Feature

Smart Segments For Urban Public Transportation: An International Survey of Practices

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This article describes the market segments that are likely to make more use of public transport without changes and also examines strategies for increasing public transport ridership as a whole by introducing user-friendly features or playing the network effect. Specific case studies based on the experience of members of the International Association of Public Transport (UITP) are presented using materials gathered from personal visits and interviews with the main players.

In the 100 years of modern urban transport history, it appears that the concept of public transport as an affordable universal service for all has gradually given way to the private automobile. This trend is still progressing—although the population of OECD countries only increased by 13% from 1980 to 1995, car ownership increased by 50% and vehicle-kilometres increased by 65%. There are four times more new cars than new babies.

Experiences of New Market Segments for Public Transport Services

The general public and their governments have different attitudes towards the automobile and public transport. The automobile—like the individual's home—reflects the so-called 'me culture' or 'mass individualism' which emphasizes individual values and rights[1] rather than social values and duties. The automobile industry has diversified its products to suit individual tastes, status aspirations and quest for recognition as well as convenience and comfort. Public transport operators can only hope to expand their users beyond the captive market segment by competing with the individual values offered by automobiles. Against this background, in 1991, UITP conducted a survey on the attitudes of Europeans to urban mobility (not public transport). Twenty questions were added to the Eurobarometer, a Europe-wide biannual opinion survey consisting of 1000 face-to-face interviews in each EC member nation; 157 elected transport officials were also interviewed on the same items by Social Data, a Munich-based company.

Notwithstanding the fact that 65% of the people surveyed were car users, they clearly understood the negative effects of congestion, accidents and pollution. They also perceived the need for measures to reduce traffic and 84% thought that priority should be given to public and non-motorized transport[2] (Fig. 1). By contrast, the elected transport officials strongly underestimated public opinion, expecting only 49% of people to favour priority for public transport (Fig. 2). Perhaps the officials favour the car over public transport because they use government cars and they read the pro-car media.

How is it possible to take advantage of the public's positive attitude to public transport so that they actually use it?

Figure 1 Traffic Planning Conflicts

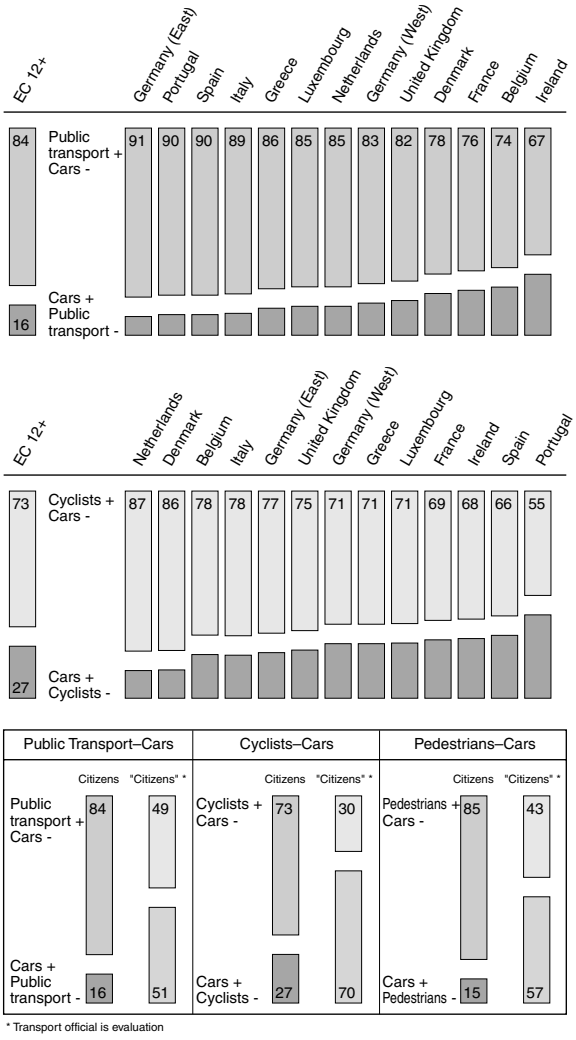

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Figure 2 Evaluation of Political Transport Officials

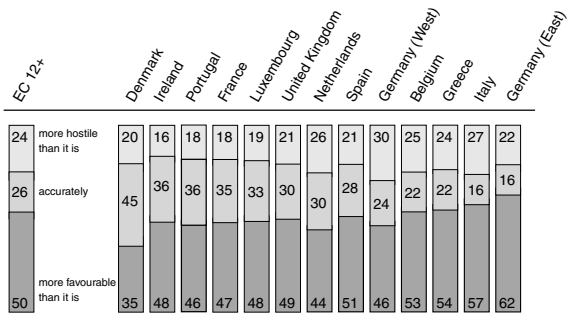
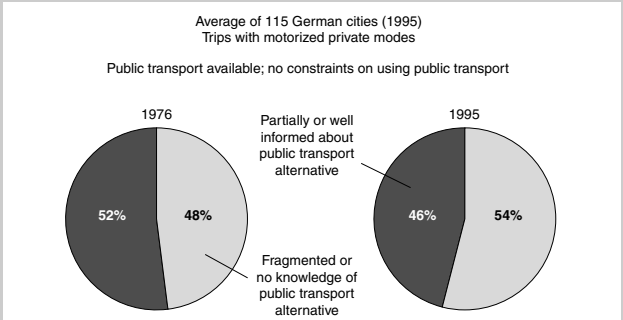


Figure 3 Extent of Information



To answer this question, UITP and Social Data joined forces with a marketing experiment called Switching to Public Transport in 115 German cities aimed at 12,000 infrequent users of public transport[3]. Initial findings showed that in addition to the 16% of current users, about twice as many (34%) had no rational reasons for not using public transport and might be 'captured.' They did not use public transport due to a lack of knowledge about services, speed and cost (Fig. 3). Before the marketing experiment, each targeted person made an average of 164 annual trips by public transport. This increased to 196 after the experiment. The overall increase in revenue was far greater than the costs, including extra staff, home visits, information materials, gifts and interview costs. Over 5 years, with no refresh contact with the same individuals or service changes, it is estimated that the revenue increase would be about 3.5 times the total cost[3].

Most importantly, the experiment showed that operators require a change of attitude towards increasing market share by providing users with more information, especially pre-trip information by phone and timetables on Internet plus real-time information displayed at stations, which is very effective in overcoming the negative image of wasted waiting time.

Best practice pre-trip information systems in NW Europe

Holland has a nationwide public transport information system (OVR) targeted at occasional users and owned jointly by all public transport operators. It consists of an easy-to-remember national telephone number that connects to 400 service staff with computers who can provide information on any trip in the country for a charge of about €1. The yearly number of calls exceeds 7 million and most calls are followed by a trip—80% are diverted from cars and 15% from bicycles. A free internet service also handles an additional 8 million requests per year.

The XEPHOS service offered by the Southern Vectis bus company in the UK operates along the same lines as OVR and provides information for about 12,000 destinations from the Great Britain Bus Timetable (GBBTT). It received 300,000 calls in 1999[4].

Intermodal information

The logical development of multimodal public transport information systems is intermodal information system targeted at car drivers in traffic jams. The huge investments in traffic data collection for car navigation aids and the commitment of the automobile industry to intelligent transport systems (ITS) have resulted in an estimated 10% market niche for navigation aids in new cars. However, they do not protect the driver from traffic congestion, which is increasing faster than the progress in road usage efficiency.

Clearly, there is potential for interfacing ITS with telephone or driver information services about Park and Ride locations and spaces, available train services and accurate timetables. Some organizations, such as the SIRIUS test-bed ITS project in France, attempted to implement such a service but the potential market share to be gained by the rail operators was not sufficiently attractive to motivate them to provide the needed real-time data.

Improving Ridership by Improving Existing Services or Expanding Network

Increasing user convenience by integrated fare collection

In addition to the lack of information about routes, connections and services, the main deterrent to public transport for unfamiliar users is fare calculation. Easy answer to the problem is flat fares but this can cause huge operating losses as well as bias against short rides. The challenge is to combine flexibility in fare setting by competing services and simplicity for the customer.

Public transport operators in Hong Kong and Singapore do not get subsidies, a situation that has forced them to be creative and to realize that joint fare payment systems are of benefit to all—even operators with competing services and different fare policies. Such systems have also increased revenues and passenger satisfaction.

Hong Kong's Octopus card and Creative Star

In 2001, more than 8 million people were using the Octopus non-contact IC card introduced jointly in 1997 by Hong Kong's transport operators. It is a rechargeable stored fare (SF) smart card that is accepted at all stations of all operators in the public

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Hong Kong's Octopus card and Creative Star (Author)

transport system., When a passenger enters the network, the card is debited by an amount equivalent to the journey to the end of the line, and when the passenger leaves the network, the card is credited with an amount corresponding to the unused part of the journey.

The operators entrusted an independent private body called Creative Star to develop and manage the system but each operator is free to set fares and loyalty discount schemes. For example, the MTR metro advertises special discounts for people entering the network just before the morning peak.

A personal Octopus card with photo is provided for tram customers and has quickly replaced the existing unlimited-use personal passes. Since the trams have open access and riders pay at card readers on the outside of the trams, inspectors with card readers make spot checks.

Although very popular, the Octopus card has not completely replaced the single-use ticket. When buying a single ticket, the passenger can select a flat fare ticket for travel through a number of fare zones but is faced with the inconvenience of determining the correct fare and pressing the right buttons. In the future, non-rechargeable non-contact smart paper tickets will be available at a manufacturing cost of less than €0.10.

Notwithstanding Hong Kong's high levels of car ownership and income, the Octopus card has been an outstanding success, especially since the 8 million cards in use far exceed the population of 6.5 million.

In technical terms, the Octopus card replaces the older magnetic cards that required a central server to record transactions and detect fraud. The high-security Octopus cards no longer require this costly investment and open the way to a new generation of decentralised systems like Singapore's contactless smart card system[5].

Singapore's enhanced integrated fare system

The contactless smart card system developed by the Land Transport Authority of Singapore and introduced in February 2000 is different from Hong Kong's Octopus card because it can be used as an electronic purse (e-purse) for purchase of non-travel services and goods. Moreover, it can be used on buses with the card reader mounted next to the driver and the writer at the bus exit. It is recharged by inserting cash into a card dispenser or directly from a bank account through a cash dispenser.

Singapore limits automobile traffic using price mechanisms (auctions of certificates of entitlement, heavy taxes on car ownership, road use and parking charges) and maximizes public mobility through use of public and non-motorised transport and taxis. To ensure maximum competition in public transport, multimodal rail and bus operators are awarded franchises for several railway lines and bus routes and all participate in the enhanced integrated fare system[6].

Effect of new rail services and improved interfaces

This section described some examples illustrating the potential of new tramway networks, the high speed–low speed interface, the heavy rail–light rail interface and their effects on demand.

Improving the intermodal interface improves demand by all market segments. In particular, the growing number of mobile older people is more sensitive to comfort and ease of use than to time savings and older people often choose a taxi for this reason. For example, a return trip on the Paris Metro with one change each way can require the same effort as climbing the stairs of an 8-storey building. Escalators have been installed in some stations but they are still not common.

Manchester *Metrolink*

The market generated by the new *Metrolink* tram–train was a direct result of the interoperability concept[7]. In 1989, the Manchester transport authorities decided to link two underused commuter lines ending north and south of Manchester City centre. This new north–south line was to operate as a tramway on the streets between the two stations and use old BR track elsewhere. A European consortium won the bidding and committed itself to take the full risk of operation without subsidies while providing 5% of the total construction cost of some $200 million. The system opened in 1992 with an extremely simple fare structure and timetable of one tram every 6 minutes (later increased to every 5 minutes) from 07:00 to 19:00, and 12

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minutes at other times. A 50% rebate during off-peak hours targeted housewives shopping and leisure trips by mobile older people. Staff were hired for service skills (no previous transport experience was required) and were trained to fill all the jobs.

After 3 years, the annual operating profits were $5 million. The system length has since been doubled and a third extension is in planning.

The example of Manchester goes beyond the new *Metrolink* system. Soon after deregulation, when on-street competition was introduced, the Manchester City authorities started measures to integrate transport supply by designing the unlimited-use Travelcard pass which is accepted by all rail and bus operators in the Manchester area.

The uniqueness of Travelcard lies in the allocation of revenue to the different operators, which is based on sampled daily demand rather than transport supply (seat-km) as used by the German Verbund. The survey using a model accepted by all operators is performed by an independent team. While expensive (around 2% of passenger income) it has been a success in terms of marketing. Passenger profiles can be identified by asking three simple questions about point of entry, point of exit and fare category (child, adult, and concession). The results permit neutral assessment of the daily changes in patronage to the benefit of each operator as well as independent assessment of the number of concession passengers.

High and low-speed rail

High-speed railway lines have been a renaissance for passengers on interurban stretches. As an example, the Paris–Brussels service (85 minutes) now has more than 50% of this travel market with business travellers making up 53% of the traffic. As a result, all Air France flights on this route have been replaced by direct trains from Brussels to Paris Charles de Gaulle Airport. High-speed trains linking Paris and Brussels effectively make Brussels the third Paris airport.

Commuters are also starting to use high-speed trains such as the TGV Atlantique from Vendôme to Paris (42 minutes), the Amtrak *Acela Express* between Philadelphia and New York (63 minutes), and Utsunomiya to Tokyo Station on the Tohoku Shinkansen (52 minutes).

High-speed train stations unquestionably open a market niche for urban and suburban public transport. Station taxi stands and parking exits often have insufficient capacity to cope with the rush of arriving passengers. Interfaces between these high-speed stations and the local rail network should be a priority investment area. Timetable information, convenient ticketing facilities, clear passenger information displays are readily available tools that are sometimes too rarely used.

There are a number of ambitious interchanges in the making, including Atocha Station in Madrid, Paris-Nord, Antwerp Central, Promenaden Hauptbahnhof in Leipzig, and the Dortmunder Hauptbahnhof.

Heavy and light rail—The Karlsruhe dual-current tram-train

Among the various passenger railway interfaces, an important theme seems to be interoperability between heavy and light rail[8]. Interoperability in this case means through connections from one line to another.

The attractiveness of track sharing by high- and low-speed trains on heavy and light rail has been demonstrated by the Karlsruhe urban and suburban tram-train network which started in 1995. The operator succeeded in convincing the main-line operator Deutsche Bahn AG (DB AG) to allow heavy and light rail vehicles to run the same tracks.

To complete the entire trip on the same train removes the negative perception of having to wait to change mode.

Duplicating this best practice in other cities with long tracks could create a promising niche for public transport but requires bridging the cultures between the staffs of traditional railways and urban light-rail operators. It would mean adapting safety standards to emphasize active security (collision avoidance) over passive security (collision resistance)[9].

The Karlsruhe experience presents a realistic case for encouraging the authority in charge of track and operations to open it up to third parties.

Opening up track to third parties should not be confused with separation of infrastructure from operations. A regulatory obligation for a track-owning operator to open up its track to operations by third parties is not in conflict with service development and new investment. The UK Railtrack experience suggests that a monopoly track owner is more motivated to maximize its position through limiting capacity rather than expanding.

If track monopolies became common in Europe, we might speculate about who would have a market-driven interest in developing new rail links. Of course, it is not simply sufficient to establish the principle for third-party access—the devil is in the details. A good case is the experience of Lovers Rail in Holland (see *JRTR* 24), which, despite a number of interesting innovations like penalty-free onboard ticketing and rental bicycles, still went out of business in 1999 due to anti-competitive behaviour by the main operator, Nederlandse Spoorwegen (NS).

New Services for New Markets—Airport Access

Public transport access to airports is a niche market, not only for passengers wishing to avoid traffic congestion around airports and parking costs but also for the airport and airline staff. However, this market segment can only be tapped if the service is competitive with the car and

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taxis. Some best practices are demonstrated by Hong Kong's *Airport Express*, London's *Heathrow Express*, Amsterdam's Schiphol *Thalys* connection, Swiss Federal Railway's baggage collection service for Zurich International Airport, the Øresund Fixed Link between Copenhagen and Malmö.

Hong Kong's *Airport Express*

Hong Kong International Airport on Lantau Island is linked to the city by MTR's *Airport Express* (see *JRTR* 19). MTR used the new airport as a chance to enter a new transport market based on an original strategy[10] of realizing that its mission was not simply to operate an airport rail link but was instead to provide a full door-to-door service in competition with cars and taxis. The first thing that arriving air passengers see is the *Airport Express* ticket counter and platform. The ticket includes a special shuttle bus ride from the MTR Hong Kong and Kowloon terminals to final destinations (mostly hotels) and is much cheaper than a taxi. The service has been very profitable for MTR with a daily patronage of 29,000 in 2000. A similar *KLIA Express* service started in April 2002 between Kuala Lumpur International Airport and KL Sentral Station.

London's *Heathrow Express*

London's Heathrow Airport has long had a direct Underground connection via the Piccadilly Line to central London but the journey time is nearly 1 hour due to the considerable number of commuter stops. Clearly there was a niche market for a new fast, non-stop and comfortable train connection to Central London and the BAA Rail Strategy Group opened the *Heathrow Express* in 1998 without government subsidy for either construction or operation.

The trip from Paddington Station takes 15 minutes and trains run at intervals of 15 minutes. The fare is three times more than the Underground and three times less than a taxi.

A similar project was launched in 1995 to serve Stockholm Airport and the 40-km link opened in 1999. The Paris Airport Authority together with SNCF also plans a non-stop line to be called the *CDG EXPRESS* linking Charles de Gaulle Airport with the Gare de l'Est every 15 minutes.

Amsterdam's Schiphol *Thalys* connection

Like Heathrow, Schiphol has an aggressive rail access strategy for capturing the niche market for passengers and staff. In addition, it has an innovative international high-speed rail strategy based on *Thalys* (serving Paris, Brussels, Amsterdam, Cologne, Geneva, Marseilles, see *JRTR* 11) targeted mainly at the Belgian passenger market. By 2005, Schiphol should be accessible from central Antwerp in 40 minutes making it the first choice of airport instead of Brussels Airport. Moreover, since the non-stop high-speed link between Charles de Gaulle Airport, central Brussels and Schiphol does not serve Brussels Airport, Schiphol should be a strong competitor for passenger traffic originating from Brussels.

It is worth mentioning that the link will be operated by an international consortium determined by European tender, which could lead to aggressive competition between long-distance high-speed and local rail operators.

Zurich International Airport—Integrated baggage handling by Swiss Federal Railways

To make rail access easier, Zurich International Airport has developed a unique baggage collection system in cooperation with Swiss Federal Railways (SBB) based on stations in 20 Swiss cities. As a result, airport traffic has more than doubled in the last 20 years.

Copenhagen–Kastrup–Malmö link

The July 2000 opening of the Øresund Fixed Link (see *JRTR* 24) for both road and rail traffic has been a challenge for public transport operators. It is too early to assess the market share (officially estimated at 4.8 million passengers in 2005) but the patronage was above expectations in the first few months

The main elements favouring the Fixed Link are 35-minute services at 20-minute intervals to Kastrup Airport using new high-speed X-2000 trains, joint ticketing with integrated rail fares for all airlines serving Kastrup, and a rail-friendly urban development policy in both Copenhagen and Malmö.

Market Niches for Access to Shopping and Leisure Centres

Shopping centres are a difficult niche for public transport because their objective is to lure car users by taking advantage of the expanded road network. An additional handicap is that large shopping purchases fit more conveniently in a car boot than in a train, tram or bus. Moreover, shopping centres fear that their parking space will be used as Park and Ride if they are close to public transport. When they are served by mass transit, they tend to remain closed until after the morning rush hour.

However, larger shopping centres like malls invite pedestrian movement and can be served by public transport at the edges. A case in point is in the German city of Oberhausen where a 70,000-m^2 shopping and leisure centre opened in 1996. The local tram and bus operator decided to take up the challenge and built (at the taxpayer's expense) a strong link between the city and shopping centre. As a result, patronage over the entire tram and bus network increased by 50% between 1995 and 1999[10].

A 50,000-m^2 shopping centre near Zurich is another good example. At first, it was

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served by one bus line but this has expanded to three and it will be served by the new Stadtbahn Zürich-Nord[12].
However, there is no doubt that quality access by public transport is best achieved through decisions at the planning stage rather than by adapting to the situation afterwards.

Eurodisneyland's rail connection

Disney's1997 decision to choose Marne-la-Vallée for its European theme park was the result of 3 years of negotiation with the French authorities, mainly about infrastructure provided by the public sector. Not surprisingly, RER, the operator of the local commuter line and owned jointly by RATP and SNCF was also a signatory to the agreement. The total public investment amounted to $50 million[12]. The theme park has 11,500 parking spots costing $10 a day. It is worthwhile remembering that the revenues from parking were a key reason for rejecting a rail connection to Disney World in Orlando, Florida.
In contrast, the Eurodisneyland collaboration with public transport goes as far as to include common marketing plans in favour of public transport access and the sale of Eurodisneyland tickets at RER ticket counters, generating a 40% modal share for RER. However, this share is largely due to the fact that most Eurodisneyland employees use public transport. Weekend use has proved disappointing.
Eurodisneyland is a good example of large planned development where the theme park is an attracting element in a multifaceted urban development that includes a 90,000-m^2 shopping centre, a second theme park, 30,000 m^2 of offices and 2000 housing units.

Sidney 2000 Olympic Games

'For once this city seems ruled by people instead of cars. Let's learn from the experience' was the headline in the Sydney Morning Herald of 23 September 2000 and summarized what some people consider to have been outstanding best practice in attracting people to sports events by public transport.
The concept was to:

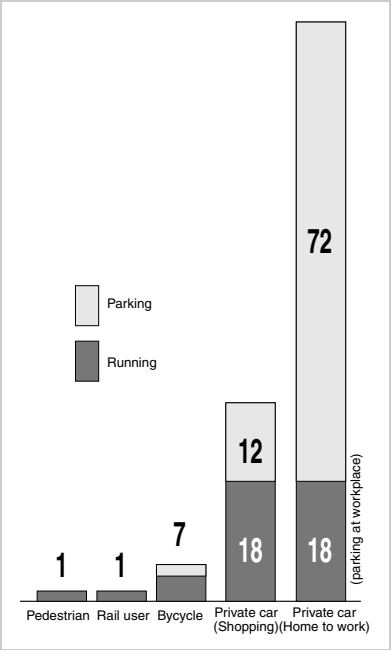
- Use the available State Transit budget to make permanent improvements to the city's railway network in general to provide easy access to the Olympics from anywhere including the airport,
- Allocate limited available parking space according to market mechanisms (pre-booking and payment), and
- Avoid congestion caused by drivers seeking parking through intensive media campaigns warning that only pre-booked parking would be available.

To allay apprehensions, the system was test for events occurring before the Olympics and was documented on behalf of the International Olympics Committee at the 2001 UITP Congress in London.

1998 World Cup and Lisbon EXPO '98

The transport provisions for the 1998 World Cup in France are also considered to have been an example of best practice. The accessibility strategy was to ensure that the public transport (commuter railways, Metro and buses) would be sufficiently diverse and flexible to reduce crowding and avoiding congestion by parking vehicles[13].
In contrast, the organizers of Lisbon EXPO '98 sought to provide as many parking places as possible (22,000) while simultaneously providing public transport access, resulting in high costs and poor results[14].
More generally, the market for tourist interurban trips is an interesting niche market for local transport. However, it can be tapped only by having optimum information about arriving tourists from all sources. Successful examples include London Transport's All-Zone Visitor's Travelcard sold to arriving passengers at London's Heathrow, Zurich's Restaurant-Tram circuit line, and Barcelona's open double-decker Bus Turístico line.

Figure 4 Area x Time Consumption for a 5 km Length Trip



Zurich's Züri Mobil car sharing system

As part of its policy of market segment maximisation, VZB/Zuri-Linie, the local public tram operator, signed an agreement with Mobility, the world's largest car sharing operator, to provide hourly car rentals from its stations. Zuri-Linie smart-card holders can gain access to the 250 available cars using the smart card. The customer only pays for the usage time period and kilometres travelled. Detailed invoicing enables customers to compare the cost of Züri Mobil cars with public transport, taxis and private cars. The Züri Mobil scheme is a smart travel choice and the overall effect seems to increase patronage of public transport[14]. However, compared to taxis, car-sharing does not solve the parking problem—it just increases turnover.

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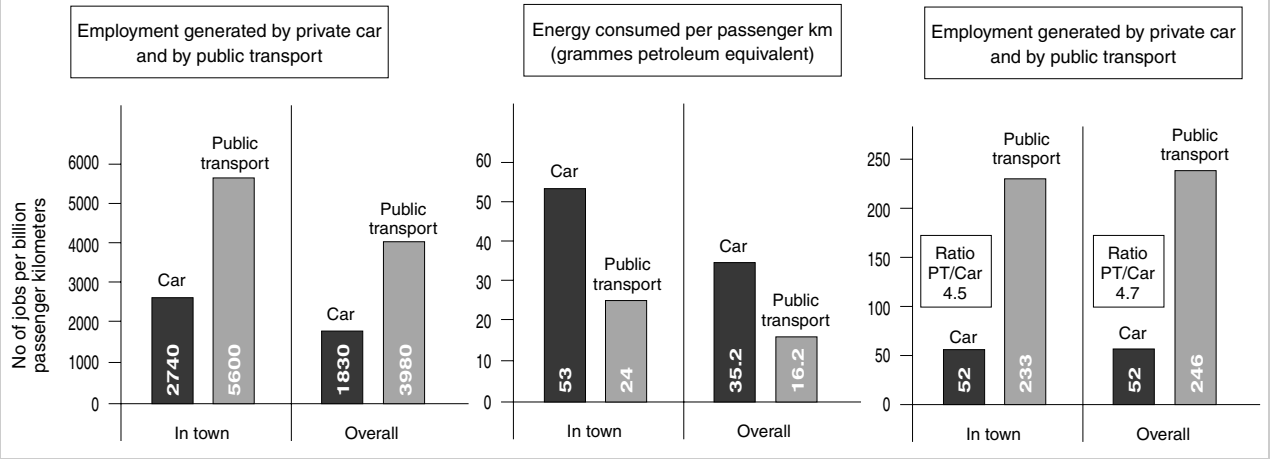
Figure 5 Employment and Energy Consumption by Mode



Dutch Trein taxi

Trein taxis are available to passengers arriving with a ticket at about 100 Dutch railway stations. The Trein taxi takes the passenger to the final destination for a fixed price ($2) but has the right to carry two additional passengers who can be dropped off en route. Therefore, the passenger can expect a maximum of three stops to the final destination.

Increasing Market through Land Use Favouring Public Transport

Many public transport operators are trying to grab new customer but the readily available market segments are quite small simply because of the unequal competition for public space with the car (Figs. 4, 5 & 6). Although public transport operators can regain some small market segments, large segments can only be regained by adopting land-use policies favouring public transport.

Cities should be developed along lines favouring effective use of public and non-motorized transport to reduce people's dependence on cars and urban sprawl (Fig. 7).

As part of its policy to reduce CO_2 emissions, the British government has decided that 60% of all new urban development until 2010 will be on urban brown-field sites instead of countryside green-field sites. In addition, its planning policy precludes all development not adjacent to existing urban areas. In line with this policy, the road building programme has been cut in light of the realization that the additional traffic generated by new roads often exceeds the extra capacity they were intended to provide, thereby actually worsening the traffic congestion. Finally, the government introduced legislation permitting local authorities to levy an annual tax of about $250 on parking provided by employers. This tax is to be used for improvements to the public transport network, such as the Manchester *Metrolink* extension.

Ghent in Belgium and Freiburg in Germany have adopted similar transport policy initiatives. Ghent has a long-term policy of reducing cars in the historic and commercial centre while promoting use of trams by older shoppers through provision of a free concessionary pass to people over 65.

Freiburg has a long-standing record of land use favouring public transport and bicycles. There is an excellent tramway system with a large Bike and Ride parking garage next to the main train and tramway station. In 1985, the city started developing a car-free zone on the site of a former French army barracks.

Conclusion

Public transport was born in the 19th century with the advent of the modern city. Entrepreneurs realized that there were enormous business opportunities to be gained by developing private railways and other transport services within and between cities. The development of the internal combustion engine soon after 1900 saw the nationalization of railways to ensure the right of access to transport for people without private cars. Despite the rising ascendancy of the automobile over the ensuing 60 years, recent concerns about the environment have shown its limitations and offer renewed possibilities for public transport in selected markets.

This article has briefly explored some markets where new technologies offer the chance to regain lost ground. To sum up:

- The easiest market segment to grow is the one that requires raised consumer awareness through marketing focussed on individuals in areas served by the transport. Persuading occasional passengers to use a system is easier than convincing non-users. Forty authorities and operators have conducted a successful experiment in individual marketing as part of UITP's Switching to Public Transport action policy.

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Figure 6 Costs Not Borne Directly by Drivers

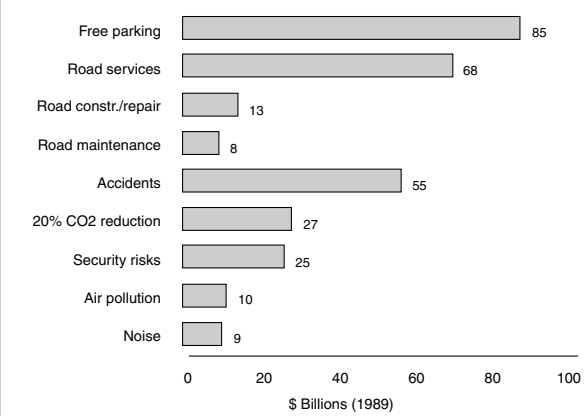
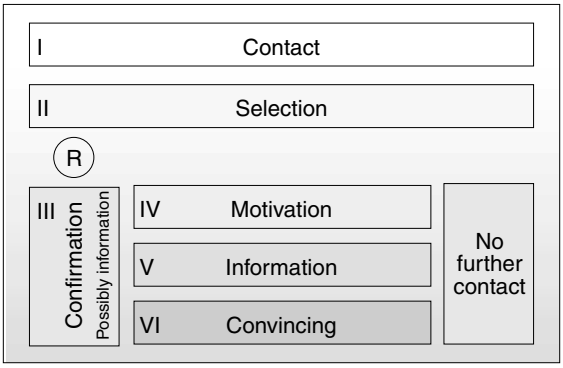


Figure 7 Concept of Public Transport-friendly Linear Development



- A more difficult market is potential users wanting pre-trip information for a multi-operator or multimodal journey. The Dutch pre-trip telephone information system suggests that this segment can be successfully regained using new information technologies. Providing real-time information during a journey is a good strategy for improving customer satisfaction.
- A easy market to regain is the potential customer who is deterred by the complexity of fares, particularly when transferring between systems. This is especially true for tourists. Customer-friendly joint-use smart cards like those in Hong Kong and Singapore are best practice.
- The reluctance of passengers to change modes suggests that through operation such as the Karlsruhe train-tram is best practice, but there are severe technical problems to overcome in most cases.
- New urban rail systems are most successful when they incorporate a network effect as demonstrated by the Manchester *Metrolink* and Travelcard.
- Airport links are a promising niche market.
- Access to leisure parks like Eurodisneyland is an easier niche than access to shopping centres.
- Access to mass events like the Sydney 2000 Olympic Games and 1998 World Cup can best be achieved by public transport when specific conditions are met.
- Taxis and car sharing can play important role in the public transport chain as illustrated by the Züri Mobil car sharing scheme.

However, the best chance for public transport to regain market share is in adoption of land-use policies favouring public transport. Operators usually have little say on land-use policies but should know that major successes have been achieved by cooperation with authorities. Working on their own, transport operators can gain small market segments but working with city authorities offers the potential for much larger gains. ■

Aknowledgement

A longer version of this article was presented at the Think-Up Workshop, Dresden, December 2000.

Notes

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