POLICY ISSUES IN IMPLEMENTING SMART CARDS IN URBAN PUBLIC TRANSIT SYSTEMS

Final Report – ESD.10 Introduction to Technology and Policy

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2 Executive Summary

Many public transportation institutions have been discarding their magnetic strip payment cards or traditional cash-based fee collection systems in favor of automated fare collection systems with smart card technology. Smart cards look like traditional credit cards or ID cards; however, using RFID technology, they allow for contactless payment and identification. Smart cards are becoming increasingly popular among transit agencies primarily because they are convenient for customers, reduce administrative costs for transit agencies, and have the potential of improving the performance of complex transit systems overall. The increased availability and affordability of contactless cards has also contributed to this trend in adoption.

This report examines six principal smart card transit systems of the world - those of Chicago, Hong Kong, London, Singapore, Tokyo, and Washington DC. Using these case studies, this report determines the principal benefits and concerns resulting from using smart cards for transit payment. The primary benefits were determined to be efficiencies for both the transit riders and transit authority. Therefore, this report also includes a formal discussion of the efficiency-equity, efficiency-security and efficiency-privacy tradeoffs which result from various implementations of smart cards in urban transit. The formal treatment of these tradeoffs differentiates this report from other similar studies. Using the knowledge gained from evaluating these tradeoffs, recommendations are given for the implementation and development of future smart card systems.

The benefits of introducing smart cards into a city’s transit system include:
- Increased punctuality of buses as boarding time is reduced.
- Reduced operational costs as the number of cash-based transactions is reduced and the printing of tickets is eliminated.
- Easy recording of transit usage data that can be used to improve the system.
- Easier implementation of complex fare structures.

The primary concerns of introducing smart cards into a city’s transit system include:
- Cost of substituting a traditional fare collection system with a smart card system.
- Selection of a smart technology standard that is compatible with other existing smart card and transit systems.
- Privacy of user information on personalized smart cards (both in terms of tracking an individual’s movements and gaining access to financial and identification data).
- Equitable access to smart cards and their benefits among different social groups such as low-income riders, tourists, and children. (For example, some smart cards require users to have a bank account or credit card.)
- Response to smart card system failures.

This report also takes a look at some of the major future trends associated with urban transit smart cards in Chapter 5. These trends include the expanding of the number of applications for each card, the consolidation of devices, and increased technical standardization along international, regional, and local levels.

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1 Hong 2006
2 Hendry 2001: 219
3 Hong 2006
4 Hendry 2001: 220
Finally, the following steps are recommended to ensure an effective, equitable, and secure implementation of smart cards in urban transportation.

- **Choose a technology standard that allows for integration with other smart card systems.**
  By choosing a standard system, these smart cards may also be used with other transportation, retail, and identification smart card systems, among others. Such an open and flexible system can more easily incorporate changes in future technology, respond to new demands from society, and meet future regulatory requirements. Furthermore, transit agencies may prefer to act as clients of another organization’s smart card system rather than being responsible for issuing the cards themselves.

- **Offer two types of cards – one with embedded personal identification data, and one without.**
  Two types of smart cards are recommended for each transit system - one with more features, but less privacy, than the other. This gives users the option to not link personal identification or financial information with their transit card.

- **Consider a distance-based fare structure.**
  Where possible, we recommend transit administrators consider the implementation of complex fare structures as a way to make ridership charges more equitable while at the same time increasing the agency’s revenue through price discrimination. If the characteristics of the city and its population are favorable for the implementation of such fare structure, we suggest distance-based fees be calculated according to the radial distance between the start and end of the trip, rather than on the distance traveled between the two locations. However, due to the specific transit routes available and socioeconomic distribution of people with respect to transit lines, some cities have found that flat fare structures remain more equitable.

- **Continue to respect different pricing structures for different social groups**
  Cities should continue to allow students, children, and seniors to obtain the same reduced fares as before the implementation of smart cards.

- **Provide financial incentives to encourage adoption**
  If trying to get a large number of riders to adopt a new smart card system early in its implementation, incentivize the switch by making it the cheapest option available.

- **Provide backup functionality in case of central system failure**
  If the smart card system fails, there should be some alternative way for riders to continue to pay for travel. Transit agencies need to consider the different options for providing backup functionality. Among these options is the continued acceptance of cash and/or magnetic strip cards, as well as equipping local computers to communicate with smart cards even if the central server is down.

- ** Routinely screen system for software failures**
  The system needs to be designed so that software checkups are routinely carried out to prevent over or under-charging of customers, and mishandling of personal data.

- **Provide parental controls in cases where smart card functionality expands**
**beyond transportation**
If smart cards can be used for the purchase of goods and services other than public transportation, such as food and retail, parental controls can prevent children from misusing their cards.