

Towards Seamless Public Transport

Public transport is presently undergoing transformations towards achieving more seamlessness. A new dynamic is particularly noticeable in the areas of ticketing, network design and institutional coordination. Essential considerations of these developments for users, operators and governments were discussed at a joint seminar of the International Transport Forum and the Korean Transport Institute in March 2012. Some policy-relevant conclusions are presented here, notably:

- ▶ **E-ticketing opens up new opportunities to users and operators, as well as governments;**
- ▶ **Bank account-based ticketing enables universal payments, both nationally and internationally;**
- ▶ **Careful network design that exploits network economies can give rise to a 'virtuous cycle' for public transport systems;**
- ▶ **The success of e-ticketing and network design depends on good institutional coordination, which is based on a strong political will and an effective tendering system.**

E-ticketing

Electronic ticketing with smart cards is now commonly available in all the world's major cities. It has reduced waiting times in front of ticket offices and machines to buy paper tickets, and has shortened boarding times on buses. For operators, it has helped to reduce passenger fraud (£40 million a year in London) and vandalism, and has increased revenues. This has in turn reduced the need for government subsidies. In the case of London, a key incentive for investing in smart cards is the fact that they can offer a low-cost alternative to the expansion of station entrances in order to meet the growing numbers of passengers. A social cost-benefit analysis in the Netherlands (2003) showed that total benefits exceed total project costs, and Net Present Value can be estimated at between EUR 420 million and EUR 1.5 billion. According to the Dutch survey, the integrated smart card system has also increased passenger satisfaction.

In particular, the smart card is more beneficial than conventional paper tickets because it allows operators to know where, when and how people travel. Using

▶ **E-ticketing provides higher benefits to users, operators and governments**

▶ **E-ticketing opens new opportunities**

this information, operators can provide optimal services according to anticipated travel demand. Before, this kind of travel information was expensive to collect and could not be surveyed frequently. Distance-based fares can also be charged by means of smart cards, charging less to those who travel short distances and more to long-distance travellers, and other economically viable fare schemes might easily be incorporated into the smart card.

However, there are some points to take into account for the successful introduction of e-ticketing. Firstly, the ticketing technology needs to be totally reliable, otherwise, operators and users will lose confidence and fear losing their money. It is also better to maintain a simple fare structure to ease the transition for travellers when changing to smart cards; as in Hong Kong and Singapore, where the introduction of smart cards mainly owed its success to a simple fare structure. Smart cards can be even more attractive and convenient when payments for small-value goods and services such as newspapers, coffees, parking fees and so forth, can be integrated. Lastly, a problem to be overcome is when travellers have forgotten to tap their cards on the checking-out pad and the maximum travel charges are then applied. This leads to unnecessary administrative costs for reimbursement.

E-ticketing may evolve in the future to be integrated into bank cards and smart phones. Users will not need to hold separate smart cards for public transport, and will not be charged before use; instead they will pay credit card or smart phone bills, which include ticketing costs. This bank account-based system offers several advantages. It enables the processing of information to be moved from the card-reader terminals to back-office computers with major cost savings. Travellers can be given refunds when there are problems with services and risks of overcharging are greatly reduced.

All sorts of marketing opportunities are also opened up, making discounts and other incentives available. The biggest benefit of all is that these cards will offer the possibility of universal payment systems compatible with systems in any city and country, where the banks agree to underwrite a minimum level of fraudulent use for travel, as they do for retailers accepting conventional bank cards. Some worries on security, including hacking issues, can be transferred from smart card operators to banks.

Network design

Network design is a fundamental aspect that needs to be carefully considered in making public transport seamless, particularly because public transport exhibits network economies. This means that costs per unit of service decline as loads increase. A careful network design that exploits network economies can help turn a 'vicious cycle' in public transport (where declining demand translates into worsening service) into a 'virtuous cycle' (where higher demand allows better, more seamless service).

For example, when adding one more bus on a particular link, the frequency of service rises for all passengers using the route, and waiting and transfer times decline. Similarly, adding stops reduces walking times, and using bigger buses saves on operating costs per passenger. Opportunities to reap network benefits

► **Technical reliability, simple fare structure are important to success**

► **Bank account-based ticketing enables universal payment system**

► **Careful network design can create a virtuous cycle in public transport system**

are often missed, perhaps because of a lack of focus on cost-effectiveness in the network design stage.

There are two kinds of approach for linking one place to another in a public transport network: hub-and-spoke and point-to-point. In the hub-and-spoke approach, passengers take subsidiary modes to reach a hub or high-speed terminal with frequent trunk line services, and then use subsidiary modes again to arrive at the final destination. In the case of the point-to-point approach, passengers can directly travel from a point of origin to a point of destination without transfer.

In general, passengers may be better off if they can travel without transfer, based on the point-to-point approach, but services may be less frequent unless there is enough demand. On the other hand, the hub-and-spoke approach can share trunk lines and provide frequent services between hubs. However, this is not always economically viable because it implies higher investment as well as operation costs and it cannot respond flexibly to changing demand. Further in-depth studies are needed to find out which approach is the more beneficial.

Public transport terminals also need to be carefully designed and operated. Survey evidence in Korea shows that the major impediments to the use of high-speed trains are poor access to stations and inconvenient transfers from trains to local transport modes. Better access to and from terminals as well as convenient transfer design and operation between modes can boost passenger use.

The accessibility of public transport terminals can be enhanced by developing the environment and services for all transport modes: walking, cycling, local buses and rental or private cars. In particular, bike- and car-sharing programmes can significantly improve access to public transport terminals. Integrating public transport terminal development with land-use plans can also contribute to improved accessibility. Agglomerations of economic and social activities such as working, shopping, eating, and leisure near terminals can considerably reduce the necessities of travel by private cars.

Good-practice access and transfer design and operation can be found in some Swiss cities, including Zurich, where routes and timetables of train and bus are coordinated with each other to provide convenient transfer services.

Institutional coordination

The importance of institutional coordination cannot be stressed too much when it comes to the seamless operation of public transport. The keys to success for smart card operation and network design rely on co-operation between stakeholders, and this can only be guaranteed through good institutional coordination.

To introduce a smart card scheme, public transport operators should agree on a fare collection system. In many cases, it has been shown to be beneficial to both passengers and operators to introduce such a scheme, but operators can have doubts about it, at least in the initial stages. They may not wish to share revenue data with other operators nor with governments. They may worry

► **Hub-and-spoke is not always a winner**

► **Accessibility to hubs can be improved by better design**

► **Success of e-ticketing and network design rely on good institutional coordination**

about loss of revenue due to mechanical errors in an electronic revenue-sharing system. Smart card operation cannot in itself guarantee more customers.

Experience in the Netherlands, Korea and the UK shows that a coordinating role for government is extremely important when introducing smart cards or e-ticketing systems. Initially, governments must convince the major operators, which account for a substantial market share, to participate in the new fare system. A strong political will or leadership can be important at this stage, and some government subsidies for installation of the new payment scheme, as well as for the purchase of smart cards, are essential in the course of the initial coordination. In the Netherlands, Netherland Railways was a leader among operators, and students were the first target group to use smart cards.

In later stages, a tendering system can be a good instrument to facilitate the introduction of the new payment scheme. It can also oblige operators to share relevant data on public goods. Furthermore, standardisation of smart cards is crucial to guarantee interoperability between different modes and operators. Then it can be applied over wider regions, possibly at national level, as was the case in the Netherlands. In this way, potentially all transport modes, including bus, metro, train and plane, may be used continuously nationwide, without separate ticketing for each mode.

Improved network design and operation can also be implemented by coordinating routes and timetables between modes and operators. It is not yet common for operators to voluntarily help each other to provide better service and increase revenues. But the role of coordination will become vital for the realisation of seamless public transport. This role may be under government responsibility or may be handed over to new or existing public authorities and organisations.

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▶ **Strong government is important for institutional coordination**

▶ **A tendering system can be a good instrument to coordinate interests of operators**