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Improving bus service provision: a review of current UK planning

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The development of bus services is a key element of local sustainable transport strategies. But in many areas of Britain, bus use continues to decline as car use inexorably rises. Those involved in planning and operating bus services thus face a challenge which so far, with a very few exceptions, they have shied away from accepting. So why is this the case, and what can be done to stimulate a renaissance in the bus sector?

The purpose of this paper is to review the factors that affect bus use, and at how a geo-demographic analysis tool may be used to incorporate these. It also looks at how commercial and social bus services are currently planned and marketed and identifies the inadequacies of these methods. The paper concludes that with the number of skilled bus planners in decline, it is time for the industry to develop more 'scientific' methods of planning bus routes and services.

The results presented are taken from the first stage of an EPSRC Future of Integrated Transport feasibility study, which aimed to develop a geo-demographic analysis-based tool for those involved in planning and operating public transport to help overcome some of the transport problems faced by people living in rural areas.

THE ROLE OF PUBLIC TRANSPORT

The development of public transport services is viewed as a crucial element of policies to address transport's environmental impacts. A review and survey of the primary life cycle fuel consumption of a wide variety of vehicles (reported in Potter, 2000) indicates that public transport in peak hours uses less than 20% of the energy consumed by a single occupancy car (and most car commuting is single occupancy). For every peak hour car trip diverted to public transport, it is estimated that, even allowing for more public transport services needing to be operated, there is a net cut in CO_2 emissions of just over 1 tonne per annum.

It is thus no surprise that the development of an attractive public transport service has featured widely in both national and local sustainable transport strategies. Although the development of new light rail networks has attracted much attention, for most towns and cities bus services remain the mainstay of local public transport. To develop these to address sustainable transport policies requires achieving modal shift from car users. This means planning and marketing systems have to be changed to identify and target suitable non-users of public transport, rather than just enlarging custom by existing users. This crucial point is not often appreciated, with any growth in bus use being considered to contribute to 'sustainability'. Such growth makes no real contribution to a sustainable transport policy, and of itself simply generates further environmental impacts from the bus sector.

Achieving growth by winning trips from more environmentally-damaging modes is the name of the sustainability game, but for buses, current planning and marketing techniques seem only to be addressing the existing customer base. There is good news; the decline in bus use seems to have, at last, been halted and even reversed in some places. The bad news is that this is largely a result of increased patronage from existing user groups. Even planning and marketing to this existing customer base is often rudimentary, and buses continue to have a poor image among car users. The core question this article poses is whether it is possible for bus services be effectively planned and marketed so as to realise the considerable potential to cut transport's environmental impacts.

FACTORS AFFECTING PUBLIC TRANSPORT USE

Taking a step back, it is important to note what the existing literature, and what public transport 'experts' see as being key elements in providing a 'successful' public transport service.

Perhaps the seminal work in deriving the major influences on public transport, is *The Demand for Public Transport*, conducted by the Transport and Road Research Laboratory in 1980. From this report and others (Black, 1995; Hanson, 1995; Simpson, 1994; White, 1995) it was clear these elements can be categorised into three, albeit strongly interdependent, 'types'. These are public transport supply features, area characteristics, and personal factors.

Supply side variables

This category appears to contain the easiest variables to change. Indeed, a major rationale behind the 1985 Transport Act was that bus operators 'freed from the dead hand of the local authority planner' would be able to manipulate these supply-side variables – safety, reliability, door-to-door speed, cheapness, convenience and comfort – to deliver increased passenger levels and lower costs. In the event, this was

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proved to be overly optimistic, and while operation costs were dramatically reduced across the country, passenger levels and services continued to decline much as before. Only in places where special conditions existed, such as Oxford, did on road competition work as envisaged by the proponents of the Act (Enoch, 1998).

Area characteristics

These 'special conditions' included not only oft-recorded factors such as distance from town centre, population density, distribution of homes, workplaces and other facilities, road layout, etc., but 'softer' influences too. Enoch (1998) found that cities exhibiting 'good practice' bus operations invariably had local transport authorities and companies that worked well together, combined with complementary land use, environmental, social, fiscal and transport policies all consistent with helping public transport perform at its best. Rather than removing local authorities from the sphere of bus operations, their involvement is crucial – but as part of a partnership approach.

Person types

Much is also made of the socio-economic characteristics of the population living in an area served by public transport. Certainly it is true that bus use tends to decline as income and car availability rises, while more women than men use buses. People under 17 years old or senior citizens too, are more likely to use the bus. However, it is also true that where bus supply is right, and where area characteristics are supportive to public transport, then a wider range of people will use the service. For example, in Ottawa, Canada during the mid-late 1980s, 70% of white collar Federal employees used buses to commute to and from work. In London too, until relatively recently, pin stripe suited middle class males were often seen catching a bus to get about the capital, a market that Mayor Ken Livingstone has said he hopes to win for buses again.

A new tool for bus planners

When one looks at what information is actually used to plan bus routes, interviews with bus service planners illustrate that it falls far short of the above analysis of key factors affecting bus use. The usual reason cited is that such data is too time consuming and costly to collect. This research sought to show how a geo-demographic tool could help overcome these barriers, and finally allow bus planners to develop a more 'scientific' basis on which to plan services.

Firstly, how could an understanding of such geo-demographic factors help revive and expand bus services in Britain? There are three key roles that geo-demographic data could fulfil. These are planning, monitoring and marketing. The following explores how a geo-demographic tool could address these three roles.

Planning, monitoring and marketing

With appropriate information, a geo-demographic tool could identify an optimum route to provide the highest revenue return or partronage and would permit an exploration of how different route options affect costs and revenues. It could also provide a good way to explore demand for less conventional modes, like demand responsive services, community transport, shared axis and postbuses. A geo-demographic tool also allows an exploration of how the above options serve the type of people who use, or are close to using buses. This will permit marketing to be targeted effectively and monitoring of the effects of service charges.

It is likely that social planners would be most concerned with the monitoring and planning tools, while the commercial planners would use the marketing and planning functions.

Desired Outputs

To meet their increasing obligations, local authorities would require most of the following outputs from any bus service planning or monitoring tool:

Number of bus departures; total bus kilometres; total bus hours; total passenger trips; total passenger kilometres; total passenger hours. Costs would also need to be estimated per bus trip; per bus kilometre; per bus hour; per passenger trip; per passenger hour; and per head of population. In addition, indicators to measure the impact of the route/service on wider transport goals – modal shift, effect on overall car mileage etc. would be desirable, and environmental performance outputs – in terms of carbon dioxide emissions, other air pollutants and energy use.

THE MAJOR CONCERNS OF THE BUS COMPANIES CENTRE ON USAGE, REVENUE AND COST MEASURES.

Required inputs

In terms of inputs, the EPSRC study revealed that socio-economic data obtained from the National Travel Survey was too coarse to be useful, whilst the type of information available limits the usefulness of census data. Therefore information from local surveys and/or data from private data gatherers such as Experian would first need to be obtained. Data fields would then need to be created for bus supply information – data on bus stops, bus routes, timetables, operational costs, vehicle capacities, and possibly limiting factors (how often bus needs to return to the garage to refuel or how often driver shifts change etc). Finally, there would need to be data relating to demand patterns. This would need to be able to cope with different time periods – time of day, day of week, time of year, school or non-school days, college or non-college days.

Current practice in planning bus routes

The research sought to identify the extent to which such data are used in practice to plan bus services, either formally as a 'tool' or in a less formal way. It was found that the way in which bus services are planned in Britain is strongly conditioned by the culture and structure of our bus industry.

Outside London, the key legislation governing the bus industry in Britain is the 1985 Transport Act. This privatised the bus industry, and passed responsibility for planning and operating the vast majority of bus services from local transport authorities to commercial bus operators. Thus socio-economic planning data became very much a secondary resource to bus usage and financial information. Despite this, local councils were required to maintain some public transport expertise to tender out – ie subsidise – services that were socially necessary but not commercially viable services, and schools transport.

London was excluded from the 1985 'deregulation'. Instead the buses were privatised with the planning function retained in the public sector through London Transport under a franchising regime.

As a result, there are two types of public transport planner in Britain:
- The commercial planners (ie bus operators), who are primarily concerned with maximising profits, and
- The social planners (ie those who work for local authorities, Passenger Transport Executives, and London Transport), who aim to use public transport to meet wider social, eco-

nomic and environmental objectives.

In addition, there are also planners of 'works' bus transport – ie employers' infilling services where they deem the existing public transport provision as inadequate to meet their requirements. The objectives here are commercial, but relate to the commercial aims of the company, not the bus operations. In order to fulfil the company's commercial aims requires bus planning that takes employee location and needs into account. Thus this sector is one where geo-demographic information is of central relevance.

Primary factors used by commercial planners

Commercial operators tend to plan bus networks by the 'seat of the pants', that is, by relying on previous experience and local knowledge. It is seen as an art that is learnt locally, and as a result good bus network planners are in high demand. Generally, the operational and financial performances of routes across a bus operator's network are monitored on a month-by-month basis. The information used by operators has traditionally come almost exclusively from ticket machine data. At its best, this allows boardings and alightings to be calculated for every stage on the route/network, from which the network designer can derive demand levels.

Factors that trigger changes to a route or network can be broadly split into two categories: supply-side and demand-side. Supply-side factors occur when the performance of a route invites changes, or when the level of resources alters. For example, if a route performs very well, more resources may need applying, or if it performs badly, services may need to be either reduced, or the service improved to try to redress this.

A second supply-side trigger, concerns the level of resources available, for example, new public money for services to be developed through the rural bus grant. Network changes are also triggered by driver shortages, traffic congestion – where more buses are needed to operate the same previous service frequency as before – and changes to the road network. A further trigger on the supply-side, purposely stimulated by the 1985 Act, has been the threat of other operators competing for passengers if the level of service wasn't up to scratch. In practice, such instances have been limited to relatively few particular areas.

Demand-side triggers include changes to housing, employment, leisure or retail development patterns and demographic changes.

Changes to routes are also constrained by several factors. A major constraint is the timetable. A route that takes 62 minutes to complete would be far less attractive to a network planner than one that takes 50-55 minutes, or even 110 minutes as the latter cases would be more amenable to operating on a 'clockface' timetable.

There are two basic principles for planning a network. One is, to provide as dense a network of routes as possible, to reduce walking distances as far as possible. The other less common approach is to operate a very simple network of services at a higher frequency. While market research seems to suggest that given the choice between less walking distance to stops and lower frequency or walking further to a service at higher frequency, most people would prefer the former, in practice higher frequency services and longer walks seem more successful.

While this whole informal approach to bus route planning can work effectively, one major problem is its reliance on one or two key people with the necessary skills and knowledge to plan routes and schedule services. This is a crucial point. What appears to have happened in the UK is that planning and information has become a craft skill that is built up over many years by a few highly experienced people with an in-

depth knowledge of the local bus market and its customers. The whole of this process is very vulnerable to the loss of such people. Furthermore, the long career paths that build up such knowledge are simply no longer present in today's bus industry. The 'knowledge' is being lost and is not being replaced by any systematic planning or data gathering systems.

In the main, commercial operators have not tended to use geo-demographic data in planning routes and services. Instead, operators have tended to rely on their own local knowledge as operators and on existing patronage data. One of the rare companies that has used geo-demographic data is The Shires – a subsidiary of transport group Arriva. Even here, a series of routes in the Hemel Hempsted area of Hertfordshire were first planned using 'conventional' local knowledge methods, and then checked using a standard geo-demographic marketing database known as Mosaic. In the event, one route was altered slightly after the package showed that better patronage growth would probably result from using a road parallel to that used previously, although most of the routes were shown to be already operating in 'sensible bus operating territory'.

In the few other cases where geo-demographic information has been gathered and used, it has tended to be used more to market existing services and not to plan them. For instance, Brighton and Hove Bus and Coach Company has built up a database of holder information on young people in its area, by offering large fare discounts to those who apply for BUS ID cards. It then uses this data to mail out further travel incentives and news of offers, thus encouraging its target audience to continue to use the bus (Bus Industry Awards, 2000). Trent and Barton Buses is another operator that makes extensive use of socio-economic data to market and monitor their services. Primarily, this is gathered in household interviews, some of which are conducted by specialised market research agencies, and some of which are conducted in-house.

There is little use of Geographical Information Systems. One exception occurred in March 2000, when Leicestershire operator Arriva Fox County conducted a marketing campaign based on geo-demographic data. Here, names and addresses of 5000 people fitting a particular geo-demographic profile were supplied by Nottingham-based data gatherer Experian and analysed using a GIS. These people, living near a new bus route linking Broughton Astley, Cosby, Whetstone and Blaby with Leicester, were then sent information packs, informing them of improvements to their local bus service. These contained personally addressed letters, and leaflets on the new service explaining where the stop is, and a step-by-step guide to using the bus in their own village. Vouchers were also enclosed, of which 499 were redeemed. Interestingly, Arriva offered occasional users (according to the geo-demographic profile) a far greater incentive than regular users, on the basis that they needed more convincing to change their habits.

KEY VARIABLES FOR 'SOCIAL' PLANNERS

For non-commercial routes in rural areas, the over-riding objective that local authorities are aiming to meet is to the improve accessibility of shopping, health, education, leisure and employment centres to residents without access to a car. This is in contrast with urban objectives, which are now often focused at stimulating a modal shift away from the car to reduce congestion, noise and air pollution.

In planning the bus network, comments by parish and district councillors tend to trigger a review of service levels. These reviews usually involve looking at what services al-

ready exist, followed up with passenger surveys and further discussions with local councillors. Village size and populations along the proposed route are also considered. Then the economic and operational feasibility of the route is investigated. Usually if the predicted cost per passenger is reasonable, and if there is money available then the new service may be implemented.

For the social planner, triggers to route changes tend to be where 'gaps' are identified by local people or their parish or district councillors. The bus planner then investigates the request by analysing what service is already there and then calculates whether introducing such a service would generate enough demand for it to be cost effective given the local circumstances – a rough socio-economic analysis. The final decision then depends on what level of subsidy per passenger trip would be required to provide the service, and on how much social benefit would be generated. Routes have often been in place over many years, and have slowly evolved as new developments have occurred or as travel patterns have changed. Most of the time, routes are seen as about right, but some passengers are ignored and some new developments poorly served. Route planning is often done with operators. Especially in towns, operators come to the council and discuss options. Thus there is as much a dependence on individual/community knowledge as there is in the commercial sector, and as in the commercial sector, this knowledge is also in decline.

Obviously, methods to meet these objectives are constrained by a limited supply of available money, and therefore services provided must be shown to give good value for money to the council tax payer. While this was an informally planned objective, as of April 2000 the adoption of the Best Value regime under the 1999 Local Government Act, now requires local authorities to formally monitor tendered bus services in their areas to ensure they are getting value for money. Informed bus planning is no longer good enough.

EXPERIENCE IN THE 'WORKS' BUS SECTOR

In the works bus sector, criteria for providing buses are slightly different again. Generally, companies expect services to be well used, ideally self funding (eventually if not immediately) and effective in getting their staff to and from work. As works buses are designed to serve employees, data on bus users is often more readily available. As a consequence, though the number of employers providing works buses is relatively small, the proportion of those using geo-demographic data is unsurprisingly higher. One example, is the Drivers and Vehicle Licensing Agency at Swansea. Here, employee address data from parking permit application forms was used to determine areas where staff had no bus alternative to the car, so that works buses could be introduced to remedy this.

The Open University is another employer that has used household location data to secure transport to work for its staff – this time for negotiations with local bus operators. In Derby, financial services company Egg invited bids for a shuttle service to its site. Operator Arriva used GIS to demonstrate that 70% of Egg's staff lived within 10 minutes walk of an Arriva route to the city centre, and so proposed providing Egg employees with a pass allowing them discount on the feeder service. In the event, rival Trent and Barton Buses won the contract with a basic shuttle bus bid, but the case further demonstrates the potential of using GIS as a powerful visual aid.

CONCLUSION

Bus service planners are currently operating as they always have, by counting chimney pots, and relying on the skill and experience of individuals to plan and market the most effective services. Only in a very few places is geo-demographic data used to either plan or market bus services. In the past, this was because such data was expensive and time consuming to collect, and took a lot of effort to analyse. It was therefore considered an unaffordable luxury. Now however, while data is still not exactly readily available, it is at least theoretically possible to analyse thanks to Geographical Information Systems – a tool that the retail sector has appreciated for many years.

The development of such a tool for the bus industry is timely, because more is expected of public transport – as a social, economic and environmental policy instrument. In addition, public money is becoming ever more tightly controlled by central Government through the Local Transport Plan and 'Best Value' processes. The old approach of 'managing decline' is becoming less and less acceptable.

Finally, and most crucially, the very highly skilled and experienced people on whom the bus industry depends to plan bus services using conventional 'knowledge' methods are gradually dying out, and not enough people are being trained to replace them. Bluntly, the black art or craft of bus service planning is beginning to break down, and so a more systematic method allowing more of the 'influential factors' to be taken into account is needed. So far though, there is little sign that the bus industry has realised this.

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