perhaps even more so for DRT services) his contention may be overly optimistic. But it is certainly true that the simpler the service, the less taxing the information requirements (and vice versa!). For example, if a high frequency service (ten minutes or less) could be operated throughout the day, probably the only information required would be details of the route and fares, the time of the first and last bus, and the time interval between each bus.

Concentrating resources and serving the core market

Morgan (1995) notes that 'any successful volume business will tell you that to succeed in a competitive world you must identify your market and design your product to meet or exceed the requirements of your customers. You will also be told never to compromise your product by trying to appeal to marginal or fringe markets. Leave niche markets to those best geared up to serve them – you concentrate on your core market – dilute your product at your certain peril.' He continues that the bus industry had tended to follow the opposite approach – whereby the operator tries to offend as few people as possible. Thus, a few vocal opponents would render any changes redundant – hence the importance of market research in finding out what the silent majority wants. Therefore, 'where operators have re-designed their products to meet the specific requirements of the core market – the majority – organic growth has resulted. If we make our services attractive to the vast majority, demand will increase and we need not worry about marginal demand – our future depends on the core.'

Interestingly, for DRT it is often the case that the 'core market' may actually refer to a whole number of different markets as defined in the conventional sense. Thus, the core market at 8 am might be commuters or schoolchildren, while at 11 am it may be shoppers and at 11 pm it could be passengers going home from the pub. Indeed, in the case of the Cango hospital service in Havant, the core user base is just too small and specialised to support the service.

Branding

Branding works at a number of levels and is now a key element in the success of almost any business. Indeed for many companies the value of the brand exceeds that of their tangible assets. At a company level, branding is used to bond users with their products – witness Levi Jeans, Coca-Cola, and indeed car manufacturers. People identify these products as part of their personality, and companies devote considerable time, resources and money to developing and defending successful branding.

Bus companies simply cannot use, as yet, branding at this level, but the tactical use of branding at the service level can yield valuable results. One visible sign of concentrating resources and of simplifying the service to make them easier for the public to understand is to 'brand' particular routes. In practice, this has not often occurred due to operational flexibility requirements – using buses of the same colour makes it easier to replace vehicles should they need repairing, and to park in the depot.

In other cases, the application of branding meanwhile has not been fully understood, and any positive message has been lost. Kevill (2000) noted that in Sheffield, buses of South Yorkshire Transport were painted red and yellow to become 'Mainline' – where frequencies of ten minutes were guaranteed. But, for some reason eventually all SYT buses were branded as 'Mainline', despite several routes not running at 10-minute frequencies, rather diminishing the brand. Also in Sheffield, some buses were branded to specific routes using vinyl strips down the side of the bus to explain which stops they served. Unfortunately, these were not always parked correctly at the depot, meaning that unbranded buses were sometimes used on branded routes (not ideal), or route branded buses were used on unbranded routes (extremely confusing for the passenger) (Kevill, 2000).

Where buses have been route branded though, especially as part of a whole package involving making routes easier to understand, results have been impressive. For example, TAS Partnership (2000) reported that Brighton and Hove Bus and Coach Company achieved growth of 8% a year on its five core branded 'Metro' routes, and the FirstGlasgow Overland network gained 4% more passengers a year (after a long period of decline).

For DRT, while nationally the concept may only be understood by a small minority, there are schemes with high recognition at a local level. Perhaps the highest profile scheme is Cango in Hampshire. Here the vehicles and infrastructure are branded in bright yellow making them hard to miss. Armstrong (2003) notes that the same brand is now being rolled out across the county with the result that more and more people recognise the service from elsewhere, making it slightly easier to sell. InterConnect too is a successful brand concept that has been rolled out county-wide with positive results (Cross, 2003).

Frequency and hours of operation

With 'on-demand' schemes, that is flexible timetabled services, the opportunity to travel is theoretically available at any time and so the concept of frequency as a measure of service quality is effectively redundant. For DRT schemes with variable routes and fixed schedules then the frequency of a service would affect patronage in a similar way to how it would on a conventional bus service. Ditto for hours of operation.

Of great importance here in areas of low public transport demand, is the idea of *opportunity* to travel rather than the actual *supply* of travel. Providing people with a high level of opportunity to travel but only actually supplying that travel some of the time is obviously extremely beneficial to the user and far more efficient and cost effective for the supplier – a win-win situation for both parties. In this case therefore, vehicle/seat *availability* is a key concern. In small vehicles (as often used in DRT operation) the low seating capacity of the vehicle becomes a significant constraint, especially where there may be peaks in demand. Other pressures affecting availability include vehicle and driver reliability.

Comfort and image

Regarding the interior design of vehicles, fully accessible vehicles are required to be used today, but there is an issue that if the services are to win patronage from cars and taxis, they need to offer a taxi level of comfort. This is a lesson taken on board by the Yellow Taxibus scheme in Scotland, where Stagecoach operates luxury vans and makes no direct link to the service being connected to the bus operator anywhere in the marketing material or on the vehicles (Bunting, 2003). Ideally therefore, DRT needs to get away from having a bus type image and especially away from the institutionalised feel of the ring-a-ride/social service operations (from which DRT is often a descendent). This feeling also applied to the specialist users themselves, many of whom do not like using specialist transport as it is so institutionalised and marks them out as being needy or different (Vane, 2003a).

There is also the off-vehicle comfort issue. With DRT, it could be argued that waiting at home is far more pleasant for the user than waiting at a bus stop. However, door-to-door services are not now the norm, and a number of DRT systems have local 'pickup' or 'checkpoints' rather than operating door-to-door. Therefore waiting places are still of relevance, and a bus stop should offer a shelter, a seat, or at least the reassurance of a clearly marked pole to provide a feeling of some certainty that the bus is supposed to arrive. Waiting at a possibly poorly defined checkpoint where a DRT does not always pass without a seat or any shelter in a UK environment is not the image a public transport mode ought to be issuing.

Booking quality issues

One quality issue that is not faced by conventional bus services is to do with the booking system. Simply, the booking system needs to be as intuitive as possible, particularly if modal shift from car use is an objective. Ideally it should be modelled on systems that car users (and also public transport users) would be familiar with, in particular booking taxis by telephone. The main tension here is between the operator's ideal to have as much advance notice of the proposed journey, and the user's preference for minimal planning ahead. Until relatively recently, technological limitations meant that in most cases trips would have to be booked at least a day in advance. Now though, schemes such as the Yellow Taxibus in Scotland can be booked as little as 5 minutes beforehand (if a vehicle is available at the time) (Bunting, 2003), while many other schemes have a cut off of 30 minutes, which is not too far removed from the level of service offered by PHVs and taxis.

Many dial-a-ride schemes for the elderly and mobility impaired needed booking well in advance, sometimes several days before a trip. However, this constraint is actually very off-putting for a significant proportion of this user group because many elderly people only want to make a trip firstly 'if they feel up to it' from a personal health perspective, and secondly if the weather is agreeable. In the DART case for example, Dufrene and Sheik (2003) suggest that use is drastically reduced in cold and wet weather. For instance, in April 2003, which was wet, there were 51 users a day compared with 60 usually. The importance of this feature is also illustrated by Wigglybus, where half of the Wiltshire scheme's users book on the day (Duffell, 2003). Meanwhile young people also tend to find it very inconvenient to plan trips in advance. Fixed preplanning is just not part of a modern youth lifestyle.

An important point to add here is to do with the issue of arrival periods or 'windows'. For example, in the DART case, users can expect the bus to turn up at any time within a 15-minute period (although this policy is under review). While this may not pose too much of a problem if the pick up was at someone's home (UK patient transport services routinely state they will arrive 'sometime on a particular afternoon' which is thought of as acceptable), in the DART situation the user is expected to wait at a checkpoint – usually an interchange. Moreover, unlike at many bus stops, DRT stops do not often feature any form of weather protection (perhaps not too much of a problem in California but certainly not attractive in the UK climate).

A related element concerns how quickly and accurately calls are answered. Obviously passengers do not like to be kept waiting for very long, and once they are able to book a journey then that journey must be properly entered in the system. Buchan (2003) notes that problems delivering this apparently simple requirement resulted in a dramatic loss of confidence in the Wigglybus system, which in turn was translated into a significant loss of riders.

On taking a call, the information required by the operator includes pick up points, destination, time of trip and connections with other modes of travel. From an operator's perspective, it is far easier and less time consuming (and therefore cheaper) if much of this required information is known beforehand and the user merely needs to suggest a number and state the nature of the next trip they want to make. But, such membership schemes should be designed in a way that encourages people to join through incentives and should not be a pre-requisite for anyone using the system.

Travel club/membership

The issue of DRT schemes being available for members only is important. Currently, many DRT schemes are run as travel clubs with registered members, often as a result of their history as dial-a-ride or community transport operations. Others are a general public transport service with no membership requirement.

Travel clubs are usually very good for operators because they generate a loyal clientele and an accessible marketing base – both extremely important. But they can exclude potential new and occasional users who for various reasons do not wish to join such an organisation. A solution to this may be to establish a travel club while allowing non-members to use the service. Such a club would need to offer some kind of incentive to encourage people to join, such as a number of free tickets (Cango in Hampshire offers six free tickets to new members – Armstrong, 2003), or a fare discount (as Wigglybus travel club members receive – Buchan, 2003). Such schemes would also need to be careful not to project an exclusive image that many of the dial-a-ride and CT schemes do, that may put off potential users. 'People are very good at discounting themselves from using certain services' (Armstrong, 2003).

Overall, DRT in many cases is a new product, and a complicated message to sell on many levels. Politicians need to be educated or they will expect too much. In particular politicians assume DRT is generally a cheaper option than a conventional bus service but this is not necessarily true. Indeed, there is a fear that there is such political weight behind DRT schemes that DRT schemes will tend to continue beyond their initially funded period and resources will be pulled in from elsewhere if need be – i.e. there is a real possibility that conventional bus services will be cut to maintain the higher profile DRT experiments.

Pricing

Pricing is another area where the bus and taxi industries have not tended to be marketing oriented. Instead of charging what the market will bear, as in other sectors such as in the retail, airline or railway industry, pricing has traditionally been based on mileage travelled. This has frequently led to ridiculous cases such as one in Milton Keynes. Here, four years ago it was possible to travel from Central Milton Keynes to the town of Bletchley in around 20 minutes for 80p. But, if another bus were taken that travelled around several estates the journey would take twice the time and cost £1.35. Thus, passengers were paying nearly twice as much to sit on a bus that took twice as long to complete the journey – and this type of example is not uncommon.

There is also a misconception that customers are fixated on price. The issue is more one of value for money – 'the price is too much for the service we get', rather than the actual fare being too expensive. It is also interesting to note that in other sectors such as telephones, electricity, gas etc., those with no choice pay far more (through payphones and meters) per unit than better off people. This sort of market segmentation is virtually unknown in the bus industry, although from a marketing point of view it may make more sense to offer special discounts to those who would otherwise use the car.

With DRT there is a strong argument for charging a premium as generally the product offers a higher quality service than a bus. In most UK cases though, this has not happened and most DRT schemes charge the same fares as buses. This is partly because of the social inclusion objectives that have often driven the schemes that are operational, but also because of a lack of understanding about how to price bus services more generally.

There are exceptions. The commercially driven Yellow Taxibus is priced at a level between the Dunfermline to Edinburgh coach fare and an averaged marginal cost of driving a car into the Scottish capital (i.e. fuel, parking and bridge toll) (Bunting, 2003). Similarly, the Bicester Taxi-Bus is priced to be less than the cost of fuel plus parking at the station and less than a taxi fare. Airport shuttles throughout the world are able to operate commercially by pitching fares between coach and taxi fares.

Apart from (but strongly related to) pricing, in the UK context a second problem is the markets typically targeted by DRT services. DRT has been developed to serve market niches where only the poorest are likely to use it, but because the poor are also the most price sensitive, there is very little prospect of such services achieving an acceptable level of subsidy (i.e. comparable to bus). Worse, the type of DRT being used is often the most complex and high-tech (and high cost), complete with new buses, call centre, routeing software, etc. – a legacy of the Challenge funding requirement for 'innovative' schemes.

There are three approaches to addressing this funding gap. One way is to provide low-tech minicab or taxi-based DRT schemes, e.g. as in the Lovedean Carshare scheme in Hampshire (Smale, 2003). Here, subsidy costs of roughly £1 per passenger trip are well within acceptable council subsidy limits, fares are comparable to those on buses and the service is well liked by its users. The second is to target better off people – the choice users – for journeys where a high quality DRT service would provide a viable alternative to the car in terms of cost, time and comfort, e.g. airport shuttles, employer shuttles, dedicated feeders to stations. The third is to recognise that DRT is more expensive to subsidise than a conventional bus, but is far cheaper to provide than specialist social service, education or patient transport services – savings can be more than £10 per trip (assuming the fixed costs of providing these services are cut as a result). Thus, the conventional public transport trips could effectively be cross-subsidised by the specialist trips. Several schemes such as Cango and Regiotaxi KAN already follow this approach. The main barriers to this occurring elsewhere are institutional. Duffell (2003) notes that substitution services are very difficult to price properly, whereas feeder and/or destination-specific services are easier.

Bluntly, captive riders tend to be used to buses, taxis and PHVs and so the concept of sharing taxis (especially with people from the same neighbourhood) is quite often acceptable. Captive users may also be happier using a system which they already understand rather than some complicated 'new fangled' concept which they would have to learn how to use. Choice users by contrast need to be wooed by something as far removed from their past experiences of public transport as possible. This may be by providing something as simple as a high quality luxury van booked as a shuttle. Or, it may be that a DRT system with all the technological bells and whistles on it would offer the step change in service quality over the bus necessary to capture this more discerning market segment.

If DRT is ever to become commercially viable, or at least able to provide services at a level of subsidy within the limit set by local authorities for buses, then serving appropriate markets combined with proper pricing is essential. DRT subsidy per trip currently is generally around double that for a conventional bus (~£5 a trip compared with around £2.50 for conventional bus or £6–7 for Cango DRT in Hampshire), and while allowing DRT to be eligible for BSOG should reduce this gap in some cases, the bottom line is that DRT is more expensive to provide.

Customer ticketing requirements

Obviously, value for money, ease of purchase, flexibility of use, simplicity, user friendliness, etc., are all very strongly related. Value is related partly to price, but also to the added value of other benefits as a reward for committing money in advance, notably convenience of purchase and flexibility of use. The problem is that operators tend to feel that 'carnet' style tickets – where customers buy a multiple pack of tickets in advance for a slightly discounted price – somehow lead to revenue leakage, especially if these are transferable. Thus, occasional users face buying tickets on board the vehicle. This can be a very stressful experience, as well as being frustrating for the driver, and time consuming for everybody. Often passengers are required to tender the 'exact fare', and even where change is usually offered, this only applies if the company provides each driver with an adequate 'float'. Otherwise further embarrassment and delay is encountered as change is sought from other passengers etc.

Logically therefore, buying tickets in advance would benefit the customer and driver, reduce journey times, and provide operators with cash up front. Such an approach is common practice across much of Europe, but although off-bus sales occur in London, where customers can buy Travelcards (and now 'Saver Six' bus Carnets) at certain shops, newsagents and from bus stop vending machines, it is not so common in other areas. This is despite public transport patronage in London increasing by 16% on the introduction of Travelcards in 1982, and a 36% increase experienced in Paris when the similar 'Carte Orange' was launched seven years earlier (EC, 1996). The classic example in the DRT sector, is probably the Regiotaxi KAN scheme in the Netherlands, which makes use of the national Strippenkaart ticketing zones, but charges a supplement to price its services between bus and taxi fares. Through tickets meanwhile, are particularly important for interchange DRT services. Lincolnshire's InterConnect is one UK scheme that offers such a ticket type. However, outside of London and Passenger Transport Executive areas in the UK, competition law as enforced by the Office of Fair Trading means that even for competing operators to accept each other's tickets is fraught with legal difficulties.

The majority of customers make the same journey on a regular basis but not on five days a week. There is also a desire for transfer journeys without the need to buy another ticket, and demand for transferability of pre-paid tickets between passengers and within the family. Again though, with a few exceptions such as Brighton and Hove Bus and Coach Company, operators have been very slow to address this.

Operator requirements

The needs of the operator have supposedly focused on the ability to maximise revenue to develop customer loyalty, both to public transport in general and the bus operator in particular. In reality, while the first part of the statement is true, in the British case the rest as a rule is not. This is a sentiment echoed by Melvyn Hopwood, the head of communications at Trent and Barton Buses who said that across the industry on market pricing and loyalty cards 'we are rubbish' (Hopwood, 2000).

As noted earlier, market-based pricing in the bus industry is almost unheard of, never mind practised – in complete contrast to the rail sector. One exception is in Manchester, where the local Stagecoach subsidiary has segmented the market by socio-economic group, and by time of day: For example, certain services have been targeted at nightclubs, with posters of a style appropriate for pubs and clubs. Another segment is the University corridor of Wilmslow Road. Here low-cost 'Magic Bus' branded services – using old buses – have actually grown faster than quality services with new vehicles (Colson, 1998). Other operator needs are to exploit sales outlets, and speedy and efficient operation – both enhanced by selling tickets before passengers board the bus.

Two more concepts that have not really caught on in the bus industry are 'added value' and 'loyalty cards'. Added value allows companies to charge a higher price justified by an improved level of service, without costing the provider much more money, while rewards for loyalty aim to persuade customers to stick with the product they use. Almost a combination of these ideas, popular among supermarkets, is the loyalty card approach. Here, customers can claim either gifts or cash back after spending more than a set amount of money. These cards now have the added benefit of being able to record exactly what products each customer buys, together with general information about the customer, providing an extremely powerful database from which marketing activity can be targeted later.

Despite these advances, even simple examples of added value in the public transport industry are rare. Rover tickets issued by operator Southern Vectis on the Isle of Wight, give discount at almost 20 key places of interest, while various bus operators have offered free newspapers to passengers at some time or other (Southern Vectis, 1999). Arriva Scotland West launched the first bus-based loyalty card in Scotland in response to competition from smaller operators. Similar in design to those used by supermarkets, 'points' recorded by a metallic strip on the card can later be redeemed against free travel vouchers, money-off vouchers at a local supermarket, or a donation to charity. The scheme boosted patronage some 15%, some 7% above similar services without a loyalty card (BIA, 1999).

With the recent developments in electronic cards, options of how passengers pay for public transport have correspondingly multiplied. The simplest electronic cards contain a fixed value or number of trips which decreases with use. More complex 'smart cards' contain memories that can differentiate fares by distance travelled or by time of day. This allows for precise allocations of revenue to various operators, while the data can also help service provision become more responsive to customer needs (EC, 1996). As yet, while various types of smart cards have been in use for many years overseas, only a few operators in the UK, such as Arriva The Shire in conjunction with Hertfordshire County Council, have taken the plunge with the various new technologies on offer.

With DRT, from the operator's perspective there are a number of ways of trying to reduce boarding times in addition to those suggested above for conventional bus. One idea has been adopted by the Nexus U-Call service, which charges fares at the same level as for buses for checkpoint-to-checkpoint services, but collects and drops off at a passenger's door on payment of a 50p supplement (Usher, 2003). Similarly the Doorstopper service in Hobart, Tasmania (in Australia) charges passengers an extra $A1 to be dropped at the door (Murchison, 2003). Meanwhile the Bicester Taxibus provides a checkpoint service rather like a regular bus during the peak periods, but a door-to-door service when the service is quieter during the off-peak.

Another help would be to encourage passengers to book ahead by offering financial incentives – a method used very successfully by the low cost airlines such as Ryanair and Easyjet.

Knowing in advance how many passengers would like to make a particular trip is especially valuable when the lack of capacity can be an issue (as it often is with DRT). However, while theoretically attractive, it is one thing for air passengers to pay a different fare every time they fly to a destination, but quite another to not know how much a bus fare might be. Less complicated, might be for pre-bookers to pay one fare and for hail-and-riders to pay a supplement. This could be justified by arguing that pre-bookers need to pay for a phone call in addition to the benefits to the operator of being able to plan more effectively. The closest match here is that members of the Wigglybus travel club receive a discount on services, compared with regular users (Buchan, 2003). This is partly because booking regular users is not as time consuming (or expensive) as booking new or occasional users.

One issue with concessionary fares is that PTEs and local authorities are facing problems with reimbursing operators due to the inadequate/inaccurate recording of travel information. This will need to be addressed, most probably through adapting monitoring procedures to allow for this.

Place

'Place' refers to the distribution of the product, the access to it – how people get hold and pay for it. Complexity is again a barrier here for DRT, particularly when compared to bus or car use. For instance, DRT services often only serve certain areas at certain times, and almost by definition these are irregular throughout the day. Similarly, fare information is often almost impossible to understand. A comparison may be made to shops, which like buses have busy periods and quiet periods, but they tend to stay open between fixed times, and are all the time striving to justify extending their opening hours as far as possible.

Place also exerts a considerable impact on the composition of the market, and therefore what type of services are needed. In public transport marketing terms, every locality is unique (in terms of wealth, culture, density, car ownership levels, road structure, etc.), and thus requires a tailored approach to developing provision. Market research is crucial in assessing the salient features of this uniqueness, and in developing a suitable service to address these. When considering how best to serve an area, market

research is needed to ascertain the needs of local people, and to develop a service that will meet those needs as closely as possible. And, operators should strive to simplify services and provide sufficient information to make it easy for people to understand and to use.

Promotion

Although promotion is closely related to passenger information, it has a slightly different emphasis that focuses on the USP – the Unique Selling Proposition. This could be that 'using DRT is cheaper than the car' or 'for a limited time accompanied kids travel free'.

Obviously a product should only be promoted when it is worth promoting – in the words of Professor John Hibbs of the University of Central England Business School 'you can only advertise a poor product once. After that it is dead'. Perhaps as a result of this combined with the public service ethos and operational culture, bus [and DRT] services have not been widely advertised, at least in the UK.

When boarding public transport nearly every single message or warning is either legal or technical and of irrelevance to the passenger (e.g. 'the capacity of this bus is 72 sitting, 8 standing'), or negative e.g. 'do not speak to the driver', 'this bus only accepts exact change', or 'do not stand forward of this notice'. This has now extended to notices discouraging the use of mobile phones and eating. Compare this to a pub or a shop, where just about every customer sees sign extols the value of a product or product range to the customer. For example, 'special offer on draught bitter', or 'two cans of beans for the price of one', or is positive 'Visa and Switch accepted here', and 'please ask if you need help' (Kevill, 2000).

To best promote public transport, the product first has to work properly. Once this is achieved, a useful method is to promote the positive features identified in the market research that reflect the desires of the existing and potential market. So, if people want a door-to-door service, provide such a service and advertise 'DRT direct to your door'. Or, for example, if people want cheaper fares, then cut the fares or give vouchers for buying season tickets, and publicise 'buy one week travel, get one week free'.

Success also depends on how such messages are targeted – if young people are being encouraged, the material should reflect that and be made available where young people are likely to see it or pick it up. Finally, good relations should be sought with the local media, local politicians and the general public.

With DRT a key obstacle is the novelty of the concept, which means that many people do not understand how to use it. To overcome this, the Cango scheme in Hampshire offers a special arrangement whereby new signed up members of the travel club scheme are given six free tickets that allow them to try out and get used to the system (Armstrong, 2003).

People

The people aspect is especially important in the service sector, which includes public transport provision. While some companies have, or are beginning to introduce such innovations, quite often efforts to improve driver friendliness and helpfulness somehow get diluted and decline over time. Despite this, there are a number of public transport operators where the importance of friendly and helpful staff is recognised.

Drivers need to understand what is required and properly trained. 'It has become apparent that driver education is critical' (Armstrong, 2003). One result of this is that a partnership mentality has developed between stakeholders, including call centre staff, drivers and passengers. MiDAS (Minibus Driver Awareness Scheme) and disability awareness training for the drivers is paramount. This also provides them with a sense of ownership. One driver described his regular passengers as his 'extended family'. There is constant feedback and monitoring, enabling improvements to be rapidly implemented.

Training the call centre staff is important too, and in the Hampshire Cango scheme's case this is partly achieved by making them travel on the buses and meet passengers and drivers (Armstrong, 2003). Technology and software provider Mobisoft meanwhile runs open days for operators.

Most crucially, the public need training. Where replacing buses, Cango routes are operated as buses for three months and during that time the drivers point out the differences with DRT (Armstrong, 2003). In the Bay Area of California, the DART scheme has set up special customer training meetings to inform potential passengers of what they can expect from the service (Dufrene and Sheik, 2003). And in Worcester, the County Council is offering a free trial period of three months for the FlexiLink scheme, as it is aware that the existence and reliability of the service is very effectively diffused by word of mouth recommendations (Radbourne, 2003).

In any service industry, people are a crucial part of the product. The experience that many people have of public transport is that this is not true. Therefore the operator needs to adapt a customer perspective, rather than the operator-led culture that currently predominates. This is not to deny that drivers need some level of control when serving the customer, to allow them sufficient flexibility to deal with passengers properly. Staff also need be involved in what the company is trying to achieve. At the moment for the most part they are not, and thus have no real stake in how well the company performs. This is especially important, as for the most part bus drivers cannot really be supervised once on the road and meeting the public. Training should also be a major priority, especially for those who must interact with the public – e.g. drivers, station staff, ticket sellers and information providers.

Key operational decisions

Once the market sector has been identified, and the marketing decisions made (or considered at least), decisions on how these services are to be delivered need to be made. Issues discussed here are DRT specific, and are as follows:

- Type and size of DRT vehicle
- Degree of route flexibility
- Degree of timetable flexibility
- Interchange or not?
- Access to infrastructure
- Level of technology
- Mode of booking
- Call centre operation

Type and size of DRT vehicle

Vehicle size should ideally be based on the predicted level of demand, but there are also a number of other factors involved.

First, there is a whole raft of regulatory regimes in place to do with licensing the operators, vehicles, drivers and routes (see Chapter 6). Which vehicle to choose therefore depends on what issues are deemed most important. A good example of where a number of issues were considered before implementation occurred in Scotland in 2003, where the Stagecoach Yellow Taxibus serving Dunfermline and Edinburgh decided to adopt an eight-seat luxury van vehicle. This was route registered as a bus, the operator is registered as a bus operator, but the driver does not require a Passenger Carrying Vehicle license and is therefore less expensive to employ. On the other hand vehicles of less than ten seats do not qualify for zero-rated VAT (Buchan, 2003).

Second, there are mandatory requirements if the vehicles are to be used for special needs type work, e.g. space for wheelchairs or low floor access. For example, patient transport services often require doors to be opened at the back rather than at the side.

Third, particularly for general public DRT work, image is crucial. For instance, women are often uncomfortable sharing vehicles with only four or five seats – a pilot scheme in Dublin failed partly because of problems of 'interference' between male and female passengers (Ahern, 2003). But, larger vehicles often give off an institutionalised aura.

Fourthly, on many services the predicted level of demand can be peaked, and thus small vehicles may be suited for the majority of the working day, but too small to deal with demand at peak times. This problem has materialised in Dengie, Essex, where seven-seat vehicles were used initially for the Dengie Village Link, but proved to be too small and have been subsequently replaced by larger minibus vehicles (Solomon, 2003). One other solution here is to try and balance the peaks so that the same sized vehicle is appropriate throughout the day. This has been tried with the Cango scheme in Hampshire, where vehicles transport commuters to rail and bus stations during peak times, schoolchildren at school times, and shoppers and leisure users at other times (Armstrong, 2003).

Finally, there is an issue to do with the DRT journey times becoming more elongated as the number of passengers increases. One approach to address this occurred in Oxfordshire, where the Bicester Taxi-Bus provides a far less flexible service in the evening than during the day. It is accordingly registered as a bus and as a taxi respectively (Yateman, 2003).

Perhaps the ideal solution to the vehicle size issue, occurs in the Regiotaxi KAN scheme in the Arnhem-Nijmegen region of the Netherlands. Here, 70 local taxi operators offer a range of different-sized vehicles (around 100 minibuses and 200 taxis) which the DRT operator calls on as and when a particular type of vehicle is required. The scope for such vehicle brokerage schemes is discussed later in the report.

Degree of route flexibility

The degree of route flexibility is also affected by the level of demand, and crucially by its distribution (i.e. the land use and road network patterns). Lincolnshire's InterConnect illustrates three levels of flexibility well (Cross, 2003; White, 2003). If one examines the Lincoln to Skegness corridor, the main line bus route links both urban centres with a string of smaller market towns such as Horncastle, Spilsby and Wragby located on the A158. A number of semi-demand responsive services (CallConnect) then connect with these hubs which serve smaller villages such as Louth along 'B' roads. When requested, these services deviate to collect/drop off passengers from smaller hamlets off route before rejoining the 'B' road to the destination. Where hamlets and villages cannot conveniently be served by semi-flexible services, fully flexible (CallConnect Plus) services are employed which serve their own 'zones'.

In general, fully flexible routes can be very inefficient because of the 'first-come first-served' nature. More efficient is where a loop/zone system can be introduced with deviations (ideally with two buses travelling in opposite directions) so that more people can be picked up, because the first-come first-served nature of the service is diluted slightly (Duffell, 2003). Reducing the flexibility also has the effect of making it easier for passengers to understand, as it is difficult to explain that it is a bus service that behaves like a taxi (Usher, 2003). Usher adds that a reasonably defined area with a basic route that is not too tightly constrained is ideal: 'People do not understand free roaming and need a basic route'.

Currently Bus Service Operating Grant is only paid for fixed route elements of journeys, although this is likely to change in the near future as a result of the Government's consultation into Flexible Transport Services.

Degree of timetable flexibility

A second way of achieving flexibility, is to vary the scheduling. Here services only run on demand – i.e. when requested by a passenger. Such services range from extremely high frequency operations (such as jitneys throughout the developed world and described earlier in the report), to very low demand scenarios, e.g. the Lovedean Carshare. In this case, a local taxi company operates up to five shared services a day

from a small community in Hampshire to a local town centre, but only when users telephone to request a trip (Smale, 2003).

Current regulations suggest that no timetable is required for services registered to run at a minimum five minute frequency, and so theoretically very high frequency jitney-style services could be run under a these rules.

Interchange or not?

The question of interchange DRT is discussed in depth in Chapter 3. This concluded that several UK DRT services have been designed to interchange with main line bus and rail services, but that as a rule 'the reluctance of people to transfer is evident' (Armstrong, 2003). Such a position is backed up by experience of FlexiLink in Worcester, where Radbourne (2003) finds that 'FlexiLink is designed to interchange with main line bus services, but the evidence suggests that people are reluctant to change modes.'

Essentially, in the UK the fragmented nature of public transport provision has impacted on people's consciousness to such an extent that even on Lincolnshire's InterConnect service – designed, operated, timetabled, marketed, branded and ticketed as an integrated service – the proportion of those actually interchanging is only 2–3% (Cross, 2003). On less well implemented examples, the figure is so low as to be negligible. This compares with US experience in Dublin-Pleasanton in the Bay Area of California, where for example the DART service boasts that 40% of its passenger trips interchange with the BART system (Dufrene and Sheik, 2003).

One UK example that has achieved a high proportion of interchange is the Bicester Taxi-Bus scheme. Here, the rail company Chiltern Railways pays a local taxi firm to operate a specially branded DRT feeder service specifically and exclusively designed to meet the trains (Yateman, 2003). Even here though, late trains arriving on an evening do cause problems for passengers already waiting on the DRT buses to go home, and this conflict between those already on the bus versus those waiting to board is magnified for other schemes where additional markets are also served.

Access to infrastructure

DRT schemes vary significantly in their infrastructure requirements, but as minimum most need some kind of terminus area at the beginning or end of a 'route'. There may also be a need for other fixed stopping points along routes or in zones, and/or a call centre from where bookings can be taken and relayed to drivers.

In terms of the access of DRT services to bus infrastructure, in many instances throughout the developing world the shared taxi and jitney-style services are not supposed to use bus stops and bus terminals. Legally, this is also true for the Belfast Black Taxibuses, but in practice space is provided by the local authority. In Mauritius, taxi-train operators were initially unable to pick up or drop off passengers within 60 metres of a bus stop, but with a severe shortage of bus capacity this regulation was later overturned (Romooah, 2002).

In the UK, DRT access to bus lanes is not often a problem, as in general bus lanes are already available to taxis. Also, should DRT ever operate within the London Congestion Charging area it would be expected that they would be able to operate for free given that London-registered taxis and Private Hire Vehicles are exempt from paying the fee. One similar case is that the Yellow Taxibus is exempt from the toll on the Forth Road Bridge when travelling between Dunfermline and Edinburgh (Bunting, 2003).

Level of technology

One reason for the take up of DRT schemes in recent years has been the development of technology. Namely, advances in software, computers, digital maps, expert systems, remote communications, in-vehicle computers and GPS technologies have suddenly made DRT viable (Duffell, 2003). But, while the costs of high tech schemes may or may not continue to fall, they are still relatively expensive to introduce, and although most of the glitches seem to have been ironed out there are still occasional problems installing and using the equipment.

When selecting the level of technology required, the first issue concerns the scale and complexity of the operation envisaged. For instance, for a relatively simple jitney or many-to-one operation with a dozen or so vehicles then complex routing software is probably not required. But, if many-to-many journeys involving general public, education, social service and dial-a-ride services need to be assigned, it will be. On the other hand, manually assigning vehicles to even a fairly simple network is a job requiring specialist staff with sufficient scheduling and local knowledge to work effectively, and such staff are becoming increasingly hard to find.

A second issue is whether or not it is strictly necessary to establish a new call centre, or whether it makes more sense to contract the job out to an existing operation.

Third, technology also allows operators to monitor and analyse service patterns, potentially allowing the system to evolve more effectively. The Corby DRT scheme in Northamptonshire uses Mobisoft software for management, which was selected for its reporting capabilities. It can apparently 'learn' from experience, identifying patterns and trends such that the service can be modified to match demand. The Community Transport groups were originally involved, but drifted away when they realised how DRT was developing (Drummond *et al.*, 2003).

Finally, technology offers almost close to 'real-time' demand responsiveness even on complex networks, to a level far in advance of manual systems.

So far there are still problems. One is that so far the costs of establishing high-tech schemes are significant and are really only being met due to central government funding. This is unlikely to change until council education, social service and general public transport departments are all 'persuaded' to work together to deliver more efficient and effective transport services. As for commercial operators, so far the few UK examples have looked to low-tech solutions based on taxi technology, which are deliberately limited in what they can achieve.

Another problem is that suppliers are providing specialist hardware to operators rather than adapting standard platforms and this could well limit future growth (Duffell, 2003).

There are several modes of booking DRT, including boarding at the terminus, 'hail-and-ride' along the route (by hand or sometimes by pressing a button at a stop so the next bus will deviate to pick up at that stop, as in some schemes in Italy, such as in Bologna), via the Internet and by telephone. Return or onwards trips can also sometimes be booked while a passenger is on the vehicle. Of these methods, the telephone offers the most high-tech and flexible approaches to be adopted, but there is the cost of the call involved. Duffell (2003) estimates this to be in the order of 10p – not insignificant – while from the operator's point of view there is a need for a call centre, possibly routeing software, and therefore additional staff. Pre-booking using a telephone has become far more viable with the widespread take up of mobile phone technology.

For the future, Internet technology is now being mooted as being the way forward (Duffell, 2003). This has the advantage of possibly offering automated (and thus far cheaper) booking, and is already widely encouraged by low cost airlines such as Ryanair and Easyjet by a significant discount offered over tickets bought over the telephone. Of course booking flights and booking a bus ride over the Internet are still very different things and it may well take until far more people use Internet-enabled mobile phones to become worth setting up.

Mode of booking

One key decision concerns the mode of booking. This can range from 'turn-up-and-go' through manual 'hail-and-ride' (either at stops or anywhere along a route); telephone where services are manually answered and dispatched; telephone where services are manually answered but dispatched using routing software; automated 'hail-and-ride' where services are called to a bus stop at the press of a button; telephone with automated answering and dispatching; and via the Internet. Crudely, the above list is ordered from low tech to high tech.

The key variables are set-up cost, running cost and flexibility. In terms of cost, low tech is of course cheaper – at least to set up – but far less flexible. Booking modes where people answer telephones and

manually match person to vehicle (as in taxi, minicab and traditional dial-a-ride) are cheap to set up but expensive to run and not especially flexible. Schemes where people answer telephones but use routing software are expensive to run, moderately expensive to set up, but very flexible. Fully automated systems meanwhile are relatively expensive to set up, but less costly to operate, and thus may be justified for larger volume schemes. It may be appropriate to set up DRT schemes with simple, low-tech booking schemes to start with and then automate as demand builds up. Schemes should therefore be designed for automation from the start to ease upgrading .

While there is anecdotal evidence that suggests people prefer to talk to a real person to book a service rather than a machine, in the future as schemes develop and expand, it is likely that schemes will become more automated due to cost pressures. This, notes Duffell (2003), is because the cost of bookings is currently too high due to the need to employ people and the process therefore needs to be automated so that the booking costs no more than 10p.

Of course schemes can (and often do) combine modes of booking to increase flexibility. This is particularly important from a passenger perspective because it provides for the spontaneous trip. For instance the Wigglybus did not initially allow hail-and-ride users, but subsequently changed its rules to accommodate such users. But there is a risk of drivers having to turn passengers away from a half empty bus at peak times where capacity is tight and where passengers further along a route have pre-booked.

Call centre operation

Experience regarding call centres tends to be mixed. Buchan (2003) says that Wigglybus faced major reliability problems due to the call centre selected – on the basis of a tendering exercise – not being a specialist DRT call centre. Instead, it may have proved better value to have spent more money by joining an operation such as Cango's. Armstrong (2003) of the Cango scheme notes that the advantages of an in-house operation are that the quality of the service can be more closely and effectively monitored. But, she recognises that the advances in technology and the high cost of each DRT scheme setting up and running its own operation are exorbitant, and feels that regional call centres would offer the best trade off between cost and 'accountability/local knowledge'.

One other problem is to do with the lack of experience among scheme promoters in tendering for and commissioning call centre operators. This has meant that PTEs and local authorities have sometimes found that the call centre operations have simply not being up to the task of providing a DRT service. A possible solution to this may be for government and/or professional groups and organisations to establish a template for DRT scheme promoters to use when tendering for a call centre.

In terms of peak times, Cango's call centre tends to receive most bookings at peak times, such as early morning and late afternoon (Armstrong, 2003), while the busiest periods in the Regiotaxi KAN call centre are between 10.00 and 12.00, and between 14.00 and 15.00 (Zuiderland, 2003). The majority of DART calls are at around 10.30 am (Dufrene and Sheik, 2003). Should the Cango scheme expand in the future, the limit on capacity would be the number of telephone lines rather than staff or computing capability (Armstrong, 2003).

Implementation issues

Once the service has been designed, in setting up a DRT scheme there are a number of issues to consider and barriers to negotiate before it is successfully implemented. ARTS Consortium (2003) defines a barrier in the DRT context as something 'which cause hindrance, delays or obstacles in the process of designing, planning and implementing new and more flexible transport services'.

Institutional barriers

At the local level, Nelson and Wright (2003) note the main problem facing DRT schemes is overcoming institutional barriers, and that organisational issues and operating/cultural barriers should not be dismissed as trivial, because they can be critical for the success of a DRT service.

Partnerships, organisation and control

Public transport systems tend to work best when the bodies involved (operators and local authorities) work together in a partnership. DRT systems are no exception, and in many cases there is an additional actor involved, which is the call centre.

Several interviewees emphasised this need for partnership. Armstrong (2003) states that DRT requires support 'probably more than usual bus quality partnerships', and says that the 'very close relationships between call centre staff, drivers, bus company and local authority public transport planners as vital to the [Cango] scheme's success'. Howcroft (2003) notes also that operators and local authorities actually stand to gain from a partnership financially. This is because bus operators tend to be revenue rich and capital poor, while the situation is reversed for councils. Thus, local authorities buying in vehicles (utilising capital spend and reducing revenue spend) and then leasing the vehicles to the operator makes a lot of sense. In practice, bus operators spread investment costs for vehicles over five years, so the saving made is not so impressive – but it is still a saving nonetheless.

It is also clear that good relations need to be established with the local community, rival transport operators (particularly minicab and taxi firms who may see a subsidised service as a threat), and local trip generators, e.g. employers, retail outlets, etc., that could encourage their staff and visitors to use the service, or even potentially sponsor or contribute towards the costs of providing the service.

The issue of partnership to taxi and private hire operators can be a major barrier. Taxi companies, especially smaller operators, are used to running their own business on their terms. Moving into DRT and being expected to work in partnership with the local authority and others is not their normal mode of operating. This cultural aspect is probably important in the difficulties experienced in getting taxi firms to tender to operate DRT schemes. This has been overcome in a number of overseas DRT projects by involving taxi and private hire associations from the beginning of the scheme's design, not just as a supplier when everything is decided.

Finally, clear communication channels with the various licensing, regulatory and financing authorities can smooth the path of implementation enormously. This lesson was learned the hard way in Hampshire, where the first shared taxi scheme was implemented without the knowledge of the local Taxi Officer, leading to a few slight problems (Smale, 2003). This was possible under a Section 11 arrangement, but the Taxi Licensing Officer would have had to initiate the scheme if it was set up under Section 10 of the 1985 Act.

Political support

Strong political support is vital for any transport project. But, whereas buses are not seen as being 'sexy' by politicians, there is widespread political enthusiasm for DRT, and local politicians are keen to spread the service and replace withdrawn buses, despite the costs. Indeed, 'members are almost too keen on DRT – they all want it in their area' (Usher, 2003). However, there can be problems initially if, for example, DRT replaces a bus service. Cango generally found that there was enormous negativity until about a month into the scheme, and now the vast majority of people (and all the politicians) are extremely happy with it (Armstrong, 2003).

The main problem therefore seems to be in making sure that DRT is put in the right places to do the right job, and not where it will make the biggest splash politically. It is also vitally important to explain to politicians that DRT is not a cheaper alternative to a conventional bus service (Armstrong, 2003). There is, however, some resistance at the local authority level to promoting DRT services because DRT may threaten conventional services which have been built up over time. Another issue is that DRT introduced in one area may suck resources away from lower profile conventional services in other areas. There is also concern that a DRT service may replace a conventional service, and then fail, so leaving a community without transport (Buchan, 2003).

Risk-averse operators

As explained above, with bus improvements it is normally political support that is lacking. However, with DRT it is the support of the operators that is the biggest problem.

Currently, the general feeling expressed by public transport operators is that DRT sounds plausible, but they are concerned about the apparently poor commercial returns. This doubt has been reflected in the paucity of bids received to run DRT operations, and in the relatively high cost of those (Radbourne, 2003; Armstrong, 2003). It is salient to reflect that both the commercially driven Yellow Taxibus and the Truro Plus Bus were only implemented under the direction of very senior management (Bunting, 2003; Crossfield, 2003). Even more revealing, is that the local Stagecoach subsidiary is understood to have entered a bid to run the Nexus U-Call service only when specifically directed to by Brian Souter, the de facto boss of the Stagecoach Empire (Usher, 2003).

One approach to dealing with this operator reticence has been for local authorities to bear all the revenue risk by issuing gross cost contracts. In practice, this has meant that the local authority buys/leases and brands the vehicles, plans the routes and then invites operators to bid to run the services for a fixed fee which they will receive no matter how many people use the service. Hampshire County Council and Nexus are two public bodies that have adopted this tactic, but both still report that despite this the tender prices received were far higher than anticipated (Armstrong, 2003; Usher, 2003).

DRT is still limited to niche markets and limited areas of the country, and considered experimental. It is almost as though DRT has to reach a 'critical mass' and more widely accepted before the conservative bus industry accepts it as a viable proposition. Thus far, DRT is seen as providing less of a guaranteed revenue stream (Crossfield, 2003).

Events in Lincolnshire tend to bear this out, with four additional operators happy to cooperate with the scheme once the initial operators had pioneered the InterConnect concept and proved that it could work (Cross, 2003).

Threat to existing public transport interests

Directly related to this and a serious operational problem that has afflicted DRT projects in the UK and elsewhere, is active opposition from rival transport operators.

In Truro, for example, taxi operators have often felt threatened by DRT (the Plus Bus) to the extent that they have been known to have kicked and spat on DRT vehicles and vehicles had to be parked at the depot for security. The problem is compounded by taxi operators who have to pay bus stations for the right to operate, hence the high numbers of taxis in the immediate vicinity of the station (Crossfield, 2003). And in Bicester, a number of incidents, some physical, have occurred between Taxi-Bus and taxi drivers (Kelly, 2003).

Outside the UK, Cervero *et al.* (1995) noted that opposition to DRT in the USA from both taxi *and* public transport operators has resulted in pressure on licensing authorities to reject applications for commercial licenses. In the Netherlands, while initially it was the taxi operators were hostile to the Regiotaxi KAN scheme being established, this ceased once they began to appreciate the increased sense of order in the market. Instead, it is now the transport unions that are more of a problem, essentially because taxi drivers are paid less than bus drivers and some bus services may well be replaced by Regiotaxi in the future. 'Regiotaxi is killing off the bus' seems to be the attitude (Zuijderland, 2003).

The converse of the problem outlined above is that some local authorities do not like dealing with Community Transport organisations, taxis or bus companies (Nelson and Wright, 2003). It has also been remarked on by many DRT organisers that they prefer to negotiate with bus operators, as DRT more closely shadows bus user markets (Cross, 2003). Armstrong (2003) notes that this problem is compounded by their image, and that taxis are often 'their own worst enemy'. There may also be a problem of a shortage of taxis in rural areas, so shared taxis may be difficult to establish (White, 2003; Richardson-Dawes, 2003).

Many commentators observed that with dealing with taxi operators is notoriously difficult, even where there is a vibrant market (Drummond *et al.*, 2003; Herraty, 2003). But, it is also true that shared taxis and PHVs may well often offer the most appropriate and cost effective DRT option, especially for serving less affluent markets, and so they need to be engaged (Duffell, 2003).

Overall, the research conducted for this study suggests that the fear of competition from DRT expressed by taxi operators is ungrounded, and DRT is in reality an opportunity. There is considerable, guaranteed profit to be gained. In essence, more needs to be made of the positive incentives for communities to encourage small, local taxi operators to participate in DRT.

Monitoring scheme performance to re-start the process

Once the scheme is in place and up and running, there is a temptation to think that the job is done, rather than just beginning. In fact, all that has happened is that the whole process of marketing begins all over again with the market research, possibly leading to a re-design of some aspects of the scheme. The basic building block of this is monitoring data.

Monitoring can range from none at all, through to the very basic use of company inspectors timing vehicle arrivals and departures and checking tickets, to incredibly sophisticated systems that use ticketing and booking data combined with local geo-demographic information to derive a series of measures that can be used to inform service development. For instance, the SAMPLUS project for the European Commission developed a range of indicators for economic viability, service provision and technical performance (Duffell, 2003). Duffell goes on to say that clients of his technology provider Mobisoft typically use the data of trip patterns to modify their routes after six months or so.

One further bonus of DRT schemes is that the variable nature of the services actually makes it relatively easy to modify them when compared with conventional services. For instance, depending on the type of DRT service, the core route, zone boundaries or ‘timetable’ may be able to be subtly altered without too much fuss. This makes DRT an attractive option for live ‘testing the market’ for public transport in areas that may or may not be able to support a conventional bus service.

It is likely under the latest registration requirements for DRT schemes proposed by the forthcoming regulations that monitoring will form a far more important element than is currently the case. For example, it may be that operators will be required to keep a record of passengers names, addresses and phone numbers (plus trip details) so as to be able to prove that a trip that was carried out. There is also a case for organisations funding and operating DRT schemes to determine how effective they are in terms of delivering passenger journeys. Indicators that may be useful might look at software reliability, cost and revenue per passenger trip (and passenger kilometre), average vehicle occupancy, call centre refusal rates, and number of no-shows (both of vehicles and passengers). Methods of gathering this could include user and non-user surveys, call centre monitoring, mystery shoppers, and analysis of any routeing software.

All in all, developing low cost and routine monitoring procedures for DRT schemes is vital if they are to develop effectively.

Summary

This chapter aimed to link the market niches identified as being most suitable for DRT with examples of good practice DRT operations at the local level. The following chapter will now seek to highlight the barriers encountered by these good practice examples that require action and support from national government.

Chapter 6 – Issues facing Government

Introduction

The purpose of this chapter is to highlight the specific barriers hindering the development of DRT in the UK, and to make suggestions as to how these might be overcome.

Combining information from ARTS Consortium (2003) with evidence from the present study, the following groupings of barriers can be determined:

Institutional, legal and regulatory – What is DRT? Legislation (or the lack of it) can negatively influence the design of an innovative transport service by excluding special operators or essential parts of the new services (e.g. where the combination of different kinds of transportation is found by operators to be extremely complex). The particular structure of the licensing and competitive tendering regimes can have similar effects.

Financial – These barriers include the absence of funding and subsidies for certain types of new transport services (although some of these issues are already being addressed) and associated infrastructure, inadequate knowledge about potentially available financial support, as well as problems with the taxation structure. There is also likely to be poor cost-coverage and related problems caused by low levels of demand for public transport.

Political – The absence of local political support for innovation (reflecting alternative analyses of a scheme's potential, resistance to new ideas, political conservatism or lack of experience) can be a major barrier.

Institutional, legal and regulatory

Before any other strategic issues such as licensing or funding can be examined, it is crucial to determine where DRT should 'fit' institutionally. This is not an easy task due to the wide variety of types of DRT.

Current road-based public transport frameworks

As shown in the previous chapters, the organisation of road-based public transport in the UK is already extremely complicated, and the 'addition' of DRT (which in itself is made up of a number of very different types of service) threatens to make this more so. In effect, there are a number of elements that go together to decide whether a public transport service is a bus, a taxi, a private hire vehicle or some form of Community Transport. On the regulatory front, there are four systems that need to be taken into account, namely – the form of operator licensing, vehicle licensing, driver licensing and route registration. The following tables attempt to outline the current situation, although it should be noted that they are indicative, and that individual schemes are judged on their merits.

Table 6.1: Operator, vehicle and driver licensing by public transport service type and number of passenger seats

	Private hire	*Taxi*	*Small PSV*	*Minibus*	*Community Transport*
Number of passenger seats	<9	<9	<9	9–16	>8[24]
Operator	Yes	No	Yes	Yes	No – issued with

[24] Informal Community Transport schemes (such as community car sharing projects) are often of less than eight seats.

Licence?					permit disc
	LA	LA	TC	TC	AB
Vehicle Licence	Car licence plus PHV plate	Car icence plus Taxi plate	Vehicle disc	PSV	Permit disc
Drivers Licence	Ordinary (plus LA test)	Ordinary (plus LA test)	Ordinary	PCV	Special rules apply – see Guide to Section 19 permits issued by the Traffic Commissioners

Table 6.2: Institutions responsible for service registration by public transport service type and level of route/timetable flexibility[25]

Route Type	*Timetable Type*	*Private hire*	*Taxi*	*Public Service Vehicles*[26]	*Community Transport*
Fixed	Fixed	Not allowed	T	TC	TC
Fixed	Semi	Not allowed	Not allowed	TC	TC
Fixed	Fully	Not allowed	Not allowed	TC	TC
Semi	Fixed	Not allowed	Not allowed	TC	TC
Semi	Semi	Not allowed	Not allowed	TC (since 23.02.04)	TC
Semi	Fully	Not allowed	Not allowed	TC (since 23.02.04)	TC
Fully	Fixed	Not allowed	Not allowed	TC	TC
Fully	Semi	Not allowed	Not allowed	TC (since 23.02.04)	TC
Fully (shared use)	Fully (shared use)	LA	A	Not allowed	TC
Fully (exclusive use)	Fully (exclusive use)	LA	LA	N/A	N/A

Table 6.3: Legislation governing route registration by public transport service type and level of route/timetable flexibility

Route Type	*Timetable Type*	*Private hire*	*Taxi*	*Public Service Vehicles*	*Community Transport*
Fixed	Fixed	Not allowed	S12	S6	S19[27]/S22
Fixed	Semi	Not allowed	Not allowed	S6	S19/S22
Fixed	Fully	Not allowed	Not allowed	S6	S19/S22
Semi	Fixed	Not allowed	Not allowed	S6	S19/S22
Semi	Semi	Not allowed	Not allowed	S6 (since 23.02.04)	S19

[25] LA refers to local authority, TC to Traffic Commissioner and AB to Accredited Board.

[26] This new category combines the Small PSV and Minibus categories of the previous table as the regulations governing route registrations is the same for both.

[27] Section 19 Community Transport services are not route registered, although Section 22 services are. Moreover, only Section 22 services are available to members of the general public.

Semi	Fully	Not allowed	Not allowed	S6 (since 23.02.04)	S19
Fully	Fixed	Not allowed	Not allowed	S6	S19/S22
Fully	Semi	Not allowed	Not allowed	S6 (since 23.02.04)	S19
Fully (shared use)	Fully (shared use)	S11[28]	S10/S11[29]	Not allowed	S19

This plethora of existing and potential regulatory regimes allows operators a great deal of flexibility in they type of schemes they devise, though in practice operators who are familiar with one system only tend to be wary of exploring the other regulatory regimes available.

Lack of institutional ownership

Currently DRT is neither 'fish nor fowl' – it is neither taxi, nor minicab nor bus. Several problems result from this 'lack of institutional ownership'.

First, it is extremely complicated to set up a DRT scheme. In effect, there was a feeling that local authorities wishing to invite operators to tender for DRT scheme needed to understand the rules and regulations of not just one public transport sector, but two or three, although things have improved with the introduction of the February 2004 regulations.

Second, all the time that DRT is not aligned with a particular institutional actor, it will not be seen as a mainstream public transport solution by all players. Hence, it is a 'novelty' side issue to bus operators, to taxi companies and even to community transport organisations that also have their secure specialist transport base. Further, while registration, licensing and financing principles will continue to be conducted on an ad hoc basis then DRT operators will be forced to negotiate from scratch each time they register a service or claim financial support. Ideally, DRT should probably have an institutional home but practically this is unlikely to happen. Moreover, in light of the February 2004 regulations it would seem that many of the most restrictive institutional, regulatory and financial problems have been tackled directly. It would therefore seem more appropriate to educate bus and taxi operators as to the benefits and opportunities now offered by DRT in particular circumstances, perhaps through a number of seminars and/or a best practice guide and through bodies such as the Confederation of Passenger Transport, Community Transport Association and the private hire and taxi trade associations.

Clarification of licensing regimes

The Government has sought to address this complex issue through the provision of information and guidance, in particular with the publication of *Flexible Transport Services* (DfT, 2002). However, several people who contributed interviews to the present study felt that significant problems still remain, despite this step in the right direction.

For example, one scheme promoter found that the current situation was 'so complex even we [a PTE] don't really understand things'. This, he suggested, meant that 'taxi operators were very slow to react and slow at returning tenders' as they had concerns over licensing routes, while Community Transport operators had the same problem. Indeed, none of the original bids materialised from taxi operators, as they seemed to be concerned with the differences in classification between buses and taxis. He concluded that 'registering the services with the Traffic Commissioners was not an easy process, and more guidance and clarification is needed (Usher, 2003). Davies (2003b) concurs, and says that 'even Traffic Commissioners seem to be confused over what a PSV is and what is not'.

Perhaps the most graphic illustration of why the system needed to be changed came from the case of the Bicester Taxi-Bus. Here, Yateman (2003) noted that in the 'off-peak the services operated as

[28] Section 11 services are not route registered.

[29] Section 10 services are not route registered.

conventional taxi services and were registered by Cherwell District Council as a hackney carriage, while in the peak periods the services operated more like a bus and were therefore also licensed as a bus with the Traffic Commissioners'. However, the situation has been greatly simplified by the new regulations allowing flexible services to be registered as bus services.

Novelty

DRT currently is hampered in its development by its novelty. Novel operations are seen by private companies as being more risky and thus more expensive. As a consequence, several DRT scheme promoters reported that it was often very difficult to persuade local transport operators (and taxi and private hire companies in particular) to bid for DRT contracts, even where the system envisaged was not so different from existing education or social service taxi contracts.

For instance, when setting up the Lovedean Carshare scheme Hampshire County Council sent out forty tender documents to taxi operators but had none returned for a shared taxi scheme, and so officers were forced to ring up and cajole operators to 'give it a go' (Smale, 2003). Telford and Wrekin Council had problems gaining operator interest for their Maxi Taxi scheme due to there being so many very small (often single vehicle) concerns, and due to the scheme being so 'different' (Herraty, 2003). And Tyne and Wear Passenger Transport Executive, Nexus, found that 'taxi, private hire and Community Transport operators were very slow to react and slow at returning tenders, as they had concerns over licensing routes'. In the event, the local Stagecoach subsidiary won the contract to operate the U-Call DRT service after the Managing Director of the Stagecoach Group, Brian Souter, personally intervened to ensure that his company entered a bid (Usher, 2003).

Crossfield (2003) notes that the commercial operator First is only likely to conduct pilot schemes with DRT until the potential of the mode has been more fully explored. Hampshire County Council officials recognised this, and thereby let contracts on a gross cost basis (whereby the council bought the vehicles and took on the revenue risk) so that the operators would be more likely to bid. Even here, though, tender prices were far higher than expected (Armstrong, 2003). DRT is still seen as a very risky business in which to be involved.

As a consequence, DRT in the UK is largely confined to pilot projects and extended projects, typically funded through Bus Challenge grants. Research conducted on a concept called Strategic Niche Management – which explains why some new technologies or policies succeed and others fail – notes that one core reason for failure is the lack of a supportive institution to protect the niche while it is developing.

One salient example of this need for 'niche protection' was in fact quite literal! Crossfield (2003) notes that the Truro Plus Bus vehicle has been kicked and spat at on a number of occasions by local taxi drivers, while there have been 'incidents' between drivers of the Bicester Taxi-Bus and drivers of rival public and private hire firms (Kelly, 2003). Several other interviewees for this study reported confrontations and verbal harassment when a DRT scheme was launched. Finally, a particularly extreme example of hostility occurred where a local minicab company won a tender to run a shared taxi scheme, but then later admitted to setting out systematically to wreck it (successfully) by not running it properly.

Davies (2003b) blames this 'prejudice' against new types of service on the fact that 'national government has not set any national rules or standards'. He goes on to say that the 1985 regulations and the 2000 Transport Act need to be reviewed with regard to DRT, and concludes that 'a root and branch reform of road public transport is necessary, in order to create a coherent structure, based on the number of seats in the vehicle. This should range from the four-seat taxi to the largest bus.' Such a position is agreed with from a wide spectrum of those interviewed. Nexus PTE's John Usher spoke of the need to simplify the bus, taxi, private hire vehicle, and Community Transport institutional arrangements. DRT expert John Nelson of the University of Newcastle also recognised the problems arising from the artificial differentiation between buses and taxis, but prefers an entirely new definition of public transport provision based on the number of passengers travelling. He adds that it does not matter to the passenger how the vehicle they travel by is classified (Nelson and Wright, 2003). Senior Traffic Commissioner Philip Brown, too, saw the advantages of starting with a 'clean slate'. Finally, Tim Davies, chair of the Association of Transport Co-ordinating Officers, added his support for a re-think of the current regime. In particular, he cites the sharp divide between eight and nine-seat vehicles in operating, vehicle and driver licensing terms, as well as in financing areas (see next section, *Funding*), and suggests that it would be beneficial if Traffic Commissioners moved towards an 'OFFBUS' format, whereby all route licensing

responsibilities would be moved to local authorities, while safety and financial management issues would continue to be regulated by a governmental agency (Davies, 2003b).

To be successful therefore, DRT needs a strong identity. This would not only enable the service to be marketed to the public more effectively, but would provide the sector with an institutional 'home'.

Recommendation: The current institutional arrangements facing DRT scheme promoters are too complicated. Ideally, over the longer term the operating, licensing and financing regimes of all the road-based passenger public transport sectors need to be re-visited and completely replaced with a new integrated system governed by common principles, based on safety and the needs of the passenger, by a single governing authority. Ad hoc and piecemeal alterations to the various regimes would seem to be counterproductive. On the other hand, it is recognised that such a wholesale change in the current political climate is very unlikely to happen for a variety of reasons and that some specific changes would benefit DRT operations (see later). As a minimum, in the short term, the DfT needs to further clarify the institutional framework for ALL potential types of DRT scheme. Also, as DRT has no natural constituency to draw from for political support, unlike the established bus and taxi lobbies, one possible remedy could be to set up a new DRT forum.

There was also some comment that more information about how to set up, plan, run and market DRT would be helpful to local authorities and bus operators. Howcroft (2003) notes that 'one thing the Government bus section is not doing well is with providing tools to help bus planners do market research or plan services.'

Recommendation: Although it is recognised that the private sector is largely responsible for providing public transport services, in many cases it is local authorities that are promoting DRT services. Accordingly, Government should improve the dissemination of public transport planning, operating and marketing techniques, possibly through the publication of a good practice guide.

After considering the wider institutional position, the next step is to look in more detail at the route registration issues.

Service registration

As noted in the tables earlier, with DRT there are many different variations in the degree of route and timetable flexibility. Prior to the introduction of the new regulations in February 2004, this was combined with uncertainty in the legislation which has led to a non-uniformity of how the legislation is applied among the six Traffic Commissioners found in eight regions.

For example, in one study Radbourne (2003) found that dealings with the Traffic Commissioner had mixed results. Although instructed by the DfT to 'accommodate' flexible routes, the Commissioner was found to be sympathetic but very conservative. This meant that timed points were insisted upon, meaning that 'fixes' had to be used for the service to work as planned. Another Commissioner's office (covering Wales), apparently 'did not want to know' about the proposed service and wanted to 'bury their heads in the sand'. In the end, the scheme promoter decided to 'pretend that the service had a timetable and fixed timing points' (Stones, 2003b). In contrast, problems in dealing with the Traffic Commissioner did not materialise for schemes in some local authorities, where a flexible approach was taken to interpreting the regulations. Often, negotiations with the regional Traffic Commissioner led to the adoption of a scheme that is 'quasi-legal'. In one case, the main practical outcome of the negotiations was that three timing points for the routes must be observed, but the operator does not have to advertise these to the public. Further, although the service is technically available to anybody, there may be situations in which a driver denies access to un-booked people waiting to board an apparently empty bus as they may deprive pre-booked passengers a seat further along the route. In another case the local Traffic Commissioner suggested there was scope for introducing flexibility as long as there were two fixed timing points per route. But there were still problems. For instance, one service only carried a very few people but must serve specific sub-areas on specific days. Thus on certain days the service has had to turn down some people who were living in the 'wrong' sub-area, just in case someone from the right sub-area phoned – an unlikely event. Finally, a third sympathetic Traffic Commissioner was helpful in devising an appropriate routing through unsuitable regulations, by registering semi-flexible DRT feeder services as a diversion away from the main route.

The second major concern to emerge from the research was to do with the related issue of timing points. Timing points are seen as being problematic because buses are required to run even if there are no bookings, and because they limit the flexibility of how the service is operated. For example, Buchan (2003) notes that Wigglybus sometimes runs empty for registration purposes, as does the U-Call service in Newcastle (Usher, 2003). This seems to defeat the purpose of *demand responsive* transport. Where passengers are using a service, Buchan (2003) and Stones (2003) both state that being forced to respect the timing points was affecting customer satisfaction, as some buses observed 'artificial' waits in order to re-time the schedule to match the timetable. And Radbourne (2003) notes that the Worcestershire FlexiLink scheme was forced to build 'sufficient slack for a bus to double back if required' into the timetable. Drummond *et al.* (2003) found that 'the current legislative structure also means that people do not appreciate that some projects are impossible.' Overall, Cross (2003) notes 'it is important that the DfT permit a greater range of flexible services', a position supported by Armstrong (2003). More specifically, Buchan (2003) suggests that operators should be allowed to register services that do not necessarily have to run. White (2003) agrees, and notes that the five minute rule currently in place for monitoring reliability is plainly 'not sensible' for DRT and suggests a new approach is needed. Once again though, this issue has been addressed by the new regulations.

Monitoring whether services run (or are available to run) or not currently determines the limit of how flexible a service can be. There is therefore a need to look at alternative approaches to the current 'catch all' timing-point method which, while appropriate to fixed timetable services, is clearly useless for on-demand style service patterns. Instead, an alternative approach to monitoring actual service compliance by the Commissioners might be the 'mystery shopper' approach, for example with a sample of services being booked by telephone to see if they are then operated as per the published standard.

Recommendation: New monitoring methods need to be devised by the Traffic Commissioners (or subsequent registration body). This would allow a more comprehensive range of flexible public transport service options to be registered.

Several more specific licensing issues were also raised by the research exercise. These were to do with taxi and minicab licensing constraints, 'own and loan' restrictions for PTEs and the requirement to tender not only services but call centre set up and call centre operations as well.

Taxi and minicab licensing

In theory, the deregulation of bus services due to the 1985 Transport Act should have encouraged bus and taxi operators to bid for operations, and stimulate competition. In practice, this has rarely happened. Negotiating with taxi operators appears to be a lengthy and often fruitless process, hindered by the various interest groups. The business case for DRT from a taxi operator perspective is difficult to understand, and dealing with taxis involves many different operators, since many drivers are self-employed. Further, although some operators may have a central reservation system, none will be equipped to run a call centre. In some deeply rural areas, such as Devon, there may not be a reserve of taxi operators willing or able to participate. Thus it requires considerable effort on behalf of the local authority to establish a service based on taxis.

Despite the promise of almost risk free operating contracts offered by many DRT schemes, operators appear reluctant to bid for new types of business. Cango in Hampshire, and the Worcester FlexiLink attracted considerable interest at their respective launches, but in practice few operators were willing to participate, perhaps fearing the 'first mover' syndrome. Almost all the UK schemes have been initiated by local authorities, with only a few exceptions. This is in contrast to the position with conventional public transport where the trend is to shift the burden of risk towards the private sector. This situation is made more problematic by a lack of capacity for local authorities to specify terms of reference. Co-ordination across district and county boundaries may present strategic difficulties.

One further issue of taxi licensing and shared taxi operation is highlighted by American experience (Cervero *et al.*, 1995). This suggests that zonal fare structures (as operated in Washington DC) are less problematic for shared taxis than metered fares. It also looks in more detail at regulations in California, finding that regulatory structures vary from those that specifically ban shared taxis, to those that permit shared rides with the consent of the first passenger, to the City of Berkeley which specifically permits shared rides. Several other cities do not address shared rides and so they are allowed *de facto*. Officials in the Bay Area of California suggest, however, that demand for shared rides is minimal.

Overall, bus operators seem better equipped to run DRT, although many operate in near-monopoly local conditions. A recurring criticism of the UK system is that bus operators understand this position and use it to their advantage. Such a case recently emerged in Northamptonshire (Drummond *et al.*, 2003), where the incumbent operator threatened to withdraw services that were in danger of becoming unprofitable. As a result, the County Council had to intervene and subsidise the services on a DRT basis using Bus Challenge funding (Corby DRT). Some of the funding was used to buy new buses, which are operated by the same operators, who also retain the farebox revenue. Such an arrangement angered the Council, who felt blackmailed. From the operator's point of view, it made perfect economic sense as it almost eliminated the financial risk to investing in new equipment. The operator was aware that it was the only one in the area that could bid for the routes, and that local authorities are not permitted to own buses and run services directly.

In summary, taxis are being under-utilised. This is because they are unwilling to work to schedules and be 'regimented' in the way they conduct business by a third party. Taxi operators also feel that there is too much paper work and regulation concerning health and safety (Davies, 2003b). Local highway authorities and PTEs in particular are also concerned about the individual foibles of the various district authorities that licence taxis and PHVs. For instance, in many cases a barrier to initiating shared taxi schemes is that there is licence plate rationing by local authorities (White, 2003), which means initiatives can only operate by persuading existing operators to take part. Elsewhere, some local authorities will not issue a taxi license to eight-seat vehicles (Davies, 2003b).

Recommendation: As a minimum, stronger guidance and/or regulation needs to be issued to taxi and PHV licensing authorities extolling the virtues of shared taxi-type operations. More beneficial would be to standardise private hire and taxi licensing rules while shifting these licensing responsibilities from the district authority tier to that of the highway authority (where the authority is not a unitary one) or to a PTE (where one is present).

Requirement to tender services

The final regulatory concern was the requirement for local authorities in the UK to put the operation of call centres out to tender. Buchan (2003) suggests that while local authorities run call centres very well, the tendering of the operation often reduces the level of service to an unacceptably low level.

'Own and loan' and the impact on vehicle brokerage schemes

A very specific regulatory barrier relating to the potential for DRT services to substitute for specialist services such as education, social service and disabled transport, was due to Section 60(5) of the 1985 Transport Act preventing PTEs from 'owning and loaning' vehicles, thus making it far more complex for them to act as a vehicle broker (Howcroft, 2003). The provision was intended to prevent PTEs from owning any vehicles so as to prevent them using dial-a-ride vehicles to re-enter the bus market via the back door – a scenario the Government took pains to avoid. However, such a brokerage system would theoretically enable a council or a PTE to provide a vehicle pool, from which private and community transport operators, council departments and Primary Health Care Trusts could lease vehicles as required for a few hours a day – perhaps significantly reducing costs. Some PTEs have devised strategies to enable them to provide vehicles despite the regulations. For example, for yellow school buses, Greater Manchester PTE pays for the vehicles but never owns them, as the buses pass from the manufacturer straight to the operator under a chattel mortgage arrangement. If another company wins the contract at a later date then the arrangement states that the operator is required to transfer the vehicles at that time. Ordinary local transport authorities do not have any specific powers to own buses, but nor are they prohibited from doing so. They can act under the 'well being' powers under the Local Government Act 2000 (not applicable to PTEs), which in broad terms says they can do anything that is in the interest of their local community and is not specifically prohibited.

Recommendation: The regulations in the 1985 Transport Act preventing PTEs from 'owning and loaning' vehicles should be rescinded[30].

Financial issues

An extremely important consequence of the institutional arrangement is whether a service is eligible for particular types of funding or not. Public subsidy accounts for 30% of bus operator revenue for services outside London, which comes from Bus Service Operators Grant, payments for tendered services and concessionary fares compensation. For DRT, as with licensing, the situation is rather less clear.

Bus Service Operating Grant

The following table looks at the position of what types of DRT service are currently eligible for Bus Service Operating Grant.

Table 6.4: Eligibility for Bus Service Operating Grant by public transport service type and level of route/timetable flexibility

Route Type	*Timetable Type*	*Private hire*	*Taxi*	*Public Service Vehicles*	*Community Transport*
Fixed	Fixed	No	Yes	Yes	Yes
Fixed	Semi	No	No	Yes	Yes
Fixed	Fully	No	No	No	Yes
Semi	Fixed	No	No	Partially	Partially
Semi	Semi	No	No	N/A	Yes
Semi	Fully	No	No	N/A	Yes
Fully	Fixed	No	No	Yes	Yes
Fully	Semi	No	No	N/A	Yes
Fully (shared use)	Fully (shared use)	No	No	N/A	Yes
Fully (exclusive use)	Fully (exclusive use)	No	No	N/A	N/A

This table shows that the current Bus Service Operating Grant funding regime is actually far from clear, although the recent round of consultations have gone some way to rectifying this (White, 2003, Stoner, 2003).

Essentially, the current position is that private hire vehicles are never eligible for BSOG, while taxis are only eligible when operating as a registered Taxibus under Section 12 of the 1985 Transport Act. Regulations were introduced from May 2002 to extend the BSOG scheme to a wider range of Community Transport services, i.e. those which are provided by a non-profit making body under a Section 19 permit. Local bus services are only eligible for BSOG providing that services are available to the general public and that members of the public can make single journeys between any two stopping places.

Before February 2004, this meant that DRT operators either had to divide their services between eligible and ineligible mileage, as with Cango in Hampshire (Armstrong, 2003), or to alter the service to comply with the rules, or else not claim BSOG. The West Sussex DORIS scheme for example, operated even when empty on the fixed route portion of the route so as to be able to claim its BSOG income (Duffell, 2003). And Wigglybus included a two minute scheduled section of route, at the beginning in order to satisfy the traffic commissioners that it is a register-able bus service eligible for BSOG (Buchan, 2003). Meanwhile Nexus PTE did not claim for BSOG for U-Call because trying to differentiate between fixed and flexible routes is too complicated a process (Usher, 2003). While the new regulations have now cleared up the above discrepancies, the rules still mean that private hire vehicle drivers have no financial incentive to operate shared taxi services.

[30] As of November 2003, it is understood that the DfT has already pledged to allow PTEs to lease vehicles and is in the process of drawing up a Regulatory Reform Order to effect this.

Overall there was a unanimous view among those consulted in the course of the research that BSOG needs to be extended to cover all mileage operated by DRT bus services, as has now occurred. There was also a concern that currently there are no real financial incentives to persuade minicab and taxi operators to offer services under Sections 10, 11 or 12 of the 1985 Act.

Recommendation: BSOG should be extended to cover all mileage on services registered with the Traffic Commissioners as 'shared use' public transport services, whether they be operated by bus or taxi. Ideally, it should also be possible for DRT schemes registered with and monitored by local authorities to be eligible for BSOG too.

Rural Bus Subsidy Grant

The Government recently decided to extend the Rural Bus Subsidy Grant (RBSG) for a further two years (to 2005/6) and to allow it to be used for funding a wider range of services, possibly including DRT (Transit, 2003), although final decisions are still to be taken on exactly what services will be covered. As of November 2003, the DFT is currently consulting interested organisations on the details of the changes to the rules of the grant.

Recommendation: Rural Bus Subsidy Grant should be extended to cover all mileage on services registered with the Traffic Commissioners as 'shared use' public transport services, whether they be operated by bus or taxi, should they comply with the 'rurality' criteria. Similarly, rural local authority registered DRT schemes would also ideally be eligible.

The future of Challenge funding

One major area of DRT funding thus far in the UK has been Rural Bus Challenge funding and, more recently, Urban Bus Challenge funding. Indeed, many of those interviewed for this study acknowledged that RBC and UBC have been perhaps the crucial element in stimulating the development of DRT in the UK. Having said this, there have been a number of problems with the schemes.

Firstly, as with all such specifically targeted funds, there have been problems at the 'boundaries' concerning which areas qualify for funds or not. In one instance, inappropriately determined rural–urban boundaries were encountered in Kettering, Northamptonshire (Corby DRT) (Drummond *et al.*, 2003). Here, the DfT definition of a 'rural' area has proved to be highly divisive, and represents a financial barrier. People view an operation in one area, but are excluded from using it or having a similar scheme as a result of the criteria applied. Drummond *et al.* suggest it would be better to have one 'Bus Challenge' fund without the artificial barriers, and that this additional funding could instead be awarded through the Local Transport Plan. A similar problem occurred with the urban FlexiLink project in Worcester, where a project was designed to provide an outer orbital bus service that would benefit from being 'pump primed' by UBC funding. However, this would have not met the 'urban deprivation' criterion and so a more modest route emerged (which had to be modified to avoid affluent areas of Worcester, and to link education, shopping and employment with the hospital) around a housing estate (Radbourne, 2003). Once again, residents in areas of the city where there is no such bus service, but which fail to fulfil the criteria for UBC funding, have felt ignored. This problem of defining an area as 'urban' rather than 'rural' for the needs of Challenge funding is also picked up by Nelson and Wright (2003), who see it very much as an 'artificial barrier'.

A second issue is that very little market research has been done when developing UBC/RBC funded schemes. For instance, the planner behind one scheme in the south of England notes that it was designed to carry commuters to an interchange where they could take the train to work, but instead it carries pensioners to the social centre. Howcroft (2003) suggests that the reason many schemes are badly targeted is there is not usually time or resources when preparing the bids to target them properly, if at all. There was also a feeling among interviewees that little effort should be expended on preparing a bid as there was no guarantee it would be successful. Nexus would have liked to have more accurate information on an area and to have done more research before introducing a DRT service, as the last time the design was driven by the requirements of the UBC bid (Usher, 2003). Despite this, speaking on the Nexus U-Call project, Usher says the UBC and RBC funding has been a good thing, but admits that Nexus won many of it bids for this funding 'so I would say that wouldn't I'.

Thirdly, in order to qualify for RBC and UBC, proposed schemes have had to demonstrate that they are innovative in some way. This was important initially, when new ideas were needed to test what type of schemes worked best. However, 'innovation' has tended to mean that every successful bid has involved a new call centre with new software, new types of operations and/or new types of vehicles which has led to far higher start up costs than were strictly necessary (it may have been better if schemes had pooled such resources such as call centres instead of continually 'reinventing the wheel'). To be fair, the Government has explicitly recognised this during the most recent (2003) guidance for RBC/UBC competitions. This states that support for schemes which, whilst not in themselves innovative, offer value for money in the improvement of urban/rural transport by means other than the support of 'conventional' scheduled bus services.

This has also meant that several of the more 'innovative' schemes have been funded that may well not prove financially viable once the central government funding runs out. Instead, the Government might have achieved better value for money had it invested in pump-priming 'financially viable' schemes instead, and if this is the case then RBC/UBC-style funding rounds may not be the best way to allocate this kind of subsidy. Once again, it should be noted that the Government has already moved towards this by specifically issuing invitations to DRT projects to bid for the Kickstart initiative 'pump-priming' funding.

Fourth, several respondents had the feeling that bus companies saw lots of extra money being thrown at DRT and put prices up accordingly. The Wigglybus operation in particular sees rising bus industry costs as threatening new and existing DRT services, and suggests there is no justification for costs having doubled in three-four years given the prevalent rate of inflation. 'It can be assumed that the private sector is seeking excessive profit margins' (Buchan, 2003). Another local authority planner notes that 'Bus Challenge funds are viewed as a simple mechanism for boosting the profitability of private operators.' While cost inflation is a problem across the bus industry, many interviewees did feel that the DRT schemes were particularly vulnerable. It should be noted though, that it was not possible to find any further evidence to support these claims.

Fifth, the 'novelty' element meant that several schemes experienced problems with the procurement and reliability of vehicles, call centre operation and routing software. Such a major infusion of money in such a short space of time meant that many schemes experienced long delays before they came on stream. Nelson and Wright (2003) note that getting hold of vehicles was difficult because 'there were 25 authorities each after a couple of individually specified vans, and the vehicle suppliers had no warning and so were totally unprepared'. Stoner (2003) says that Northumberland's Phone and Go DRT was forced to wait for over a year to finally have its vehicles delivered, partly because of the company not really knowing about the requirements of a DRT operation. Wigglybus (Buchan, 2003) and Cango (Armstrong, 2003) experienced unreliable vehicles, while Wigglybus also had horrendous problems with its call centre. Meanwhile problems installing the routing software affected Wigglybus, Phone and Go, and Cango. It should be said though, that the majority of these glitches primarily affected only the earliest schemes.

Finally, there is 'a nervousness' about what will happen when UBC/RBC funding ends (Armstrong, 2003; Nelson and Wright, 2003).

Overall, the general opinion was that RBC and UBC 'has had a very positive effect on the [DRT] industry' (Duffell, 2003). However, there are problems in that it is overly complex, encourages innovative schemes rather than potentially cost effective schemes, and requires time to be spent on bidding for resources with no guarantee that any money will be forthcoming. Advice on what to do next was more mixed, and ranged from advising the Government 'not to lose its nerve over RBC and UBC funding' to replacing it with a more general form of DRT or bus subsidy. The biggest concern though, was actually about when the scheme will finish and what will happen afterwards.

Recommendation: The Challenge funding mechanisms have served their purpose, and there is now a need for a more predictable source of money to support DRT schemes as they strive to become a financially viable form of public transport. This could be offered through BSOG or RBSG, or perhaps through a 'pump priming' fund (such as the Kickstart initiative), whereby the subsidy gap between DRT and conventional bus routes might be covered for the first two or three years. In any event, a decision as to the long-term future of the Challenge funding scheme (and about any replacement money) would be appreciated as soon as possible.

VAT

Value Added Tax is the next financing issue affecting DRT. The current position is illustrated in the table below.

Table 6.5: VAT rating by public transport service type and level of route/timetable flexibility

	Private hire	*Taxi*	*Small bus (<9 pass seats)*	*Big bus (>9 pass seats)*	*Community Transport*
VAT rating	17.5%	17.5%	17.5%	0%	0%

Essentially, while vehicles of ten seats (including the driver) or more qualify to be zero rated for VAT on costs on fares, private hire vehicles and taxis do not (HM Customs and Excise, 2002b). This inconsistency with the VAT treatment of costs and fares does have an impact on the take up of shared taxi schemes (Drummond *et al.*, 2003; White, 2003). Once again though, the issues of monitoring and enforcement are crucial.

Recommendation: Ideally, subject to an appropriate monitoring and enforcement regime being established, taxis and PHVs should be eligible for zero-rated VAT on costs and fares whenever they are operated as public as opposed to exclusive-use transport system.

Political

The third major category of national barriers affecting DRT can be described as political. In some ways, DRT already has a strong political backing for a number of reasons. In particular, DRT presses the 'social inclusion', 'access for disabled', 'countryside' and 'urban deprivation' policy buttons and it could be developed to meet 'resource efficiency', 'integration', 'environment' and 'congestion' objectives too. However, while DRT is mentioned as a possible solution to these issues in a number of reports from a range of government departments, agencies and units, there are a number of areas where it could be embedded further.

Need for new indicators of public transport supply

One key way this could be done is through accessibility planning. At the moment, a number of government agencies, including the Engineering and Physical Sciences Research Council, which is conducting a large research project, are involved in devising a national accessibility regime which aims to ensure that everybody in the UK has at least a minimum level of accessibility to various facilities.

Previously, when such standards have been introduced, there has been a tendency to consider access to public transport services in terms of distance from a bus stop and frequency of service. A subtle alteration to these indicators, e.g. by suggesting that people be offered at least an hourly *opportunity* to travel would mean that DRT would become the most efficient way of meeting the standard in many places (Buchan, 2003).

Recommendation: Government needs to set a framework from which to set legislation concerning how often the public should have access to transport. An hourly opportunity to travel would be a good standard. A national accessibility standard for rural areas would promote DRT, as it would be the only efficient way of meeting the standard in many places.

Planning for DRT

Land use is a significant shaping factor in the effectiveness and efficiency of public transport systems. In recent years there has been a tendency to allow low-density out-of-town developments to proliferate, although this trend has been slowed since the approach reached its zenith during the 1980s. Clearly such developments are car-friendly (a major reason behind such dispersion) and bus unfriendly – often both because the dispersed trip patterns are more difficult to serve by bus, but also because at the micro design

level such developments often involve the building of cul-de-sacs and road humps that severely affect the planning of bus routes. Such factors may mean that DRT is likely to be more appropriate than a conventional bus in these areas, (although this should not mean that developers should be allowed to carry on in a similar vein using DRT as an excuse). Indeed, planning rules need to be altered to prevent this type of public transport unfriendly development from going ahead. DRT does not eliminate the public transport/dispersed land use conflict, even if DRT can adjust more readily. DRT should not be taken as an excuse to relax land use/transport concerns as happened in Milton Keynes during the 1970s (Potter, 2003).

Recommendation: Planning guidance should recognise that low-density out-of-town developments are not conducive to public transport operation and should be discouraged. However, where such developments already exist, DRT may be a possible solution to poor public transport accessibility.

Costs, subsidies and wider benefits

A further issue of importance is in the calculation of costs and benefits relating to DRT (and to public transport as a whole). For instance, enabling older people to access social networks and transferring people from the car onto public transport delivers far wider health, social, economic and environmental benefits than currently allowed for in current cost benefit calculation techniques. But how can that benefit be 'reclaimed' by the transport sector? From a public transport perspective generally therefore, there is a need for research on cross sector benefits, but particularly for DRT (where per passenger trip subsidies tend to be higher) (Davies, 2003b).

In practical terms, evidence of DRT contributing to social inclusion goals has mainly been anecdotal. For instance, Radbourne (2003) reports that there has been evidence of rural economic regeneration in local communities outside Worcester, as FlexiLink passengers have realised that that they do not have to travel into the city but can gain access to the services they require from the local village or town en route. It also saves them money by not having to travel further than necessary. Similarly, Cross (2003) says that the Lincolnshire InterConnect scheme has been a success from a social inclusion perspective – consultant Steer Davies Gleave used the Sonata Package to determine that the county achieved its goal at the macro level of reducing 'unmet travel needs' (Sonata package). At the macro level, the target has been to reduce 'unmet need' from 18% to 12%. Lincolnshire also claims to have met the DfT national indicators of access to public transport, including access to an hourly service, while anecdotal evidence suggests a positive effect in 'quality of life' social and health impacts.

Recommendation: Government ought to sponsor more research into the wider environmental, social and economic benefits of transport in order to help justify higher public transport subsidies.

Very much related to this, is the question of subsidies to other forms of transport. In the USA for example, Cervero *et al.* (1995) suggests that the most serious obstacle to DRT expansion has not been regulatory, but the market place, whereby competitors (the car and transit) receive huge subsidies that distort the economics of operation. Further, insufficient demand drives up the unit costs of liability insurance, permits, and other ongoing expenses. Interestingly, there are relatively few regulatory barriers to expansion. The problems surrounding public transport subsidies and DRT in the UK have already been discussed, but it is also important to note that the costs of using public transport relative to the marginal cost to the user of using a car due have risen significantly over recent years, and any future widening of the cost gap between public transport and the car will undermine the viability of DRT.

Recommendation: Government needs to consider policies aimed at reversing the trends whereby car use is becoming cheaper and public transport use more expensive.

On a more prosaic level, while DRT is typically more expensive than conventional fixed route bus services per passenger trip, it is also usually far less expensive than specialist education, social service and health transport services. Clearly then, allowing DRT to take on these trips may well provide a more cost effective option for a local authority currently subsidising these services separately, and many industry observers now suggest that future 'mobility management' will witness greater integration of services, such as patient transport systems (Nelson and Wright, 2003). But, although public transport departments within local authorities have a duty to co-ordinate such services (see Section 88 of the 1985 Transport Act) (Stoner, 2003), and multi-use systems are becoming more common place as local

authorities begin to realise how inefficient current vehicle policies are due to the best value reviews they must carry out, relatively few councils have yet managed to do so (Duffell, 2003). Even where such agreements are nominally in place though, in practice there are significant institutional and cultural barriers to be negotiated before any meaningful integration can take place (Duffell, 2003; Gough (2003); Nelson and Wright, 2003). In particular, it is vital that financing streams are properly established.

Recommendation: Government ought to examine ways and means of encouraging the establishing of vehicle brokerage operations.

Other barriers

The proliferation of call centres is also seen as a problem. While scheme by scheme centres may be desirable from an operational viewpoint (local knowledge of an area is valued by customers), the set up and operational costs involved are typically high, and many current UK DRT schemes are simply far too small to justify the level of investment required. Moreover, developments in routing and mapping technology now mean that local knowledge is not as crucial as previously, making regional or even a national call centre(s) viable, potentially allowing significant economies of scale to be realised (Duffell, 2003). Care would need to be taken though. Buchan (2003) warns of the dangers of trying to deal with call centres 'on the cheap', while Armstrong (2003) suggests that local knowledge is not critical, but that communication between the drivers and the call centre is important as both need to understand and appreciate local road and route conditions. Such a relationship can be very time consuming, so it is impractical to share the call centre with other service functions. Armstrong therefore suggests that regional-level call centres probably offer the best balance between cost and operational requirements.

Recommendation: Government needs to look at ways of developing a more rational network of DRT call centres.

Other technological barriers are that there is still no mobile telephone coverage in some very remote areas of the country such as parts of Cornwall and the north west of Scotland (arguably where DRT might be most effective), making high tech DRT schemes very difficult to introduce (Crossfield, 2003).

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Appendix A – Detailed DRT Case Studies[31]

PP1 Public Policy: Interchange DRT

PP1.1 InterConnect, Lincolnshire, UK

The InterConnect network is a suite of rural services, and includes two strong DRT elements in CallConnect and CallConnect Plus. It uses existing bus networks, but has limited flexibility. The service offers the potential to change into other bus networks at designated interchange points.

It has been funded from Bus Challenge and rural bus grants; £1.75m so far. The County Council initially bid for 25% of the available grant. The aim is to fulfil the transport needs of the county, and channel the demand into the interurban network. This has meant using the existing commercial bus network, but it has proved difficult to utilise the rail network. In Lincolnshire, the county is dominated by market towns that serve the wider rural communities for health, banking, retail, etc. The DRT act as feeders into interchanges positioned at hubs in these market towns along the interurban bus routes. The feeders were originally based on fixed routes.

There are two types of DRT:

1. CallConnect is a semi-fixed service that operates between the secondary network, across the main interurban network and down the main corridors.

2. CallConnect Plus is a fully demand responsive services that operates in specified zones around a town, such as Horncastle. The service is hourly, and returns to the same place to connect with other services. However, in practice there is little evidence that passengers really use the network to switch from one network to another.

The services do not target one particular socio-economic group, but the operating period renders it unsuitable for commuters. As the County Council has no real idea of likely future performance, it would like to extend the operating period to 07.00–19.00. There is currently no justification for running evening and Sunday services, but instead the focus is on the quality of the current network. It has proved to be difficult to engage with younger people. It is mainly a local network, and it has proved difficult to link to the rail network. Centro, the West Midlands Passenger Transport Executive – which subsidises rail services in the area – was quite supportive of the idea, but required increased frequency of a feeder service. In principle, Centro agreed with the idea of through ticketing, although it is probable that only a few passengers need access to trains, and there are no local powers to enforce integrated services post-privatisation.

All the subsidised feeders remain in the control of the County Council. The strategy was developed by the County Council with the co-operation of the bus operators. When the level of service was increased it was put out to tender, and the incumbent Lincolnshire Roadcar (part of the Yorkshire Traction Group) won.

The feeder service helps operators strengthen their main services. Operators have also co-operated by introducing six new low floor buses with some County Council grant aid, and introduced new services

[31] IMPORTANT NOTE: The cases described in the appendices were correct when completed in December 2003. However, since then (in February 2004) the DfT has introduced new regulations for DRT operations in the UK that address some of the issues highlighted (see http://www.dft.gov.uk/stellent/groups/dft_localtrans/documents/page/dft_localtrans_027309.hcsp for further information). Moreover, the DfT is also consulting over the issue of funding eligibility.

during the week. Most of the growth has been along the Lincoln–Skegness (100%), Lincoln–Boston (60%) and Lincoln–Grantham (30%), all representing increased revenue to the operator. Once the original operators realised how successful the project was, it had the effect of attracting the co-operation of four other operators in the area. The County Council act as project managers, while the operators are key players. They also received additional funding from the EU 5B scheme and the Countryside Agency. The Lincolnshire Access Forum (local disability group) was involved in the design requirements of the buses. The County Council also improved the infrastructure, such as raised curbs, new shelters, etc. The eight-seater buses have been painted in the Interconnect livery. Publicity has been through extensive leafleting in villages, house to house. 'Word of mouth' is also very important, leading to 'clusters' of users, who then recommend the service to their acquaintances. It was a slow process to build up the service, which increased steadily for six months, then the ridership levelled out. This branding and publicity has been central to the success. Public surveys reveal 75% county-wide awareness of the service.

Fares are on a zone basis, ranging from £0.60 for a single zone single fare through to £5.90 for a five - zone return (e.g. Louth to Lincoln).

The Transport Co-ordination network is managed by the 'Matrix' at the County Council. Mobi-Route software is used to make bookings. Journeys are confirmed with a text message sent to the driver, giving a 10-minute window for picking up. The booking centre runs all the DRT and dial-a-ride services. The annual running costs are £50,000–60,000. The centre derives some income from work for Peterborough. It impossible to quantify the savings since the centre is an integral part of the operation, and there are too many variables to assess over the twelve-year operating period. There is segregation of the user groups, such as schools and social services serving different client groups. Social Services is sensitive about dealing with concerned parents of special needs children mixing with adults.

The level of ridership is low by the nature of the services. The capacity is determined by the time of the service, not the number of seats available. The current daytime interurban service is already commercially sustainable. The evening and Sunday services will require subsidy, as will all feeder operations in future, which implies increased rural bus grant. The Government intends to extend the project until 2006, which is considered politically astute, since there is strong local support at a local level. Overall the average subsidy (e.g. Horncastle route) is around £4 per passenger. There is currently no BSOG on flexible services, but should it be permitted, this would have the effect of reducing the subsidy by around £1 per passenger. The overall cost of operating the service is around £30,000 per annum. This is considered to be very economical in absolute terms.

In terms of addressing social exclusion, the service has been considered a success. Using the DfT national indicators, including access to an hourly service, it is also successful. The consultants, Steer Gleave Davis, have measured 'unmet travel needs' (Sonata package). At the macro level, the target has been to reduce 'unmet need' from 18% to 12%. It is impossible to gauge the effects on 'quality of life', but anecdotal evidence suggests a positive effect in social and health terms;

'I have been released from a transport prison.'

'My husband died and has taken the transport with him.'

The services meet the Government targets of access to a bus within a 10- minute walk, and reduce social exclusion in rural areas. It has also had the effect of increasing revenue for operators, resulting in a win-win position for both parties.

The barriers include the provision of a subsidy to increase the frequency of the service on commercial routes. Regarding the semi-fixed routes, the County Council negotiated with the Traffic Commissioners, who proved to be sympathetic. They found a way around the existing regulations by registering the service as a diversion away from the main route. Although the regulations are highly prescriptive, the Traffic Commissioners helped with devising this 'fiddle'. It is important that the DfT is planning to revise the regulations governing DRT before the summer recess, and will permit a greater range of flexible services. All the services were registered as conventional bus services. As they are eight-seater buses, it is theoretically possible for taxi operators to tender for running the services. In practice, none have bid for them. The County Council prefers to deal with bus operators who better understand bus markets.

One operational problem is that with the semi-fixed route feeders, not many people are picked up 'off-route'. It has proved difficult to run due to the uncertainty, and therefore harder to sell as an idea. In contrast, the flexible buses simply require pre-booking.

There is considerable scope for developing the service in the future, as it meets local and national objectives, and contributes to the wider benefits of 'best practice' and 'Beacon Council' status. Specifically, the plans for the future include extending the period of operation, and eventually covering the entire county. A pilot DfT project identified huge potential scope for providing access to health transport, which would work alongside Social Service, for example as a patient transport facility. The County Council also intends to eventually contract out all aspects of the operating contract, including vehicle ownership and maintenance. It is likely that the entire bus subsidy will be redirected to increased DRT services, which are highly cost-effective for deeply rural areas, supplemented with a dial-a-ride service as a safety net.

If the scheme were to be re-run, the County Council felt it had had the right approach and that moving to a fully flexible service is critical. It would miss out the intermediate stage of running the initial fixed routes. It would also not supply the buses, but specify the performance due to the potential for responsibility and ownership conflicts.

The novel aspect is the flexible service element, and the mature working relationship the County Council has with the operators. The fact that ridership levels have doubled has proved to be important, combined with the quality of services offered, the interchange facilities and service branding.

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PP1.2 Direct Access Response Transit (DART), Bay Area, San Francisco, California, USA

Livermore Amador Valley Transit Authority (brand name 'Wheels') serves a relatively affluent suburban area (Dublin, Pleasanton and Livermore) to the south-east of the Bay Area of California. Buses serve school kids, senior citizens and a handful of dependent commuters. Buses were reasonably well-established in Livermore which is slightly less well off.

The situation is that 51% of the trips on the system are carried on a single fixed route – the number 10 bus. This operates 7 days a week throughout the day. Elsewhere on the network, buses were relatively empty between the peak periods, although some people still need a public transport service. So, LAVTA commissioned Nelson Nygaard Consulting to do a study. This looked at a paratransit solution and found examples in Seattle (King County Metro) and San Diego.

As a consequence, the DART (LAVTA's DRT) system began operating on the same day as the Bay Area Rapid Transit station opened (10 May 1997). With hindsight, this was a mistake, as the fixed-route system should really have been tried to see if BART increased its patronage. But, BART was 18 months late, and the date for launching DART was not moved to accommodate this delay.

DART operates between 09.00 and 14.00, and between 19.30 and 21.30 on all routes except Route 10. Three vans leave the Dublin-Pleasanton BART station every hour on the hour to various zones. Some zones overlap. Zones cover East Pleasanton, West Pleasanton and Dublin. The service is intersection-to-intersection rather than door-to-door. Passengers not boarding at the BART station can dial-a-ride up to two hours before they travel. Fares for DART are the same as for fixed route buses. People who qualify under the Americans with Disabilities Act (ADA) can use the DART (and fixed route) service for free. If the user has a bad health day or the weather is bad then ADA riders pay $1.25 to use the dial-a-ride service. This is the standard fare for able-bodied users of fixed route and DART – although transit agencies may charge up to double the standard fare for dial-a-ride. Transit agency is not allowed to deny

an ADA rider a ride – even if this means putting on an extra van. This is in addition to a taxi-based paratransit service for disabled.

A contractor currently operates LAVTA services which are planned by LAVTA. It is paid by the hour and expected to collect origin-destination (OD) data. It is interesting that 80% of the OD pairs are served by the fixed route services at different times of day, while the remainder are off the former main line routes.

Currently passengers must arrive 5 minutes before the allocated time and allow up to 15 minutes after (ADA or disabled accessibility rules) for the bus to pick them up. This is not ideal as the main dial-a-ride service is not door-to-door (though ADA services are door-to-door and so this is more acceptable). LAVTA is looking to tighten this standard soon. As of May 2003 the vans have been controlled manually, but it is intended to switch to computerised allocation in two months time. The upgrade cost for the new computerised scheduling equipment is ~$60,000, and the software leasing fee is $7,000 a year.

In terms of the wider cost, there is not much difference between buses and minibuses. Vans are cheaper than buses ($80,000 compared with $300,000) but do not last as long due to regulations (four, five or seven years instead of twelve for a bus). Meanwhile, whereas it used to be cheaper to employ minibus drivers than bus drivers, this is no longer the case. There are however fuel savings using the vans. Four DART vehicles replaced five buses – three vans are used during the week and four at weekends. This was not really done for cost savings (agency had money from the state until the energy crisis) but for perception reasons. Fully allocated costs are $65 an hour per vehicle. Use on average is around 12–13 passengers per vehicle hour, and the Revenue Cost ratio is just less than 20% – the California minimum. However, this is acceptable thanks to the BART exemption – the costs of co-ordination.

Productivity is not great, but the vans are used to replace a very unproductive 2.7 passengers per hour buses. It is also the case that while DART is not always filled with users, the dial-a-ride van on the other hand is nearly always working. The aim is to shift dial-a-ride users to DART wherever possible. In terms of cost, the cost per passenger hour for dial-a-ride is around $28.49, DART costs $4.51, and fixed route bus is $3.85. Capital costs are not included in this (price of vehicles) as the Federal Transit Administration pays 80% of these costs. Related to this is that the biggest plus of DART is that the public perception of nearly empty vans is that they are acceptable. The public is not happy seeing empty buses. There are lots of advantages to getting rid of the buses, the main one being that vans can go where buses cannot. The public perception of the vans is that they offer wider coverage. Therefore DART is good for testing new services in sensitive neighbourhoods as vans are acceptable where buses are not for example when the authority is faced with such demands as ‘we need new service’ and ‘get that bus off my street’.

Use is heavily weather related due to the waiting regime – with use (among choice users in particular) drastically reduced in cold and wet weather. For instance, in April 2003, which was wet, there were 51 users a day compared with 60 usually. Services run all day Saturday – there were 85 users per day in April. Sunday services have also been operated over the past two years or so. In summer, the DART service is used by a lot of children – mainly because they understand how to use it which is not the case with some adults – and occasionally there is not enough seats/capacity. The majority of trips are made by senior citizens going shopping and for leisure, etc. Some service workers also use it. Peak dial-a-ride operation is on Monday at 9 am. DART usually receives 78 calls a day, but none on Sundays, with the dial-a-ride getting around 20 calls a day. Most of those are at around 10.30am.

There is quite decent interchange to BART – 16% for the system as a whole. Around 38% of trips (over 5 working days) transfer, and out of them 40% transfer at the BART interchange – although some of this will be to other buses. Surveys are conducted every three to four years. The biggest motivation for users to take the bus to BART would be a lack of parking space at the station, but in this case there is enough free parking at the station and it is unlikely that anyone will suffer two transfers to get to work (other end too).

Additional services have been tried and withdrawn. One service idea was suggested by a politician. This served a rail line to Silicon Valley – three trips in the morning and three in the afternoon peaks. This was unrealistic as there was plenty of parking at the station served. From September on Sundays there will be a new DART service from Livermore Transit Center.

The big obstacles to use are trying to explain how the system works, and the 5-minute window idea. Hopefully this will be solved with the switch from manual to computerised dispatching. Meanwhile LAVTA has instigated training sessions for ADA dial-a-ride users and their families to manage their expectations of what the service can and cannot do. An alternative way of providing such a service may be to provide core routes with time built in for the vehicle to divert where necessary – i.e. a semi-flexible service.

Experience shows that different types of people like different types of public transport. While the bus has a better chance of attracting riders than DART, there are some very loyal DART riders. Basically, some users prefer the predictability of fixed route service, but the problem is that buses could never provide some OD pairs. Anyone can use the DART, but regular bus passengers tend to be put off because the service is three times slower than an ordinary service. Interestingly LAVTA would ideally like to return to a fixed-route service. In Seattle, once services generate six passenger trips an hour they are converted to fixed-route operation. The original plan was to map the origin and destination pairs and then perhaps implement fixed routes where the demand was generated.

In Seattle, King County Metro operates a DART-style service in some outlying areas. Metro began serving door-to-door but was then forced to pull back to intersection-to-intersection very soon after due to the high cost. It also put up very expensive wooden signs at fixed destinations. This failure was painful. Instead, LAVTA paints the kerb and marks existing bus stops with DART logos. Monterrey, California is another area with limited DART-style service.

LAVTA also operates three employer-based subscription bus services to work sites in Santa Clara County. Two buses travel to Lockheed Martin and one goes to Intel. These buses are operated by employees of Lockheed Martin and Intel. While they are behind the wheel, the drivers are employees of LAVTA's contract operator, ATC Vancom. The prime time routes originate at the Livermore Portola Park-n-Ride. They then travel west to the Pleasanton Park-n-Ride before heading south on I-680 to Santa Clara County. Las Positas College has an evening shuttle available after fixed route service ends. Las Positas College DART is available Monday–Thursday at 20.30 and 22.00. This demand response service operates between the college and the Livermore Transit Center.

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PP1.3 Corlink and DIRECT, Cornwall, UK

CORLINK is a joint project between Plymouth (in Devon) City Council and Cornwall County Council and was launched in July 2002. The City Council was awarded £214,800 to implement the service that is due to run until late 2004. It is a completely flexible, demand responsive service covering two areas in south-eastern Cornwall, and originally aimed at attracting commuters travelling into Plymouth from two corridors to the west and north of the city. It operates between 07.00 and 23.00, every day of the week. All vehicles used in the 'Corlink' project are wheelchair accessible, and the scheme addresses social exclusion due to the poor public transport provisions in South Eastern Cornwall, but also aims to provide transport for tourist attractions (including the Eden Project), shopping centres, employment and leisure and social activities.

The service is split into three zones. The first covers the Bodmin/Padstow area of Cornwall and is operated exclusively by Cornwall County Council under the 2001 Rural Bus Challenge award. Zone 2 was designed to link with established bus and rail services west of Plymouth, in the region around St. Germans and Widegates. Zone 3 covers the area around Gunnislake, Callington and Tavistock to the north of Plymouth. All three are largely deeply rural areas.

The Zone 3 service is designed to integrate with conventional transport services in Gunnislake, which has good links with Callington. Zone 2 has proved to be more successful and will be split into three areas to limit journey lengths, and feed into bus services at Liskeard and trains at St. Germans. This will also include Whitsand Bay, as there is an industrial estate, and in the summer a significant tourist population. This was due to start in June 2003. The buses used are seven-seat Mercedes 'Travel liner', converted for wheelchair access. Zones 1 and 4 operate entirely in Cornwall and appear to be successful, using larger buses. Journeys are booked at least one hour in advance, and in theory open to all members of the public. The current level of subsidy is extremely high though, at £28.25 per passenger.

Publicity is effected through leaflets and personal appearances by council officers to community groups likely to benefit from the service. It has proved difficult to convey the nature of the service to elderly people. There has been opposition and competition from taxi operators. For example, in Zones 1 and 2, the bus operator was physically attacked by irate taxi operators who thought the bus service was likely to threaten their trade. By contrast, the local bus operators have been highly enthusiastic about the project, and have been making useful suggestions and innovations, which are being implemented. Passenger surveys have shown that passengers are well disposed to the service.

There have been problems, including the software designed to manage the system, which lacks sufficient flexibility. It has proved to be unable to communicate with buses, possibly due to poor signal strength, and to calculate if particular journeys are practical. Trips are now planned manually, and some areas are apparently resorting to faxing journey itineraries to drivers. A further problem has been the lack of co-ordination between Devon and Cornwall, with Cornwall County Council setting the fare structure.

Overall, the aims and objectives of these services have not been met, and further funding will not be sought, although other options include increasing the service area and the number of drop off points. If the scheme were to be introduced in the future, some changes would be made. The area would be more thoroughly researched to identify demand for any type of service. The interviewee would also resolve the problems of funding cuts imposed. The original bid was cut by the Government from £140,000 to around £43,000. It was suggested that the operators were asking for too much money. The software costs were £32,000, with an additional maintenance fee of £10,000. Cornwall received help from the Government to operate Zones 1 and 4 and the operations centre.

The DIRECT project is managed by Cornwall County Council in partnership with First Western National, and has been awarded £845,000 by the Government through the Rural Bus Challenge to set up a Demand Responsive Cornish Transport (DIRECT) pilot project. It runs between Bodmin Parkway Station and Padstow. It is fed by smaller demand responsive vehicles transporting passengers from out-lying communities bounded by the Bodmin, Wadebridge and Camelford area. An innovative communications link allows a high level of integration between these services and enables the public to have improved access to essential services and other facilities. The service also features smart ticketing and bike racks on buses. The aim is to improve accessibility to employment, education, shopping and leisure for local rural communities within the area, and therefore address social exclusion. It was introduced in 2002.

Source(s)

Cornwall County Council (2001) Demand Responsive Cornish Transport. Visit http://www.cornwall.gov.uk/newsdesk/ns-1-2001/ns01-044.htm Last accessed 22/4/03.

Cornwall County Council (2002) Corlink Celebrates Record Number Of Passengers Using Innovative Flexible Bus Service. Visit http://www.cornwall.gov.uk/newsdesk/ns3-2002/ns02-315.htm Last accessed 02/04/03

Gliddon J (2003) Corlink. Personal Communication, Rural Transport Officer, Plymouth City Council, 22 May.

PP1.4 Village Link, Gloucestershire, UK

Village Link started in June 2000 as a result of a successful Rural Bus Challenge bid of around £900,000. It took almost a year to set up, and the current phase 2002–3 has a grant of £1,787,000. Publicity material

states; ‘The objective is to provide a more frequent and accessible bus service for a rural area in a cost effective way by combining conventional and demand-responsive transport.’

A key aim is to address the problem of social exclusion and increase the level of public transport provision. The services aim to interlink with conventional services, such as at the local Tesco supermarket. The conventional services are provided by Stagecoach. Three vehicles operate on three colour-coded routes covering southern Gloucestershire. The vehicles are owned by the County Council and operated under contract. The original partnership featured Halcrow as consultants, who involved ‘Message Link’ to manage the software. There is a flat fare structure, and through ticketing is available. The income generated is around £1,200 per month, and exceeds expectations.

The most effective mechanism for publicity has been public meetings, since public consultation has proved to be critical to the success, as people do not understand the nature of the flexible service, and in particular that pre-booking is not essential. It is particularly difficult to explain that while the bus might pick up directly outside somebody’s house, the following day might entail a walk of 100 m to a particular picking up point to limit the degree of flexibility and guarantee timings. The overall success has tended to be because of word of mouth, based on the credible, reliable service offered. The booking technology needed some work to resolve teething problems, and the next phase may include a free telephone number. A taxi service is used as a guaranteed back up. If a bus fails to pick up a passenger, and the fault can be traced to the operator, they have to pay the cost of the taxi.

The main barriers involved the Traffic Commissioners, who refused initially to allow fixed timing points. It seems that the regulations are being amended to reflect the growth of flexible services, and to help overcome the perception that the DRT is a regular bus service. A further issue has been that people do not like to have to pre-book, and where the service operates along conventional routes using bus stops, there is the risk of overloading. Drivers and the call centre staff need training in order to manage the effects of allowing people onboard who have not pre-booked. Finally, at the time of tendering for the services, because demand responsive transport is a new idea to users and operators alike, there was a large degree of variance between the bids. At least one proved to be wholly unrealistic.

The next phase of the bid, budgeted at £630,000 will enable the service to run from October 2003 for a further two-and-a-half years. The level of subsidy is estimated at around twice that of a conventional service, but is cheap relative to an hourly, normal bus. It is intended that this phase will include provision of the tourist market, serving destinations such as Slimbridge, Berkely Castle and the canal network. There will also be a joint operation with a call centre, using different firms. A pool of trained drivers will be used. Future plans include hiring the buses out to other groups, such youth groups to maximise resource efficiency.

Source(s)

Blackett G and Jackson K (2003) Personal Communication, Urban and Rural Transport Co-ordinators, Village Link Flexible Bus Scheme. Gloucester County Council. 13 June.

Village Link (undated) Gloucester County Council Environment Department Transport, Village Link. Visit http://www.gloscc.gov.uk/pubserv/gcc/environ/ Last accessed 02/04/03

PP1.5 Village Link, Dengie, Essex, UK

Dengie Village Link is a rural taxibus service which is part of a radical re-organisation of public transport on the Dengie Peninsula in Essex, with the ‘hub and spoke’ service of taxibuses connecting people from villages both with towns and the station and with commercial and tendered bus services on main radial routes. It is aimed at rural residents without access to a car, and addresses the key problem of rural isolation, particularly access to employment, services, the District General Hospital, and schools and colleges, and forms part of the Essex Rural Strategy. The project is funded with Rural Bus Challenge funding (from October 1999) with a 3-year grant of £803,100. The bid for funding was supported by the two local bus operators and the local rail operator, Maldon District Council, Mid Essex Hospitals NHS Trust, and the Parish Councils of the Dengie peninsula.

The partners involved in delivery are the County Council and the operator, currently Arriva. The County Council provides the vehicles and the infrastructure and Arriva runs the service. The scheme has lead to a very large increase in the use of local public transport overall. However, the removal of a regular 'big bus' (tendered service) has led to capacity shortages, which will be addressed with larger vehicles.

The service comprises two levels of public transport, a conventional bus service linking to major towns, complemented with three 'Flexibus' services, each providing a regular hourly 'slot' between defined villages but utilising the proposed 'self-scheduling' system to determine the route of each journey. The service destinations included a hospital, the local rail and bus networks. The route can be used as a hail-and-ride, and it is also a flexible service so that if the driver is telephoned in advance, they can diverts off the main route to pick up people from points a reasonable distance from the route. Village Link vehicles are seven-seaters, or six seats with space for a wheelchair. These have a high quality feel about them. One bus runs each route, and there is one spare. The service currently uses existing bus stops and shelters.

Fares are by zone and are the equivalent of bus fares, and through fares and Day Rovers are available with special fare deals and concessions for regular travellers and young people aged 16–25. The fare depends on distance travelled, varying from the cheapest child fare of 20p to the day rover fare of £3, and a multi-ticket which allows ten journeys for the price of eight. There is an element of subsidy from the County Council.

The buses run throughout the day and evening, 6 days a week (not Sundays), from approximately 06.00 to 23.30. Timetable information is available at bus stops, which also gives details of appropriate commercial services, as well as information about the local community transport provider, Viking. In the first eleven months patronage had increased by 92%, from an average of 5,050 trips per week before October 1999 to an average of 9,700 trips per week. Some problems with under-capacity were experienced, as some passengers were turned away due to lack of seating. This is particularly noticeable in the morning peak period and when concessionary passes can be used, and affects work and education trips, two of the main social inclusion reasons for the introduction of the service. The service also experiences problems when linking to other regular transport services, since there is very little slack in the scheduling to allow for more than one diversion from the route.

Source(s)

Solomon J (2003) Essex Good Practice; Dengie Village Links. Personal communication, April.

PP1.6 Phone and Go, Lower Coquet Valley, Northumberland, UK

The 425 Lower Coquet service links a roam zone that covers an area around Felton, Aclington, Shilbottle and Amble. The service began operating in December 2002 and now has 220–250 users a week.

The timetable is designed to allow connections at Felton with buses to and from Newcastle, Morpeth and Alnwick, and there is scope to interchange with buses at Amble and Warkworth to buses serving Newcastle, Ashington and Alnmouth. It is also possible to connect with the train from Acklington to Newcastle in the morning and the return in the evening. The connecting services are highlighted on the timetable and roughly 2–3% of passengers interchange.

Meanwhile a second Phone and Go service operates in west Northumberland. The 689 flexible service started in October 2002 and is centred on Allendale and Haydon Bridge in the Allen Valleys. This is less successful and only carries 100–110 users a week, of which 80 or so are school children on a contracted service. Even this low level of patronage is an improvement on previously due to the service now connecting with the railway station at Haydon Bridge on the Carlisle, Hexham, Newcastle route. Interestingly, this school contract actually means that the service performs better financially than the far better used Lower Coquet service – an illustration perhaps of the future for social DRT in the UK.

Users need to book an hour before they travel, and the call centre is open 08.00–19.30 Monday to Friday and 09.00–16.30 on Saturdays. One interesting feature of the service is that the call centre is housed in the Transport Operations Group of the University of Newcastle's offices, with the University being heavily involved in the design, operation and monitoring of the service.

There were a number of delays in implementing the services. Some related to vehicle procurement – there were real problems getting the seats and doors as desired for the vans as the company did not realise all the necessary regulations and was out of its depth – and others to the software. Both are now sorted out and are working fairly well. These delays also meant that the launch date was dependent upon when the vehicles and software were ready rather than when the marketing suggested and one output of this was that the user needs survey did not deliver what was required. Ideally the plan was to develop a DRT-suitable profile and then see what worked. But in the end the route had little rationale to it. This made it even more difficult to market.

Northumberland County Council has a good working relationship with the local Traffic Commissioners. There is scope for introducing flexibility, as long as there are two fixed timing points for the routes. But there are still problems. For instance, one service only carries a very few people but must serve specific areas on specific days. Thus on certain days the service has had to turn down some people were living in the 'wrong' area, just in case someone from the right area phoned – an unlikely event.

Source(s)

Nelson J and Wright S (2003) Interview, Transport Operations Research Group, University of Newcastle, Newcastle, 22 August.

Northumberland County Council (2003) Lower Coquet 425 and Allen Valleys 689 Information Leaflets, Northumberland County Council, Morpeth.

Stoner P (2003) Interview, Public Transport Officer, Northumberland County Council, Durham, 22 August.

PP1.7 Transit Taxi, Hallett Cove, Adelaide, South Australia, Australia

This scheme provides a demand responsive solution to the problem of dispersing commuters from a mass transit terminal. Hallett Cove lies in the southern suburbs of Adelaide and is connected via an arterial train link to the Central Business District (CBD), which has no local bus service. This scheme consists of contracted taxis that meet every evening train, arriving at the station hourly, from the city. The service is provided every day during the evening off-peak, from 19.00 until the last rail service. After 19.00 until the last train, the 'Roam Zone' service connects as closely as possible to the required destination. Selected Roaming Services connect to rail and bus services entering the Roam Zone from Adelaide and the Marion Shopping Centre. Normal Metrotickets fares apply, which can be purchased onboard, at various shops, information centres and rail stations. Prior to 19.00, passengers have to board a Roaming Service at a designated bus stop. After 19.00 these services can travel down any street in the Roam Zone. Passengers who wish to board hail the driver to be picked up. In operational and technical terms this service is a simple operation that requires little or no communications infrastructure and minimal start-up cost. The trip requirements of individuals can be conveyed to the driver at the time of boarding the vehicle, the route can be determined by the driver on the basis of personal experience, and the arrival time at the destination is flexible. The system exists instead of a more expensive conventional public transport service, so some element of subsidy is justified, and there are practical limits to the size of vehicle used as the service begins to take too long if there are more than six destinations. Demand cannot be established before arrival of a particular train. This can lead to shortfalls in service, on isolated occasions, due to the logistics involved in this particular case study, with the location of the nearest taxi rank being quite a distance from the station. Therefore long wait times may ensue if demand is substantially greater than normal on any particular day. A major limitation to the service are its hours of operation and the fact that passengers still have to find their own way to the station for their journey to the city, so it is not really a many-to-one service. The website promotes the environmental and economic reasons for choosing the service for commuting, by stating how much carbon dioxide (and other air pollutants) and money (redundant second vehicle) are saved by catching the commuter shuttle.

Source(s)

Adelaide Metro (undated) Get up and go on a Roam Zone. Hallett Cove, Sheidow Park & Trott Park. Visit http://www.adelaidemetro.com.au/improved/pdfs/roam_zone.pdf Last accessed April 2003.

PP1.8 Ringbuss, Höör, Skåne, Sweden

The municipality of Höör, which has 13,000 inhabitants, is situated in the Skåne region of southern Sweden, about 20 miles north of Malmö and 320 miles south of Stockholm. Ringbuss in Höör is fully flexible within a designated zone, and is a rural dial-a-ride service feeding into, and receiving passengers from a commuter train system ('Påga-train'). The service started 1991as a trial for two years and continued on a permanent basis thereafter. One of the objectives of the Ringbuss system was to improve public transport services in the Höör municipality, and make them more uniform. The three existing types of services (county public transport company services, school buses and transport services for the disabled) were replaced by a single 'request' service. This meant more frequent services than the previous county routes and supplementary services. 'Ringbuss' replaced the few regional buses and some dial-a-ride taxies with two to three tours a week and low numbers of passengers. Travellers dial a booking centre one hour before the bus leaves the village of Höör.

'Ringbuss' runs according to a timetable, but is not restricted to fixed routes (only a fixed zone). The municipality is divided into eight 'Ringbuss' areas. Every area has it's own timetable with between 3 and 12 buses a day, from Monday to Friday. The bus drivers, rather than a computer system, decide on the optimum route, depending on where the travellers want to be dropped off and picked up. Travellers from Höör do not need to pre-book the bus, since the bus passes four regular stops in the village. The return journey must be booked at least one our in advance. Bookings are made to a centre in Eslöv, which sends them to the drivers by fax shortly before departure. From Höör the commuter trains go to Eslöv, Lund and Malmö. Every 'Ringbuss' tour is connected to an arrival and/or departure of a local train. The fare system in 'Ringbuss' is the same as for the other public transport in the county. The public authority in the county of 'Skåne' manages the 'Ringbuss' operation, which is run by contractors.

The number of trips has increased by 200%, from 550 a week in 1990 to about 1600 a week in 1998. The average number of passengers per tour is eight. The public transport authority pays 60% of the costs, the municipality pays a further 20% and income from ticket sales accounts for the remaining 20%. The Höör Ringbuss services costs about 50% more than previous arrangements. In terms of deficit per journey, the cost in 1994 was £4.07 in comparison with £5.10 for the previous supplementary services. The Ring Bus deficit is expected to drop to £2.48 per journey as a result of the 1995 outsourcing contract.

Source(s)

Ringbuss, Sweden (2000) VIRGIL: 'Verifying and strengthening rural access to transport services'. Rural Transport in Europe: Good Practice Guide. Visit http://www.bealtaine.ie/virgil/ Last accessed 28/4/03.

PP1.9 Ride Connection's U-Shuttle Public Transportation Program, Washington County, Oregon, USA

Rural Washington County residents faced problems accessing employment and training in Portland, and so a publicly financed shuttle service was launched on 11 May 2000 to allow residents to get to fixed route bus and light rail services. The operation is managed by Ride Connection, a private, non-profit agency that co-ordinates public transport. The shuttles and demand responsive services operate between Monday and Saturday, from 05.00 to 23.30. The extended hours mean that the service is geared to the needs of late night shift working commuters. Low-income residents can also use the U-Shuttle services to access fixed route bus and light rail. Since 2000, Ride Connection has provided over 8,200 journeys, and the U-Shuttle averages over 150 rides per day. The intention is to expand the service to increase the number of people with access to transportation options.

Source(s)

Jeskey C. (2001) Linking People to the Workplace; Community Transportation Association of America, Washington D.C., January. Visit http://www.ctaa.org/ntrc/atj/toolkit. Last accessed 23/04/03.

PP1.10 RTD Call-n-Ride, Denver, Colorado, USA

RTD (Regional Transportation District) established the 'call-n-ride' service as a semi-flexible demand responsive transport system. This covers several districts of Denver, and offers a curb-to-curb service. It is designed to supplement the existing conventional transport services and enable trips for commuters, school children and others. The vehicles are small buses or taxis. Trips need to be booked at least one hour in advance, but can also be scheduled up to two weeks ahead. The fare structure is the same as for buses, and can be used as credit towards connecting other RTD services, such as the park-and-ride. Typical operating hours are Monday to Friday 05.30 to 19.00, Saturdays 09.00 to 19.00, no service on Sundays.

Source(s)

Regional Transportation District Home Page (2003) Denver Call-n-Ride. Visit http://www.rtd-denver.com/ Last accessed 23/4/03.

PP1.11 Videobus, Borgo Panigale, Emilia Romagna, Italy

Borgo Panigale is a small village to the North West of Bologna. Videobus is an on-demand bus service linking a small community of users with a main public transport corridor – an operation that would not be economically viable using an orthodox scheduled public transport service. The service is primarily available to residents of the community, and booking is through home computer terminals supplied by the bus operator, Azienda Transport Consortium (ATC).

The scheme started operating in June 1995 to cover the village and surrounding area, although the area covered has increased slightly since that time. The service operates to a fixed route with 30 stops, 17 of which are only utilised when booked. The bus is timetabled to run hourly, but only operates if booked. The service operates 14 hours a day, six days a week. The community served is very small, with around 60 families and some 10 to 15 companies. All of these are supplied with magnetic cards that are used to confirm payment once the user is on board the bus. Booking is made through the terminals by following on-screen instructions, using simple keystrokes to choose pre-set information such as card number, day and time of trips, start and final stops, number of passengers. Reservations are accepted until 35 minutes before the bus leaves the terminus. The reservation automatically forwarded to the bus driver via an on-board LCD display and paper printout. The bus also has a radio link with the dispatch centre that operates the entire bus network in the region.

ATC operates the service under licence from Emilia Romagna Region, and the Bologna Municipality, the current licence being valid until June 2004. The operation is subject to the same safety regulations as any other bus service. Videobus was developed by ATC, ENEA and Emilia Romagna Region under the EU's THERMIE Programme.

The route is serviced by one 33-seat vehicle, owned by the operator. The 14.5 hours (two shifts) staff time is sub-contracted to a small drivers' co-operative.

The main transport corridor involves bus services to Bologna, and it is assumed that the majority of the trips have the Bologna urban area as the ultimate origin/destination. Because use of the scheme must be made through a terminal, much effort has been made to tell users about the service, and to train them in the use of the equipment.

At each stop, the driver can identify the number of passengers with a reservation and the number of seats available because each passenger registers on-board by inserting his magnetic card into the reader; the same card links the payment, confirmed on the bus by marking a ticket, to the reservation. The system incorporates routing software. The entire public transport system in the area is managed by a GPS system. This allows the Videobus to be co-ordinated with the timings of buses on the main Emilia road corridor, so that passengers can make easy connections between the other public transport services.

Before this scheme there was no other public transport in the area. The scheme is seen to be very successful locally and there are plans to replicate the approach in other areas. The fare revenue covers 30% of the total cost, and transports around 180 people per day.

Source(s)

Videobus (2000) VIRGIL: 'Verifying and strengthening rural access to transport services'. Rural Transport in Europe: Good Practice Guide. Visit http://www.bealtaine.ie/virgil. Last accessed 29/04/03.

PP1.12 Siilinjarvi Service Line, Siilinjarvi, Finland

The Siilinjarvi Service Line is a single accessible minibus, reserved for day-centre use for four hours per day, and then used as a dial-a-ride service for public users. The dial-a-ride serves different areas on different days of the week. Three of the areas are served by minibus and two areas with minor demand are served by taxis. The area is largely rural, with a low population density in Eastern Finland. The scheme started in February 1999. Previously, four of the areas were served by dial-a-ride taxis, three times a week during summer holidays. This is an entirely new service in one area.

A key feature is the provision of transport for two day-centres. One is a work centre for disabled people and the other a day centre for elderly people. The bus is reserved for the use of these centres from 07.00 to 09.00 and from 14.00 to 16.00. Because of the variation in timetable and routes of the trips to day centres, it is difficult to offer the service to members of the public during this time. Between 09.00 and 14.00, and again from 16.00 to 17.00, the vehicle operates a semi-scheduled dial-a-ride service. In the early morning (06.00 to 07.00) and at the end of the day (17.00 to 18.00), the bus operates a scheduled route service in one local area. This also feeds into other public transport services at the bus station. The only fixed stop during the dial-a- ride operation is the bus station, which is visited once an hour. Different parts of the municipality are served on different weekdays. Bookings are made by telephoning the Travel Dispatch Centre (TDC), operated by the city of Kuopio. The TDC amalgamates bookings to produce routes and timetables, and informs the vehicle's driver via a vehicle data terminal, provided by a mobile phone connected to a small computer terminal. Three reservation staff run the TDC, but they also take bookings for four other schemes in the region.

The bus is owned by a private bus company which provides the drivers. The vehicle has 16 seats plus accommodation for two wheelchair users. The taxis used have between four and eight seats. The scheme operates under normal bus and taxi licences issued by the provincial state authority. Any licensed operator may bid for work, with contracts awarded for one year. Normal bus tickets and national smart cards are valid, and there are additional concessions for the elderly and children under four. Wheelchair users travel free. Trips are booked by telephone, and software organises the route. Requests for taxis are faxed to the taxi centre and then communicated to the drivers. Most of the users are elderly and disabled people, and the most popular uses of the transport are for shopping and other facilities (banks, pharmacy and offices).

The cost of the scheme is £53,355 per year. Fare revenue covers about 30% of costs. The remaining costs are met in equal share by the municipality and the provincial government. The services provide 130 passenger trips per day, with the average fare of £0.94. The cost is £1.72 per passenger trip, which translates as £0.61 per km. In two areas, the service has expanded from a 3- month period to a round-the-year service. There is pressure to increase the number of buses, which would also enable better integration with school trips.

Source(s)

Siilinjarvi Service Line (2000). VIRGIL: 'Verifying and strengthening rural access to transport services'. Rural Transport in Europe: Good Practice Guide. Visit http://www.bealtaine.ie/virgil/ Last accessed 28/4/03.

PP1.13 U-Call, West Denton, Newcastle-upon-Tyne, UK

Money from the 2001 Urban Bus Challenge helped establish the U-Call scheme in West Newcastle. The scheme, operated by Stagecoach on behalf of Nexus, Tyne and Wear's Passenger Transport Executive, was focused on West Denton and began operating in June 2002. The checkpoint-based routes serve a number of markets. It supplements existing bus services in the city, and serves supermarkets, employment, commuters, clubs and bars. Commuter services operate in the morning and evening peaks – connecting to the Tyne and Wear Metro at Kingston Park – and local community services operate during

the day and after the evening peak. Overnight there is an on-demand service to Newcastle Airport, mainly for staff.

So far the employment services are not performing that well, but the community services are very popular. In particular, U-Call is seen as being safe for women, and the service is well used by the elderly. Lots of trips were also made to the doctor's surgery. But, some people are so dependent on dial-a-ride they would never use a bus or even U-Call – they like the knock on the door. Dial-a-ride is also used to travel further while U-Call is very local. Altogether there are 2500 people registered (a very simple process) and around 1300 users a week.

The current routes will be modified in October based on experience thus far.

Three vehicles plus one spare are currently used in west Newcastle, and the scheme involves testing two Aleros and two Rohil Harriers Community Transport vehicles, both with 14 seats. Results so far suggest that the customers like the former, and the drivers prefer the latter. No reliability problems have been reported, although replacement parts for Aleros come overnight while standards are not as high in the Community Transport sector. U-Call uses Trapeze software, which is also used for dial-a-ride. This has automatic scheduling facility – times, journey lengths, fares, etc. – sent electronically to the vehicles.

In terms of finance, the call centre cost £165,000 to set up and £22,000 a year to run plus staff costs. Fares are the same as for bus, but while normal service is checkpoint based, at evenings and weekends there is a door-to-door service offered for a 50p premium. Revenue forecasts were on the high side. The bid estimated an 80p average fare but the actual figure is 49p. This is due to there being lots of elderly people using Community Transport passes on very short journeys. The subsidy is £6–7 per trip including fixed costs, and the Stagecoach tender cost is £70 an hour. Stagecoach operates vehicles leased from Nexus on a gross contract basis – i.e. at no commercial risk. This was to protect the service if Stagecoach should pull out for any reason, although the 'own and loan' rules mean this cannot be done in an easy way.

Regarding loadings, Nexus is turning some people away, especially on pub buses, while other services run empty. If there are no bookings, Nexus don't run the airport service, but at the moment the other vehicles run when there are no bookings (this will change in the review).

Registering the services with the Traffic Commissioners was not an easy process, and more guidance and clarification is needed. Nexus does not claim for BSOG either because trying to differentiate between fixed and flexible routes is too complicated a process. If Nexus was able to claim, then the per trip subsidy figures would be a little closer to those for conventional bus.

Feeding back on the process, Nexus has said that when planning DRT services it is vital to consult with bus service departments so as not to damage the rest of the bus network. It is crucial not to give operators any excuse to remove services. It is also sensible to set a reasonably defined area with a basic route, although this should not be too tight. This is because people do not understand free roaming and need a basic route. And, before implementing a DRT route in future, Nexus would have liked to have more accurate information on an area and to have done more research. Last time the design was driven by the requirements of the UBC bid. Despite this, Nexus believes the UBC and RBC grants have been a good thing, but then Nexus won many of those it applied for.

For the future, additional funding has bee received for an employment service in the east of Newcastle that began in early August 2003, while another scheme in west Gateshead will start in September – this will part replace one bus route and fully replace another bus route.

In the longer term, Nexus is actively looking to expand the DRT concept. A key part of this involves trying to persuade operators to try DRT commercially. One way may be for Nexus to provide access to the call centre and booking system for commercial operators to use. While operators are interested, they are not sure of its viability. Overall, Nexus sees DRT as possibly being cheaper than fixed route buses in the future for tendered services.

Another avenue being followed is for Nexus to use the current system to allocate the most appropriate vehicle for Social Services operations, patient transport and, education needs, within a U-Call vehicle brokerage system. One link currently is with Age Concern, while Nexus is also looking to use DRT

vehicles in Gateshead for care services, and there has also some interest from a local hospital which has talked to Nexus about possibly replacing/enhancing its non-emergency patient transport with U-Call.

Fundamentally, co-operation with operators of other transport providers is vital if U-Call services are to be financially sustainable.

Source(s)

Usher J (2003) Interview, NEXUS, Newcastle, 22 August.

PP2 Public Policy: Network DRT

PP2.1 Regiotaxi KAN, Arnhem-Nijmegen, the Netherlands

Four years ago, the Dutch Government decided to do a number of experiments in an attempt to cut the cost of public transport provision while maintaining or even improving levels of public transport accessibility. In addition, it hoped to cut the high cost of providing access to disabled people. The concept it came up with was called CVV – Collective On-demand Transport. This was only loosely defined as being available for anyone to use (i.e. not just old people or disabled), with no schedule or timetable (i.e. on demand), while the vehicles must carry no more than eight people. The legal status of CVV remains experimental – it is incorporated as such in a Federal Law on Public Transport – but this will almost certainly become permanent in the next batch of transport legislation.

For the Nijmegen scheme, the CVV scheme is called Regiotaxi KAN, where KAN is a region of Arnhem, Nijmegen and 19 other municipalities. Novio Express (NE) is a management company that plans and co-ordinates the services but did not and does not own any vehicles or employ any drivers, but instead buys the vehicles and brands them, and leases them to the taxi operators through a bank. Vehicles are typically not more than two years old. It was this company that won a tender put out by the regional government which ran for three years to 1 June 2003 with an option for a two year extension, which the Region has taken. Novio Express also won a tender to operate a similar scheme called Taxihopper in the northern part of the nearby Brabant province (principal town Limburg). This started on 1 June 2002 and should continue until June 2008.

Regiotaxi KAN and Taxihopper operate as follows. First, the customer rings a call centre (operated by Novio Express) with a journey request. Then an Internet message is sent from the call centre to one of 14 taxi control centres (depending on the postcode of the customer), who then send a mobile data message to one of the taxis/small buses it 'controls'. Overall there are around 70 taxi companies contracted to NE. In the KAN region there are around 200 taxis and 100 small buses, each of which has a driver in a uniform and the necessary equipment that gives the addresses of the next three passengers to collect. Most passengers have a unique pass that contains their user information and this keeps average calls down to 90 seconds or so. Times of operation are between 06.00 and 01.00 on weekdays and until 02.00 at weekends. The busiest periods are between 10.00 and 12.00 and between 14.00 and 15.00.

Of course in such an arrangement the taxi controllers and drivers are responsible for the level of service quality delivered and this worried Novio Express. So, early in 2003 it introduced a logistics centre into the operational set up. This monitors the whole operation in real time – how many services are operating, how many are failing and so on – and can therefore act immediately to switch passengers from one taxi controller to another if it is clear that one operator is overloaded or not delivering for some reason.

Punctuality targets are built into the contracts. Taxihopper must ensure that 95% of services are no more than 15 minutes early or later than promised, while the Regiotaxi KAN target is 90%, but also 95% from June 2003. Taxis carrying a passenger are also allowed to be diverted to collect another passenger if the routes correspond – indeed this is encouraged.

Regiotaxi can carry passengers up to five public transport zones outside of the KAN regional area, as can the Taxihopper – thus, while the zones are not actually physically linked their service areas do overlap slightly, which can sometimes help with operational requirements. At the moment, Regiotaxi tends to

provide supplementary trips to bus services, but this is likely to change next time the bus services are next time. It now looks likely that Regiotaxi routes will replace some late night and weekend bus services.

In fare terms, Regiotaxi is between bus and taxi. While it uses the StrippenKaart zones and system, the rates are higher at €1.40 per passenger per zone. Registered disabled pay €0.35. This fare is retained by the taxi operator. The taxi operator is also given money from NE (in the region of €1.80–2.30 per passenger per zone depending on the contract agreed which is dependent on the area type/cost of providing the service). Meanwhile NE is given money from the Region of €1.91 per passenger per zone – which amounts to around €8m annually – which in turn is reimbursed by the state. One further complication is that the difference in fare paid by registered disabled people is paid for by the responsible municipality. As for costs, hardware costs are not too high, but buying, maintaining and upgrading the software, as well as operating the data communication systems is significantly expensive. Overall, public subsidy levels are of the order of 55–60%.

Passenger growth has been impressive. In the KAN region, 90,000 services were provided that carried 113,000 users (and only 130 complaints – most of which concerned taxis being late or not turning up). The Taxihopper scheme carried 28,000 passengers in January 2003, up from 12,000 six months before. In terms of users there is a high proportion of disabled users and elderly people. Before the Regiotaxi scheme, government had the WVG arrangement for carrying disabled people. This is now integrated into the new system, and registered disabled passengers make up 30% of the customers. The service is door-to-door. In Arnhem, a further contract with the municipality means that old and disabled are virtually escorted to and from inside their homes/destinations. In addition, Novio Express has contracts with two insurance companies, which use the Regiotaxi system to transport their customers to the doctor or hospital – 150 journeys a day. And, Novio Express has done deals with large employers in the area, for example British American Tobacco, to carry their employees to and from work or between sites. This is extremely helpful in that the work is regular and full vehicles are almost guaranteed.

There were quite a few problems initially while Novio Express got to grips with the technical and administrative system. In particular it was very difficult to predict how many taxi services would be needed, how many passengers and how far they would want to travel. It was also difficult because the clients were unfamiliar with the rules of the game. Fortunately the regional government was understanding at the time, but understandably it now wants results. There are not so many barriers now. Punctuality is now over 95% and satisfaction surveys show 7.7 out of ten.

Disabled users have expressed the most dissatisfaction with the system, as it is not always able to accommodate them as well as previous arrangements. There are also many different types of wheelchair, which it can be difficult to accommodate, and the system does not cater for more severely disabled users.

Abstraction from the bus is not too big a problem because the fare differential is significant enough. However, the transport unions are unhappy because taxi drivers are paid less than bus drivers and some bus services may be well be replaced by Regiotaxi in the future. The attitude seem to be that Regiotaxi is killing off the bus. As for the taxi operators, they were initially hostile but they now appreciate the increased sense of order in the market.

In summary, lots of new systems are starting up across the Netherlands. There are problems with the tendering regime, though, and costs are being forced through the floor. This is because there are 60 quality indicators. Obviously each bidder wins on some but not on others, and this seems to cancel out the quality side leaving a straight fight on price. There is therefore a risk that before long companies will promise what they cannot afford. If this should happen, it is likely that the local authority would need to step in and rescue the company, or else risk losing its public transport service. This poses a significant problem. Regiotaxi is growing very fast but there is no extra money from government, meaning that the Region is having to find the difference. There is a real risk that the system will become too-well used, to such an extent that Novio Express is actually paying money back to the Region, and might therefore have to fold. This fear of failure due to overuse means there is no marketing of the system (at the request of the Region) and so growth is fuelled by word of mouth only. Use of the service is therefore concentrated in areas of low car ownership (such as in parts of Arnhem) where people have heard about the system from their neighbours.

Similar systems to Regiotaxi are also in place in many other parts of the Netherlands, including Achterhoek, Haaglanden, Ijsselstreek, Twente, Utrecht and Vechtdal.

Source(s)

Europa (2002) Transport Research Centre Knowledge Programme. Visit http://europa.eu.int/comm/transport/extra/index.htm Last accessed 02/04/03.

MobiMax, Achterhoek, Netherlands (2000) VIRGIL: 'Verifying and strengthening rural access to transport services'. Rural Transport in Europe: Good Practice Guide. Visit http://www.bealtaine.ie/virgil/ Last accessed 02/04/03

Zuijderland A (2003) Personal Communication, Novio Express, Regiotaxi KAN. 12 February.

PP2.2 Wigglybus; Pewsey, Wiltshire, UK

Wigglybus seeks to address three key transport issues: the social exclusion caused in rural areas for those without cars; the unsustainable and environmentally damaging patterns of travel in rural areas, especially the faster than average traffic growth; and the need to support local economic and social activity and regeneration in the countryside. It was launched in May 1999.

The basic concept behind it is to serve a wide area with low passenger demand much more frequently than previously thought possible by not going to every settlement within a service loop on every round, but only when requested. So, while passengers are not guaranteed a bus every hour, they are guaranteed an opportunity to travel every hour. There are three zones, two of which are centred on Pewsey and one on Devizes. Each zone is served by buses travelling round a core route on an hourly frequency, which can 'wiggle' off when requested to do so by a telephone booking (which must be made no less than 20 minutes before the bus leaves the first timing point on the route, i.e. the Co-op at Pewsey or the Cinema Bus Stop in Devizes).

These routes operate from 07.30 to 17.30 with an additional night bus service. Standard single fares are £1.40, while return fares are £2.50. Regular users can join a travel club (£20 a year for the first family member, £10 for the second, £5 the third and nothing thereafter) and pay 55p single or £1 return.

In addition to these three routes (Lines 1, 2 and 3), there are three additional 'stopping services', and an express service which are branded as Wigglybus (and can be pre-booked) but which operate more like a conventional bus service with fixed route and timetables at certain times of the day and week.

Lines 1, 2 and 3 are registered with the Traffic Commissioners as bus services. The core routes operate even when no bookings have been taken in order for the scheme to qualify for BSOG. Wigglybus is not eligible for BSOG on the 'wiggle' elements of its service. The network was funded mainly by Rural Bus Challenge money, with £120,000 supplied by Kennett District Council and up to the same by Wiltshire County Council over a three year period. It is operated by Hatts Coaches, and the call centre by commercial company MessageLink. The software used is provided by Mobisoft.

In terms of use, 75 users a day (2,000 passengers a month) were using the service by the end of the first year, while by June 2001 the corresponding figures were 140 users a day and 3,500 a month. Unfortunately, at this time a number of technical problems occurred which led to a decline of 20% or so due to reduced reliability. By 2002 , ridership was back to within 5% of the peak. A survey conducted in March 2001 revealed that the dominant journey purpose was shopping (49% of trips), followed by school (15%) and work (13%). Not surprisingly travel club members predominantly used the service for regular work and school trips. The survey also explored how journeys had been made previously. Significantly, it found that 54% of trips had not been made previously, 14% had walked, 11% had been given a lift, 7% had driven, 7% had used other bus services, 4% had cycled and 3% had taken a taxi.

In terms of costs, the rise in bus operating costs has been significant. While they were estimated at £105,000 in the bid, the actual costs were £125,000, £177,000 and £184,000 in the first, second and third years respectively. These increases were despite that fact that Wigglybus provided the vehicles, thus lessening the operator's risk considerably. By contrast, the call centre estimate was £30,000 a year, while the actual cost stayed constant at £27,000–28,000. Interestingly subsidy per trip (including capital costs) fell from £7.22 in year 1, to £3.92 in year 2 and then rose to £4.22 again in year 3.

Source(s)

Wigglybus (2002) The Wigglybus End of Term Review, Wigglybus, Pewsey, Wiltshire, September.

Wigglybus (2003) Wigglybus Users Guide and Network Map, Wigglybus, Pewsey, Wiltshire, July.

PP2.3 Cango: Flexible Route Network, Hampshire, UK

Hampshire County Council is notable for launching a series of innovative, long term, viable sustainable transport programmes. The Cango flexible bus service has been in operation since July 2002, and partly complements and partly replaces existing poorly patronised bus services.

As of August 2003, four Cango networks were in operation, of which one is described here in depth and three are described in more general terms.

In the Andover area, there are seven Cango routes numbered C1 to C7. The C1 connects a roam zone to the north west of Andover with Andover railway station, and provides two commuter services in the morning and two in the evening. The C2 links commuters from an area to the north east of Andover with Whitchurch station three times in the morning and evening. This was an instant hit, because there are regular services into London and there are parking issues at the station. However, commuter trips were disturbed because of unreliable trains in the evening, which over one period were often later than the 15 minute window allowed, and this put off some users.

The five remaining services operate after the commuter and school runs in the morning, until the school and commuter services begin again in the late afternoon, serving roam zones mainly to the north and east of Andover. These services offer a choice of drop off points, largely for shopping and health.

Altogether, there are 8000 households in the Andover area, and 1950 registered users of the service. In a typical week of operation during the summer of 2003, there were 547 users, of which 44 were commuters to Whitchurch station. The average loading is six or seven people, and there is little risk of overloading the buses, except on Thursday (market day), where people are encouraged to change to a later service. In terms of growth, the west Andover rural service experienced growth of 65–70% after the DRT replaced the two-day a week bus service.

In financial terms for the Andover operation, Cango received £95,562 from the Rural Bus Challenge to set up and operate the scheme. Another £46,495 came from what the council had previously spent on bus contracts, £22,000 from school contracts and £30,000 from fare revenues.

Passenger numbers are monitored weekly, a diary is kept of all comments received and reviews of the service are conducted every three months. Most of the passengers (90%) are repeat users. Riders are predominantly the elderly, children in school holidays and young mothers. There are also a reasonable number of former dial-a-ride users. Many people who previously used the bus use DRT more, while previous non-bus users use it as they have heard about it from their friends – word of mouth is crucial.

The Optare-sourced, 13-seater Alero vehicles are owned by the County Council, with is also responsible for the maintenance, fuel, drivers, etc. Unfortunately there have been reliability problems and so a reserve vehicle has had to be used. To help deal with this unreliability, and to maintain the public's faith in the system, once a promise of a journey is made, it is kept, with a taxi being put on if necessary. If it is a call centre fault then the council pays, but if a bus problem than the operator pays.

The problems of dealing with Traffic Commissioners (TC) have not materialised in Hampshire. The County Council has been in negotiations with the TCs in Bristol, who have been willing to adopt a flexible approach to interpreting the regulations – indeed the scheme as operated is probably strictly speaking illegal. Their main concern was an insistence of three timing points for the routes, but the service does not have to advertise them. While initially this was 'resented' by the operator, the timing points do provide structure to the service, although the mid-point timing sometimes is a problem. The fixed timing points are stopping points and are colour coded green, while the bookable stops are coded yellow. Around 80% of users are picked up at the end of their roads. There is a 6–7 minute window in which the bus should arrive.

The service is technically available to anybody, but there may be situations where a driver denies access to un-booked people waiting to board an apparently empty bus as they may deprive pre-booked passengers a seat further along the route.

Council members are committed to Cango and are looking to roll out the scheme across the County. Revenues are rising across most of the schemes. There is also a move to consolidate DRT by stealth by tapping into other local authority markets and revenue streams, e.g. Social Services, health, etc. So far all vehicles are used to operate schools contracts, which adds money to the pot. Also, is cash added from funds previously used to run a two-day-a-week service that was replaced by the DRT service.

The contracts were set up on a gross contract basis – i.e. the council takes the risk and keeps the revenue – but despite this, after tendering, the costs of delivering the service were still higher than expected. The buses are branded to suggest inclusiveness, and appear in the same livery across the county. There is also potential to brand smaller vehicles, including taxis.

Passengers need to register with the scheme the first time they use it (although this is a very quick and simple process), mainly to identify a suitable pick-up location. Return trips can be booked at the same time using the Mobisoft software, or else passenger can turn up and go if there is room. No paper is involved in the process. The stopping points are not always regular 'bookable' stops, and the door-to-door philosophy is actively discouraged – only one has been made ever. This enables the system to maximise the number of passengers. New passengers are offered the incentive of six free tickets. In the case of equipment failure, the schedule can be faxed to the operator the night before. Bookings must be made at least 30 minutes in advance through a dedicated call centre located in the County Council offices. It operates weekdays between 08.00 to 19.30 and Saturdays from 07.45–16.30. Theoretically bookings can be made in 30 seconds. The call centre was established through Test Bed funding, which is due to run out. Most of the bookings are made the day before or on the day. The regular users have built up a relationship with the individual call centre operators, thus improving accountability. Training the call centre staff is important, and this is partly achieved by making them travel on the buses and meet passengers and drivers. Internet bookings will be available from November 2003 – although users will need to ring the first time in order to register. The cost of tickets is as for regular buses, and tickets are transferable. Fares are also designed to encourage commuters to switch by being linked to car parking charges. Block bookings are accepted, a feature especially appreciated by commuters.

In Hampshire, the threshold level of bus subsidy per passenger is £2.50 per passenger trip, while dial a ride costs £6–7 per trip. Meanwhile the Andover DRT costs less than £5 per passenger trip. Fares are comparable to bus fares and have interoperable tickets. Parking charges are low in the area so DRT fares need to be cheap. The rural scheme fare income is around £30,000 per annum. There is a strong incentive for the County Council to maintain the service, although it costs £108,000 to operate annually.

Although the Test Bed funding for the call centre is due to run out, the increased workload means that it will be kept open. The software cost £66,000 to buy initially, and around £13,000 per annum to maintain. The call centre began with two schedulers plus a supervisor, and there are now two additional schedulers. Currently these are on short-term contracts, but they will need to become core centre staff. Staff costs now are around £80,000 a year. There is more to the booking centre than just taking calls, and 30% of the time is spent reacting to problems. Staff ring people when a bus is late, and order taxis where the bus doesn't turn up. One advantage of the council operating its own call centre is that drivers are accountable, as it is more difficult to play off call centre and bus company managers against each other. The call centre capacity can be easily increased, with the limit being set by the number of available telephone lines. The transport management centre may eventually absorb the dial-a-ride function and Social Services volunteer drivers. The various functions can be shared within the call centre, and the costs shared. The transport department is also looking at providing transport for health related journeys in the future.

Also in the future, the County Council is planning to conduct a network review to identify areas where there are low-frequency bus services. It should be noted that if there is no existing bus user ethos, it is difficult to change behaviour and encourage bus use from a zero base, and so these areas will not be targeted.

More specifically, following the adoption of Internet booking, it is intended to provide evening services, which currently do not exist, for young people. In the Andover-based Cango areas, the scheme may be extended to provide feeders to buses into Andover and Basingstoke. Similarly in Havant, the Council is

looking to provide evening DRT services to link into bus services from Leigh into Portsmouth. It is important to note that there are peak loadings at pub closing times.

In terms of lessons, the key to the service has been the drivers, who are MiDAS trained to respond to customers needs, and to help with tasks such as securing wheelchairs. Hampshire County Council sees itself as supporting its drivers as much as Stagecoach does. Most of the dial-a-ride users are also able to use Cango, although the Alero vehicles can only accommodate one wheelchair – although on one route (through Elham Alamein) more spaces were required so a larger Solo vehicle has to be used instead. But while all the vehicles are wheelchair accessible, care needs to be taken to ensure that able-bodied people are not put off by that – people are very good at discounting themselves from using services. Vehicles therefore, are not converted and do not have a welfare feel. Meanwhile the scale of the scheme has meant that in several cases a driver has noticed when a regular user has not turned up and checked that things are OK – therefore providing a community transport feel/level of service.

One lesson is that it is crucial to let people book on the day, especially older people (as they often only decide to make a journey if they feel up to it and if the weather is nice). Overall most journeys are either booked the day before or on the day of travel. Dial-a-ride typically needs to be booked six or seven days ahead. Users tend to be far happier travelling on a general public DRT bus as there is no stigma.

Initially, changing existing buses to DRT causes problems, as existing passengers are reluctant to telephone for a service that once arrived automatically. Once in place though, passengers love them. To educate people into using the system where buses had existed before, the new DRT services run past all stops regardless of booking so that people get used to seeing buses on the route for the first three months. If there is no option, then people will try and use DRT, but otherwise they will stick to what they are familiar with – i.e. the bus.

The DRT service often means that people who previously had no transport now do. One old lady now has her friends and family able to visit her in her remote house.

As for the three other three Cango networks, the Urban Bus Challenge funded project in Leigh Park low income housing estate, Havant, is not doing well and may well be abandoned once funding stops. The route serves employment needs in the peak periods (C11) and then does hospital trips during the day (C14), both connecting a roam zone centred around the Leigh Park estate with Havant town centre. It was set up because local businesses had complained of lack of bus services for workers, while local hospitals were also seen as being difficult to get to from the estate. The service has not really worked, one problem being that the two hospitals and the business park interests (which participated in the bid) now have not wanted to participate. Health is an emotive issue, and people have *perceived* needs, rather than actual demand. Uptake on three services was very poor (less than 100 people per week) so the service has been reduced to two vehicles. It seems the schemes are more successful where there is no alternative transport mode.

Another major problem is that the service cannot take people shopping, as it is not allowed to compete with the commercial network – the estate does have a strong bus user ethos and there is a regular commercial bus service. And, there is no regular pool of users for the hospital services – a big disadvantage. Consequently, the usage is embarrassingly low. Worse, there were also reliability problems and this lost a lot of users. And, while the services start at 06.30, the call centre does not open until 08.00, so early bookings have to be made the day before (instead of 30 minutes before), and if is service does not turn up there is no one passengers can contact.

One problem may be that the information seems too complex for the users in the estate – they simply do not understand the concept. There is some transfer to bus and rail services. Job seekers can use a pass on the bus but even then there are few employment users.

Rather more successful is the New Forest service. This operates in the County Council leader's locality and usually carries around 135 passengers a week. One vehicle operates on two routes, the C32 and C33. The C32 operates between New Milton and Lymington via a roam zone centred on the village of Sway, while the C33links Lymington bus station and Lymington hospital via a roam zone centred on Buckland. The operation this has seen an increase of 60% in ridership since it was introduced. The network is partly a replacement and partly additional service to what existed previously. The service was not funded through the Bus Challenge but was instead financed by general revenue. This is a new operation and

again is used for school contracts and carries mostly older people. The council is also looking to develop a service that would connect with fast trains into London at Brockenhurst.

Finally, Bus Challenge funding has enabled the County Council to launch several new services. One network (C21, C22, C23 and C24) was started in late August 2003 and links a roam zone centred on Burghclere with the Berkshire town of Newbury – with its rail station, hospital, shops, schools and businesses. This was also viewed as partial service replacements in partnership with the local District Council. It also includes school contracts but will mainly serve commuters and shoppers.

Source(s)

Armstrong J (2003) Interview, Hampshire County Council, Winchester, 8 August.

Hampshire County Council. (2002). Cango Rural Bus Challenge Fund. Visit http://www.hants.gov.uk/decisions/decisions-docs/021030-awhtsp-R8.html. Last accessed 02/04/03

Hampshire County Council (2003a) Cango: Closer to home, Timetable Information Supplements, Hampshire County Council, Winchester.

PP2.4 The Herefordshire Hopper, Hereford, UK

The Herefordshire Home Hopper Rural Taxibus Scheme successfully won a grant of £78,000 to pilot two taxibus schemes from the DETR's Rural Bus Challenge Competition in 1999/2000. The idea for the project came from the local authority officer responsible for public transport who had come across a similar project in another county, and had become familiar enough with the needs of Herefordshire to suggest that something similar might be applicable there. The funding covers the operation, publicity and administration of two schemes that cover Hereford and Leominster.

The Hereford Night Hopper service is a rural taxibus operating from main interchange points in Hereford and Leominster. The service is aimed at those rural residents who travel to Hereford or Leominster by conventional bus in the morning (or at other times during the day) and for whom transport is not available in the evening as the existing bus services have finished operating for the day. The service is also aimed at Herefordshire rural residents who arrive back in Hereford and Leominster on the train from other destinations, and who can then use the taxibus to return home. Its first outward journey leaves Hereford at 18.30 and the last at 22.30, except on Fridays and Saturdays when the last service leaves at 23.30. The cost to passengers is equivalent to the conventional bus fare and in most cases the passengers are taken right to their door, which is particularly appreciated by women. It thus provides additional travel opportunities for people living in rural areas, and helps to improve integration between public transport modes, in particular in increasing the availability of train services for people living in rural areas who do not have access to a car.

The Hereford Hopper service is run using a 16-seater accessible vehicle and registered as a local bus service with a standard PSV licence. The contract was awarded in September of 2000 to start in October at a price of £70 per day, revenue to go to the operator.

For the outward journey, it serves three pick-up points in Hereford, the third of which is the railway station. The Hopper is timed to depart from the station at 35 minutes past the hour but drivers are instructed to check train arrival times and wait for up to ten minutes for any trains scheduled to arrive. There is a scheduled route around various local villages, and passengers are set down on request along the line of the route, diverting for up to one mile from the route where requested. Journeys can also be pre-booked from pick-up points on the route, with this facility available between 09.00 and 17.00. For the inward journey, back to Hereford, journeys have to be pre-booked from or near stops along the route. Fares are by zone and range from £1 to £1.40, half price for children aged between 5 and 15 and concession holders, but no return tickets are available.

In the event of delay, the driver contacts the operator who will have a spare bus available for the following departure. If all seats are taken, additional passengers are advised that the vehicle is full and that they will need to make other arrangements. This information will be relayed to all three pick-up

points. In this event, it is suggested that the driver might contact base to arrange taxis, which would however cost the normal taxi price.

The Hereford Hopper is under contract to an enthusiastic local 'family business' operator which is very keen to make the service work and to develop its possibilities. The company runs a number of vehicles and also undertakes contracts such as education contracts. The Hopper vehicles are required to be dedicated because of signage and the need for a regular driver. The operator is working with the County Public Transport Officer not just to have a small sign indicating that the vehicles are a buses, but to have them made very conspicuous looking in order that potential passengers, who for years have not had any evening transport, should become aware that there is now a regular bus running near or past their homes on which they can rely. There is potential for the commercial development of the service to include people from Hereford who want an evening out at a country pub, for example.

The other service operated under the scheme is the Leominster Hop, which is essentially the same service. The main difference is that the fares are between £0.50 and £1.20. Eight-seater vehicles with an additional wheelchair space are used, and the contract price is £58 a day. The first bus leaves Leominster at 18.30 and the last at 22.10, except on Fridays and Saturdays when the last service leaves at 23.10. It is expected that some adjustments to the route and timetable will be needed as the service develops.

The Hereford service started with two passengers in the first week of October 2000. It had risen to 58 passengers by Christmas of that year and has averaged 40 a week since then, with no notable dips. The total revenue raised for the first five months of operation was £444.40. In contrast, the Leominster service started with eight passengers in the first week of October. It had risen to 26 passengers by Christmas, with a maximum of 36 in the run up to the festive period, and has averaged about 19 a week since then, with no notable dips. Revenue collected in the first five months was £300. Both sets of returns have exceeded the expectations of Herefordshire City Council, which, while it expects to end up carrying considerably more passengers than this, had believed it would take much longer to build up even a basic clientele. The schemes are monitored by Herefordshire County Council Transportation Unit. The ticket records the date of journey, the time of the journey, the type of passenger and the fare paid. There is also to be a passenger survey to find out who is using the service and for what purpose, and what improvements they might like to see.

Source(s)

Solomon J (2003) Hereford Hoppers, Personal Communication. April.

PP2.5 On-demand bus services, Bologna, Italy

Bologna features both on-demand fixed and variable routes, initially in the city. The first services were implemented on the urban network of Imola, using eight equipped bus stops on six fixed routes. The operations that started in 1990 proved the effectiveness of the technical and management solutions and its user acceptance. In the future, a new on-demand route will be started in San Lazarro, a little town at the south-east border of the municipality of Bologna. The network of calling terminals will turn the city into an integral part of a centralised system of public transport control and management. The main impetus for the system is public policy directed at improving the existing infrastructure (supply management) through efficiency gains, combined with safety and environmental (air quality and energy reduction) targets.

The system in operation is based on an EU-funded project designed to implement and evaluate IT systems for use in a DRS, and aimed to part of a general public transport management system. The project was funded through an EU VESTA project. A GAUDI project funded the Automatic Vehicle Location (AVL) software. The systems were in place in 1992 with 15 buses. The aim was to expand the IT infrastructure to 306 buses (over 90% of the vehicle fleet) by 1994. Future systems will include real time information for passengers, ticketing and ticket validation and traffic signal controls to give buses prioritisation.

This cross suburban network was started in 1990, and supports main routes with large radials. It permits limited deviation from preset routes, depending on the level of demand. It requires a user to contact the bus from a stop equipped with an electronic terminal. The terminal is equipped to inform passengers of timetables, routes, time to next bus and possible delays. The passenger inserts a coin, and confirms the reservation.

The flexible route system was originally believed to be uneconomic due to poor demand. This proved not to be the case, and there were enough users to justify a regular bus service. Reservations are made through a 'videotel' terminal directly from users' homes. The dialogue between the users and the system is aided by simple instructions. Reservations are made by completing the fields in a screen, such as start location and final stop, time and number of passengers. A similar list of fields applies to the return trip. Reservations can also be made for the same or following week. The incoming calls are monitored using application software developed by the national telephone company, and assigns calls to buses to allow calculation of bus route length. A deadline is set, after which reservations are not accepted. The boarding list is forwarded to the on-board terminal. Un-booked passengers waiting at bus stops may also be picked up providing there are sufficient spaces. The driver has the passenger list and their destinations to determine the turning point. The return point can be modified if a passenger without a reservation who needs to travel further gets on board. Each passenger registers on-board by inserting a magnetic card into the reader. The service is operated by a private company, although the management and control is the responsibility of Azienda Trasporti Consorziali (ATC).

An LCD graphic user interface displays a sequence of simple instructions and functional keys that leads the user in their choice of menus. When the user wants to make a reservation, they insert a coin and confirm their choice. The terminal acknowledges this and sends a signal, via ISDN, to a 'detour traffic light'. There are two detour traffic lights situated next to each detour point on a bus route, one for each direction. A detour traffic light consists of a control unit and a transceiver that communicates with the system on-board the bus.

Future expansion around the hills of Bologna is planned. The project was due for evaluation at the end of 1994, and assessed for energy savings produced by this mode of transport. Success also depended on providing an adequate level of service to end-users.

Source(s)

Berrini M and Debernardi A (undated) Ambiante Italia. Transport Policy And New Urban Traffic Plan In Bologna (Italy). Visit http://www.epe.be/workbooks/tcui/example2.html Last accessed March 2003.

PP2.6 RUF-BUS (Rapid Urban Flexible), Flexible Operations Command and Control System , Wunstorf, Hanover, Germany

Wunstorf is an area of 40,000 inhabitants situated near Hanover in Germany. It was the site for the first demand responsive bus system in Europe, with its main aim being to adjust the public transport service to the actual demand and to make better use of the transport capacity available. The system consists of several service zones, each with route deviation options. According to the timetable a certain trips may be either fixed or flexible, depending on the time of day. Patrons must notify the operations centre 30 minutes in advance to if they wish to utilise a scheduled demand responsive service. Each bus route is then optimised by means of electronic data processing. Depending on demand, different types of buses are utilised. These include a regular bus (50 seats), an R-Bus (25 seats), and minibuses (8 seats). The fare for DRS and regular services are the same. Also the arrival and departure times at Wunstorf Train Station (which has an express rail link to Hanover) are optimally correlated with the timetable of the express rail traffic. This flexible operation has increased the coverage of public transport by 40% with an increase in patronage of some 75%. It has also been shown that a similar conventional system would be more expensive and provide a less satisfactory service. The communication links incorporated are provided via ordinary telephone systems. The RUF-BUS system had a number of important features. One of these was the call-boxes that were installed at frequently used 'bus-stops'. The average number of passengers per month (1979) was 20,000, and the system was continuously expanded in the Friedrichshafen area until, by 1981, it covered a large service area. The average waiting time was between 6 and 8 minutes and 90% of all passengers experienced waiting times less than 13 minutes.

Source(s)

US Department of Transportation Federal Transit Administration (1993) German 'Smart-Bus' Systems. Potential for Application in Portland, Oregon. Volume 1, Technical Report. RUF-BUS Visit: http://www.fta.dot.gov/library/technology/gsbsvol1.pdf Last accessed 02/04/03.

PP2.7 The Belbus midibus, Flanders, Belgium

The Belbus midibus service is a demand responsive bus in the largely rural west of the Belgium, and operates on request between a network of identified bus stops, and supplements the fixed route services. The scheme started in June 1997 as a partnership between the participating municipalities and the regional government, which funded the regional public transport operator. Part of the catchment area (about 30% of the stops served by the Belbus) was previously covered by a regular bus service running roughly every two hours, which has been maintained. About 60% of the stops now covered by the Belbus were previously served by a relatively poor bus service, which only gave a peak hour, Monday to Friday, coverage. The Belbus also features some 10% of stops not previously served by public transport.

The service runs hourly, seven days a week, from approximately 06.30 to 21.00. It operates between recognised stops (there is no door- to-door service), but routes are flexible. Bookings are made by telephone. The vehicle used is a wheelchair-accessible midibus. There are three full-time drivers and 1.5 full time equivalent operators taking telephone bookings. The service provides connections to the hourly rail service at the local railhead as well as with local bus services from Eeklo. There are no systematic connections to bus services at other locations. The fare system is fully integrated with other local bus services, as well as with rail services with weekly, monthly or annual passes.

Timetables are displayed at bus stops. Belbus leaflets were distributed to every local household when the service was launched and are now available on request from the public transport company. Telephone calls to make reservations are answered manually, but once details of the requested journey have been entered, routing and other functions are handled automatically by software known as Ring, developed for the purpose by De Lijn. Vehicle position is monitored using GPS, and mobile telephone contact with drivers allows routes to be diverted if last minute reservations are received. There is no real-time information system for customers. Fares are calculated on a zonal basis.

The publicly owned public transport company De Lijn has a monopoly of urban and local public transport within the region. In Meetjesland, the operation of the Belbus is sub-contracted to a private bus operator. The contract was granted for an unlimited period with a five-year term of notice. Recently however, five years' advance notice was given of the termination of the contract and De Lijn will issue a call for tenders requiring competitive bids. The new contracts will also be valid for a fixed period of five years.

Most passengers (80%) travel to and from Eeklo, the main local town and transport hub for train and bus services. There are 13 journeys scheduled every day in each direction, but in reality only about 70% of these services run (Sundays the figure is 40%), since the bus only runs when a seat has been booked. The service has an average of 18 journeys per day, with passenger numbers rising to around 55 per day. The Belbus costs £150,000 per annum and £0.42 per mile, with revenues of £64,389 per annum. The share of public transport remains too small to see any significant increase of local services. Mobility of elderly people, young people and other people without cars has increased significantly, now allowing nearly every trip at any time of the day. According to a survey, the necessity for reservation is not considered to be a major disadvantage.

Source(s)

Belbus (2000) VIRGIL: 'Verifying and strengthening rural access to transport services'. Rural Transport in Europe: Good Practice Guide. Visit http://www.bealtaine.ie/virgil. Last accessed 28/4/03.

PP2.9 Shared night taxi, Linz, Oberösterreich, Austria

The public transport provider in Linz, ESG, introduced a share taxi scheme in 1987 to reduce the cost of providing the transport service and also to tailor service to the needs of the passengers. It based the service on the idea that the demand in the evening is for security and comfort rather than high frequency and low cost, and as such, run in direct competition with the tramways and regular buses. The vehicles used are Mercedes sedans from the taxi fleet, marked with distinctive signs in the windscreen. The service is only run at night with half hourly departures between 20.00 and 00.00 and hourly departures from 12.30 to 03.30. Bookings must be made a minimum of 30 minutes prior to the desired trip. Vehicles depart from five designated stops in the town centre and will drop passengers at their door. The service

has been popular and now has about 180 stops around the city. A proposal to abandon a service in a residential area caused heavy protest and resulted in a reduction of frequency instead.

Confusingly, Meschik and Meth (2002) reported on a proposed shared taxi scheme, and referred to it as the Country Mobile in region around Linz. It appears to be a scheme introduced late in 2002.

Source(s)

Meschik M and Meth D (2002) Innovative Transport Solutions For Rural Areas. European Conference on Mobility Management, 15 – 17 May, Gent: Shared Taxi, Linz. Visit http://www.epomm.org/ecomm2002/presentations/Workshops/public_involvement/Meschik.pdf Last accessed March 2003.

Schwartz S (2000) Smogbusters Brisbane. Demand Responsive Transport: Linz shared taxis. http://www.qccqld.org.au/smogbusters/files/DRPT.pdf Last accessed March 2003.

PP2.10 'Taxi-train' shared taxis, Mauritius, Indian Ocean

One example of where taxi-trains operate is in the Indian Ocean island of Mauritius. Here, Section 103 of the Road Traffic Act 1962 first permitted licensed taxis to operate as so-called 'taxi-trains'. These are effectively supplementary buses that are able to stop and pick up passengers along a particular route and charge separate fares of each passenger. While initially these taxi-trains were unable to collect passengers within 60 metres of a bus stop, the public transport situation became so chaotic during the mid-1970s, with many passengers waiting for inordinately long periods for a bus, that the 60-metre rule was rescinded. Interestingly, the separate fares charged are set at the same level as for a bus operating the same route, despite the rather quicker and more comfortable ride offered by the taxi-train. Understandably, there are many people who prefer to wait for a taxi-train, even if a bus to the same destination arrives in the meantime. Taxi drivers are not provided with any subsidies to operate as a taxi-train. However, they are offered an 80% rebate by Customs and Excise on the purchase taxes of their vehicles, a substantial incentive given that this can be set as high as 200% of the value of the vehicle, and they pay only half the annual road tax. Overall, it is not known how many or what type of trips are made using taxi-trains in Mauritius, or what type of people are using the mode. Around 5300 taxis are registered nationwide.

Source(s)

Romooah D (2002) Personal Communication. Official at the National Transport Authority, Cassis, Mauritius. 15 January.

PP2.11 'Anrufbus Leer', Leer, Germany

The demand responsive, flexible-route rural minibus 'Anrufbus Leer' has been operating since 1992. It has flexible routes and times. It serves the cities of Leer and Papenburg and the municipalities of Ostrhauderfehn, Rhauderfehn and Westoverledingen in the southern part of 'Landkreis' (district) Leer in the north-west of Germany. Each minibus has nine seats. Although open to all sectors of the public the Anrufbus is especially intended for unemployed people in district Leer, who have no access to other transport means. The main actors involved are the municipalities of Leer, Papenburg, Ostrhauderfehn, Rhauderfehn and Westoverledingen, the Verkehrsunternehmen Landkreis Leer (VLL) and the training centre for the unemployed. The system was developed by VLL, the local transport company in partnership with a local training centre for the unemployed.

Travellers pay according to the distance travelled based on a zone system. In the pilot stage all deficits were paid by the central government. Now only the respective municipalities pay for the financial loss.

The VLL Travel Dispatch Center (TDC) takes telephone reservations from passengers. Normally, everybody is picked up at their own house within 15 minutes. The exact time of departure is calculated by a computer program with the aid of GPS and is communicated to the client. The TDC then contacts the driver of the nearest Anrufbus by radio, and informs them of the booking. There are five buses. At the TDC the optimal itinerary is determined and the Anrufbus takes passengers to their destinations. The

Anrufbus operates between 06.00 and 19.00 on weekdays, from 07.00 on Saturday, and from 09.00 on Sunday. The service area of the Anrufbus is restricted by law. In the case of Leer, no Anrufbus is allowed to come within a range of one mile from a regular public transport stop between half an hour before and after a public transport line service. The service also avoids competition with regular taxi companies as it is not allowed to pick up extra passengers alongside the route or transport medical patients. In 1993 the number of passengers amounted to 90,000 annually, and ticket revenues accounted for around 30% of the cost.

Source(s)

VIRGIL (2000). VIRGIL: 'Verifying and strengthening rural access to transport services'. Rural Transport in Europe: Good Practice Guide. Visit http://www.bealtaine.ie/virgil Last accessed March 2003.

PP2.12 FlexiLink DRT, Worcester and Feckenham, Worcestershire, UK

Worcester County Council has recently (mid-2003) introduced two FlexiLink DRT bus services. One service has a largely urban route, intended to service a large housing estate with high levels of social deprivation. The other is mainly rural, based around the town of Feckenham, where it starts in Inkberrow, and runs on a fixed route until arriving at a 'roam zone' in Feckenham. FlexiLink is designed to interchange with main line bus services, but the evidence suggests that people are reluctant to change modes.

The scheme originated through pressure to address social exclusion goals and financial reasons. It was assumed that DRT was a cheaper alternative than a conventional service, but this has been disproved.

There is an element of flexibility in the system to link with health, shopping and education services. People in Worcester are familiar with a 'market day' bus service, so while some switch to other services, most do not change their travel behaviour. Consultants initially identified other routes, including one that started and returned to a fixed point in Inkberrow, but that failed to generate many trips.

The County Council held an open day for operators to outline the nature of DRT, and what was required. It was well attended by both bus and taxi operators, but did not result in an increase in tenders. The general feeling expressed by operators was that DRT sounded plausible, but they were concerned about the apparently poor commercial returns, and this doubt was reflected in the bids received. The DRT service was initiated and implemented by Worcestershire County Council. The bids from operators received were high, but reflected the nature of the cost of delivering low volume, short duration trips.

A pilot project was operated to test the systems and software, supplied by Mobisoft.

The scheme was promoted as a hybrid, something between a bus and a taxi. It was noted that other 'hybrid' transport systems have a short life, such as trolley buses that lasted around twenty years. This is because although they have all the advantages of a conventional bus service, they also combine the key weaknesses, being slow and inflexible. The bus-based DRT has inbuilt disadvantages. Passengers have to pre-book, like a taxi service, but do not necessarily get a door-to-door service. The image and branding of the service is critical. Many people seemingly refuse to use the system because they identify it with dial-a-ride, run for the benefit of the operator, and catering mainly for the disabled.

In common with other flexible bus services, the system is designed to respond to pre-booking, up to 30 minutes ahead, and collects from a pre-arranged point. It is not necessarily a door-to-door service, but caters for wheelchair users. The urban service is scheduled to operate Monday to Friday, from around 07.20 until 20.45. The buses are newly built eight-seaters. The routes identified appear to be appropriate, and the operators recently introduced further pick-up points in Inkberrow. The second phase of the service saw the introduction of two vehicles on a route into Worcester city centre and a further roam zone, but with the option for either bus to take a faster, direct route, or a slower route in the zone, depending on demand.

The urban project was originally designed to cover a larger area, as it was decided that Worcester needs an outer orbital bus service, to be 'pump-primed' by Urban Bus Challenge (UBC) funding. However, it

would have not met the 'urban deprivation' criteria for UBC funding, so a more modest route emerged around a housing estate. At the tendering process, it became apparent that the operators bidding for the business increased their costs. This had not been anticipated by the transport consultants. Bids to operate the scheme were received from both taxi and bus operators. The taxi operators were able to expand into this market from their experience of running wheelchair accessible minibuses. The route had to be modified to avoid affluent areas of Worcester, and to link education, shopping and employment (including County Hall) with the hospital. The timetable needed fixed timing points to satisfy the Traffic Commissioners, but it has sufficient slack for a bus to double back if required. Two buses navigate the routes, running clockwise and anti-clockwise. The system is designed to overlay (complement) existing commercial bus routes, and can operate as a hail-and-ride service between fixed points. Passengers are encouraged to pre-book to avoid confusion and limit the degree of flexibility. The message is kept as simple as possible for potential users, who are encouraged to telephone the call centre if they need further explanation.

Bookings and data are delivered direct to the bus drivers through on-board micro-computers. There are paper based back-up systems at the call centre, and drivers have mobile telephones. Bookings are taken by registered passengers at the call centre, which is based at the County Council Transport Department building outside Worcester. Mobisoft mapping software, based on Ordnance Survey maps is used. The calls booked are transmitted directly to the operators. Bookings have to be made at least 30 minutes in advance using the local call cost phone number. The fare structure is based on distance travelled, with adults paying at least £1. There is access to a taxi company in the event of a bus not picking up passengers, for which the bus operator has to pay. The County Council is offering a free trial period of three months, as they are aware that the existence and reliability of the service is very effectively diffused by word of mouth recommendations.

Ridership levels are low at present; currently less than one passenger per trip on average.

The urban scheme has better usage than the rural service, and tends to be used by people who live on roads with no regular bus service, although they may live less than 400 m from a bus stop. This is important, as one of the criteria for identifying the need for a bus service is the 400 m distance from a bus stop. It was noted that the *perception* of isolation and lack of transport can be a highly subjective and emotive issue.

Problems encountered include the fare structure. Short hops appear to cost almost the same as longer trips, and the service is almost in competition with existing buses. The fares also have to avoid direct competition with taxi operators. Marketing has proved to be very difficult. A second problem has been the demand from an area of Worcester where there is no bus service, but the area fails to fulfil the criteria for UBC funding, and residents have felt ignored.

A critical issue for bus service operators is that of concessionary passes. Bus services (particularly when operated by small operators) are not financially viable when dependent on farebox takings, and the majority of riders qualify for concessionary passes (elderly, children, etc.), even when the government rebate is 75% of the cost of the service. If the operator receives County Council funding, the contract can be operated on a cost or subsidy basis.

The relationship with the Traffic Commissioners has been mixed. Although they are instructed by the DfT to 'accommodate' flexible routes, the Commissioners in the Midlands were sympathetic but very conservative. One of the tricks used to avoid problems with timed points is to alert passengers to the 'over 100 *bookable* pick-up points across the network'.

The rules of UBC funding restrict the coverage of the DRT service. Although there is scope to cover a potential market in the South West of the city and other areas, the UBC rules prevent the service developing beyond the zones covered by the 'social exclusion' criteria.

The pilot scheme revealed evidence of rural economic regeneration. Passengers realise that they do not have to travel into Worcester, but can gain access to the services they require from the local village or town en route. It also saves them money by not having to travel further than necessary.

DRT is costly, and the degree of subsidy is not yet known. The set-up costs are also high. Advertising, marketing and designing the bus livery cost around £30,000, all paid out of the UBC grant. The DRT

does address the politically sensitive issue of social exclusion, which may be immune to cost. Critical elements of the system are well-trained drivers who have a good rapport with the call centre. Due to the nature of the ridership consisting largely of concessionary fares, while the Government is keen to promote bus use, these riders will not contribute enough to the farebox to run an economically viable bus service. Any service will need subsidy. In effect, it will have the effect of shifting government aid from one sector (welfare) to another (transport). The riders are unlikely to be affluent commuters, and therefore have limited resources, so travel beyond the immediate vicinity to gain access to basic services, such as shopping and health care, is not a high priority. This will have the unexpected benefit of keeping money circulating within the local economy.

A third scheme is planned in the area east of Evesham, between Pebworth and Stratford-upon-Avon. A key problem here is that the route crosses the county boundary. It is expected that it will be costly to upgrade the mapping system software. One option is to run a standard service, although the current operator is likely to withdraw the present service. Another option is to introduce a flexible service that serves 'nuclear' villages, and is co-ordinated with rail and bus stations and those services.

The transport consultants JMP produced a bus strategy, which identified a core network of financially viable 'quality routes', combined with interurban, semi-fast buses and village-to-town services on an hourly timetable. This is supplemented with secondary services based on 'blobs of demand'. In an area of limited demand, a flexible service can fulfil this unmet need.

One possibility is that all buses could be replaced by occasional DRT combined with regular daily services on core routes. Another option is to provide a 'micro link' shared taxi that feeds into main bus services, but that would dramatically increase costs. It would also require the co-operation of a taxi operator, but there is probably a better speculative passenger market.

In theory the services could be highly successful, but will have to be carefully designed to avoid the pitfalls of hybrid designs. The open day for operators was a good idea, and the Mobisoft software worked well.

Source(s)

Radbourne K (2003) Interview, Principal Customer Services Officer, Worcester County Council, 1 August, Worcester.

PP2.13 DRT, Corby, Northamptonshire, UK

DRT in Northamptonshire is due to be introduced against a background of declining urban bus users. The effect has been that operators are deregistering their non-profitable services. This arises from a combination of poor marketing and old buses. The DRT scheme launched in the Corby area of the county aims to reverse this trend. In 2000, operator Stagecoach was considering withdrawing services from the area, so the County Council intervened. In 2001 it held a 'Corby Transport Day' to highlight the future of public transport in Corby, and this culminated with a Bus Challenge bid in August that year. This was unsuccessful, possibly because at £2.5m it was over ambitious. It was revised and successful in August 2002. Of the £1.2m bid, £950,000 has been received to pay for the infrastructure (buses), with a further £250,000 pledged by Corby Borough Council for new bus shelters. Following the launch and the parade of the new buses, which obviously impressed people, ridership increased some 54% in the first three months of operation. The new, well-designed buses have been bought by the County Council and 'given' to Stagecoach, which also retains revenue from the farebox. Two buses of the new fleet are for use by the DRT project. Stagecoach was originally unwilling to invest in any new buses to replace their ageing fleet.

The DRT service is a partnership between Northamptonshire County Council, Stagecoach, the Borough Council and Catalyst Corby (regeneration agency), Community Carpools and the local government office. The funding the project received from bids to the Bus Challenge grants included funding for the Journeyline Call Centre, based at the County Council offices. The DRT services are scheduled to start in October 2003.

Corby is notable for having a vibrant taxi market, although the operators have proved to be difficult to negotiate with. Since the introduction of the DRT service, bus ridership has increased, helped by Stagecoach's policy of £1 for an all-day bus fare.

After declining bus usage, the second reason for applying for Bus Challenge funds is for pump-priming, based on Section 106 of the latest planning regulations, which cover transport in new infrastructure, and enables the provision of core services. DRT is viewed as a good transport solution for new developments.

The third reason for introducing DRT is to address access to industrial services and commuter travel. The County Council is hoping to bid for European finances to address congestion. This is becoming a major problem in several towns, and car parking is becoming a critical issue. Ironically, it is coupled with objections from local residents in new housing projects, who refuse to have a bus stop sited outside their property. It is easier to have them installed at the outset of planning, rather than have them retro-fitted. Such action will require the co-operation of planners, developers and transport operators.

Fourthly, there was a goal of increasing the ridership levels of community transport, including dial-a-ride. These tend to use old equipment and have low ridership, so new buses should improve efficiency and the attractiveness of the service to users. The scheme features six drivers and appropriate support. The Kettering based project is Test Bed sponsored, with the aim of selling the idea to the rest of the county, and eventually combine all Community Transport into the Journeyline booking infrastructure.

At present, the process to operate the system prevents bids placed across financial boundaries. A brokerage service based on users rather than operators would overcome this problem.

The scheme in Corby will operate as a bus service. It is intended to serve a network on a half hourly schedule, but not on a door-to-door basis.

The Journeyline call centre cost £30,000, and it was decided to keep it in-house to gain experience of running a call centre, with the potential for contracting out this function in the future.

The Corby Scheme uses Mobisoft software for management, which was selected for its reporting capabilities. It can apparently learn from experience, identifying patterns and trends such that the service can be modified to match demand. The Community Transport groups were originally involved, but drifted away when they realised how DRT was developing. The Journeyline control centre is well positioned to identify potential riders. Membership is required for journeys, which can be booked in both directions. The call centre is open from 07.00 to 18.00 Monday to Friday, and trips can also be booked online. Booking is effected through a freephone telephone number, available anywhere in the county. Access to the free telephone number has been identified as an important feature for users. It is intended to replace some of the poorly performing routes. One particular aspect that has been identified is careful management of the local media. Newspapers are quick to try and criticise any new initiative. New signs on the flexi-routes will feature a 'bookable' flag to differentiate from conventional bus services. Stagecoach has been co-operative in providing publicity. The new fleet of low-floor buses will be branded 'Corby Star'. The fare structure will be as for the existing service, and although the tickets can be used on any other part of the bus network, this might lead to problems in the future. One aim is to increase the scope for interchanging from one transport network to another through the provision of new bus waiting facilities and services. As in other regular services, the flexible routes require three timing points to satisfy the Traffic Commissioners. Stagecoach will monitor the state of the service.

The relationship between the County Council and the operators is very fraught. It should be noted by the Department for Transport that 'Quality Contracts' are not valued by the bus operators. Deregulation has created some major problems. There is no local competition, so Stagecoach operates in a captive market. The Bus Challenge funds are viewed as a simple mechanism for boosting the profitability of private operators.

In contrast, the Traffic Commissioners did not present any objections. VAT regulations create more problems. Two of the vehicles used in the Kettering area have more than nine seats, and so are VAT-exempt.

Marketing is important for success, as it is critical for the public to understand how the system works. Market research can assist in identifying potential markets, but there is still the uncertainty that such work

will not automatically translate into ridership. Offering early members discounts can be a major factor. The current legislative structure also means that people do not appreciate that some projects are impossible.

The bid that the County Council submitted to the Rural Bus Challenge was based on costs estimated from other Community Transport operations, but was inaccurate. They realised it was very difficult to guess the real costs of the DRT projects. The funding did not fit the original model, so had to be revised to match the operational needs.

The rural service is based around Kettering, which is according to DfT definitions a 'rural' area. This definition has proved to be highly divisive, and represents a financial barrier. People view an operation in one area, but are excluded from using it, or having a similar scheme because of the criteria. It would be better to have one 'Bus Challenge' fund without the artificial barriers, and so that funding could be recycled through the Local Transport Plan. The conclusion is that Challenge funding is overly complex.

The initial service will have two buses, and it is hoped to increase to three following further funding. The aim is to serve a new housing estate. It has proved to be highly problematic when dealing with various government agencies, particularly when negotiating responsibilities and funding. It is anticipated that the Journeyline call centre will eventually be open 24 hours a day.

The service will be reviewed after three months to identify patterns of use, and thereby locate aspects that should be revised. The County Council originally bought three different types of vehicles as an experiment and to serve the variety of user groups. It may prove to be better to have two types of buses, or locate funds to replace inappropriate vehicles.

Source(s)

Drummond S, Levell S and Jones M (2003) Interview, Northamptonshire County Council, Northampton, 12 August 2003.

PP2.14 The Fare Car, Devon, UK

The Fare Car is designed to replace declining rural buses through a network of shared taxis offering subsidised fares, and operates on fixed departure and arrival times, although the trips are flexible. It covers the mainly rural areas to the north and south of Honiton in Devon.

The 1985 Transport Act in theory offered private taxi operators the opportunity to register fixed routes on the same basis as a conventional bus service. It also allowed taxis to collect separate fares, so drivers can make sequential pick-ups. This arrangement requires an agreement (contract), if the service is advertised in advance and the passengers agree to sharing the service. In practice, very few operators took advantage of the legislation due to the increased financial risk. Deregulation did not result in an increase in entrepreneurship. The fundamental error was the belief that taxis are cheaper than buses. A taxi can cost the same as a small bus, and most of the costs are in wages.

The costs of operating buses are rising as vehicle standards improve. This is combined with a consistent decline in the rural bus user population. The County Council concluded that the only realistic way to save money was through a pre-booked, private hire arrangement. The fixed costs of the service are the driver, which in turn influences the degree of subsidy required. This is the main limitation of systems such as Corlink. The level of subsidy is unjustifiable.

The Fare Car operates on a 'pay-as-you-go' basis. It was set up with Rural Bus Challenge funding, although the first funding was from the Countryside Agency, and initially covered the area around Honiton. It was started and organised by Devon County Council. Bookings are handled by a local Community Transport office. This will be developed such that the local offices can serve as 'brokerages' and provide a local information function. It was also useful to have the office verify taxi claims for trips made under the scheme, and thus reduce fraud. The intermediary could cross check bookings.

There is no means testing, and the service is available to everybody. The benefits are that they know the client base, and it provides the users with a sense of 'ownership'. The main problem is that some people

have treated it like a taxi, and although it looks like one, it really operates as a bus, with fixed times. There are no legal barriers, once the service is registered, since it is not a conventional bus service. There are contracts with the operators and the booking agency. Under the 1985 Transport Act (Section 11), it is legally a private hire agreement, and the operator needs to abide by those regulations. This has the advantage over regular bus services, since Traffic Commissioners are not sympathetic to the idea of 'flexi buses'.

There is a problem of finding taxi operators in rural areas. Even some market towns lack taxis. Those that have taken advantage have been able to expand because of this service, so in effect it uses spare capacity. The firms participating only need to start with a few hours each week, then build up the service.

The pick-up and drop-off points vary according to bookings, and there is no set route, although the arrival time at a particular destination is guaranteed. The operator benefits as it is part of the conventional service, as bookings are made by 4 pm each day, so each driver knows the following day's itinerary and route. Since the level of commitment is known, the DRS forms part of the normal operating pattern, and drivers are free to accept other bookings. Where demand is very low, there may not be a need to operate all of the services.

A conventional bus may cost around £80,000 per annum, while the Fare Car may cost around £20,000. If every journey is pre-booked, then a small bus may be sufficient. It has been running for around three years, and provides 300–400 passenger trips per month.

It is used by a mix of people. Young people use it for work and leisure, elderly use it for medical appointments. It mainly addresses social exclusion. It does not run on a Saturday night, as it would compete with the conventional taxi operators. The main destination is Honiton, as this has social and health facilities, education and employment, and is also a link for local connections.

Sustaining this form of public transport in rural areas is more cost effective than a conventional bus service. The target level of subsidy is around £4 per passenger but the current subsidy level is £10. The 'best case' scenario would be that certain trips become very popular, so it may be possible to raise the fare and reduce the subsidy for some of the other journeys. The 'worst case' is that every service is patronised by very few passengers, so the level of subsidy is high. This is the problem of the lack of concentration of demand. Current ridership intensity is 1.25 people per car.

A 'willingness to pay' survey revealed that users were prepared to pay £2–£2.50 per trip. This is in line with the current fare of £3 per trip. This suggests some trips are almost commercially viable, or require very low subsidies. Customer surveys show most are satisfied with the service, particularly the door-to-door aspect, and the drivers know the people they pick up. It was thought too early to judge the overall success of the scheme. Other schemes that attempt to address conditions of low population density, high distances and low load factors face similar problems.

Source(s)

Devon County Council (2003). Devon on the Move: Centre of Excellence. Visit http://www.centreofexcellence.org.uk/cases_index.asp Last accessed 28/4/03.

Richardson-Dawes J (2003) Personal Communication. Senior Transport Co-ordinator, Devon County Council. 22 May.

PP2.15 Bus of the Port, Gennevilliers, Ile-de-France, France

The so-called Bus of the Port operates as a fixed route service during peak hours (06.00–09.15 and 16.00–19.15) and as a demand responsive service during the off-peak interval. When in DRT mode, users telephone the service (which deviates a certain amount within the industrial estate to pick up and set down passengers) and are then transported to either a railway or an RER (regional metro system) station or a bus terminus depending on their ultimate destination.

The system began operating in June 1999 and was established by a partnership between the public transport providers, local authorities, trade unions and companies of the Port of Gennevilliers to allow the 6,000 employees spread over 250 companies located there to get to work.

Source:

Enterprises et Mobilite en Ile-de-France (2003) The Bus of the Port, Enterprises et Mobilite en Ile-de-France, Paris. Visit http://www.emif.fr. Last accessed December 2003.

PP2.16 Cityrider, Stoke-on-Trent, Staffordshire, UK

The initiative was awarded funding of £721,500 through the Urban Bus Challenge (UBC) from a bid in 2001. The service was launched in November 2002. The UBC money was able to fund a project officer, three new accessible vehicles (Optare Aleros), information technology, setting up a dedicated call centre and subsidising the service. The service is operated by Wardle Transport for Stoke-on-Trent City Council

The new service was set up to provide enhanced public transport within deprived wards to the north of the city and help improve access to health facilities, focusing around the Haywood Hospital walk-in centre. Improved transport was considered necessary after the Health Report for the City of Stoke-on-Trent and the National Neighbourhood Statistics showed that the north of the city had high levels of mortality and morbidity with existing transport service not proving acceptable links between the community and health facilities (CST, 2003).

The call centre has an easy to remember number, 82 72 82, which is advertised on all publicity material as well as on the vehicles themselves. All call centre staff received specialised training in order to be able to provide good quality information with a high level of customer care. There was some confusion at the beginning with many in the community thinking the phone number was only for booking, not for enquires as well, but a publicity campaign adverting the number as a ‘helpline’ addressed this in Spring 2003.

Revenue grew steadily in the first five months of operation from £434 for the month of November 2002 to £909 for March 2003. The fares were kept deliberately very simple, with a flat fare system for the main route, and very low at 50p single, £1 return, half price for concessionary travellers. Those using the demand responsive service have to pay a little more, arranged at the time of booking.

From ticket machine data, 6,589 people had used the service over the first five months, however only 72 of these were using the demand responsive service, whilst the rest used the service as a conventional bus. Those questioned using this service said that they would usually rely on family and friends for lifts, often due to their disability and were pleased with the independence that the service was able to give them. The project officer is keen to try and understand why the uptake of the DRT element of the scheme has such low levels of usage and address this.

The two services both operate on scheduled timetabled routes, sharing some common route in the middle; they have a hourly frequency during the day Monday to Saturday, starting at 08.25, finishing at about 17.30 in the week and 15.30 on Saturday. If booked in advance they will deviate off the main route to serve a number of areas in a demand responsive way, a service that is available to the whole community. The vehicles will normally stop at pre-defined bus stops along the core route, but will be more flexible with disabled users, stopping outside their houses, providing it is safe to do so. The timetable has sufficient slack in it to allow the vehicle to deviate off the core route and call at locations in the demand responsive areas. The services are operated by three fully accessible minibuses, seating 12 with a space for one forward facing wheelchair.

There is currently funding for a 3-year project, from that obtained from the UBC so far, but Stoke-on-Trent City Council believes that three years is not long enough for the service to have any real effect on the deprivation indices. Therefore they are keen to win additional funding in this year’s UBC competition to extend the service another year, enabling an ‘exit strategy to be planned’.

Sources:

City of Stoke on Trent (2003) Report 2003 'An Innovative Demand Responsive Service improving access to Healthcare facilities' City of Stoke on Trent.

Marriott P N (2003) Demand Responsive Public Transport Services, MSc Dissertation in Transport Planning and Engineering, School of Civil Engineering and the Environment, University of Southampton, September.

PP2.17 Doorstopper, Hobart, Tasmania, Australia

Metro Tasmania is the main operator of bus services in three of Tasmania's four cities and is wholly owned by the state government. The plans for a DRT system in the state capital, Hobart, were advanced reasonably quickly. The inner suburb of New Town was identified as the place to launch the pilot scheme for the following reasons:

- an elderly population
- proximity to shopping centres
- somewhat thin conventional bus service
- proximity of the company's main depot (Springfield)
- wide streets.

This was because Metro was in the position of owning 22 MAN midi buses. These 29-seaters were new in 1991–3 and built with a 'small bus' body. Metro had trouble finding work for these vehicles, because whilst their 29 seat capacity was adequate for many off-peak services, the morning rush hour and school services would see them struggle to cope with loadings. However, these MANs were ideal for the provision of demand responsive services in New Town, as the streets are wide and presented few access problems for these buses.

In starting the scheme in July 1997, a small roster of selected drivers was devised. It was important that the drivers had a detailed knowledge of the area and it was also seen as important for the potential passengers to be able to see familiar faces on the route. Two routes were registered initially. The first served East New Town (route 18) and the second travelled through West New Town (route 19). Both routes started at North Hobart shopping district and finished at K-mart shopping centre in New Town. Both routes were to run once an hour in each direction between 09.00 and 16.00. The area was already covered by through bus services but, apart from the 'main road' bus, these were fairly sparse.

Upon request to the driver, the bus would stop at any safe location along the route, and in addition, would divert off the route to set down passengers. A free telephone hotline was set up that intending passengers could ring to book the bus to pick them up at their door, off the bus route. Alternatively they could hail the bus at any safe location on the route. When a booking was received, the driver of the bus would be radioed by control. A fee of $A1 was added to the fare for this service. A diversion on the return journey would be free of charge.

The service was monitored for a year and patronage was growing. The main failing was seen as its southern terminus being in North Hobart. The routes were extended to reach Hobart City bus station and have seen patronage growth since then. A further two parts of Hobart were therefore identified for the Doorstopper concept. These were Warrane on the Eastern Shore and Chigwell in the Northern suburbs. The main difference separating these two schemes from the earlier New Town scheme was that the services were to replace the current daytime conventional bus service in the two areas. These two schemes were launched in 1998 and operated in a similar way to the pilot scheme. The Chigwell service (route 35) employed a bigger bus, but the Warrane service (routes 246 and 256) used another of the 29-seater MANs. These two timetables listed the streets they would serve as a 'demand response area' from the start. The charging scheme and telephone hotline number were the same as previously.

Patronage for these two routes was much higher from the start. This was entirely due to the fact that the conventional bus service was severely reduced during the Doorstopper's hours of operation. It is interesting to note that whilst the New Town routes were extended to reach Hobart city centre, neither the Warrane nor Chigwell schemes originated from the city centre, despite the conventional services they replaced being through services to the city centre. This is partly due to the further distance of these two areas from the city centre.

As of December 2003, the routes were operating in a fashion closely replicating that introduced in 1997. There have been no further introductions of this concept in Metro Tasmania's operating areas.

Source:

Murchison W (2003) Demand Responsive Transport in Tasmania, Student Research Paper, Loughborough University, Loughborough, December.

PP3 Public Policy: Destination-Specific DRT.

PP3.1 Deeside Shuttle, Deeside Industrial Park, Flintshire, North Wales, UK

Flintshire County Council is the lead authority for an innovative demand responsive transport scheme and are now set to press ahead with implementation plans following a recent successful bid for funding to the National Assembly for Wales. £400,000 of a full bid of £1.4m will be provided initially for the provision of three buses dedicated to the first phase of the pilot scheme centred around the Deeside Industrial Park, which will be closely monitored before the balance of the funding is made available. The industrial estate transport system was initiated following a meeting held in May 2001 on demand responsive transport. This was in response to the statistic that out of 10,000 employees on Deeside Development Zone, including the Industrial Park, only 31 people travelled to work by public transport. The County Council commissioned a Public Transport Consultancy to carry out a feasibility study of a DRT to provide an attractive, less conventional public transport system to serve Deeside Development Zone, Airbus (Broughton) and Unilever (St.David's Park, Ewloe).

The service itself has been in operation since early March 2003. The DRT shuttle service is exclusively for commuters, who need to register with the service. Ten per cent of all employees live within the area serviced. To date, 750 people have registered, and almost 1,200 passengers are carried each week on three buses (14-seater Aleros). As of mid-December, two more buses will be added, and ultimately the plan is for 16 vehicles. There are currently two call centre staff. The service uses Trapeze Software.

As a promotion, for the first week fares are free, and staff are issued vouchers. The second week, the fare is reduced by 50%, and 25% the following week. Thereafter it is £5 per week. The major problem is that at peak times the system is operating at capacity – and this somehow needs to be increased, while there are also difficulties caused by congested traffic at the entrance to the site.

Source(s)

Deeside Industrial Park (2003) Deeside Shuttle Homepage. Visit www.Deesideshuttle.com Last accessed 29/05/03

Stones S (2003a) Deeside Industrial Park. Personal Communication, April

Stones, S (2003b) Telephone interview, Deeside Shuttle, Flintshire County Council, Flint, Wales, 15 August.

Blainey D and Stones S (2003) Deeside Shuttle, Paper presented at *Preparing for the Revolution in Demand Responsive Transport Conference*, Landor Conferences, 5 December, London.

PP3.2 Public Vanpool, King County Metro, Washington State, USA

King County Metro is the largest public vanpool operator in the USA. In 2001 697 vanpools were in operation, with employer members of the vanpool programme including a number of major companies like Boeing, Microsoft, AT&T, Philips Oral Health Care and the University of Washington.

Nearly three million passenger trips were undertaken by King County Metro vanpools in 2001, with an average occupancy of 8.6 and an average round trip of 56.6 miles. Figures published in a King County Metro fact sheet state that vanpools eliminate around 7000 vehicles from the road network each day. There are several advantages to do with economies of scale and expertise offered by a specialist large vanpool operation that enable it to provide services far more cost effectively. In particular, employer operated schemes have not typically offered as high a quality service, while there are issues surrounding the provision of the vans. A basic van costs roughly £16,000 which then requires upgrading, and 'aftercare', including maintenance, databases, insurance and so on. Further, employer-provided vanpools fall foul of company car taxation rules, while operator provided vanpools do not as the employer is not directly involved.

In one year, a vanpool group saves about 6,666 gallons of petrol, reduces air pollutants by 4.9 tonnes and removes more than 104,160 vehicle miles, or around 12,900 miles per commuter. Overall in the Puget Sound area (Greater Seattle), vanpooling has achieved a 2% market share of the overall commuter market, a figure that rises to 7% for commuters who travel more than 20 miles each way.

Vanpooling first started in Washington State in 1979 when the City of Seattle began operating 21 vans to provide an alternative to fixed route transit to serve commuters who do not have access to transit or have longer distance commutes. This was made possible by the Ridesharing Act, enacted by the Washington State Legislature, largely in response to the fuel crisis. This provided a sales tax exemption for the vanpool vehicles, established liability insurance as 'ordinary standard of care' for the *volunteer* driver, and allowed the use of government vehicles for the purposes of ridesharing. It also defined vanpooling as 'a group of not more than 15 persons commuting from home to work or school'. The vanpool operation was then transferred to King County Metro in 1984 with 130 vans. The passing of the 1992 Air Quality Commute Trip Reduction Act changed the minimum size of a vanpool from seven people to five. This resulted in the minivan portion of the fleet growing to almost 400, or 60% of the fleet by 2000. Finally, the Taxpayer Relief Act of 1997 and the 1998 Transportation Equity Act for the 21st century provided for increasing the non-taxable vanpool commuting benefit ceiling to £64 a month from 1 January 2002, with the resumption of increases indexed to inflation. Employer subsidy aids vanpool participation, while Washington State Commute Trip Reduction legislation combined with the commuter check tax incentives encourage employers to subsidise vanpools. Local benefits to vanpools include discounted fares and priority access on the region's ferries that are used by 11% of public vanpools and 60% of private vanpools.

The vanpool programme provides vans, staff support, maintenance, fuel, and insurance to groups of between 5 and 15 people who commute together. The Department of Licensing conducts background checks to eliminate drivers with bad driving records, while credit checks eliminate persons with a bad credit history. Driver orientation classes provide safety training.

One volunteer from the group drives the van and travels for free while the rest of the group pay a monthly fee based on the number of vanpoolers and the round trip mileage of the commute. Although the average monthly fee is £37, the average 'out of pocket' monthly fee is £24 as 79% of employers now provide a direct or transit partnership fare subsidy to vanpool employees, including 15% of employers who subsidise vanpool fares 100%. A guaranteed ride home is available to every vanpooler who needs emergency transportation during work hours. Each group has one primary driver and at least one back up. In 2000 there were just over 2,500 registered drivers.

Since 1997 companies have also been allowed to use the vans during the day for business purposes, i.e. providing transport for employees to get to meetings, and allowing shuttle-type access to an employer campus or between sites. Commuter groups that make their vehicles available receive a special subsidy. Other schemes such as the *Shared Use* programme, which enables qualifying social service organisations to lease the vans, and the *Job Seeker* programme, which provides transportation for welfare reform clients to job training and employment also make use of vanpool vehicles outside of commuter hours.

The annual operating costs in 2000 were £1.7m, which was covered by income from the passenger fees, grants, sale of vans (which are sold after five years' use) and the self-insurance reserve. These sources also contributed to 45% of the £1m administration costs, while the remainder is covered by public subsidy.

King County Metro also works with the Washington State Ridesharing Organisation (WRSO) and the Washington State Department of Transport (WSDOT) to assist and encourage independent vanpooling.

In addition to King County Metro, five other public transport operators run vanpools in Washington State. Specifically, Community Transit operates 239 vanpools, Pierce Transit (148), Kitsap Transit (92), Intercity Transit (51), and Island Transit (30), while it is estimated that there are another 200 or so informal vanpools operating on a regular basis.

As a consequence the Puget Sound region has the highest number of vanpools per capita (4.5 vans/10,000) in the USA. Experience shows that vanpools work best when employees working for the same company live relatively near each other in suitable clusters, but more than 15.5 miles from their workplace. Ideally, they should also all start and finish work at the same time. Interestingly it is this lack of flexibility is the biggest reason why staff choose not to vanpool, although those that do are very positive.

Similar vanpool programmes exist in other parts of the USA, including San Antonio, Texas. They also operate in various countries in the Middle East, such as Dubai, Oman and Saudi Arabia. In Dubai there is also a type of vanpool system which is a semi-legal operation by private transport companies using minibuses, who pick people up and take them to work on a monthly subscription basis (Howes, 2002).

Source(s)

Enoch M P (2003) Pooling together: Why vanpooling works in the US and the Netherlands, *Traffic Engineering and Control*, **44** (1), January, 12–14.

Howes A (2002) Personal Communication. Special Transport Advisor, Dubai Municipality Public Transport Department. 11 December.

King County Metro (2001) *King County Metro Rideshare Operations*, Fact Sheet, King County Metro, Seattle, August.

Pacebus (2003) Vanpool Information. Visit http://www.pacebus.com/ Last accessed 03/04/03.

PP3.3 Vipre Vanpools, the Netherlands

While there had been a few Dutch company-arranged vanpool schemes, and one other leasing company tried but failed to start up a successful vanpool operation, vanpooling did not really begin to develop in the Netherlands until the arrival of US vanpool provider VPSI four years ago. Vanpooling Services Incorporated (VPSI) is a private company and operates about 3000 vanpools, making it the largest vanpool operator in the USA and therefore the world. VPSI emerged from the Chrysler rideshare experiment of the 1970s as a Chrysler subsidiary to provide vanpooling services to companies, and is now part of the Budget Group. VPSI is particularly active in Southern California, Texas, Atlanta, and the Bay Area (greater San Francisco), with one programme at Chevron Texaco in California and Houston having over 200 vans and one at Kennedy Space Centre at Melbourne, Florida, having 400–500 vans.

As of summer 2001, VPSI's Dutch subsidiary Vipre (acquired from Philips) operates 80–85 vanpools with 600–650 vanpoolers, making it the largest vanpool provider in Europe. On average, each vanpool consists of around seven people. Vipre has offices in Amsterdam, Rotterdam and Eindhoven and sees itself as a facilitator of mobility for companies, drawing up and implementing mobility management strategies (travel plans).Vipre services three companies in Rotterdam, two in Amsterdam, one in the south, one in Groningen, and one in Leeuwarden.

Shell was the first Vipre client to adopt the concept towards the end of 1998, and now has 13 vanpools of around 75 staff. The vanpools were established as a way of transporting its staff to the industrial complex

as public transport is very poor around the site. Two people from neighbouring oil company Atofina also use the Shell vanpools (Atofina has five vanpools itself). However, in general it is very difficult to organise 'inter-company' vanpools, even on business parks. Aircraft manufacturer Fokker's Hoogerheide site in the south of the country has the largest vanpool network of 53 vans in total for around 450 employees, representing a third of the workforce. Parking requirements were reduced nine-fold. The Dutch Mint started two or three vanpools when it moved from The Hague to Haarlem, as there was no suitable public transport available for early morning shift workers.

Vipre leases vans for four years from a lease company. For flexibility, the vans are all of the same type. Interested companies can then lease either for one year or four years, while shorter month-by-month user agreements are likely to come on stream soon to further reduce barriers to entry. Those that opt for four years benefit from a discounted rate and are able to customise their vans as they wish.

Vipre organises insurance, maintenance, and repairs for the van, and ensures backup for staff that have an emergency during the day or need to work late. It also organises the collection of subsidy available to companies under the Subsidy for Company Transportation rules, which many local authorities have offered for many years. For example, in Rotterdam, companies providing vanpools that do more than a minimum level of mileage a year are granted a subsidy of €0.03 per passenger kilometre. This is especially attractive, because companies can only usually claim if their vanpools do a minimum number of passenger kilometres. As Vipre is able to collect this on behalf of its member companies, even the smallest vanpool gets some money back.

In the Netherlands, vanpools have a maximum of nine members. In principle the vanpool has a recognised driver and a reserve driver, but in practice they are encouraged to 'live their own life'. The aim is to make the vanpool as close to a car environment (and therefore as comfortable as possible), but with the added benefit that people can read or just relax instead of driving. Vanpools usually also have reserved parking places close to the company entrance. Typically, fuel is paid for on a vanpool smart card. Vanpools also have an element of team building, and in some vanpools, companies give the nominated driver a fee for the extra responsibility, getting up earlier, administration, and so on.

The price for companies hiring a van is roughly the same as it would be for it to give eight to nine employees their maximum car commuting allowance each month, although it is somewhat dependent on the vehicle kilometres travelled.

As commuting is a tax-deductible expense in the Netherlands, the tax issue for vanpooling has been less of a difficulty than it was before the introduction of the Transportation Equity Act in the USA (or still would be in the UK). But the tax situation on incidental private use of the van is problematic, and because vanpooling is not defined legislatively as it is in the USA, vanpools are thus subject to taxes discouraging large car use (e.g. liable to 40% luxury tax). As a result, despite the tax relief and the fact that vanpools are often eligible for local subsidy under the Subsidy for Company Transportation rules mentioned earlier, providing vanpools still cost companies money.

To further enhance the appeal of vanpools, Vipre is seeking permission for vanpools to use bus lanes. In principle the Dutch Ministry of Transport has agreed, and a trial is currently being conducted in the Port Area of Rotterdam. However, this concession requires that each van be fitted with a transponder so that it can trigger the traffic lights so as not to slow buses, and transponders are expensive.

Source(s)

Enoch M P (2003) Pooling together: Why vanpooling works in the US and the Netherlands, *Traffic Engineering and Control*, **44**(1), January, 12–14.

PP3.4 Telford Travelink Maxi Taxis, Telford, Shropshire, UK

The background to the scheme revolves around the physical development of Telford as a new town. It is planned on the same basis as Milton Keynes or Los Angeles – i.e. a grid network of high capacity roads – but has several key differences. Although it is organised on a dispersed housing pattern, with areas 'blocked' for different activities, such as industrial zones, it lacks an active town centre, in the sense that there is little apart from shops. Initially the housing was constructed by Housing Associations, and the

recent major expansion has been built by private builders. It is dominated by three major industrial estates and the centre features a retail park, which effectively closes at 6 pm. because there are not yet theatres or other reasons for people to remain in town for the evening. Additionally, Telford has new town status, so there are no Planning Guidance requirements. For example, PPG13 demands formalised travel plans to reduce car travel on and off sites.

Another critical difference is the nature of employment. Unlike Milton Keynes, much of the work available is manual, low-paid, shift work, and unemployment is around 1.5%. For this reason, some 20% of the workforce cannot afford to buy or run a car, and are engaged in temporary work. Addressing social exclusion is a major concern.

The Chamber of Commerce is concerned about the poor provision of public transport to the industrial estates. All previous attempts during the 1990s at providing transport failed because of the low levels of ridership. The new approach was the Maxi Taxi, funded through the Urban Bus Challenge bid in 2001. It was seen as a good compromise between a bus and a taxi. Members pre-book a pick up time and destination, and have to be willing to share a taxi with up to three other people. It operates around the conventional bus system.

Historically, Telford has had a proud taxi fleet of Hackney carriages all capable of carrying wheelchairs, but because they cost around £30,000, they are more expensive than conventional private hire taxis, so their population is declining. The private hire market is still vibrant.

The aim of the Maxi Taxi project is to pick up passengers from their home and deliver them to the place of work. This is particularly important for women working anti-social hours. The current membership is around 200, with some 90 active passengers, and so the council currently pays out around £1800 a week to the drivers to operate the scheme. The service is coupled with a shuttle bus service, which operates during normal operating hours. The service covers three large circuits and links to the main interchange points. When this service is available, members of the Maxi Taxi cannot use the taxi service, so the local authority avoided paying a ‘double subsidy’. This was not wholly successful, as local residents objected to the interchange location for the buses.

A further issue has been dealing with the taxi drivers. Nearly all are owner-drivers. This has the advantage of the authority running the scheme being able to know the drivers and who operates which contract, rather than deal with a firm and a switchboard. It also enabled the taxi drivers to develop a sense of ‘ownership’ of the scheme, and for them to establish a relationship with the riders. The taxi drivers were initially sceptical, since they believed that if the business existed, they would have developed and exploited it. They were unaware of how much administrative effort was required to run the operation.

An early idea of running the scheme was to set up a radio system, but given that the drivers already used mobile phones the decision was taken to use those combined with faxes. It was critical to persuade the drivers that the scheme had to start from effectively zero riders and develop over time. They submit invoices detailing their fares every two weeks. This submission can be cross-referenced to the passenger schedules to eliminate fraud. However, it has not proved to be easy dealing with them. Some drivers insist on cash only transactions, and the idea of waiting for two weeks for payment is alien. Ironically, these are often the same drivers who supply contract work to the education department, and are paid six weeks in arrears, but appear happy with the arrangement.

The pricing is based on a weekly contract with the drivers and passengers, as both have to know what fares to expect. Typical weekly costs are £20 per person. The pricing has been calculated on a price matrix based on timings and costings, one each for drivers and passengers, and fares are typically a third of taxi fares. The subsidy needs an average of three riders per trip to break even. Passengers have to book four days in advance, and pay weekly in advance. Some drop out, and the authority is considering the introduction of a deposit to avoid this problem.

The current subsidy is planned for two years with central government Bus Challenge funding. The authority will decide next year (2004) if it will continue beyond this date. This may require increasing fares to break even. Another view is that it costs around £15,000 per annum to maintain somebody on benefits, and many of the riders are job ‘starters’, so the scheme targets these people deliberately.

The marketing campaign was highly intensive. The benefits of the scheme were promoted very strongly to companies and recruitment agencies in the area. Firms are also starting to experience difficulties with parking, but few have expressed an interest in organising travel plans. They do not view it as their problem, but the local authority's. Many firms used to run their own staff buses, but following redundancies, these became uneconomic, leaving the local authority with that responsibility.

All the local transport provision is organised through the Travel Centre. The administrative software is a highly sophisticated GIS developed by JamBusters consultancy, originally based on their car-sharing programme, and cost £25,000. This is seen as a good deal, particularly as the contract required the firm to design, install, test and refine the package, although it was delivered late and considered costly at the time. The software also manages databases of drivers and passengers, is flexible enough to incorporate repeat bookings, and produces invoices for both groups. It is currently unable to calculate the pricing matrix, which is done manually. The next phase may see the introduction of booking on-line using credit cards. There is considerable commercial potential for this kind of software.

The target is 1% of the total bus ridership, double current levels. It has proved so successful that new taxi operators are interested in joining. The authority also aims to provide a third of the shared taxi market for people travelling to work, and wish to emphasise they are not taking that market, since their passengers are people of limited means.

In the future the authority has identified the lack of subsidy as a potential problem, rated at around 1% of the total bus subsidy to reflect the target market size. There is no scope to recover the administration overhead costs.

Source(s)

Herraty T (2003) Telford Travel Link Maxi Taxis. Personal Communication, Transport Co-Ordination Officer, Telford and Wrekin Borough. 12 June.

Telford Travel Link (2003) Maxi Taxis. Visit http://www.telford.gov.uk/FreeTime/PublicTransport/Taxisharing.htm Last accessed 24/4/03.

PP3.5 JAUNT, Charlottesville, Virginia, USA

JAUNT is an urban and rural demand responsive transport system that complements regular public transport in Charlottesville, Virginia, USA. The aim of the programme is to provide a 24-hour transit service to those in receipt of the welfare to work benefit. This will provide these people, who have limited access to regular transport, with access to job readiness classes, interviews, education and childcare. The result is a demand responsive van or sub-contracted taxi that operates after the regular public transport service has ended. Funding was initially provided through the State Department of Social Services. A subsequent grant from the Federal Transit Agency (Job Access and Reverse Commute) in November 1999 enabled the service to expand and cover three additional rural counties. The grant covered the cost of the infrastructure, such as cell phones and a transportation co-ordinator. The service runs every day, all day. One problem is that of cancellations or no-shows. This barrier is tackled through the threat of the withdrawal of the service to repeat offenders. In the first two years of the project, the service provided over 53,000 trips. In the first seven months of the second grant, it provided over 21,000 trips. The main challenge appears to be locating future funding.

Source(s)

Jeskey C (2001) Linking People to the Workplace; Community Transportation Association of America, Washington D.C., January. Visit http://www.ctaa.org/ntrc/atj/toolkit. Last accessed 23/4/03.

PP3.7 DRT, Langage Business Park, Plymouth, Devon, UK

This demand responsive service started in June 2003 to serve the Langage industrial estate on the eastern side of Plymouth. It aims to address the problem of social exclusion, since at present the business park is poorly served by public transport. One employer on the site refuses to employ any staff unable to make their own way onto the site. Orange had their own dedicated staff bus service, costing some £250,000 per

annum transporting staff located around Plymouth to their call centre. This had tax implications for the company. A staff survey showed that staff believed that the local bus service was unreliable. Orange approached Devon County Council to partner a bid to the Urban Bus Challenge, and agreed to fund around 50% of the cost. The service will run daily except for bank holidays and Christmas day. The DRT will be branded 'Orange', but non-employees can use the service. During the day the same vehicles are used by the Shopmobility scheme. It is synchronised to arrive and depart the business park to coincide with the shift patterns. Bookings must be made at least 20 minutes in advance. The DRT element will operate an eight-seater minibus in the evenings from 20.00 until 02.00 and all day Sunday, while the conventional bus operates during the day. Currently only the employees of the call centre need the DRT facility. There is limited demand for the bus, as most of the daytime administrative staff drive to the site, and Orange is the only employer at present that operates a shift system during evenings and weekends. The DRT will charge a flat fare of £1.50, and £0.50 to Orange staff. Return fares are likely to be around £2.30. The aim is to make the project self-funding after two years, if other partners on the site are willing to participate. The DRT may need a normal bus service in evenings depending on the level of demand. The problems overcome include local taxi regulations that limit the number of passengers, and registering a flexible bus route with the Traffic Commissioners.

Source(s)

Ellis T (2003) Langage Business Park. Personal Communication, Urban Bus Officer, Plymouth City Council. 22 May.

PP3.8 Allobus Roissy, Charles de Gaulle Airport, Paris, France

The Allobus service commenced in 1998 and aimed to enhance access for employees working at Charles de Gaulle Airport. The routes are operated 24 hours a day, 7 days a week using demand responsive minibuses following four routes from Paris Charles de Gaulle (CDG) airport to various destinations around Paris. It is particularly useful for the employees of the airport who work shifts. Reservations are made at least one hour in advance, with departures guaranteed every 30 minutes. Pick up and destination points are required. Bookings can be made several days in advance. It uses the existing bus lines from the airport, and features 13-seater minibuses, co-ordinated by radio-telephone, which also monitors position. It also uses conventional ticketing. The operation costs around £800,000 per year, of which 33% is funded by STIF, the region of the Ile de France. The rest comes from the Department of the Val d'Oise, Paris Airports, the community of Tremblay-en-France, the European Social Fund and passenger revenue. There are 12,000 passengers daily.

Source(s)

Syndicats des transports d'Ile-de-France (2000) Annual Report 2000, Syndicats des transports d'Ile-de-France, Paris.

Etudes et grandes projets-experimentation (undated) 'Allobus Roissy CDG' – un servie d'autobus à la demande. Visit http://www.stp-paris.fr/etudes/exper/1999/main.htm Last accessed 17/04/03.

PP3.9 Student Union DRT scheme, Southampton University, Southampton, Hampshire, UK

Southampton University provides a range of transport services, including its own bus operation, however what is of interest here is the smaller-scale initiative organised and run by the Student's Union, offering a demand responsive method of safely getting home from the Union in the evening. Being a one-to-many service makes it very easy to organise – the bus has a stop at the Union reception, the passengers board and state their destination, and pay a fare of £1. This offers a safe way of getting home after a night out, in an affordable manner. The driver then decides if they will be able to serve that request and once the bus has a number of passengers on board will drive around Southampton dropping various people of along the route. The service is aimed at providing a door-to-door level of service at a low price, the fact that the route is not the most direct is not of much importance, as there is no specific time the bus needs to be anywhere to make connections.

This is a very simple system with minimal overheads, and there is no software or call centre needed. However, it does suggest that one of the cheapest and possibly easiest options would be to have a bus or taxi at the railway station that would take anyone from one or two trains to a particular district of the town/city at a price less than if they were the single occupant of a taxi, closer to their destination than a conventional bus and probably quicker than the normal bus.

Source:

Marriott P N (2003) Demand Responsive Public Transport Services, MSc Dissertation in Transport Planning and Engineering, School of Civil Engineering and the Environment, University of Southampton, September.

PP4 Public Policy: Substitute DRT

PP4.1 Lovedean Carshare, Cowplain, Hampshire, UK

Hampshire County Council currently run a number of shared taxi schemes, most of which replace under utilised bus services. The idea of devising shared taxi schemes came from the Devon Fare Car example.

The Lovedean Carshare service allows registered users living in Lovedean and Cowplain who previously used the number 36 Emsworth and District bus service to access facilities in Cowplain and Waterlooville. Fares range from 40p to £1.20. The service features fixed start and end points, and if no bookings are received, the service does not operate. This reduces the subsidy – a full taxi requires virtually no subsidy – and does not need to be registered as a bus service as it only runs on demand.

The taxi operator – a local firm called Cowplain Cars – quotes for the cost of a journey minus the fare, which reduces its risk exposure. Claims made for trips are verified by cross-checking with users to confirm invoices – drivers must log user details each time they operate the service. However, in spite of the no-risk income it has proved difficult to get interest from taxi operators. Initially forty tender documents were sent out but none were returned, and the council had to chase up operators by telephone to persuade them to bid.

According to council figures, the Lovedean service operates between three and five trips a day and carries an average of roughly two-and-a-half to three passengers per trip. Average subsidy costs per month range from £370 to £490 a month, while average monthly fare revenues are between £140 and £175 – i.e. a revenue cost ratio of between 35% and 40%. There are between 240 and 300 trips made per month and in May 2003 there were 58 registered members. Subsidies come out at roughly £1 per passenger trip.

Three other taxishare schemes subsidised by Hampshire County Council include:

1. The Campbell Road Taxishare transports users to and from Eastleigh town centre for a flat fare of 60p. This service began in May 2002 when it replaced Solent Blue Line bus service 44.

2. The Chalvington Road Carshare serves destinations in Eastleigh for a flat fare of £1.20.

3. The Northney Taxishare service replaced a bus service on Hayling Island in June 2002, allowing users to access other parts of the island and Havant for a fare of between £1.00 and £1.50.

In the near future, it is intended to set up a scheme for commuters living in Droxford, Corhampton, East Moon and West Moon wishing to travel from Petersfield station into London. Tenders are currently being invited and the service is due to start in December 2003. This will fully or partly replace a bus route. A non-Cango DRT bus will be used off-peak that will use a local taxi office call centre.

However, shared taxi schemes are not guaranteed to work. Some years ago, a New Forest DRT scheme was set up but failed. Apparently, although many people registered, few actually used it. This was due to the winner of the contract, a local taxi business, deliberately setting out to sabotage the scheme, as it had

felt threatened by the competition. Due to poor information, people didn't understand where to wait for the service. This led to the council wanting to run its own call centre to maintain control.

Another failed shared taxi scheme was set up after the removal of a bus service in Fordingbridge that was not used very much caused a huge outcry. Apparently, although people were waiting at bus stops, neighbours usually offered them lifts before the bus arrived and this had led to the bus company finding so few passengers. In the event, a community car share scheme was set up across three parishes as a replacement.

Hampshire County Council also tried shared taxi schemes for young people to link them to main bus feeders, but this didn't work either. Children and teenagers aren't good at pre-booking.

Source(s)

Hampshire County Council (2003b) Low cost taxi service and carshare information sheets, Hampshire County Council, Winchester.

Hampshire County Council (2003c) Lovedean Carshare Statistics – July 2002–May 2003, Hampshire County Council, Winchester.

Smale A and Armstrong J (2003) Interview, Hampshire County Council, Winchester, 8 August.

PP4.2 TAXIBUS, Rimouski, Quebec, Canada

Sitting near the Gulf of St. Lawrence, on the river's south shore, Rimouski is home to 32,000, and had a privately run bus service that went out of business in the 1980s. Rimouski and neighbouring towns commissioned a study looking at various public-transportation options. The researchers concluded that a conventional bus service would run a deficit of several hundred thousand dollars, well beyond Rimouski's means.

In September 1993 the City Council initiated a demand responsive public transportation service that solely uses taxis. All urban public transit is now provided by subsidised taxi service. After studying various transit service scenarios using buses, Rimouski chose to launch its TAXIBUS service for economic reasons. A recent cost comparison with other transit services in Quebec cities of similar size showed that costs associated with TAXIBUS are an average of £5.36 less per capita. The service is available Monday to Friday, serves 300 stops by predetermined schedules, and currently averages three passengers per trip. Transportation of people takes place according to a predetermined schedule (hourly or half-hourly departures); it involves no transfers and is set from one stop point to another. This schedule facilitates concentration of demands on common time periods thus increasing the occupancy rate of the vehicles. If at any given hour no transportation is required, no service will be provided and no costs will be incurred. Consequently, the vehicles' routes will vary at each departing point according to the needs of the various users.

Each passenger must pay the taxi driver £1.07 in cash. A £31.54 monthly pass is also available, which allows passengers to use TAXIBUS as often as they wish during that month. Once a journey is booked the rate has to be paid, even if the user is not at the bus stop, unless he had already cancelled his reservation.

Users have to be registered with the service, and costs £0.45. To make a reservation, the user must phone in advance and give the following information: his/her user number printed on his/her user card, the departure time, and the stop point numbers corresponding to the origin and destination of the trip. The stop point numbers are shown on the stop point signs and on the network plan, which is given to the user by the city clerk upon completion of the registration procedures. Reservations can also be made on a regular basis. Quebec's Ministry of Transport developed the software to help manage the service.

The 45 members of the Coopérative Taxi 800 of Rimouski provide transportation. The drivers are paid according to the readings of the taxi meter, from the time the first passenger is picked up to the time the last passenger is dropped off, subtracting the amount paid in cash by the passengers. Then, the taxi co-operative sends an invoice to the Rimouski TAXIBUS Corporation, an organisation established by the

city to manage this transportation service. Finally, the Ministère des Transports du Quebec provides the service with a subsidy according to the Government Assistance Program (40% of the revenues not to exceed 75% of the operating deficit).

After four years of operation, TAXIBUS has become increasingly popular, growing by 37% over that period. Cost increases were kept down by a 6% increase in productivity (by grouping more passengers together, which also has ecological benefits). The number of passengers per ride rose from 1.6 during the first few months of operation to 2.8 by 1996. Service costs per ride have dropped from £2.32 to £1.94 per passenger, 21% of which are administrative costs. In 2000, 42 taxis made 22,000 trips and carried close to 63,000 passengers. A service also now connects with neighbouring towns. Passenger revenues paid for 45% of the total cost of £151,039 in 2000. Provincial subsidies covered 21% of the expenses, with the city of Rimouski picking up 31%, or £46,107. Sponsorships made up the balance. Starting in 1998, the taxi company granted the city a discount of 4% on the meter rate.

Source(s)

Dougherty S (2001) Taxibus: Home Pickup At A Reasonable Cost, *Montreal Gazette.* October 6.

Litman T (2002) Taxi Service Improvements, TDM Encyclopedia, Victoria Transport Policy Institute, Victoria BC, Canada. Updated 31 December. Visit www.vtpi.org. Last accessed April 2003.

Trudel M (1998) The Taxi as Transit Mode. The City of Rimouski Demonstration with the Taxibus. Paper presented at the Annual Conference of the International Association of Transportation Regulators (IATR), Miami, 3 November. Visit http://www.taxi-l.org/taxibus.htm Last accessed April 2003.

PP4.3 Wisconsin Shared Taxi, Wisconsin, USA

The scheme was started because in Wisconsin, many smaller communities realized the need for some form of public transportation, particularly to meet the needs of older persons.

In many of these communities the existing privately operated cab company(s) faced closure due to the high cost of insurance and vehicles. They were rapidly approaching the point where they would have to charge fares that would price them beyond the means of many older citizens just to meet costs. State and federal funding programs were in place to provide assistance to public transit systems that had traditionally meant a bus service. These communities were not large enough to really support a viable bus service. Since the taxi systems were, in many cases, already in existence the state decided that a 'shared-ride' taxi service did in fact constitute 'mass transit' as the rider was not assured sole use of the vehicle and their ride may have to deviate to pick up or drop off other passengers. The first shared-ride taxi system was funded in the city of Ripon, Wisconsin, in 1978. That was the only community with this service until 1981 when four additional cities began the service. In 2003, forty-four communities received funding for their shared-ride taxi service.

The key organization for the creation of this scheme is the Wisconsin Department of Transportation. In addition to state support, local public bodies, primarily cities or villages and in some cases counties, are involved. The state (Wisconsin Department of Transportation) provides state and federal aid to the local public bodies through annual contractual agreements. The local government in turn contracts with a provider to operate the service. At the present time, the combination of state and federal funds covers up to 67% of the cost of operation. The remaining local cost is covered through passenger fares and local tax dollars. Due to the involvement of federal funding, the local government is responsible for meeting all requirements that accompany the federal financial support. These include requirements of the Americans with Disabilities Act (ADA) to assure accessibility, 'Buy America' requirements, drug and alcohol testing requirements, equal rights requirements and other legislative measures. The combined state and federal funds cover operational costs, and the federal funds can also be used to cover capital costs to a level of 80% (90% for equipment needed to meet ADA). Many communities utilize the federal capitol funding to provide modern and ADA accessible vehicles that are then leased to the private operator at minimal cost.

There were some barriers that needed to be overcome, namely:

- The federal assistance program recognised shared-ride taxi as mass transit. Prior to 1979 the state program did not. As a result the city of Ripon only received federal aid in 1978 at a level of 50% of 'net cost', which is total cost less passenger revenue. The balance of the net cost was covered by city tax dollars.

- Once state funding became available for shared ride taxi systems, it was available only to communities with a population of 5,000 or more. Many communities under that population threshold wanted to provide service, but were limited to receiving only federal aid at the level described above.

These barriers were resolved by;

- The State Statute and Administrative rule, under which the State Transit Operating Assistance is provided, was amended to include shared-ride taxi service in the definition of public transit systems. This change was implemented in 1979.

- In 1989 changes were again made to the State Statute and Administrative rule to change the definition of 'urban area', which reduced the population threshold to 2,500. This change gave smaller communities access to state assistance.

The scheme has been considered to be successful, given the level of subsidy (67% of cost), and the state legislature has obviously acknowledged the success of the service and continues to support it. The reduction of the population threshold in 1989 made state funding available to more communities that in turn broadened the support base in the state legislature. Several communities generate sufficient passenger revenue to cover all local costs and in some cases actually require less than the maximum state and federal aid possible due to higher revenues. By contracting with private operators the communities have seen lower costs than had they chosen to operate a municipal system with public employees and full benefits. Shared-ride taxi systems all offer reduced fares for elderly and disabled passengers, yet even those riders typically pay more to ride than passengers on public bus systems around the state. The passengers seem willing to pay higher fares because the service is demand responsive and offers curb to curb pick-up and drop-off, unlike bus systems where passengers board and depart at designated stops and at designated times. As mentioned above, 44 shared ride taxi systems exist throughout the state and annually provide in excess of 1.6 million rides.

There have been no substantive changes since 1989 and none are planned at this time. The services and funding levels seem to be operating to everyone's satisfaction. The program started small and grew in line with demand. Changes to state law were also accomplished as demand dictated. This method seems to have worked well and seems to be a good template for others considering implementing a similar programme.

Source(s)

Chatfield D (2003) Wisconsin Shared Taxis, Personal Communication. 1 April.

PP4.4 Gaberlunzie Bus, East Lothian, Scotland, UK

A 'gaberlunzie' was a wanderer of the countryside, popping into isolated farms and communities performing some work in return for food and shelter. East Lothian is a rural area in south east Scotland of some 270 square miles. Most people live in coastal towns and some 200 square miles of the area is deeply rural with only one major settlement, Haddington. The Gaberlunzie bus service was inaugurated in January 1999, and travels the countryside, visiting isolated homes and collecting residents who have booked a journey, taking them to a major town to give about two hours for shopping etc. before returning. The service is designed to complement the existing network of conventional bus service and rail service links in East Lothian.

Public transport in the deep rural areas has been non-effective for a number of years despite efforts to promote rural bus services. Although the rural areas have very high car availability (some 76% of households) many residents are still left isolated in their rural homes, including elderly people, children and families.

The council used Rural Public Transport Grant funding from the Government to invest in appropriate software (ArcView GIS Version 3.0) to develop a route-planning package to determine the best route for the vehicle on any particular day of operation. The rural parts of East Lothian have been split into seven operational areas, each having a fixed identified start point.

Each service consists of one or two journeys per week and employs a single wheelchair accessible Mercedes minibus to operate the services. They have a fixed start and end point, and will generally use a single road between the two points, but the service will deviate from that primary route to pick up and set down passengers at isolated houses and farms etc. within a defined zone. Passengers wishing to use the service are required to telephone (free of charge) a central control point, with details of their journey requirements by 16.00 hours on the day before departure. Passengers wishing to travel on a Monday must book in advance on the Friday. The booking line is open Monday to Friday between 09.00 and 16.00. Passengers are required to give their name and required pick up point. A postcode is sufficient detail for pick-up location. At the end of the day, the start and end points along with all intermediate pick-up requests are entered into the route planning software and the best route is identified. A map of the route along with a detailed written route description are produced and faxed to the service operator by 17.00 the day before that particular route is operated. When there are no intermediate requested stops a basic, traditional service run is made. Fares are fixed at £1 for an adult, £0.70 for a child and the local concessionary scheme is also applicable.

East Lothian Council has awarded the contract to operate the services to First Lowland Ominibuses, a subsidiary company of First Group plc. First Lowland Omnibuses are responsible for managing the day-to-day operations of the new service, and the council ensures contract compliance by the operator. The service has been publicised by a special publicity/timetable leaflet that has been widely circulated across East Lothian. In addition the service is featured through the council's website, advertisements placed in the local press, and through the telephone enquiry 'Travel Line' operated by the council. The council received guaranteed funding from the Scottish Office for the service for a period of three years. There is no evidence to suggest the service has abstracted patronage from existing taxi operators.

Source(s)

Gaberlunzie (2000) VIRGIL: 'Verifying and strengthening rural access to transport services'. Rural Transport in Europe: Good Practice Guide. Visit http://www.bealtaine.ie/virgil Last accessed 02/04/03

Kerr D (1999) The Gaberlunzie Bus, East Lothian. Scotland's Public Transport Laboratory. East Lothian Council. Visit http://www.atco.org.uk/news/news992/kerr.htm Last accessed 07/04/03.

PP4.5 TaxiTub, Douai, North Eastern France, France

A public transport service in the north east of France in the Nord-Pas-de-Calais region utilising fixed routes, stops and timetables which is operated by regular taxis, started in 1992. This is an on-demand service, so vehicles only operate if a booking has been made. The scheme is run by the local public transport authority. This is a former mining area of 180,000 inhabitants centred around the local town of Douai (45,000 inhabitants). The majority of the population is concentrated along an east–west corridor covering both the city of Douai and the former mineworkers 'cites' of 2,000–3,000 inhabitants each. The rest of the area is rural, comprising small settlements. The motivation was to increase the level of service at a reasonable cost. Before TaxiTub, the area was only served by regular bus services, mostly operating only two or three times a day. Some villages now served by TaxiTub had no public transport at all.

There are twelve services (described as 'virtual lines', since, although scheduled, they only operate when required). Most customers travel to and from Douai, the main local town, which is the transport hub for train and regular bus services. The services mostly link remote settlements with bus stops used by conventional services, so customers usually have to transfer between TaxiTub and a regular bus services. TaxiTub users get guaranteed bus connections to Douai. Services are hourly or half-hourly, 6 days a week, from approximately 06.30 to 19.30. Users must book by telephone, at least 2 hours in advance, and must have paid an annual registration fee of £3.10. No vehicles are permanently allocated to the scheme. All the vehicles used are regular taxis that are booked only when required for a specific journey. The taxi operator closest to the origin of the booked journey is always approached first. Bookings are handled

automatically by voice-recognition software, so that the authority needs only to employ the equivalent of 0.25 full-time staff in order to run the scheme.

The transport authority (financed itself by the municipalities) pays the regular taxi fare to the driver, minus a small commission. The passenger pays a standard public transport fare. When the taxi driver is not operating under the TaxiTub banner, there is no payment. The fares are the same as regular public transport. Since the service operates to fixed routes, no routing software is needed. All ticketing is manual, although fully integrated with all other types of bus ticketing. Taxi operators participating in the scheme require the usual taxi permit. They then sign a contract with the local public transport authority committing them to the conditions of the scheme, although they remain free to refuse any individual request for their services. There is no competitive bidding involved in the transport delivery side of the scheme. Optitod provided the reservations and management software or the management of the operation.

The cost of the scheme to the authority has been slight, requiring an initial investment of £468,500 and an annual staff cost of £34,450. Costs per passenger of £5.80 are significantly less than they would be for conventional buses operating the same route. Most of the 12 lines were served as a regular service two to three times per day. The number of TaxiTub passengers was estimated at 10,700 people per year in 2000, involving 12 taxis, and an average seat occupancy of 20%. Bookings can be made at any time by telephone and the Internet.

The service has improved mobility for all users, with the exception of those with severe mobility difficulties, as none of the vehicles is wheelchair accessible. It is also useful for providing home-to-school transport for schoolchildren.

Source(s)

Taxitub (2000a) VIRGIL: ‘Verifying and strengthening rural access to transport services’. Rural Transport in Europe: Good Practice Guide. Visit http://www.bealtaine.ie/virgil/. Last accessed April, 2003.

Taxitub (2000b) l'adaptation de l'offre à la demande. Visit http://perso.wanadoo.fr/urba2000/rapport/tpt_3.html Last accessed 29/04/03

PP2.8 TaxiBus Ludinghausen, Nordrhein Westfalen, Germany

This is an on-demand service using taxis, visiting fixed stops to a fixed timetable. Only those stops for which reservations have been made are visited. The TaxiBus covers the district of Coesfeld, north of Dortmund in the federal state of Nordrhein Westfalen in the mid-west of Germany. The scheme started in 1996, replacing existing public transport services in the area. The main objective of TaxiBus is to provide a substantial transport service in low-density areas not served by public transport, at relatively low costs. The local authority in Coesfeld is responsible for the scheme, which is run from the public transport centre of the local authority. The service is operated over five different routes by five local taxi companies.

There are five separate routes, all with fixed stops, and an hourly service operating between 06.00 and 19.00 on weekdays, 06.00 and 14.00 on Saturday, but no Sunday service. Users book the service by telephoning the public transport centre. At present the reservation system is entirely manual. There are plans to automate this process using a computer system. Receptionists take down journey details and fax them to the appropriate taxi company. Taxi companies then decide which vehicle to use. Vehicles have between four and eight seats and differ from company to company. The vehicles are not adapted to be accessible to people with mobility difficulties. Disabled users overcome this problem by hiring the same vehicle, which is then charged at full taxi rates to take them between the bus stop and their home. Customers pay normal public transport fares to the taxi driver. Ticket revenues go to the local government which pays the normal taximeter tariff, discounted for volume purchase to the taxi companies, less a £0.90 commission for each booking. Drivers are provided by the taxi companies, but the equivalent of an additional four full-time booking staff are required to administer the system. TaxiBuses are now scheduled to connect with commuter trains and other regional buses. The service uses regular taxi licences because the capacity is limited to eight passengers. The local government is responsible for the

competitive tendering process. Contracts are valid indefinitely, but may be terminated at 3 months' notice.

School pupils are the largest user group (43%) and commuters are also significant users of the service since connections with other services have improved. On weekdays, about 80% of the potential scheduled services run, on Saturdays it is around 40%. The average number of passengers per taxi journey is a little over three. Before the introduction of TaxiBus the combined cost of the pre-existing services and school services was £551,200 per year. The combined cost of TaxiBus and supplementary school services is now £372,000 per year.

Before the new TaxiBus service was introduced, the regular bus service was used by 35,340 people in 1996. In 1998, the TaxiBus service carried 81,500 passengers. Numbers continue to rise, but do not abstract passengers from regular taxis. There appear to be two distinct user groups; taxi-users and new Taxibus-users.

Source(s)

TaxiBus, Germany (2000) VIRGIL: 'Verifying and strengthening rural access to transport services'. Rural Transport in Europe: Good Practice Guide. Visit http://www.bealtaine.ie/virgil. Last accessed 28/4/03.

PP4.6 Community Shuttle, Vancouver, British Columbia, Canada

Community Shuttle minibuses are intended to provide more cost effective and flexible transit services in suburban areas. Every area that TransLink serves has specific transit needs and the service has been adapted to fit with the local travel needs for each of these communities. Small neighbourhood friendly vehicles provide an efficient, inexpensive alternative to a conventional bus service. Community Shuttles seat eight passengers and can accommodate up to two wheelchairs. In the evening hours, after 18.30, Community Shuttles provide a flexible drop-off. If requested, the Shuttle will deviate from its regular route to let passengers out closer to their destination. This service is provided at the discretion of the operator and would typically be two or three blocks within the regular shuttle route. Evening pick-ups are at the designated stops only.

Source(s)

Translink (2003) Greater Vancouver Transportation Authority Community Shuttle, Vancouver. Visit http://www.translink.bc.ca/ Last accessed 03/04/03.

CD1 Commercially Driven: Interchange DRT

CD1.1 Taxi-Bus, Chiltern Railways, Bicester, Oxfordshire, UK

The service was initially an experiment in improving access to Chiltern railways services through a dedicated feeder bus to the London service. It was partly driven by the problems of restricted parking facilities at the Bicester North station, coupled with growing demand for rail travel from an expanding local population. Off-peak passengers were experiencing difficulties with parking, leading to lost revenue. Conventional bus services did not integrate with the rail network timetable for various reasons. The rail operator provided a cheaper alternative to parking, particularly aimed at local housing estates. The Taxi-Bus service features eight routes, with one vehicle on each, serving four urban housing estates and four surrounding villages. It is a regular timetabled service at peak times, then reverts to demand responsive mode at off-peak times. It runs from Monday to Friday, 06.30 to 20.00. It is semi-flexible, running on set routes with 'hail-and-ride' stops. The urban routes are operated by a franchise with leased vehicles in the Chiltern livery. Chiltern also takes the revenue risk. The rural routes are operated in a partnership with Oxfordshire County Council with funding from the Rural Bus Challenge. The vehicles are purchased by the council, which also subsidises the service.

The fleet comprises high quality Ford minibuses. There are 6 seven-seater and 3 eight-seaters, with space for wheelchairs. Tickets are sold on vehicles, and season tickets are sold at the station. It is envisaged that

in the future tickets will be sold at non-Chiltern stations. Through tickets to the Taxi-Bus are already available, with fares designed to undercut the cost of car parking. The operation is effected with GPS for vehicle tracking, and the Taxi-Buses wait for late running trains. Even the station is designed to favour the service, with the forecourt modified for the operation, such that the Taxi-Buses leave ahead of other traffic.

The main barriers are those of licensing. A restricted operators licence was required, while Public Service Vehicle (PSV) licences for the vehicles were seen as costly and restrictive, particularly for demand responsive services. An alternative route is to apply for Hackney Carriage licences, which require less specialist knowledge and the operator is eligible for fuel duty rebates, although VAT is due on fares. This option requires the co-operation of the local authority and the supply of 'plates' (licences) is tightly controlled. Two contracts for the service were awarded to council approved operators.

The urban service was introduced in April 2002, the rural service in June. The urban service carries nearly 1,100 passengers per week (35% in the peak), and the rural one just over 160 (50% in the peak); this translates as a growth of 250% in 18 months in the urban service. The main problem occurred when changes to the timetable were introduced. The service has increased the number of non-rail users by 9%, estimated that some 60% were previously car drivers, and freed up over 30 car parking spaces. The direct operating loss is compensated by the increased revenue from the associated rail travel.

The service has had no effect of abstracting passengers from potentially competing buses, as they serve different markets. The service has contributed to the growth of conventional taxi passengers. The company is committed to running the project for two years and will refine the urban routes based on experience. Particularly successful has been a partnership with Bicester Village, a local retail shopping outlet, which has helped grow the off-peak usage on the urban routes. The rural routes will be dependent on external funding. Both could act as prototypes for feeder services for other parts of the Chiltern rail network, such as dedicated bus links between rail and airport. Multi-modal interchanges are also being planned.

Source(s)

Dare A (2002) 'To the Train and home again', Paper presented to the *Regional Railways Conference*, Landor Conferences, 22 November, London.

Kelly P (2003) Interview, Union Cars, Bicester, Oxfordshire, 15 July.

Yeatman S (2003) Bicester Taxibus, Paper presented at *Preparing for the Revolution in Demand Responsive Transport Conference*, Landor Conferences, 5 December, London.

CD1.2 Treintaxi, the Netherlands

Treintaxi is a nation-wide system for shared taxis for transport to and from rail stations, where both rail and non-rail customers are allowed to use it. It operates from around 100 train stations in the Netherlands and is accessible by around 60% of the Dutch population. Areas excluded are the three main cities and the north of the country (where there are no trains). The system was implemented in 1990. Around 80% of journeys are from the station (as opposed to delivering people to stations). The fare is fixed. Dutch State Railways subsidises the scheme by paying the shortfall between revenue and costs. A company called Transvision manages the operations, but has no taxis of its own, but it has contracts with local taxi firms. Treintaxi is a uniform product with the same recognizable vehicles (Mercedes) nation-wide. Taxis can be requested by pressing a button at the rail station taxi stand (if one is not waiting). The first passenger may have to wait for up to 12 minutes for other customers before departure. The Treintaxi can transport up to four people at most. The ideal route is the responsibility of the taxi driver, and does not reply on computer programs. For travel to the station, a Treintaxi can be requested by phone.

The Treintaxi is relatively cost-effective, because high trip combinations are possible (average 2.2 people per trip). Total costs of the Treintaxi system are £5.83m per year. About 65 % of total costs, some £3.8m, is recovered through ticket revenues. The remaining 35% (£2.08m) is replenished by the State Railways (NS). Currently, Transvision is looking for other sources to replenish the deficit. Attempts to raise contributions from the regional governments have failed, but some municipalities have already

contributed to the system. Recent market research by the EU-sponsored VIRGIL Project revealed that 16% of the Treintaxi customers are new train passengers for NS. Moreover, these are mostly long distance, first class travellers, travelling outside peak hours.

Finally, some municipalities are actively involved in the system, resulting in less dependency on NS. However, the Treintaxi is expensive when compared with regular public transport, so the service is limited during daytime, when regular public transport services are frequent. Also, there are many taxi companies to deal with.

Source(s)

Transport RTD Projects (2001) CORDIS: Transport RTD Programme, Urban Research, VIRGIL. Treintaxi, Netherlands. Visit http://www.cordis.lu/transport/src/48351.htm Last accessed 14/4/03.

Treintaxi (undated) VIRGIL: 'Verifying and strengthening rural access to transport services'. Rural Transport in Europe: Good Practice Guide. Visit http://www.bealtaine.ie/virgil. Last accessed March 2003.

CD1.3 Plus Bus, Truro, Cornwall, UK

The Truro Plus Bus is a shared taxi feeder serving the Cornish capital's railway station and surrounding area. Based on the Dutch Treintaxi concept, the service is underwritten by rail operator First Great Western and is a key part of the company's push towards transport 'integration'.

Truro Plus Bus was launched in April 2002. It was initiated by a visiting Managing Director who decided that First Great Western should try out the idea in practice. As a result, a local manager developed the scheme, the idea of which is that the passenger hires the seat and not the vehicle (as they would with a taxi).

The Plus Bus is available from the first train in the morning until the last one at night – 05.00 to midnight throughout the week and is provided by a single six-seater Ford Galaxy operated by First Great Western. This is leased under a four-year deal and is branded as being a First Great Western vehicle. When the vehicle is off the road a local taxi operator takes the jobs.

Every week the three staff that operate the service cost £900, while the van costs £600 a month to lease (on a four-year contract). Then there is petrol, insurance, office and licensing costs on top of that – the vehicle is registered as a Hackney Carriage in all the districts within the zone. VAT is also payable on a six-seater vehicle. Fares are zoned, ranging from £2.20 to £13, with the largest extending as far as Falmouth and Newquay. Altogether, it costs £1200 a week to run the service.

Unfortunately, fare revenue only covers 25% of that outlay, and usage is higher now than previously. From December 2001 until June 2002 there were roughly only 15 users a week, while the peak number was around 70. Around 245 passengers a week are needed for the service to break even. One other point is that the Plus Bus is used almost exclusively by regular users (50–80% are probably in this category). These passengers use the service every day or every other day and see it as their personal chauffeur service. It is relatively rare to see new customers. On the positive side, the service is liked by regular users – typically commuters and business users. It is personal, reliable and bespoke. Drivers are known by their names. Ironically a more successful service would probably not be so personal or reliable.

The low ridership is due to a number of factors. Most crucial are those to do with the design of the scheme. For example, the market research was based directly on Dutch data that was not tested using UK subjects and in UK conditions. Worse, the local manager failed to highlight that the Dutch system required subsidies from the train operator. This meant that:

1. Less people were attracted to the service because in the UK there is a cultural barrier against sharing taxis because of the proximity of strangers in small vehicles, and because of the idea of deviating slightly to drop off other people;

2. The cost to First Great Western was far more than expected due to the failure to realise that subsidy was needed and because the fares (modelled on the Dutch scheme where public transport fares are far lower) were too low to recoup a higher share of the costs.

In addition, the zones in which the service operates are far too large – trips can be taken to Newquay and Falmouth. This means that the vehicle is often still on a trip when trains arrive at Truro (possibly with people who have reserved a journey). It also means that potential deviations can be significant.

One other lesson has been that, with hindsight, Truro was not the best place to implement the scheme and was chosen mainly due to it being the path of least resistance, i.e. the council was supportive (at least in words if not in deeds or investment). Other sites looked at included Pewsey in Wiltshire – rejected due to the presence of the Wigglybus – and Newton Abbot in Devon, which while serving more passengers had stronger taxi and rail competition and a hesitant council.

There have been operational problems too. One is that rival train operator Virgin has refused to publicise the service on its trains, while even First Great Western train staff often fail to announce the Plus Bus before the Truro stop. On the other hand, the system is at least well publicised in on-board train literature, at stations, and by hotels, shops, etc., around the area served. Another problem has been that opposition from local taxi operators – they have been known to have kicked and spat at the vehicle – has meant that the vehicle is usually parked at its depot rather than on the station forecourt as originally envisaged.

Overall, it is assumed that the service will never make a profit, although there may be scope for subsidy to fall from the current 75% to a more palatable 30%.

In terms of future development, there are a few options under consideration. One alternative idea is to brand three taxis among the Hackney Carriage fleet in First Great Western corporate livery and draw on them as required. This approach was put forward for the initial scheme but rejected, as the responsible Managing Director wanted a First Great Western vehicle driven by First Great Western-trained drivers. The other alternatives involve shifting the scheme. Castle Cary maybe an option as it has good bus services, no competition from taxis and an appalling rail service. The taxi vehicle here could also be used as a rail replacement service when required. And, if the ‘integration’ angle is abandoned, then Swansea might be a possibility. This is because the service westward to Carmarthen is unreliable and the company spends a fortune on taxis transferring passengers and train drivers too. It has even been known for drivers to be transported by limousine when there were no taxis available.

Acting as a brake on these ideas, there are the following reasons. In particular, the project has featured in many award ceremonies and in the bid to the Strategic Rail Authority for the proposed merger with Thames Trains and has earned First Great Western a good reputation in the ‘integration’ area. Pulling the service would also mean ‘egg on the face’ of the MD that suggested the idea in the first place too. More practically, the service is advertised in the rail timetables as operating at least until May 2004, and so it would in any case be impossible for the service to be withdrawn before then. In short, the prestige of the company is seen to be at stake.

STOP PRESS: The Truro Plus Bus is to stop operations with effect of the summer rail timetable changes in May 2004 due to purely financial reasons – the scheme was losing around £40,000 a year (Crossfield, 2004).

Source(s)

Crossfield R (2003) Interview, Regional Customer Service Manager South and Wales, First Bristol, Bristol, 4 September.

Crossfield R (2004) Personal communication, Regional Customer Service Manager South and Wales, First Bristol, Bristol, 27 January.

CD1.4 Shared Taxi Scheme, Paddington, London, UK

Prior to the advent of Heathrow Express (HEX), Paddington used to work well for taxis. There was a large waiting area for 50 cabs and separate drop-off and pick up points. After HEX, there was a single

smaller pickup and drop-off area. This led to awful cab congestion with many complaints that there was hardly any point in the HEX if you had to queue for an hour at Paddington for a cab. The taxi-sharing scheme emerged from this problem.

The taxi-sharing scheme uses a ticketing system. Tickets are sold at £4.50 per person plus a group cab fare. The cost of the ticket plus the group fare comes out less than an individual cab fare, so the passenger gains. For the cab driver, they get a higher fare for taking a group. Marshals, paid by Licensed Taxi Drivers Association (LTDA), make up the groups. The ticket income pays for the marshals. It should be noted that this arrangement is technically illegal, but works as passengers co-operate and no taxi operator has objected. The Public Carriage Office seems to view this as a working solution where the legislation needs to catch up.

The shared taxis only operate in the periods of most demand, generally between 08.30 and 10.30 in the morning, Monday to Thursdays. The marshals have a very simple way of deciding if it is needed, in that the queue of people for single taxis stretches beyond a certain point. Typically, two marshals walk down the line of people waiting for taxis asking them for their destination, and if they are bound for an area within the zone of operation, alone, and want to participate in the scheme, they are given a coloured ticket corresponding to the zone to which they are bound. The passengers are then directed towards a different pick-up point on an island, fed by a separate line of taxis whose drivers wish to have sharers in their cabs.

The scheme is very popular amongst the taxi drivers, as they know they will be taking at least four people. The shared taxi scheme is also popular with those who use it, with regulars knowing which zone taxi queue to get in. Other users benefit from the convenience of a taxi, at a known price lower than that of the sole-use of a taxi.

Transport for London estimates that the average number in a shared taxi is 4.75 passengers per taxi. A similar system was tried at Kings Cross and Marylebone, but there was not sufficient demand at these stations to groups of people.

Sources:

Galvin M (2003) Interview, Managing Director of Computer Cab plc, Harrow, Middlesex, 17 November.

Marriott P N (2003) Demand Responsive Public Transport Services, MSc Dissertation in Transport Planning and Engineering, School of Civil Engineering and the Environment, University of Southampton, September.

CD2 Commercially Driven: Network DRT

CD2.1 Public Light Bus, Hong Kong, China

Public Light Buses (PLBs) are minibuses with not more than 16 seats. Their number is fixed at a maximum of 4,350 vehicles. Some PLBs are used on scheduled services (minibuses with green roofs) and others on non-scheduled services (minibuses with red roofs). PLBs account for 15% of all public transport journeys in Hong Kong (contrast with taxis at 12% of all journeys).

Red minibuses are free to operate anywhere, except where special prohibitions apply, without control over routes or fares. There were 1835 red minibuses by October 2002. Augmenting franchised buses and PLB fleets are about 9,800 buses, minibuses and coaches used mainly on contract for carrying tourists, factory workers, school children and commuters.

Green minibuses operate on fixed routes at fixed fares and according to timetables. By October 2002, there were 71 green minibus routes on Hong Kong Island, 76 in Kowloon and 193 in the New Territories, employing a total of 2,515 vehicles.

Red minibuses carry about 510,000 passengers a day, while green minibuses carry about 1,150,000 passengers daily.

Source(s)

Annual Transport Digest, Hong Kong (2000) Public Light Buses, Hong Kong Government. Visit http://www.info.gov.hk/td/eng/publication/annual/annual.html Last accessed 30/05/03.

Hong Kong Transport Department (undated) Public Light Buses, Green routes. Visit http://www.info.gov.hk/td/eng/transport/public_tran_index.html Last accessed 30/05/03.

Little S (2003) Hong Kong Transport: Public light buses. Visit http://www.geocities.com/tatra_transport/hongkong.html Last accessed 30/05/03.

CD2.2 Yellow Taxibus, Dunfermline, Fife, Scotland, UK

The Yellow Taxibus scheme between Dunfermline and Edinburgh was launched on 18 August 2003, and was claimed to be the first truly commercial DRT scheme in the UK. The market niche is seen as a number of new housing estates of three and four bedroom detached houses to the east of Dunfermline to where people who cannot afford to live in Edinburgh have migrated. These estates are seen as being bus unfriendly and currently have no real bus service.

Thirteen high-quality eight-seater Mercedes Vito vans (£17,000 each) are used to operate the Yellow Taxibus scheme, which offers a 10-minute frequency during the peak, and 20-minute off-peak. In-vehicle journey time is roughly 40 minutes from these estates to two drop off points in the city of Edinburgh (outside Waverley Station and on Princes Street). To meet licensing requirements the service needs to keep to the timetable on the fixed route between Edinburgh and central Dunfermline, but if no bookings are taken the flexible element (around the estates) need not be run.

While on the fixed route section the service acts as a normal bus, and on the flexi-route portion of the service it does not run unless there are telephone reservations. But, if the service is running, then it is be possible for passengers to hail it en-route. Travel from Edinburgh is on a turn-up-and-go basis. Eventually Internet booking is envisaged. Stagecoach is also looking at the idea of multiple tickets and advanced bookings. At the moment, users can book up to one minute before (realistically 30 minutes before). For evening trips, passengers need to book by 20.00. Services operate 06.00 to 23.00 with late trips at weekends. Multiple-advance bookings can be made.

Fares are £4 single or £8 return to Edinburgh; this compares with a taxi fare of £20 and is slightly more expensive than a bus (Stagecoach Express bus fares are £3.50 per person), and have been set in line with toll and parking costs and taxi fares, not just conventional bus fares. This is possible because the existence of the Forth Road Bridge as the sole congested road corridor into Edinburgh is significant. The 80p bridge toll creates a cost advantage with respect to private car use. The bridge operator is assisting with marketing (which is consistent with the public sector bridge owner's intention to reduce car commuting into Edinburgh). Passengers can also use the service for local trips within Dunfermline for £2 – a slight premium over the bus.

Three people work in the call centre. They are employed to develop a marketing strategy when not taking bookings.

Currently there is the very successful Ferrytoll park-and-ride – 2,000 spaces and 90% occupancy – where drivers leave their cars on the north of the River Forth and then they are bused in to Edinburgh on bus lanes. One purpose of the scheme is to develop this facility and so the Yellow Taxibus drops into park-and-ride. Users can book a pick up from there. This service will be more expensive than the bus currently serving the site, but it may be that some people are prepared to pay a premium to ride in an executive van.

Ultimately Stagecoach would like to franchise out the service to owner-operator drivers. This is for a number of reasons. First, the concept is very differently positioned to the rest of the company. Second, Stagecoach does not enjoy a wonderful image in Fife, in particular among council members. Third and most crucially, franchising would significantly reduce costs – maintenance, trade unions, administration, would be farmed out. Drivers could be employed on flexible contracts, do split shifts and so on. To be sustainable the wages will be low (around £5 an hour) and the terms and conditions need to be 'competitive'. As a result, 'no hassle' drivers are being sought (e.g. 18-year olds, females), prepared to

work for £5 per hour. This type of driver is also seen as being more suitable for the intimate surroundings of the eight-seater vehicle. This choice of vehicle size is important too – eight seat vehicles do not need PSV licensed drivers – an ordinary driving licence is sufficient – and this helps Stagecoach avoid unionised labour. Interestingly, the flexibility offered to potential drivers has meant that there has been a good response. Stagecoach is also keen to encourage more women to drive.

Franchising is a little while away. Initially Stagecoach is expecting to take a financial hit and a company obviously cannot sell a franchise to drivers if there is no guarantee it will work. Indeed, Stagecoach managers are still not convinced that the service will make money but they are now more optimistic than previously. The prudent assumption is that the service will lose money in its first two years. This is due to there being 13 new small vehicles with consequent high depreciation (and no discount for a bulk buy as with larger buses). Further, the vans needed to be re-engineered to meet the service requirements and so will probably have to be written off after five years, plus there is need for a control centre (although this will double up as a marketing operation). All this equals high set up costs, despite the service being implemented as cheaply as possible. Accordingly, it is estimated that an average load factor of four to five people per trip will be needed for the service to break even.

The original very low-tech commercial DRT service concept behind the Yellow Taxibus aims to minimise the capital requirement and hence reduce the commercial risk. A second justification is to simplify operation, thereby maximising likelihood of success in a market niche that Stagecoach is newly entering.

The livery is the reverse of the blue and yellow Magic Bus (a low cost Stagecoach bus service brand that runs on key routes in large cities such as the Wilmslow Road corridor in Manchester), and as with the Magic Bus there will be no obvious Stagecoach branding. In short, Stagecoach 'parentage' is acknowledged, but not publicised. Stagecoach should have a good impression of the commercial viability and hence the future of the scheme by Christmas 2003.

Supporting institutions include Edinburgh City Council, whilst the bus trade unions have not objected, perceiving a new social service at no cost in terms of existing jobs. Fife Council is somewhat ambivalent, having preferred a DRT feeder to Dunfermline station. Scotrail has resisted the taxibuses entering Waverley station. The view of the taxi community has been mixed with some upset about the new threat, and others seeing it as an opportunity to grow their own market.

If the service does work, one option may be to sell the concept to other local authorities in the future. Other possible scenarios could see Stagecoach developing Yellow Taxibus to serve the airport, business parks and business-to-business services as well.

Initial indications are that the service is doing well. In the first 3 months the service is described as being 'half way to commercial viability', with passengers numbering around 1800 a week and revenue raised at about £6,500 a week (compared with a rough operational cost of about £10,000 a week). Night-time services have been particularly well used from the start, although shopping and commuting trips are now also increasing.

Source(s)

Bunting P (2003) Interview, Director of Business Development, Stagecoach plc, London, 6 August.

Andrews R (2003) Yellow Taxibus, Paper presented at *Preparing for the Revolution in Demand Responsive Transport Conference*, Landor Conferences, 5 December, London.

CD2.3 Belfast Black Taxibus, Northern Ireland, UK (current)

The so-called Black Cabs of Belfast and Londonderry in Northern Ireland are shared taxi services that operate commercially in parallel with the local bus network, although they originally emerged to provide public transport when buses were withdrawn during the Troubles of the late 1960s and the 1970s (see Belfast Black Taxibus (1969) in the section *Commercially Driven: Substitute DRT*).

Currently the service operates what is effectively a stage carriage service on specific routes, usually from 05.00 to 01.00 on weekdays on a fill-up-and-go basis. In general they observe restrictions on maximum load (six excluding the driver). However, they remain unlicensed for stage carriage operation. The taxis may only pick up passengers from taxi ranks or in the streets within 5 miles of Belfast city centre, although they can carry fares to destinations outside beyond. They are hailed by flagging down the driver at any point on the route. The taxis display the route on the car windows. Outside Belfast, public hire vehicles are usually saloon cars that can only ply their trade within the licensing district's area. Private hire vehicles can only operate as pre-booked or from the premises. In principle they need a license to operate but in practice this has not really been necessary, although a legal challenge may lead to changes in regulations. Altogether, it is estimated that the West Belfast Taxi Association operates 200–300 taxibuses, the North Belfast Mutual Association around 90 vehicles and the Londonderry operation about 60 taxibuses. It is estimated that there are roughly 18 taxibus ranks (six each for WBTA and NBMA in central Belfast and six in Londonderry city centre). The taxibuses serve rather poor areas and seem to abstract trips from the bus. The bus does not really have a good reputation in Northern Ireland. Most of the trips seemed to be shopping trips. One barrier to transferability could be that in Belfast the cabs are allegedly monitored by paramilitaries, so that there are very few problems with passengers 'misbehaving'. Also, the tight nature of the communities that are served makes the mode more effective than it probably would be in a less 'cohesive' area.

Source(s)

Dumigan J, Cousins R and Campbell C (2003) Personal Communication. Belfast Black Taxis. Driving Vehicle Licensing Northern Ireland, Belfast. 14 January.

West Belfast Tourism (undated) Transport: Black Taxis. Visit http://www.westbelfast-failte.com. Last accessed April 2003.

CD2.4 Jitneys: New York, Miami and Atlantic City, USA

Jitneys are private vehicles running along a semi-fixed route but with no fixed schedule and have a history of success in southern California and other cities in the USA. They first appeared in Los Angeles in 1915, as soon as cars became widely available. Under pressure from the streetcar companies, regulators imposed restrictions that stamped out the jitneys. Years later, as the weight of the restrictions diminished, jitney services cropped up again in such places as Marina Del Rey and Long Beach. As public transit became more heavily subsidised, however, it lowered its fares, and private jitneys could no longer compete. Yet today jitneys are able to compete with subsidised public transit in cities like New York and Miami, where they are mostly illegal, and San Diego, where they are legal.

The regulations that restrict the private provision of shuttles and jitneys are largely motivated by public transit's dislike of competition. Just as the LA streetcar companies clamoured for protection from the jitneys in 1915, most modern transit agencies oppose the introduction of private transit service. California PUC regulations require an applicant for a jitney license to show a 'public need' for the service. Of course, wherever there is public transit, there is no 'need' for a private service, and the application is denied.

In New York and Miami, the transit agencies are in a constant uproar over illegal jitneys 'stealing' their customers, yet many jitney riders would not otherwise ride city buses. A study in Miami found that only 25% of jitney passengers were would-be public transit riders. Riders prefer the jitneys to public buses for a variety of reasons. The jitney trip is quicker, there is always a seat, and the driver will not let disorderly or threatening passengers on the vehicle. Also, many minority riders enjoy a jitney whose driver speaks their native tongue.

Experiments in Miami have shown that jitneys do not succeed if they are not allowed to operate along the busiest and densest routes. Jitneys should not, however, be permitted to stop at regular bus stops, a practice which creates conflict in New York. Rather, the jitney stops should be interspersed with the transit bus stops. As jitney services evolve and mature, the need for transit buses on some routes may be reduced or eliminated. This could allow the agency to make necessary cuts, or to focus its resources on areas dependent on scheduled transit services.

The Atlantic City Jitney Association (ACJA) was started in 1915. It quickly became very successful and today ranks as the longest running non-subsidized transit company in America. The first Jitney Buses arrived in 1947 and were large, black touring cars that used a rope and pulley system to open the back doors. Today's version is a 13-seater minibus in uniform colours of white and blue. The Atlantic City Jitneys fleet of 190 vehicles are individually owned and operated. Buying into the ACJA costs £109,000 that includes the price of a bus and a share of the franchise. They run 24 hours a day, 365 days a year and pass a Jitney stop an average of once every 4 minutes 45 seconds. Jitney stops are located on the corner of every route and originate one block from the Boardwalk on Pacific Avenue. The cost of a trip is £0.90 each way, with discounts for regular travellers and the elderly. The new fleet is being funded by a £60m federal grant and a £1.44m loan from the Casino Reinvestment Development Authority. The Atlantic City Jitneys are the only non-subsidized, profit-making mass transportation system in the USA, and it carried 6.8 million people in 1996.The Jitneys are powered by alternative fuels, such as propane and reformulated gasoline, and some radio dispatched vehicles will be equipped with wheelchair lifts.

Source(s)

Atlantic City Jitney Association (undated) The Atlantic City Jitney Association: since 1915, an Atlantic City tradition. Visit http://www.visitac.com/jitney/ Last accessed 22/4/03.

Litman T (2003) Shuttle services: small buses, jitneys and free transit zones, TDM Encyclopedia, Victoria Transport Policy Institute, Victoria BC, Canada. Updated 31 January. Visit www.vtpi.org. Last accessed March 2003.

Moore J T (1996) Lets Give Jitney Customers a Ticket to Ride. Orange County Register, 31 January. Visit http://www.taxi-l.org/jitneyed.htm Last accessed March 2003.

Gambling on Retail in Atlantic City (undated) Transportation Improvements. Visit http://www.specialtyretail.net/issues/january99/acretail.htm Last accessed 22/4/03.

CD2.5 'Kombi'/'combi' shared taxis, South Africa

In the 1950s, unmetered taxi services operating in large sedan cars began to provide public transport services in townships. In 1977 the regulations relating to taxi services were relaxed, permitting a maximum of eight passengers. This legalised operations with the eight-seater kombi or minibus available at the time, and initiated a rapid growth of the minibus-taxi sector, initially with 8 and later with 16-seater vehicles. Such vehicles, intended by the manufacturers for family use rather than public transport, were ill-suited to heavy loads and continual usage. Attempts by the authorities to regulate and limit entry of new operators were overruled by the government in order not to stifle the growth of the entrepreneurial informal sector. This resulted in a huge growth of the sector, to the present stage of over-saturation. This rapid growth is partially due to the relative ease of obtaining permits and partially to the large portion of pirate operators (without permits). During the past two decades the minibus-taxi has captured more than 60% of the commuter market share – a remarkable feat, particularly as the minibus-taxi industry receives no direct subsidy.

Routes are served by 12–20-seater minibuses, and provide up to 50% of many urban transport markets, and are competing with buses and trains on major routes. The absence of regulations also promoted chaotic service and schedules, the absence of safety standards or accountability, unregulated fares and the operation of hundreds of vans in major corridors served more effectively by buses and trains. There are also problems of violence between rival companies or associations vying to control routes. National, provincial, and metropolitan government initiatives to bring stability and regulation have fallen short. Some measure of peace seemed to have been established in early 1996, but violence in several cities flared again later in the year. Official efforts have generally not sought to situate the kombis within an overall passenger transport plan based on expanded public transport, and have failed to address fundamental problems of regulation and over-supply. The unabated conflict has fed growing public support for revival of traditional public transit.

Source(s)

Institute of Transportation Studies (2000) University of California, Davis. Publications. Visit http://www.its.ucdavis.edu/publications/2000/RR-00-12.pdf. Last accessed 07/07/03.

Orcutt, J. (1997) Transportation Struggles in the Post-Apartheid City. Visit http://www.plannersnetwork.org/htm/pub/archives/125/safrica.htm Last accessed 30/05/03.

CD2.6 Jeepneys, Manila, Philippines

Jeepneys are a type of vehicle with a capacity up to 15 seats that is used as a shared taxi throughout the Philippines. They have the appearance of a jeep at the front end. Although they are now mass-produced, the design originates from the jeep left behind by the Americans after the Second World War, and are usually brightly decorated. In Manila, they account for at least half of public transport journeys. Most jeepney routes are prescribed, starting from recognised depots. They are demand responsive in the sense that there are not necessarily fixed departure times, and they can be hailed en route. Fares start at £0.01 for the first 3 miles, then £0.0018 for every extra mile. Prices work out similar to the buses. Jeepneys in Manila are either owner-operated, or an individual may own several vehicles and employ drivers on an informal basis. Many are arranged into officially recognised cooperatives. They are licensed or 'franchised' (as Public Utility Vehicles/Public Utility Jeepney) and regulated by the Land Transportation Office (LTO) of the Philippines. Strong national unions promote the interests of the drivers.

In Manila 45% of trips are carried by the 'down-market' jeepneys. Another 12% are now carried by the 'up-market' Tamaraw FX minivans, Toyota's entry into the Asian utility vehicle market. These air-conditioned, 12-seater minivans follow the same routes as ordinary jeepneys and are proving to be a more comfortable alternative. 'Take the FX' has become part of the commuter lingo of Metro Manila in recent years).

Based on the Metro Manila Urban Transportation Integration Study (MMUTIS), the jeepney accounted for 39.1% or 6.9m of the 17.75m person trips (a trip made by an individual regardless of purpose and transport mode) made in Metro Manila (metropolitan region of the capital of the Philippines) per day in 1996. At this time, the number of jeeps operating in Metro Manila and outlying areas was placed at around 69,700. According to LTO, only 28,000 were officially licensed.

Source(s)

Pattison T (1999) *Janes Urban Transport Systems*, Janes Information Group, Coulsdon, Surrey.

CD2.7 Matatu shared minibus, Nairobi, Kenya

Minibuses also known as 'matatus' are the most popular mode of transport within the city, as well as to the outskirts of Nairobi and up-country routes. Unlike the train services, the matatu industry is privately owned and run by individuals. With the dawn of liberalisation of the transport industry in Kenya, many individuals ventured into public transportation which is currently a thriving business. A matatu is assigned to almost every route within the city and these could be the normal Nissan 18- or 25-seater minibus, which has a designed in built sound system to entertain the passengers. Fares are slightly lower than bus fares. In law they are regarded as private vehicles and therefore avoid public transport rules. Attempts at regulation in the 1960s and 70s failed. Up to 3,000 vehicles operate. In addition to people, matatus transport goods, and are owned and licensed as private vehicles.

Source(s)

Kapila *et al.* (1982) The Matatu Mode of Public Transport in Metropolitan Nairobi. Available from http://www.mazinst.org/matatu.html (Not online)

CD2.8 Marshrutka shared minibus, Moscow, Russia

Marshrutka is a minibus that runs on around 50 fixed routes and can be hailed like a taxi. They usually have the same numbers as the buses or trolleys and go the same route. They drop passengers off at any

point on a fixed-route that has no fixed stops. The drivers are employed by the same department as that managing conventional taxis. It largely duplicates other public transport modes. A fleet of over 500 minibuses carries some 50 million passengers per year.

Source(s)

Pattison T (1999) *Janes Urban Transport Systems*, Janes Information Group, Coulsdon, Surrey.

CD2.9 Dolmus, Turkey

The dolmus (pronounced 'dolmush') is a form of hail-and-ride minibus that operates in urban areas across Turkey. Vehicles typically operate on an owner-driver model and are licensed to run on specific routes by the local authority. Dolmus services generally wait at a central point in the town until they are full before setting off, most often on a radial route. In Izmir several hundred minibuses and Dolmus shared taxis operate, carrying an estimated 150m passengers each year. Numbers have officially been limited for ten years with any increases subject to city approval after consultation with ESHOT (Elekrik Su Havagazi Otobus Troleybus), the public utility operator. Minibus and Dolmus stops are differentiated from bus stops where the private vehicles are not allowed to pick up passengers.

Source(s)

Pattison T (1999) *Janes Urban Transport Systems*, Janes Information Group, Coulsdon, Surrey.

CD2.10 Sherut, Israel

A 'sherut' (Hebrew for service) is a multi-passenger taxi-van that normally carries 6–12 passengers in and around cities in Israel. The sherut driver often finds busy bus routes not sufficiently serviced by a bus and follows the bus route. (The route is identified by the number displayed in the bus window.) The sherut service is usually cheaper than taxis by about 10%, faster than buses since they carries fewer passengers and hence stop less often, and the driver is more accommodating. Pick-up or drop-off is almost anywhere, not just at bus stops, and it is around £0.14 more expensive than a regular bus. The sherut service runs both intra-city and inter-city, but only on busy routes and with a full complement of passengers, and they are often the only form of transport on a Saturday.

Source(s)

Frommers.com (2003) Frommer's Israel, 3rd. Edition. Destinations: Israel: Planning a Trip: Getting Around: By Sherut. Visit http://www.frommers.com/destinations/israel/0227033011.html Last accessed 30/05/03.

CD2.11 See-lor / Song taew, Bangkok, Thailand

The *song taew* can often be found near universities, markets and other such places. They are converted pick-up trucks with twin rows of seats (or three rows if very busy) in the back and they ply the main routes, looking for passengers day and night, with no fixed stopping points. They are 'hail-and-ride'. Travellers have to accommodate the destinations of other passengers. Passengers press a button on the ceiling when they want to get off. Passengers may also sit next to the driver, in the cab. During rush hours, song taew are overcrowded, with passengers standing outside the vehicle, holding onto the bars in order not to fall. These vehicles are the main form of transportation in the cities and countryside. *See-lor* means four wheels, whilst *song taew* means two rows of seats.

Source(s)

Public Transport in Thailand (Part 1). (2003) Thailand. General Means of Public Transport. Visit http://www.hasekamp.net/transport.htm Last accessed 22/4/03.

CD2.12 Mikrolet / angkot, Jakarta, Indonesia

Mikrolet and *angkot* (these vehicles also go by other names) are smaller vans/minibuses that serve set routes on smaller main roads. They seat 9–12 people, depending on the type. The beginning and end points of the routes are visible on the front and back of each bus, along with a route number.

Source(s)

North Sulawesi Transportation (2002) Local Transportation: Mikrolet Visit http://www.north-sulawesi.org/transportation.html Last accessed 02/6/03.

CD2.13 Shared taxis, Dubai, Oman and Saudi Arabia

Ordinary taxis allow passengers to hire a taxi and split the cost – and an 'engaged' (not shared) taxi does not charge extra for extra passengers. In both Dubai and Saudi Arabia shared taxis existed for inter-urban transport, but were not allowed in cities. They occupy the same space as taxi stands at a terminal, the driver says where he is going, and waits until he has a full car – or at least enough to justify the trip. In Dubai, local taxis (engaged or shared) are allowed to operate to other emirates, but have to return empty. Some of these 'shared taxis' are in fact minibuses. In Dubai and in Oman, these shared taxis are about the only form of inter-urban public transport, although in Saudi Arabia there are also long distance buses.

Source(s)

Howes A (2002) Personal communication, Special Transport Advisor, Dubai Municipality Public Transport Department. 11 December.

CD2.14 St Budeaux Taxibus, Plymouth, Devon, UK

The St Budeaux Taxibus is a single blue hackney cab that serves the Kit Hill area of Plymouth at half hourly intervals between 09.00 and midday, Monday to Friday. The route serves two health centres, a library and Victoria railway station, and the vehicle can be hailed at bus stops or anywhere along the route that it is safe to stop. Passengers pay a flat fare of 50p (20p for children or 25p for concessions) and the service will divert up to 100 yards from the normal route by prior request at no extra charge.

The service provides public transport links into areas otherwise completely inaccessible to public transport, and has operated under Section 12 of the 1985 Act in Plymouth since it came into effect in 1986. While this was operated on a commercial basis until 1995, a decline in the Royal Navy's residential requirements saw the transfer of the route into the City Council's subsidised portfolio. However, the service has always been in the council's concessionary fares scheme, and roughly half of the 150 or so weekly passengers take advantage of this. The local taxi trade has not expressed interest in operating a similar service elsewhere in the city.

Sources:

Plymouth City Council (2001) Local Transport Plan 2001–2006, Plymouth City Council, Plymouth.

City of Plymouth (2003) The St Budeaux Taxibus, Leaflet, Plymouth.

Crocker D (2003) Personal communication, Plymouth City Council, 28 November.

CD2.15 Green Line 797, Stevenage and Hatfield, Hertfordshire, UK

The Green Line 797 service provides a coach link between the towns of Stevenage and Hatfield with Central London. It has operated for decades, and now consists of modern coaches providing an hourly service throughout the day from Stevenage town centre, through Hatfield to London Victoria. The service is extended in the morning to pick up people from the residential areas of Stevenage before reaching the bus station and in the evening drops people off close to their homes. For a number of years an unofficial demand responsive service operated from the town to the stop closest to the users' houses, with the driver

asking the customers where they were bound, once the coach was at Stevenage bus station. The driver would then drive around in as efficient a way as possible to drop the people off quickly and with the minimum of coach miles. This process is entirely though the driver's own knowledge of the town. With the release of a new timetable this September the service has officially become demand responsive in the evening over the residential sections in Stevenage.

These example is at the very simplest end of demand responsive services, an area which more and more bus companies are exploring with sections of their timetables. It generally works in a similar manner to the Green Line service example given above, in that the last section of the route for setting passengers down will operate in such a way. As customers and operators get more used to this, the more sophisticated services that involve a technological element are less different to what they have become accustomed to, making take-up rates increase. As the technology becomes cheaper to facilitate DRT its use will become more widespread. The appearance of automatic booking (no call centre staff being required) with the use of the Internet or SMS from mobile phones will also aid the wider acceptance of DRT.

Source:

Marriott P N (2003) Demand Responsive Public Transport Services, MSc Dissertation in Transport Planning and Engineering, School of Civil Engineering and the Environment, University of Southampton, September.

CD2.16 Intercity shared taxi services, Cyprus

Public transport in Cyprus is provided by buses and taxis, there are no rail services. There are buses operating in urban areas as well as connecting almost all towns and villages. They are cheap but infrequent and they serve mainly tourist areas. The only contribution in minimising the use of private vehicles in the island of Cyprus appears to come from taxis.

Taxis run 24 hours a day within and between all the main towns on the island. Fares are regulated by the government and all taxis have meters. In addition to these usual services there are also the intercity taxis. This service offers the opportunity to the client to share a taxi with 4–7 other passengers. It provides connection between all major towns of Cyprus (Nicosia, Limassol, Larnaka, Paphos), every half hour, Monday–Friday 06.00–18.00, Saturday and Sundays 06.00–17.00. Seats can be booked by phone and passengers can be collected from and dropped to any place they wish within the municipal boundaries. Pre-arrangements can also be made for pick-up on consecutive days, and weeks. This is particularly useful for people living and working in different cities. Operators keep a database of their frequent passengers and also, when travelling often, get to know the operator and sometimes the taxi driver personally.

Prices are fixed regardless of the number of passengers, and range up to £3 for a 45-mile trip. Taxis run to a timetable; pick-up and delivery is from door-to-door. Fares under this system are often one-tenth of the usual rate. The Youth Card allows European travellers between the ages of 13 and 26 discounts on taxi fares. Each passenger's fare depends on the distance travelled. An outline of current fares is provided below.

Fares are reasonable and journeys fast. Instead of the usual Mercedes seven-seater cars there is a slightly cheaper option provided by minibuses. Intercity taxis do not operate between: a) the airports and the towns, b) towns and villages.

Cyprus intercity taxi services have recently entered a new chapter in their history, with the merging of all existing companies into a single one, under the name of 'Pagkypria Eteria Yperastikon Taxi Ltd' (Cyprus Interurban Taxi Co. Ltd). All previously independent intercity taxi agencies are now shareholders. 'Travel and Express Ltd' is operating out of one or two offices in each of the island's cities and apart from passenger services also runs a parcel delivery department.

Source(s)

Ieromonachou P (2003) Interurban shared taxis in Cyprus, Open University, Milton Keynes, June.

CD3 Commercially Driven: Destination-Specific DRT.

CD3.1 Vodafone Commuter DRT, Banbury, Oxfordshire, UK

Around 600 people currently work at the Banbury Vodafone call centre – to be increased shortly – which is sited in a fairly rural location and operates 7 days a week. However, at weekends there is no bus service as the area cannot support it. Instead, at the beginning of 2002 Vodafone set up its own on-demand DRT service using smaller vehicles. This is well supported thanks to the added flexibility when compared with a big bus – for example, on the home leg the staff can be dropped off on their doorstep.

Call centre staff obviously need to get to work on time. Users are given a time window for when they are to be collected. Staff can order the service by phone or via the Internet, and can block book services in advance.

The service is free to the user and costs Vodafone £560 a week to operate. The service is managed by a project management team – Logical Transport – which sorts out the contracts, software, maintenance, etc., while a taxi company called Airport Connections runs the single 12-seater bus.

As the service is not a public service, and anyway runs only on demand, there is no need to register it with the Traffic Commissioners. The lowest usage in a weekend was 38 and the highest 71. There is a maximum of five services each way on Saturday and Sunday. Generally fewer people tend to take the bus from work than to work, largely because people are offered lifts and so on.

While Vodafone has tried to persuade neighbouring companies to join the scheme there has been little interest as they do not seem to have the same transport problems. Interestingly, parking is not really an issue at weekends. More important is that the company wants to support those without a car and get them to work.

Elsewhere, Vodafone is looking to use DRT to act as a feeder from its major sites in the Newbury area to the rail station in the town every 30 minutes or so. This is because commuters and visitors arriving at the station are currently not that well served by the existing network of fixed route buses due to the problems in co-ordinating the complex rail and bus timetables.

Source(s)

Hopkins C (2003) Interview, Vodafone, Newbury, 8 August.

Willson A and Hopkins C (2002) DRT as Good Business Sense? Results from Vodafone's pilot study of Demand Responsive Transport. The Landor Demand Responsive Transport Conference, London. 19 June.

CD3.2 SuperShuttle, Los Angeles Airport and San Francisco Bay Area, USA

In 1980, California Public Utilities Commission (PUC) relaxed its standards for newcomers to have to prove the need for new airport vans. The PUCs laissez-faire attitude ignited a boom in the airport ground transportation business. The number of airport shuttle companies in the Los Angeles and San Francisco area has grown from zero in 1976, to 26 in 1987 and over 60 in 1994. The airport shuttle has carved a niche between the price of a taxi and the cost of a scheduled bus. Pioneering California's airport shuttle industry was a single carrier, SuperShuttle International. SuperShuttle initially entered the Los Angeles and Bay Area markets in the early 1980s with some 100 vans and more than doubled its fleet size by 1989. As required by both the Los Angeles International and San Francisco International airports SuperShuttle served all out-bound flight trips through telephone reservation; inbound trips may be prescheduled or operated on demand. Today, SuperShuttle remains the dominant airport shuttle operator in both areas. Deregulation has increased competition in the area but the shuttle industry was carrying over 8 million passengers per year to/from these two airports. Initially no one travelled to the airport in a van, but now almost 10% do. It is thought that vehicle emissions have been reduced by 65 tonnes annually due to the use of airport shuttles. Average ridership stands at 3.5 per vehicle trip. Complaints in airport shuttle service have necessitated the need for the airport to write strict operating rules in and around the terminals.

Source(s)

Cervero, R. (1997) Paratransit in America; Praeger: Westport, Connecticut Pgs 194–195

CD3.3 Airport Shuttles: Auckland, Wellington and Christchurch, New Zealand

Shuttle buses offer economical transportation between Auckland airport and city or suburbs on a 'shared ride' basis, as the conventional taxi fare is around £14.28. There is no further information about the operation of this service.

In Wellington, a taxi company (A and C Shuttles) also offers a door-to-door shuttle service – one passenger pays £3.57–14.28 according to distance, each extra passenger pays between £0.71–1.79. The company claims to offer the best airport shared ride shuttle service, clearly aimed at travellers, rather than airport workers. It operates a fleet of ten-seater minibuses, as well as conventional taxis 24 hours, 7 days a week, and provides links to and from hotels, rail and ferry transfers. Other airports offer similar services, including Christchurch, where the price varies with the number of passengers.

Source(s)

Auckland International Airport (2002) Taxis and Shuttles servicing Auckland International Airport. Visit http://www.auckland-airport.co.nz/taxi.html Last accessed 17/04/03.

Airport and City Shuttles & Taxis (undated) Wellington Airport. Visit http://www.taxicab.co.nz/html/shuttle.htm Last accessed 17/04/03.

CD3.4 Yellow Line Airport Taxi, Helsinki, Finland

Yellow Line taxis have been operating a shared taxi to and from Vantaa Airport since 1992. Journeys may be booked in advance, although this is mainly to guarantee a seat for passengers leaving on a morning flight who need to telephone a reservation the previous evening. The service comprises a fleet of 16 eight-seater minibuses. The price varies from £22.00 for a single passenger, and drops to £8.25 per passenger for a full van (eight passengers). It aims to pitch the price between that of conventional taxis and regular bus services.

Source(s)

Helsinki Airport Taxi (undated) Airport Taxi Yellow Line. Visit http://www.airporttaxi.fi. Last accessed 17/04/03.

CD3.5 MaxiCab Airport Shuttle, Singapore

The Maxicab offers a scheduled service with flexible routing to almost all hotels within Singapore (excluding hotels on Sentosa and Le Meridien Changi). Alighting points are flexible and any destination within the Central Business District is catered for, including Mass Rapid Transit (MRT) rail stations. The six-seater MaxiCab is accessible to wheelchair users and features luggage room. The service operates from 06.00 to midnight at frequencies of 30 minutes during off-peak hours, which are 07.00 to 18.00, and 15 minutes during peak hours (18.00 to 23.00). The fares are £2.40 for adults and £1.72 for children. Bookings are made at the airport shuttle counters and payment made to the MaxiCab driver. Return trips to the airport can also be made with the shuttle service on the day of departure. There are four designated pick-up points, at the Concorde Hotel, Mandarin Hotel, Excelsior Hotel and Marina Mandarin. The return trips from these hotels operate daily from 08.00 to 22.00.

Source(s)

Singapore.Sawadee.com. (undated) Singapore Transport: Airport Shuttle. Visit http://singapore.sawadee.com/transport/ Last accessed 17/0403.

CD3.6 Other Airport Shuttles, USA

The Bay Porter Express service is a shared ride, door-to-door shuttle, dedicated to taking people to and from the international airports of San Francisco and Oakland. It has been in operation since 1987, and runs from 03.30 to midnight. Advanced bookings are required and can be made by phone or via the Internet. The fare structure is based on one person travelling one way (for example to Berkeley costs £11.48), with subsequent passengers in the same group paying £6.04 each, or £3.02 for children.

Supershuttle operates in many cities throughout the USA**.** In 1983, the firm was among the first to deliver shared ride door-to-door transport with the opening of its Los Angeles, California operation. Each day the shuttle provides door-to-door service for over 20,000 passengers, or almost seven million per year. It currently services 23 airports with a fleet of approximately 1000 minivans, which have around 12 seats. Booking is made by telephone or via the Internet.

Source(s)

Supershuttle International Inc. (1998) Supershuttle Transportation Systems. Visit http://www.supershuttle.com/ Last accessed 17/0403.

Bay Porter Express (undated). Bay Porter Express, Airport Shuttle Service. Visit http://www.bayporter.com/index.htm Last accessed 24/4/03.

CD3.7 San Francisco Airport Shuttle, California, USA

The Caltrain-SFO Shuttle travels between the Millbrae Caltrain station and San Francisco International Airport locations from Monday to Friday only, including holidays until approximately 22.00. Passengers pay a fare on the train but ride free on the Caltrain-SFO Shuttle. Caltrain offers monthly and 10-ride tickets. Caltrain also offers a ticket-by-mail programme. The shuttle is operated by San Francisco International Airport, and funded by the San Francisco Airport Commission and San Mateo County.

Source(s)

Caltrain Shuttles. San Francisco International Airport (2002) San Francisco Int'l Airport Shuttle. Visit http://www.transitinfo.org/ Last accessed 17/04/03.

CD4 Commercially Driven: Substitute DRT

CD4.1 Black Taxibus, Belfast, Northern Ireland, UK (1969)

(See also Black Taxibus, Belfast, Northern Ireland, UK (current) in the section *Commercially Driven: Network DRT*.)

Before the Taxibus (Black Cab), normal bus services were in place across Northern Ireland. But, with the Troubles from 1969, buses became the ideal barricade and many were burnt in the streets as a result (mainly in Belfast and Londonderry). As a result, the bus operator refused to send buses into those areas (Falls Road, the staunch nationalist area of West Belfast and later the protestant-dominated Shankhill Road area in North Belfast). This niche was then exploited by the taxi operators, who formed the West Belfast Taxi Association and the North Belfast Mutual Association, and began to offer what is effectively a bus service to their communities, whereby passengers got into these 'taxibuses' in their communities, paid a fare about the same as the bus fare and shared with several other people for a journey into the city. On the way home, residents boarded a Taxibus at an unofficial taxi rank, paid their 'bus fare', and waited for the Taxibus to fill up, whence it would set off.

The Black Taxibuses are all Austin black taxis purchased second-hand in Great Britain, and first appeared in the Falls Road area of West Belfast during 1971, a period of severe civil disorder when city bus services were forced to withdraw for as long as 10 days at a time. In subsequent years the Black Taxibuses in this area were grouped to form the West Belfast Taxi Association currently operating about

250 vehicles. Similar outbreaks of disorder in North Belfast in 1974 saw the introduction of Black Taxibuses in the Shankhill Road and Shore Road areas. These are now grouped as the North Belfast Mutual Association with some 90 vehicles in operation. Initially none of the Black Taxibuses conformed with any of the legal requirements for road vehicles. However, over the years their operations have been regularised to the extent that all the vehicles are now taxed and insured and subjected to roadworthiness tests annually. The drivers must hold PSV driving licences.

In general they also observe restrictions on maximum load (six excluding the driver). However, they remain unlicensed for stage carriage operation. In 1981 Black Taxibuses appeared in Londonderry city operated by the Derry Taxi Association, which was started as a community job creation scheme. Some 40 vehicles are currently operating from the city centre to outlying estates in direct competition with Ulsterbus services. However, the Black Taxibuses in Londonderry have not been able to achieve the same impact or growth as those in Belfast. The legislation tightly controls the use of vehicles as taxis, although the black taxis have gained an exemption. The Northern Ireland Government changed the legislation, and in 1996 it approached the WBTA and asked it to consider registering its vehicles not as public hire taxis but as private hire taxis (not a bus as the vehicles used carried too few passengers). This enables the government to maintain the facility to licence them. The incentives for the WBTA were that the taxibus would then be legal, and also might be able to claim fuel duty rebate. Thus WBTA vehicles are now allowed to serve destinations as far as Lisburn (14 miles) along the Falls Road corridor. The NBMA was also approached but refused to comply, because the other side had complied. The NBMA still operates under a public hire licence that strictly speaking makes the service illegal. Interestingly in Londonderry, a sister organisation of the WBTA also operates taxibuses to the nationalist areas of the city, but it has so far chosen to operate its taxibuses as *public* hire vehicles rather than *private* hire vehicles. However, the lure of fuel duty rebate may soon change this position.

Source(s)

Dumigan J, Cousins R and Campbell C (2003) Personal Communication. Belfast Black Taxis. Driving Vehicle Licensing Northern Ireland, Belfast. 14 January.

West Belfast Tourism (undated) Transport: Black Taxis. Visit http://www.westbelfast-failte.com. Last accessed April 2003.

CD4.2 Taxi Collectifs, St Andre, Réunion, Indian Ocean (Department of France)

The Taxi Collectifs (shared taxi) system on the Indian Ocean island of Réunion (a Department of France) was initiated roughly twenty years ago by the taxi operators, who faced a fall in trade due to increased car ownership. As a result, a few taxi owners in St Andre approached the local mayor and requested that they be allowed to operate as a 'bus'. This was granted. While initially these taxis operated alongside buses, they have since replaced them in many cases as car ownership levels continued to grow.

Overall on the island there are roughly 540 taxis, of which 250–300 are registered as Collectifs. The drivers are all members of a syndicate, and this allows good rates for loans, parts and insurance to be negotiated. Licenses are offered for an indefinite period and the routes are operator planned. Many operators now use vans of up to ten seats, which is the maximum allowed under a special licence.

On the St Andre to Champ Borne route there are five taxis that provide a 'turn-up-and-go' service between 08.30 and 17.00. The Collectifs operate a fixed route and pick up and drop off passengers as requested. Users of the service tend to be the poorest members of society, and fares are roughly set at the same level as bus fares.

Some local authorities are more advanced than others, and offer subsidies for the routes operated. Indeed, there is even a shift being made towards per kilometre subsidies – as used for buses. There is also a shift towards scheduling services in some areas. Finally, many of the bus operations on the island have recently been re-organised so that main line 'Car Jaune' [Yellow Coach] buses are now met at several interchange points by integrated feeders known as 'Car Jaune ti' [Petite or Small Yellow Coach] buses.

Source(s)

Murdan S (2003) Taxi Collectifs in Réunion, France, Case study notes based on interviews with owner drivers, St Andre, Réunion, April.

Appendix B – Additional research on DRT systems

Further research on DRT Systems

The purpose of this appendix is to identify a series of other research projects into DRT so as to provide a useful resource for those requiring further information about the setting up and operation of DRT schemes.

SAMPO

SAMPO (System for Advanced Management of Public Transport Operations) is a Europe-wide pilot project administered by the Department for Transport Telematics in consultation with the EU Fourth Framework Programme.

The main goal of SAMPO was to assess the potential and the effectiveness of telematic technologies to provide Demand Responsive Transport services. The aim of the project was to develop public transport services in rural areas, urban areas and regions, and for the use of different passenger categories, such as the elderly, disabled and other special groups as well as general public. An important objective was to reduce operating costs of public transport services.

Test sites were located in five European states. The sites were Seinäjoki and Tuusula-Kerava-Järvenpää region in Finland, Hasselt in Belgium, Kilkenny region in The Republic of Ireland, Florence and Campi in Italy and Gothenburg in Sweden. DRTS are undertaken on a variety of modes i.e. buses, taxis, invataxis (specially equipped for mobility impaired persons), minibuses and feeder services for express coach, tram and rail services.

A comprehensive 'user needs analysis' was carried out in early 1996 across the five demonstration sites. The technical solutions were based on generic telematic elements. They include GSM, Mobitex, GPS, GIS, digital maps, in-vehicle display units, and smart cards. The primary technical development centred on the travel dispatch centre software. This required booking and reservation functions, network, route and vehicle databases, optimisers, and integration with the communication and AVL elements. These have been successfully developed and implemented during the project.

Technical performance of the systems was extremely good, with very low failure rates. The systems performed as anticipated. The time taken by users to reserve transport ranged from 30 seconds to 2 minutes, depending on the site. User acceptance of the booking procedure was generally very high, as was user perception of the services, which was supported by the high growth rates in most of the locations in terms of passenger numbers. Good economic data has been obtained, but the project considers that it will require two years' data to fully understand the business case. The market prospects for DRTS are considered to be good.

The telematics systems used in SAMPO have been proved to function successfully in the operational conditions across the demonstration sites. While many of the elements existed beforehand, the travel dispatch centre software was all developed within SAMPO. In Belgium, Finland, Italy and Sweden the number of DRTS services have been increased both at the sites and elsewhere in the country.

Source:

ANIMATE (2003) Systems for Advanced Management of Public Transport Operations. Visit: http://www.cordis.lu/telematics/tap_transport/research/projects/sampo.html last visited 14/08/03

SAMPLUS

The overall aim of SAMPLUS (Systems for Advanced Management of public transport systems PLUS) was to demonstrate and evaluate Demand Responsive Transport (DRT) services using telematics technologies. SAMPLUS involved undertaking major demonstrations of telematics-based DRT services at five sites in four different EU member states (Belgium, Finland, Italy and Sweden). The five demonstration sites covered a variety of socio-economic characteristics, four of them continuing from the SAMPO project that immediately preceded SAMPLUS. In addition, feasibility studies were conducted in two UK, one Irish and one Finnish site.

The main findings of SAMPLUS are categorised into four areas – demonstration systems, evaluation results, assessment of market potential and guidelines.

Five main demonstration sites were in operation at the end of SAMPLUS. These are continuing in full operation and are seen as best practice examples of how telematics based DRT can be achieved.

The evaluation activities in SAMPLUS focused on indicators in the areas of economic viability, service provision and technical performance. In all of these areas the SAMPLUS demonstrators showed good results. The wider market for telematics-based DRT services has been explored. Detailed guidelines were developed during SAMPLUS to provide suggestions for those who wish to plan, develop and implement DRT service concepts in the future. These are widely available to interested organisations through the SAMPLUS Website.

The demonstrated benefits of telematics-based DRT to the public transport operator or municipal authority include reduction of operating costs in comparison with alternative means of meeting transport needs. The main benefits to the community concern improved accessibility. Telematics-based DRT can be used to serve a wider geographic area than a conventional public transport service that only operates on a specific route. It can also offer possibilities to travel at times of day that would not be available with a conventional service. The quality of service is also seen to be higher.

The conclusion is that the SAMPLUS project has advanced the state-of-the-art telematics-based demand-responsive transport services. In particular, it has provided a large-scale extended evaluation of telematics-based DRT approaches, which were shown to have significant advantages in terms of transport service provision over more established techniques.

Consideration of whether telematics-based DRT systems and services are economically worthwhile requires individual judgement to be made over every scheme, to evaluate the cost versus social benefit relationship. At all SAMPLUS demonstration sites, the local judgement was that the investment has been ‘amply justified’ and the DRT systems and services will not only continue to operate but in some cases will be further expanded and developed. In determining applicability to different national markets, the key factors concern the regulatory framework in operation and the economic situation.

Source:

Ayland, N. (2002) Samplus project, http://www.europrojects.ie/samplusmainweb/, last accessed 16/07/03

Demonstration and Feasibility Sites in SAMPLUS

Limburg, Belgium

The common denominator for most of the study area of Limburg, West- and East- Flanders is the rural characteristic of the areas, making them so-called ‘difficult public transport areas’. The former regular lines proved to be inefficient with very poor cost-benefit ratios. De Lijn (the Flemish public transport provider) chose to restructure these environments so that the primary or lowest level in the public transport hierarchy is to be performed by DRT services, freeing up resources to spend on the more efficient rapid trunk-lines. In this context, DRT services act as partial feeder services to these trunk-lines.

In SAMPLUS, the local objectives are to extend the demonstrator to an even wider scale from eight vehicles in six areas during SAMPO, aiming at a full evaluation of twenty DRT services in seventeen areas for SAMPLUS. Since the end of 1997, the number of flexible services has grown to sixteen in the province of Limburg, most of which will participate in this demonstration phase. Furthermore, the province of West-Flanders, which has had DRT services running for over five years now, will be participating in the SAMPLUS evaluation with four services. Most services now have an average ridership of 30 to 40 passengers a day.

All services are operated by De Lijn, via the three organisational entities for the provinces of Limburg, East- and West-Flanders. Consequently, three Travel Dispatch Centres have been locally equipped with the required telematics applications.

Tuusula/Järvenpää/Kerava, Finland

Public transport in the test area is run by eight privately owned bus companies, the state railway and about 100 taxis, including taxis and minibuses equipped for mobility impaired people. The county and municipalities buy some services. There is no central organisation.

The Finnish test site consists of one telematics site with TDC application, which will manage DRT in the TSL area (made up of the Municipality of Tuusula and the towns of Kerava and Järvenpää) which was part of the SAMPO project. Surveys of users will determine the principal user groups. However, certain end users can be pre-defined: patients at three health centres in the TSL area, about 550 users of Social Centres, and school children, particularly disabled ones.

In the TSL area prior to SAMPO there were conventional bus services on two trunk bus routes in addition to the national trunk railway and taxi/invataxi services. However, there was a low service level in rural areas and special transport service costs were increasing rapidly. Institutional and organisational barriers prevented effective DRT. After the SAMPO demonstration one bus line was replaced by a DRT service on Saturdays, and the service area was enlarged to the whole of the Municipality of Tuusula. Institutional and organisational barriers were examined and, if possible, removed so that taxis became part of the DRT service. Problems lay in transfers of passengers to operators not in SAMPO, hardware in taxis and incompatible ticketing systems. DRT services will be extended during SAMPLUS by replacing more bus lines and buying in more minibuses to supplement the taxis.

Florence, Italy

The SAMPLUS demonstrator supports the DRT service at three main sites in the Florence metropolitan area. Services are operated by ATAF, the public transport operator in the Florence metropolitan area. The disabled service, which carries 70–90 passengers daily, covers the entire Florence urban network. This service does not cater for elderly, mobile people. Prior to SAMPO there was a manual DRT service which was unable to manage complex assignment and route planning issues without increasing service costs; the limited system was unable to increase the number of users. Following SAMPO the automated DRT service offered greater route flexibility and improved booking procedures.

The Campi Bisenzio site is a peripheral rural area located in the western part of Florence metropolitan area. It is characterised by a low public transport demand with a significant number of mobility origins and destinations (shops, factories, shopping centre, schools, public offices, banks etc.). Prior to SAMPO a low-frequency conventional bus service was operated, leading to high unit costs and poor user uptake. Uptake was also limited by the dispersed nature of potential users and competition from other services (bus and rail). The introduction of a DRT service in SAMPO offered similar advantages and outcomes as the disabled service.

During SAMPLUS the disabled service and Campi Bisenzio routes were extended, together with the introduction of services in Porta Romana. It is a part of the urban area where the potential users are residents; it also has a low public transport demand.

Gothenburg, Sweden

Gothenburg is the second largest city in Sweden, situated on the west coast, between Oslo and Copenhagen. It is an industrial city with the largest port in Scandinavia. The site is in the city district of Högsbo. It has about 16,000 inhabitants, mostly in high-rise buildings, and the highest proportion of elderly in Gothenburg (33% are 65 or older). Due to economic problems the Traffic and Travel Authority has sought more efficient solutions than the Special Transport Services (STS) to meet special needs by using intermediate forms between public transport and STS. SAMPLUS continues to monitor new operating strategies with telematics applications and flexible service routes (FlexRoute).

Stockholm, Sweden

This site is a suburban area in northern Stockholm including Kista (the Silicon Valley of Sweden). It is a DRT 'green field' site where some of the most appropriate existing SAMPO technologies were validated on a new user category, airport access travellers. This group places a high value on time, since they are often business travellers. Many of them are sophisticated telematics users, more able and willing to experiment with new automated booking technologies than the elderly users which are the focus of the Gothenburg site.

SL Flygbussarna AB (SLF) currently operates 50 airport express buses to Arlanda, the Metropolitan Stockholm Airport, in a very efficient manner and has a 38% market share of airport access travel in Stockholm. In order to prepare for competition from the future rapid rail link between the city and Arlanda, SLF is considering the use of DRT as a means of maximising surface coverage, with a fleet of minibuses providing feeder services to the express buses.

Surrey, UK

The county of Surrey lies to the south-west of London and has a population 1.1 million people, making it a fairly densely populated area. Surrey is well served by conventional public transport, having a fairly intensive suburban rail network and private taxi companies operate throughout most of the county. Bus services are well distributed, particularly in the north-east of the county nearer to London. In ten out of the eleven boroughs in the county dial-a-ride services operate for the disabled and elderly, who are the prospective end users of a DRT service. Unlike the SAMPO based sites, these services are not based upon an Intelligent Transport System (ITS), leading to a need for more cost-effective services with improved coverage.

VIRGIL: Verifying and Strengthening Rural Access to Transport Services

Definitions of 'rural areas' vary significantly throughout Europe, and the criteria used for definition ranges from population to geographical position, from land-use to income. The combination of low population density and geographical isolation means that conventional approaches to passenger transport, which are based on significant numbers of passengers travelling together, lose their viability in rural areas. Innovative demand-responsive transport services can stop or reverse the population loss, improve the quality of life and revitalise rural areas.

The project objectives were to compile an inventory and assess experiences on rural access to transport in several European countries; and identify further research needs by consulting widely with key stakeholders and rural citizens. Specific aims of the project were to analyse the application of Information and Communication Technologies (ICTs) in rural transport systems, and to study the potential for integrating passenger and freight transport.

A database containing past and present experiences on rural access to transport has been developed and can be consulted on the project's website. The database includes a total of 134 books and articles and over 100 case studies, providing an extensive overview of rural transport systems in Europe.

Twenty-eight case studies (both passenger and freight transport) were analysed in depth with regard to:

- resource inputs and service delivery outputs;
- legal base and preconditions for operation;
- use of telematics;
- experience with integrated passenger and freight transport.

A good practice guide targeted at rural communities presents twelve different transport schemes providing innovative rural services across Europe. A report on future research needs has been prepared, based on extensive consultation with key stakeholders and validated during an international seminar. The report addresses several topics, including the integration of local services, the licensing environment for demand responsive services, the institutional and legal barriers, and the role of telematics.

Improving rural transport services is part of a development and wealth redistribution policy. On the development side, the policy gives traditionally isolated areas potential mobility not dependent on the private vehicle. With respect to wealth redistribution, the policy favours public transport 'captives' and 'poor' demand segments, such as elderly people and young people. VIRGIL has highlighted problems of rural transport and ideas to improve it, providing a Europe-wide overview. The project's results are of immediate interest both for the local/regional/national authorities promoting rural transport and for the operators providing such services.

The project specifically highlights the possibilities that ICTs offer in improving rural transport. The need for telematics is largely dependent on the need for flexibility of rural transport. The deployment of telematics in rural transport is still relatively new and most countries have little experience. Comprehensive research is needed into the viability and operational characteristics of using ICTs in integrated ticketing (e.g. multi-purpose contactless smart cards), pre-booking, real-time passenger information and route-planning systems. The research should not focus on developing new, high-technology tools, but should concentrate on the adaptation of already existing telematic tools. Experience from the VIRGIL project has shown that, compared to urban transport, simpler and lighter software systems could be in place for the needs of rural transport.

Rural services carrying both goods and passengers can provide environmental benefits due to better capacity utilisation, economical benefits for providers and users, and an image gain for the region by focusing on environmentally sensitive tourism. There is only a limited experience with such services in most European countries, but VIRGIL proposed that such a possibility should be researched. The main issues in preventing the integration of freight and passenger transport are the legislative barriers (e.g. in Italy).

Source:

Verkeer, L. (2000) VIRGIL – Deliverable 5 final report; Visit: http://www.bealtaine.ie/virgil/final_report-final_version_v4.0.doc last accessed 08/08/03

ARTS

The ARTS (Actions on the integration of Rural Transport Services) project started in 2001 and is due to run until the middle of 2004. ARTS is a continuation of the VIRGIL project and is funded within the 5th Framework Programme and focuses on integrated mobility services in low-density rural areas. It is a demonstration project with the main goal to test and demonstrate the effective provision of innovative transport services in the rural environment. It aims to identify barriers that may inhibit the development of such services and will provide possible ways of overcoming them. Ten demonstration sites have been developed in eight EU and one Accession country (Hungary). The project hopes to benefit the European rural transportation development by ensuring the transferability of results through detail evaluation of the case studies. The results are yet to be published and will be available from summer 2004.

The project will evolve through three specific phases:

Phase I. Identification of barriers to overcome (WP3): This stage is directed towards the identification of barriers for the individual countries at national, regional and local level.

Phase II. Demonstration development (WP4): This stage will focus exclusively on the preparation and development of the demonstrations. The large body and variety of experiences in rural transport across the EU justify the inclusion of a comprehensive number of eight demonstrations. The demonstrations will include all the areas of interest referred to in the task description. The proposed demonstrations are supported by a strong commitment from authorities, transport operators and other agencies, forming operational local boards. At the same time, the demonstrations have been selected based on their feasibility. The demonstrations will be conducted in accordance with guidance produced in WP2, in order to ensure that the process may be replicated in future and that transferable elements of the demonstrations may be identified.

Phase III. Evaluation and transferability (WP5, WP6,): During this phase, the results of the demonstrations will be evaluated from the perspective of the effectiveness in obtaining the desired project objectives. During the entire demonstration process, evaluation will be conducted to identify the expected, estimated and actual impact of the measures (to be) implemented. The demonstration and evaluation partners will monitor the impact through the lifecycle of the demonstrations to check which of these are (most likely to be) met and which are most readily transferable. Cross-site analysis will be a critical activity in order to compare results and to test its transferability to other experiences.

The Consortium will dedicate a great deal of effort to achieving results, which are transferable to the Consortium member countries, as well as to countries across Eastern Europe and beyond.

Transferability analysis will be undertaken in WP6, not only at a National-regional level but also paying attention to the potential transferability of findings into specific experiences.

Source:

European Transport Telematics (2002) Actions on the integration of Rural Transport Services; Visit:

http://www.rural-transport.net/demo.phtml?site=demo&theme=theme_1_9 Last accessed 08/08/03

SCRIPT – System for Community and Rural Integrated Public access Telematics

The SCRIPT project was generated by a group of eight European regions brought together in December 1994 with the common objective of utilising telematic processes to meet the needs of the rural communities they represented. The SCRIPT consortium, led by West Sussex County Council and including Devon County Council (UK), County Limerick (Ireland), West Sweden (Sweden), Umbria (Italy), Peloponnese (Greece), Upper Normandy (France) and Hameenlinna in Finland, put together a plan envisaging the creation of a network of sophisticated computer terminals exploiting to the full the capabilities of information technology designed to be needs-led rather than technology-led.

The SCRIPT regions proposed conceptual designs covering over 70 telematics applications to implement telematics services intended to address the various problem areas and user needs identified.

West Sussex, UK

The overall system is structured to separate the management and provision of information from information delivery. Information from external provider systems will comply with pre-defined formats. The system will be client/ server and PC-based, and will be based on Intel platforms running Windows NT. The system is designed to run within the existing and emerging communications infrastructure available in West Sussex.

Limerick, Ireland

Limerick plans an interactive information access and multimedia communications system providing access to information on local and government services, education and training services, rural business and local community activities. Access to the system will be provided by dialup PCs using Internet access and standard browsers, multimedia terminals and public kiosks.

Devon, UK

Devon plans to build on this infrastructure and to implement an integrated community information vision based around web technology, 2-way Bulletin Board (First Class BBS as used by Sweden), distributed SQL-compliant databases and videoconferencing. All the technology is Internet capable, and direct dialup access is also planned.

Umbria, Italy

Umbria's conceptual design aims particularly at the provision of transportation on demand in areas of low public transport use, with further extension to community information and other telematics services. The user interfaces will be based on either PCs, screen phones and/or telephones. Further developments will include other transactional services related to town hall and health services certificates and information, telematic meter reading and banking Services, etc.

At the local level in every SCRIPT region, user reference groups were established among service providers and end users. Extensive efforts were made during the assessment of SCRIPT user needs to raise the awareness of SCRIPT issues locally. The policy was to canvass widely among all potential interested parties to provide them with the opportunity to participate at some level in the project.

At the national level the project used the media to publicise the initiative. Presentations to national conferences raised awareness and interest among other local authorities in the SCRIPT member states and attracted a number of interested 'follower regions'. Existing national professional networks provided a useful channel of dissemination in this respect. The project also disseminated material to relevant national ministries covering the SCRIPT sectors and discussions were held to ensure that SCRIPT influenced national policy developments.

Source:

Ellison, P. (2002) System for Community and Rural Integrated Public Access Telematics; Visit: http://www.ex.ac.uk/SCRIPT/welcome.html. Last accessed 08/08/03

FAMS – Flexible Agency for collective, demand responsive Mobility Services

FAMS takes forward the lessons learned from the SAMPO and SAMPLUS projects in particular, to demonstrate how a so-called 'flexible agency' might be planned and operated. This is intended to establish a new service chain to allow:

- different transport operators to benefit from a shared IT infrastructure and common services for the management of the intermediate services they are individually offering;
- the FAMS service operator to have a global view of travel needs and service offer, ensuring the best matching of users' demand and available services;
- DRT and intermediate transport users and users' groups to benefit from a unique service centre able to serve their needs in the most integrated and best possible way.

There are two trial sites. Florence in Italy and the Angus region in Scotland. FAMS is partially funded by the European Commission under the Information Society Technologies Programme. The project began in March 2002 and is due to last for 20 months.

Source:

FAMS Consortium (2003) FAMS project web site. Visit http://www.famsweb.com. Last accessed December 2003.

INVETE – Intelligent in-vehicle terminal for multimodal flexible collective transport services

The main aim of the INVETE project was to specify, develop and validate a modular intelligent in-vehicle terminal (IVT), which could be used for different transport services (regular and flexible collective transport) and different transport modes (bus, taxi), and which operates in different environments (GSM, private radio network).

The INVETE Consortium consisted of the Technical Research Centre of Finland (VTT), Instrumentointi (Finland, device manufacturer), Mobisoft (Finland, software developer), Softeco (Italy, software developer), ATAF (Italy, public transport operator), De Lijn (Belgium, transport operator), and MemEx (Italy, consultant), Tritel (Belgium, consultant) and ENEA (Italy, government agency).

The project was funded by the European Commission under the Information Society Technologies Programme. It started in January 2000 and ended at the end of May 2002.

Source:

VTT Technical Research Centre of Finland (2002) INVETE Project Website, VTT Technical Research Centre of Finland. Visit http://www.vtt.fi/aut/kau/projects/invete/. Last accessed December 2003.

Summary

In summary, the majority of the above research projects have proved to be demonstration projects that have aimed to test that the various technology facets (e.g. the routing and scheduling software, communications equipment, vehicles, etc.) actually worked. Only one – the ARTS project – is really seeking to explore the wider barriers to implementing DRT systems and then on a general European rather than a UK scale.

Appendix C – Developing the Comparative Categorisation Grid

The purpose of this paper is to develop still further the idea of policy movers and shapers put forward in an earlier Discussion Paper. This new structure centres on the same ideas of the inception, perpetuation and transfer phases, and of policy movers and shapers. However, the process separates out the actual scheme details and then the scheme performance from these policy movers and shapers to try and clarify the process.

Inception phase

The inception phase covers the process from when the scheme is first proposed until it is implemented.

Policy movers

At the stage a new public transport service is first proposed it is possible to identify what the motivations are behind that decision. These are the policy movers and are outlined below.

SCHEME NAME	*INITIATING BODY*		*DRIVER*		*TARGET MARKET SOUGHT*		
	PRIMARY	SECONDARY	PRIMARY POLICY OBJECTIVE	SECONDARY OBJECTIVES	CORE JOURNEY PURPOSES	CORE USERS	OTHER LIKELY USERS
	Local authority, Government, public transport agency or operator, business		Social inclusion, environmental, economic, cost reduction		Commuting, education, health, social	Unemployed, poor, car users, elderly, mobility impaired	

Policy shapers

The second stage is to determine the conditions under which the proposed service is to operate. These conditions are termed policy shapers and are outlined in the following table.

SCHEME NAME	*POLICY CONTEXT*		*AREA FACTORS*				
	FINANCIAL SITUATION	REGULATORY AND OWNERSHIP STRUCTURE	POPULATION	SOCIO-ECONOMIC DETAILS	DEMOGRAPHIC DETAILS	LAND USE PATTERN	TRIP DESTINATION ATTRACTIVENESS
	Amount of subsidy available – higher or lower than before, source of subsidy,	Deregulated, regulated, franchised, private companies, owner drivers, taxi or bus	Size of population in the area to be served	Distribution and level of Income	Distribution by age, sex,	Population density, road layout, degree of urbanity	Shopping centres, railway station, etc.

Resultant scheme design

As a result of these influences, the proposed service can be designed and implemented. In basic terms this could be described as being:

mover factors + shaper factors = scheme to be implemented

The following table establishes how the scheme actually operates.

SCHEME NAME	TYPE OF SERVICE				LEVEL OF SERVICE		FARE LEVEL AND STRUCTURE
	TYPE AND SIZE OF VEHICLE	DEGREE OF ROUTE FLEXIBILITY	DEGREE OF TIMETABLE FLEXIBILITY	MODE OF BOOKING	FREQUENCY	OPERATING HOURS	
	Bus, minibus, taxi, number of seats	Fully flexible in a zone, route deviation, fixed route	Fully demand responsive, semi-scheduled, scheduled	Turn-up-and-go, hail-and-ride, telephone, web, push button at stop	Number of times per hour, day, week	By time of day, day of week, time of year	Zonal, time-based, distance-based, flat, higher than existing public transport or the same

Resultant scheme performance

The next logical step is to determine how well the scheme performs against various criteria. These are outlined below.

SCHEME NAME	PATRONAGE	FINANCIAL	TRANSPORT	ENVIRONMENT	SOCIAL	BARRIERS ENCOUNTERED	DOES IT MEET OBJECTIVES?
	Number of users	Cost, cost per trip, Revenue cost ratio, subsidy level, subsidy per trip	Modal shift,	Emissions, energy use, greenhouse gases	Use by target groups	Organisational, cultural, educational, financial, legal	Yes, partly, no

Perpetuation phase

The perpetuation phase begins once the scheme is up and running, and refers to the influence of a whole range of factors which may evolve over time that impact on the implemented scheme. It should be noted that for a scheme operating in a continually changing policy and/or physical environment there may be a number of perpetuation phases.

New policy movers

Changes in the policy movers could have a major impact on a newly implemented scheme.

SCHEME NAME	CHANGE IN INITIATING BODY		CHANGE IN DRIVER		CHANGE IN TARGET MARKET SOUGHT		
	PRIMARY	SECONDARY	CHANGE IN PRIMARY POLICY OBJECTIVE	CHANGE IN SECONDARY OBJECTIVES	CHANGE IN CORE JOURNEY PURPOSES	CHANGE IN CORE USERS	CHANGE IN OTHER LIKELY USERS
	Local authority, Government, public transport agency or operator, business		Social inclusion, environmental, economic, cost reduction		Commuting, education, health, social,	Unemployed, poor, car users, elderly, mobility impaired	

New policy shapers

As could policy shapers.

SCHEME NAME	*CHANGES IN POLICY CONTEXT*		*CHANGES IN AREA FACTORS*				
	CHANGES IN FINANCIAL SITUATION	CHANGES IN REGULATORY AND OWNERSHIP STRUCTURE	CHANGES IN POPULATION	CHANGES IN SOCIO-ECONOMIC DETAILS	CHANGES IN DEMOGRAPHIC DETAILS	CHANGES IN LAND USE PATTERN	CHANGES IN TRIP DESTINATION ATTRACTIVENESS
	Amount of subsidy available – higher or lower than before, source of subsidy,	Deregulated, regulated, franchised, private companies, owner drivers, taxi or bus	Size of population in the area to be served	Distribution and level of Income	Distribution by age, sex	Population density, road layout, degree of urbanity	Shopping centres, railway station, etc.

Consequent modifications to scheme design

Changes to either policy movers or shapers may lead to alterations in the scheme design.

SCHEME NAME	*CHANGES IN TYPE OF SERVICE*				*CHANGES IN LEVEL OF SERVICE*		*EVOLUTION OF FARE LEVEL AND STRUCTURE*
	CHANGES IN TYPE AND SIZE OF VEHICLE	CHANGES IN DEGREE OF ROUTE FLEXIBILITY	CHANGES IN DEGREE OF TIMETABLE FLEXIBILITY	CHANGES IN MODE OF BOOKING	CHANGES IN FREQUENCY	CHANGES IN OPERATING HOURS	
	Bus, minibus, taxi, number of seats	Fully flexible in a zone, route deviation, fixed route	Fully demand responsive, semi-scheduled, scheduled	Turn-up-and-go, hail-and-ride, telephone, web, push button at stop	Number of times per hour, day, week	By time of day, day of week, time of year	Zonal, time-based, distance-based, flat, higher than existing public transport or the same

Consequent scheme performance

Modifications to the scheme design may also influence the scheme performance.

SCHEME NAME	*CHANGES IN PATRONAGE*	*CHANGES IN FINANCIAL PERFORMANCE*	*CHANGES IN TRANSPORT PERFORMANCE*	*CHANGES IN ENVIRONMENT PERFORMANCE*	*CHANGES IN SOCIAL PERFORMANCE*	*BARRIERS OVERCOME AND REMAINING*	*DOES IT MEET OBJECTIVES NOW?*
	Number of users	Cost, cost per trip, Revenue cost ratio, subsidy level, subsidy per trip	Modal shift,	Emissions, energy use, greenhouse gases,	Use by target groups	Organisational, cultural, educational, financial, legal	Yes, partly, no

Transfer phase

The final phase is rather different to the preceding two in that the inception and perpetuation phases refer to actual experience of schemes, whereas the transfer phase is designed to be a predictive tool.

As a starting point, it is suggested that the predictive tool developed in Discussion Paper 7 be used.

Appraisal of potential for introduction of DRT service (in UK context)

		PUBLIC-SECTOR				PUBLIC AND/OR PRIVA							
		REGULATORY BARRIERS	FUNDING / SUBSIDY CONSTRAINTS	COMPLIANCE WITH		APPROPRIATENESS OF TYPE FOR TARGET MARKET SOUGHT							
					ENVIRONMENTAL PROTECTION OBJECTIVES	SOCIO-DEMOGRAPHIC VARIABLES	DEPRIVATION INDICATORS	CORE USER JOURNEY PURPOSES					
LEVEL OF EXPERIENCE WITH TYPE OF DRT WORLDWIDE													
TYPE OF DRT	ROUTE												
	TECHNOLOGY												
LAND USE PATTERN IN TARGET MARKET AREA													
LEVEL OF SERVICE	LIKELY TYPICAL FREQUENCY												
	AVAILABILITY OF SPECIFIC VEHICLE TYPES												
	SIZE OF AREA IN NEED OF SERVICE												
FINANCIAL BASIS	POSSIBLE FARE STRUCTURE												
	PROJECTED INITIAL REVENUES												
	PROJECTED REVENUES FROM MATURE SYSTEM												
	AVAILABILITY OF PUMP-PRIMING SUBSIDY												
LEGAL BARRIERS	TRANSPORT SECTOR												
	BEYOND TRANSPORT SECTOR[32]												
CULTURAL BARRIERS													

[32] e.g. insurance barriers, tax barriers

Using the comparative categorisation grid

In using the CCG, it is suggested that the above tables be inserted for each of the eight composite modes. For the final report, each table would use data only from the best six cases per composite mode in the long list report so as not to become unreadable. There is scope for the transfer phase to be conducted in a later discussion paper if it is felt that more work is required on developing it, especially as the current table is designed to analyse a single scheme at a time.

Also important is setting up the database. This should contain information for all the long list cases. In the short term the database will be used to identify where particular case information is missing. In the longer term, the range of experience found in the database should allow policy makers and designers of DRT schemes to find a 'template' that they could learn from so as to maximise their chances of success.

ERROR: rangecheck
OFFENDING COMMAND: .installpagedevice

STACK:

-null-
-dictionary-
-savelevel-