

Development Department

Research Programme

Research Findings No. 99

Interchange and Travel Choice

Institute for Transport Studies, Leeds University
&
Transport Research Institute, Napier University

A key component of an integrated transport network and of the “seamless journey” is easy and convenient interchange for the public transport user; interchange is often regarded as an impediment or even a deterrent to public transport use. In order to improve understanding of the role and effect of interchange on the individual travel behaviour of bus, train and car users, the Scottish Executive commissioned new research. Available literature was reviewed, focus groups and interviews conducted to discuss experiences and attitudes towards interchange, and stated preference and attitudinal surveys conducted in Edinburgh and Glasgow to provide valuations of interchange.

Main Findings

- As interchanging interrupts journeys most people favour direct services and may avoid making journeys that require interchange, or make them by car rather than by public transport; only 1 in 5 bus users rated interchanging as convenient.
- The interchange penalty is valued as equivalent to 4.5 minutes for bus travellers, 8.0 minutes for train travellers and 8.6 minutes for car commuters; a guaranteed connection could reduce the bus penalty to 0.9 minutes.
- The most important attributes of interchanges for bus users are good quality, fully equipped shelters, real time information on bus arrivals and printed timetable information; attitudinal surveys showed that bus journeys involving interchange would be most improved by buses being reliable (‘on time’) and frequent.
- For bus users the amount of affective (emotional) effort - coping with uncertainty - was deemed excessive by one half (46%); 25% of the train sample thought they had needed to expend high amounts of physical, mental and emotional effort on their journey.
- In contrast, commuting by car requires low physical effort and high mental effort (concentration). Car users thought commuting by bus with an interchange would require from them less mental effort but more physical effort and a lot more affective effort than their current car commute.
- 87% of car commuters said they would commute more by public transport “If they did not have to interchange”. However, the inducements to do so would require to be “pull” measures such as frequency, reliability and speed of travel; “push” measures such as increased parking costs were deemed less effective.

Study Objectives

The objectives and scope of the study were wide ranging:

- to explore the extent to which the reality and perception of interchange deters public transport use, absolutely and in relation to other deterrents;
- to investigate how public transport users perceive interchange; how they make choices and trade-offs in travel cost and time and the influence of interchange attributes on those choices;
- to assess which components of interchange act as the greatest deterrent to travel;
- to investigate the extent to which interchange penalties vary according to relevant personal and trip characteristics.

Literature Review

An extensive review of the available literature showed that there has been considerable work:

- on establishing the monetary value of the 'interchange penalty' generally using Stated Preference (SP) techniques, and
- on qualitative examination of thoughts and feelings about interchange as a barrier to travel.

However, studies of the first kind have been heavily biased towards inter-urban rail travel, have not always clearly distinguished the overall interchange penalty from transfer time, wait time and integration components, and have not systematically studied how responses vary with interchange conditions. Studies of the second kind have tended to place a value on the barriers to interchange without seeking some typology underlying the dimensions of judgement.

Focus Groups and In-Depth Interviews

Qualitative research with four focus groups and 32 interviewees made clear:

- That interchange is viewed as a negative feature of travel, that public transport is viewed as second rate and that as public transport users they often felt treated as 'second class'.
- That many public transport staff needed training in better customer care to make them more inclined and better able to help passengers with special needs and others with assistance, accurate up-to-date information and way-finding.
- That interchanges could not be examined in isolation from other features of the interchanging journey, which tend to be longer than direct journeys and need more pre-planning. Car drivers especially value the speed and spontaneity which the car promises.
- That services should be 'more reliable'. On interchanging journeys reliability is at a premium, with the waiting and worrying seen as stressful.
- That interchanges should be 'more convenient'. Additional effort has to be deployed in an interchanging journey and in negotiating an interchange compared to a direct service. Through-ticketing and better information both before and during a journey would reduce some of the additional hassle.

Stated Preference: Bus Travellers, Car Commuters and Train Travellers

Stated preference work was undertaken with bus travellers changing services in Edinburgh City Centre both on street and at the bus station; with car commuters whose alternative bus journey to their work on the outskirts of Edinburgh would involve interchange; and with interchanging rail passengers in Glasgow.

The bus sample (n=241) completed three SP exercises, looking at valuing the penalty, waiting and walking components of interchange relative to in-vehicle time, looking at the relative desirability of bus interchange features, and examining package effects in interchange improvement.

Car commuters (n=182) undertook an SP exercise which contrasted travel to work by car or bus, varying journey time, walking time, interchange time and monetary cost and incorporated ratings of the physical, cognitive and affective effort required by each journey scenario; a second SP exercise comparing the value of potential improvements to the bus service; and a transfer price exercise to identify the point at which cost changes might induce mode shift.

The train sample (n=125) completed three SP exercises. The first sought to value interchange attributes, the second to value interchange improvements, and the third compared different interchange costs such as a missed connection.

Interchange Penalties

The survey of interchanging bus revealed results on interchange penalties consistent with a large body of British empirical evidence. The data indicated that an interchange penalty was valued at 4.5 minutes, but that a guaranteed connection could significantly reduce the interchange penalty to 0.9 minutes.

There were clear variations in values according to personal and trip characteristics. For example commuters were found to have values of both in-vehicle and wait time at levels 47% higher than leisure travellers do. Wait time is valued 36% more highly when the interchange is on-street compared to a bus station and 19% less when some of it can be used productively.

The bus interchange penalty was valued more highly by women, by those bearing burdens and by those aged 50 and over.

Interchange penalties for train users and for car commuters were significantly higher than for bus users at 8 minutes.

Comparisons Across Modes

For the bus sample, waiting at the interchange was rated as being 'too long' by half (48%); bus users who interchange on-street are more impatient than those interchanging at a bus station. Waits of over 5 minutes were considered too long by a substantial proportion of users. For the rail sample, waiting at the interchange was felt to be the least satisfactory trip component (25% thinking it too long), but for all trip components explored the proportions satisfied were higher for rail than for bus. Compared with bus commuters more car commuters anticipated that all elements of the bus interchange journey would take 'too long'. Car commuters have very poor perceptions of the local public transport available to them; half rated it poor or non-existent.

Analysis of the customer satisfaction 'gap' between ratings of service *performance* and service *importance*, established that bus journeys involving interchange would be most improved by the buses being reliable ('on time') and frequent; train journeys involving interchange would be most enhanced by improvements to interchange convenience and service cleanliness.

For the bus and train samples, judgements of how well services were delivered factored into three distinct groups:

- Cost considerations ('good value', 'cheap');
- Instrumental travel needs ('on time', 'frequent', 'fast') and
- Psychological travel needs ('safe', 'simple', 'clean', 'comfortable').

Bus users accorded high importance and a high level of "disgruntlement" or dissatisfaction to cheap fares, protection from the weather and convenience.

For both bus and train samples, aspects of the interchanging journey experience grouped into four distinct areas:

- The need for pre-trip planning;
- Trip generated anxieties about connections and journey completion;
- The amount of walking and waiting and
- Concerns about personal safety and vulnerability.

Effort Expended in Travelling & Interchange

Time and money have been the dominant measures in studies of transport choices, but when planning a journey a person will usually take into account the expenditure of other personal resources. A journey can involve unanticipated or unwanted expenditure of physical effort, mental or cognitive effort, and emotional or affective effort.

Physical effort when travelling is used for maintaining body posture in walking, waiting or carrying. Comfortable seats will reduce the amount of such effort expended, negotiating an awkward interchange while burdened with infants and baggage will increase it. Cognitive effort is needed to collect and process information before and during a journey. Route

familiarity will reduce the amount of cognitive effort needed, while if the journey needs constant monitoring of progress and the seeking out or interpretations of information this will tend to increase it. Nervous energy is expended on worry about whether the journey will be successfully accomplished. Uncertainty about connection, arrival or personal vulnerability will tend to increase the amount of 'affective spend' on a journey.

For **bus travellers** surveyed:

- 27% said the amount of physical effort was more than they would have liked;
- 27% said the amount of cognitive effort was more than they would have liked, but
- 46% said the amount of affective effort was more than they would have liked.

Most **car commuters** assessed physical effort required to drive as low (78%) but mental effort high (67%). However for their available alternative interchanging bus commute:

- 63% said the physical effort required would be high;
- 41% thought the cognitive effort required would be low, but
- 78% said the emotional effort would be high, while only 9% thought it would be low.

The researchers believe this perception contributes to increasing car use.

For **rail users**

- 38% said the physical effort required to interchange was low, though 27% saw it as high;
- 48% thought the cognitive effort low, though 26% thought it high;
- 53% said the affective effort was low, though 27% reported it as high.

Conclusions on Improving Practice

There is a clear preference for direct, frequent and reliable services. Improving the interchange experience for customers may ameliorate this. This study identifies the psychological dimensions of that experience and suggests an agenda for improvement.

Improvements could be made in those areas that would reduce physical effort, mental effort and uncertainty. Improved service reliability, although not a direct attribute of interchange, reduces uncertainty in the mind of the traveller.

Service performance divides into psychological benefits, instrumental benefits and cost benefits. Because cost benefits (fares) are seen as separate from instrumental travel needs (speed, reliability, frequency) and psychological travel needs (safety, ease and simplicity, comfort and cleanliness) the analysis clearly identifies three independent areas under which policies for improvement should be targeted, asking of any proposed changes:

1. Will this improve price benefits to the customer?
2. Will this enhance instrumental service benefits to the customer?
3. Will this better meet our customers' psychological travel needs?

Psychological reactions to bus and rail journeys involving interchanging indicated clearly that interchange activity can be regarded as having four main types of effects on passengers.

- trip generated anxieties about connection and completion and associated feelings of control;
- amounts of walking and waiting;
- personal safety while travelling and while waiting;
- cognitive load especially in planning a trip.

The design and operation of interchanges may influence these.

If you wish further copies of this Research Findings or have any enquiries about the work of the Central Research Unit, please contact us at:

Scottish Executive Central Research Unit
2J
Victoria Quay
EDINBURGH
EH6 6QQ
Tel: 0131-244 7560, or
Email: cru.admin@scotland.gov.uk
Web site: www.scotland.gov.uk/cru

If you wish a copy of 'Interchange and Travel Choice' the research report which is summarised in this research finding, please send a cheque for £5.00 made payable to The Stationery Office to:

The Stationery Office Bookshop
71 Lothian Road
Edinburgh
EH3 9AZ
Tel 0870 606 5566
Fax 0870 606 5588
<http://www.tsoline.co.uk>

This document (and other CRU Research Findings and Reports) and information about the work of CRU may be viewed on the Internet at <http://www.scotland.gov.uk/cru/>

The site carries up-to-date information about social and policy research commissioned and published by CRU on behalf of the Scottish Executive. Subjects covered include transport, housing, social inclusion, rural affairs, children and young people, education, social work, community care, local government, civil justice, crime and criminal justice, regeneration, planning and women's issues. The site also allows access to information about the Scottish Household Survey.



SCOTTISH EXECUTIVE

Designed and produced on behalf of Scottish Executive by Tactica Solutions B17355 12/00

I S B N 1 - 8 4 2 6 8 - 4 4 4 - 2



9 781842 684443