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A survey of Demand Responsive Transport in Great Britain

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ABSTRACT

Ever since the 1970s, Demand Responsive Transport (DRT) has been promoted as a transport solution in circumstances where more traditional services are not economically viable, although so far a range of barriers has prevented its widespread adoption. More recently, new developments in operational and vehicle technology, coupled with significant cuts to public transport subsidy budgets, promote a willingness to explore 'institutionally challenging' options such as integrating transport provision across a range of different sectors. This has once more pushed the DRT concept forward as a possible option for saving money whilst retaining opportunities for accessibility.

Accordingly, it is now useful to explore the current provision of DRT in Great Britain, in order to determine what type of services exist and to examine which are working well and why. Specifically, the paper draws on a national survey of DRT providers to examine the design, performance, rationale and likely futures of DRT schemes.

Key findings suggest a growing role for stakeholders from the voluntary sector and the private sector, the latter resulting in a greater use of smaller vehicles. Linear regression models highlight that passenger numbers are influenced by the size of operation (in terms of seats offered) and by the use of smaller 'car' vehicles, particularly in rural areas. Increasingly, objectives highlight the importance of DRT in providing access and geographical coverage, though insufficient revenue presents a challenge in achieving this. The long term financial sustainability of such schemes continues to be questioned, with a limited number of schemes recognised as commercially sustainable. Naturally, therefore, cost and funding remain dominant concerns of DRT service providers. The organisational response to funding reductions has been diverse. The result is that DRT services have either been withdrawn or, in some cases, replaced conventional bus services due to DRT being a more cost-effective way of meeting local needs.

1. Introduction

For the purpose of this paper, public transport can be categorised as being Demand Responsive Transport (DRT) if

- the service is available to the general public (i.e. it is not restricted to particular groups of user according to age or disability criteria or place of employment);
- the service is provided by low capacity road vehicles such as small buses, vans or taxis;
- the service responds to changes in demand by either altering its route and/or its timetable; and
- the fare is charged on a per passenger and not a per vehicle basis.

While such provision is common in economically less developed countries where institutional and/or land use factors prevent conventional buses from meeting demand (Cervero, 1997), in the UK and Western Europe as a whole such flexible transport options have largely been focused on meeting the needs of mobility impaired passengers.

Interestingly though, ever since the 1970s there have been a number of occasions when DRT has been seen as the solution to a variety of transport problems, particularly in circumstances where more traditional services are not economically viable, although so far a range of technological, social, market, economic and institutional barriers has prevented its widespread adoption (Enoch et al., 2004). Yet this lack of take up may be about to change.

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Specifically, there are three elements that are now coming together in this regard:

1. There have been a number of direct technological improvements to the DRT 'product' in terms of routeing and scheduling software for example, alongside more indirect technological implications arising from the widespread adoption of internet-equipped smart phones mean DRT is now potentially more efficient and effective than ever before.
2. There are wider societal trends including a rapidly ageing population and potentially far higher levels of unemployment, coupled with still rising car use (and its associated impact on increasing levels of car dependence in the form of, for example, lower density development) are combining to ensure that the need for non-private car-based transport is becoming increasingly important, although the ability of trains and buses to meet those needs is actually decreasing.
3. In the UK there are significant cuts to public transport subsidy budgets promoting a willingness to explore 'institutionally challenging' options such as integrating transport provision across a range of different sectors.

The aim of this paper, then, is to examine and assess the design and performance of DRT schemes in Britain and the conditions in which they operate, so as to evaluate which are working well and why. Specifically, it first reviews existing literature, and then explains the method adopted. Next, the current UK context relating to DRT is briefly explained, and the survey results are presented, before possible DRT futures are discussed and conclusions are drawn.

2. Previous work

2.1. Operational context

Considering the operating context, in developing countries DRT options typically serve busy urban corridors, thus attracting sufficient numbers of passengers to create a profitable service by being more attractive to users than public transport options by virtue of their being quicker and more comfortable (Adeniji, 1987; Vuchic, 2005, Cervero and Golub, 2007). Whilst often introduced in an unregulated market, the institutional and regulatory framework can evolve over time to be accepted as part of overall approach to supply, often in a manner designed to improve quality and safety but sometimes in a manner designed to reduce supply in the longer term (Finn, 2012). By contrast in economically more developed countries, DRT for the general population tends to be regulated, and most commonly operates in either suburban or rural areas of low demand thereby requiring subsidy, though there are some notable exceptions in niche markets (see for example Cervero, 1997; Davison et al., 2012).

2.2. DRT scheme design

In looking at the choice of vehicles for DRT, in rapidly developing cities such as Bangkok there are a whole range of types from motorised vans, cars and motorcycles, to man-powered pedicabs (Cervero and Golub, 2007). By contrast in economically more developed countries, the basis of current provision for the general public has mainly developed from transport designed for more specialist markets; particularly Dial-a-Ride provision for mobility impaired individuals (similar provisions are made in the USA in response to the Americans with Disabilities Act) or provision from the community transport sector (Brake et al., 2007). Such services are largely provided through the use of accessible minibuses, though more recently, there is recognition of an increasing diversity (e.g. Mulley et al., 2012). This has been driven in part by changes to regulations, together with evidence that taxis can provide a cost effective alternative to conventional public transport and DRT bus-based options in deep rural areas (CfIT, 2008; LEK Consulting, 2002). Whilst there is a risk that a diverse range of vehicle types held by an individual operator can lead to extra costs (Mulley et al., 2012), Mulley and Nelson (2009) explored how flexible transport systems organised via travel dispatch centres can now use technology to mitigate this, noting that institutional barriers are now the major block on progress in Europe, the USA and Australia. Interestingly, the Ghana Private Road Transport Union, as one of a number of organisations in Africa and Asia which has adopted a cooperative approach to DRT provision may offer a potential solution to this issue. Here, both minibus and shared taxi operations are combined under a single operation and regulatory regime (Finn, 2012).

In terms of service design, DRT is flexible across time and space. In developing countries, the 'jitney' or 'dolmus' concept of (largely) fixed route but non-scheduled DRT is particularly common, whereas in Europe and North America it is usually (though certainly not universally) the case that the timetable is fixed and the route varies (Enoch et al., 2004). TCRP (2004) defines 'flexible transit services' as being anything between an ADA service and a fixed route bus, and notes that route deviation, where vehicles operate along a fixed route but can accept request to deviate to meet demand, is the most common.

The level of technology used in DRT provision can be influenced by the size, scale and the level of flexibility, or in some cases the availability of funding (Enoch et al., 2004). In larger, more complex systems there is significant potential for technology to deliver efficiency in routeing and scheduling. This element of design is one area where there has been a greater proliferation in more developed countries, through projects including but not restricted to SAMPO and SAMPLUS, although a publication by the World Bank (2012) discusses how, for example, GPS tracking is being utilised in Jeepneys in Manilla.

2.3. DRT scheme performance

When introducing DRT, the rationale in developing countries has been essentially commercial, with private operators seeking profit, whilst in more developed countries such opportunities have been restricted to niche markets, e.g. airport shuttles (e.g., Ambrosino et al., 2004) meaning that social objectives have tended to dominate. This is highlighted by Laws et al. (2009), who in a survey of publicly funded DRT schemes in England, found the main motivations for introducing a scheme were either to social inclusion or else related to funding availability.

The rationale for introducing a scheme can in turn influence the performance, which can be considered both in terms of market appeal, and for subsidised schemes, of cost per passenger. The market appeal for public transport more widely, in particular road-based options, is largely identified as being the captive market without access to a car (White, 2009). As a solution to a lack of car access, DRT services can be highly resource intensive by nature, influenced in part by the expectations a 'Dial-a-Ride' type service (Brake et al., 2007). Of the English schemes surveyed by Laws et al. (2009) meanwhile, just over half required a subsidy of over £5 per person per trip with those operating in rural areas requiring higher levels and being less cost-effective than those with suburban or urban elements.

In learning from such experiences, Brake et al. (2007) suggest that for DRT to be commercially viable in the UK and Europe, providers of flexible transport options should pool resources and work in partnership to cater for need. Another solution is to price DRT fares to better reflect the service provided (Enoch et al., 2004). This in turn could attract commercial operators, who are generally absent from the UK market for example.