One Card Fits All:
Integrated Public Transport Fare System

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1. Policy Implementation Period

The integration of modal fares between public transportation means and services within public transportation means was initiated in 2004 as part of the series of reform of the public transportation system in Seoul.

2. Background Information

Seoul Traffic

The population of Seoul jumped from 2 million to approximately 10 million over a 30 year period from the 1960s to the 1980s. Based on the economic development plan initiated under the supervision of the government, the inflow of population to Seoul as the central area of economic activities was not unexpected within the flow of industrialization. Thus, the need for the construction of a subway system as a mass transportation facility that suited the demand for transportation and the expansion of population in Seoul was recognized. However, a subway system requires a long planning and installation period, and thus, it will take approximately 30 to 40 years to develop it into the main means of public transportation in Seoul.

In view of the progress of the mass transportation in Seoul, the surface car constructed in the early 20th century was the main means of transportation in modern Seoul, and although the line network expanded following the expansion of the city, the use of cars significantly increased since the 1950s. Buses allowing free commuting, which resulted in the natural declination of the

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surface car which was relatively difficult to install and expand. In 1968, the last surface car line was closed. The historical flow of transportation is in tune with large cities of many other countries, including the USA, with the only notable difference in the time period.

At the time that the surface car line was closed, the share of surface cars and buses out of public transportation was 50% respectively. Seoul began to grow in earnest during this era, and Seoul used buses as the main means of transportation to gradually construct roads from areas close to the down town. This illustrated a clear distinction from western metropolitan cities that formed urban districts surrounding railroads.

However, while going through the era of rapid urban growth, the increase in road facilities and road construction for the expansion of bus services caused a rise in the use of cars and consequently resulted in a lack of road. Furthermore, the continuous rise in personal income meant corresponding rise in the increased usage of cars, which led to the road congestion, reduced travel speed of buses. However, expanded road spaces, as a solution to the congestion and speed issue, failed to meet the ever rising demand for roads. Such vicious cycle repeated over and over again.

The increased usage of cars continued regardless of the construction and expansion of the subway since the early 1970s, and in the early 2000s, 72% of Seoul traffic was accounted by cars, with 79% of these cars being drive-alone cars. The shift in modal share signified an annual consumption of 4 trillion 100 billion won, and the social cost due to traffic congestion reached an annual cost of 5 trillion won.

Public Transportation in Seoul

The mode share of the subway increased relative to that of buses in the early 2000s, where the overall role of public transportation declined along with the sudden increase of personal car usage. Although this was not irrelevant to the institutional support of making the subway the main axis of transportation in Seoul, the decreasing level of road services caused by the excessive use of cars relatively reduced the service competitiveness of buses, which depend on roads, and this declination of the level of service produced an outflow of traffic users to other transportation means. This change resulted in the vicious cycle of the bus industry accelerating in terms of the deterioration of the bus service industry.

In 1997, the number of bus corporations in Seoul reduced from 103 to 57, and the remaining bus corporations operated within a structure of excessive competition toward profitable routes, the unilateral closing of low-profit routes, and the connection of the number of passengers to profit. With this structure, the bus corporations were left on a path of decreasing quality of service, such as head-running, violent driving, the rejection of elderly or disabled passengers, and violation of traffic signals.

The declining level of road service not only caused a reduction in driving speeds, but also poor quality of bus services in various forms. As a result, the modal share of buses displayed a continual decrease from 30.7% in 1996 to 26.7% in 2002. The reduced number of passengers led to poor management, which caused increase in fares, and a combination of poor service and

increased fares became sufficient causes for citizens to use buses less as a main means of transportation.

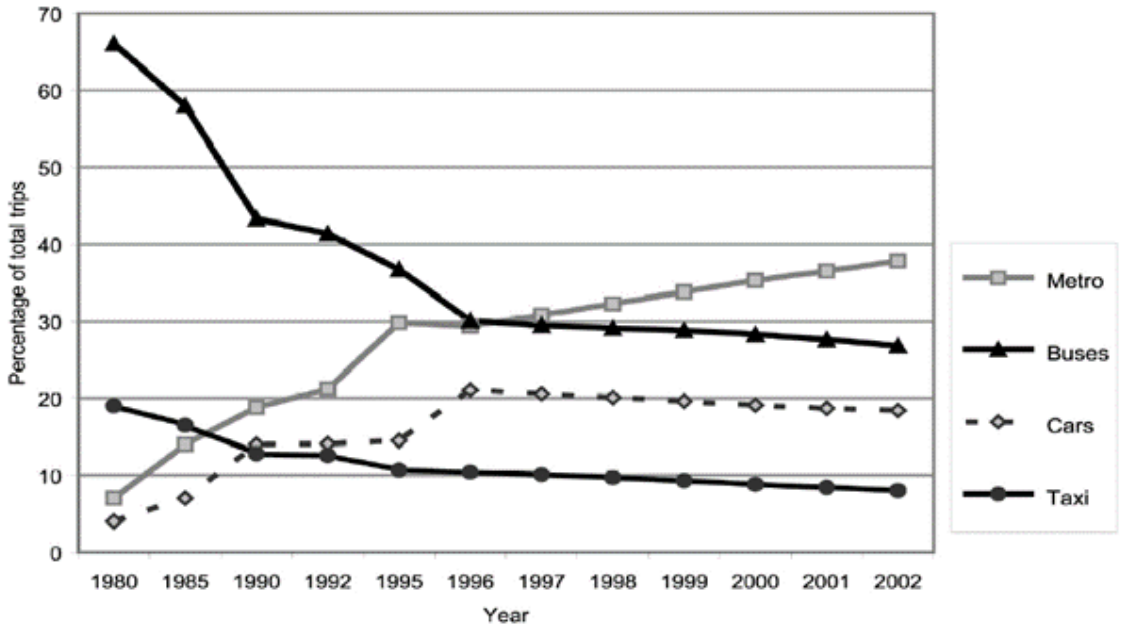


Fig. 1. 1980-2002 Progress of the Delegation of Public Transportation

Source: The Seoul Metropolitan Government 2004; Seoul Institute 2003

Reform of Public Transportation in Seoul City

As with most cities in the 21st century, Seoul has stated a goal of establishing a traffic system that achieves sustainable transportation by enhancing traffic mobility by relieving traffic congestion, and increasing individual accessibility so as not to leave any groups isolated socially or spatially. In addition, with the growth of civic awareness and their income, the demand for public services and expectations of administration has increased in the 2000s.

Seoul displayed relatively reasonable services and modal share compared to certain overseas cities, particularly in North America, where the citizens overly depend on personal cars. However, within the trend of the 21st century where the share of buses has increased as an environmentally friendly and sustainable method of transportation, the problem of traffic congestion caused by increased cars and the declination of the bus industry remains a task to be solved. Although the city has partially attempted several means of improvement related to the operation of buses, a noteworthy achievement has as of yet been reached. When a new mayor was elected in 2002, however, a public transportation reform plan for improved traffic within the city was conducted on an extensive scale.

The two main facets of this reform are as follows:

1) Contribution to the integrated public transportation network, which connects the subway with the bus system in order to improve competitive edge over car, and

2) Structural change. At the time, the bus industry was in the form of a privatized market. However, a so-called quasi-public bus operation system was established, wherein the city government intervenes within the operation and management, which is a portion that is deemed essential for the strategic goal of the integrated public transportation network.

The quasi-public bus operation system is considered an essential tool for achieving the integration of the bus-subway network. In other words, this was a logically reasonable determination to have buses supplement the subway, which was already the main public transportation means, rather than maintaining a competitive relationship. Furthermore, reorganization of bus routes was essential to plan a supplementary traffic service system. However, this was impossible when bus corporations remained completely private. Thus, there was a need to redirect the right of planning bus lines to the city.

Furthermore, in order to increase the competitiveness of public transportation over cars, it was necessary to connect buses and subways, which fundamentally have different characteristics and advantages, and to provide enhanced services at competitive prices. Thus, in order to truly integrate the services, the integration of fare was essential, and thus, it was necessary to return the right of determining the travel fares to the city.

The quasi-public system is focused on recovering the right of designing the bus lines and the right of determining the fare to the city, and also includes the preparation of a frame of amicable cooperation between private businesses and devices surrounding financial assistance from the city. It's only natural for bus corporations not to welcome the intervention of the city government with significant authority in the private market. To make the 'quasi-public operating system acceptable to the bus industry, subsidies from the government are essential. The median bus lanes, which became one of the most distinguished features of the public transportation system in Seoul, were a very successful product for reinforced competitive edge over cars. However, it is an element of policy that can be enforced without reform of the entire system. Although, since the extensive reform of public transportation was simultaneously enforced, there has been a great contribution of this reform on the increased effects of the policy.

Against this backdrop, the integrated fare system of public transportation was introduced, and in 2004, a determinate element was initiated within the great frame of initiative called the public transportation reform. Although the traffic card had been used since 1996, there were problems concerning fare including restrictions in the capacity of data processing, and excess charges (22.4 trillion won annually). Ultimately, therefore, the integrated fare between different means of public transportation (bus-subway) was not realized.

3. The Importance of the Policy

Public transportation largely contains two significances in regard to urban traffic. First, it provides accessibility to the citizens so as not to miss the opportunity of participating in the economic, social, educational, and leisure activities within the city due to a lack of transportation means. Second, it is an environmentally friendly means of transportation that generates less social costs around issues, such as traffic congestion, atmospheric contamination,

and traffic accidents, compared to private transportation means.

These two aspects are closely connected. In cities where public transportation is not properly developed, its residents naturally depend on personal transportation means, such as going on foot, bicycles, and cars. When a city physically expands, and the role of environmentally friendly transportation means (such as going on foot or bicycles) is reduced, and cars are not financially viable, motorcycles and other small vehicles are gradually depended upon, which rapidly increase social costs for issues such as traffic congestion, atmospheric contamination, noise pollution, and traffic accidents. Once the public tend to prefer private transport, it gets extremely hard to make them prefer the public transportation. In cities relying on the motorcycles due to economic pinch, a huge population will naturally prefer private cars once their income level raises based on the economic growth.

The city of Los Angeles, where most citizens commute on personal transportation means including cars invested a large sum in public transportation means, such as subway and rail transit, in order to reduce the proportion of personal transport in the 1990s. However, the awareness and attitude of the citizens toward traffic and the urban spatial structure had already settled around cars. Thus, a great change could not be achieved in the modal share of transportation, and other North American cities, as well as cities in Australia and Europe also had similar experiences.

Personal transportation means provide remarkable flexibility demanded in complex spatial structures of the modern city. Also, in most of the times, the important advantage of speed efficiency allows drivers to reach their destinations in less time. Some cities' experience of belated investment into public transportation suggest once the public gets accustomed to the use of personal cars, it's extremely difficult to make them use the public transportation due to such benefits.

With this trend, some cities have succeeded in raising the modal split to some extent while reducing the dependency on cars. The cities are similar in that they have made extraordinary efforts to enhance competitive edge of public transportation over cars rather than merely supplying public transportation services.

Furthermore, there are many cases that have targeted the goal of integrated services between buses, bus-subways, and public transportation-personal transportation means.

With respect to integration between transportation means, there are four aspects of information integration, service integration, fare integration, and physical integration. Among which, cities (including London, Paris, Hong Kong, and Seoul) that have achieved the integration of fares using smart cards, all displayed an increase in the number of passengers of public transportation.

There have been many studies on the reason as to why passengers choose public transportation when they are asked to make two choices between public transportation and personal transportation. The most common and notable reasons were the relatively long commute times and the transfer penalties incurred. The latter, specifically, includes the psychological cost in addition to the quantitative index of time - such as increased fares due to transfer from the obtained information of transfer fares, the time consumed to pay the fare, the time and effort for purchasing the ticket, and preparing the exact cash for the fare, which forms the recognition that 'the use of public transportation is inconvenient'.

The Seoul Metropolitan Government's reform of public transportation in 2004 was focused on enhancing the competitiveness of public transportation with the minimization of this transfer penalty, and accordingly, the integration of bus services and the integration of different transportation means (bus-subway) were included as the most important aspect of this reform.

To enhance public transportation facilities, we may consider increasing network density by constructing additional subway lines. However, unlike the cities in the early 20th century, which had a linear structure with the growth of the railway era, the official growth and expansion of the road and car era were achieved, and a spatial structure was gradually formed. Thus, the construction of a system that depends only on the single means of the subway operated on a fixed track is not an efficient public transportation plan in Seoul. This particular system is applied to the least-developed industrial cities that grow based on tire-based traffic network without having a railway-based linear structure.

Furthermore, it takes at least 10 years to construct one subway line, and at a cost of 130 billion won for 1km of track. Thus, supplying the accessibility of public transportation to all residents with a dependence on the subway does not demonstrate realistic financial feasibility.

It is evaluated that integrated fares of public transportation was an extremely perceptive institutional choice in that the quality of public transportation was enhanced to have 'competitiveness in comparison to cars' through the use of existing facilities and services without resource-concentrated investment, such as with the subway. This has had a great implication on the cities of other countries displaying rapid growth within the era of cars and roads after the late 20th century in a similar manner to Korea.

4. Relevance with Other Policies

According to the general principle of the integration of transportation, the integrated fare is one of four aspects of integrating public transportation. All four aspects were initiated upon reform of the public transportation system in Seoul. The four aspects of unifying public transportation are as follows:

- Service integration
- Fare integration
- Information integration
- Physical integration (transfer centers)

The integrated fare system is closely related to the other three integration aspects.

Among which service integration was formed between bus-subway systems, bus-bus systems, and different types of bus systems, and mainly emphasizes the technical and planning aspects. The roads were divided into feeder lines covering short roads within the region and trunk routes covering mid-to-long distances between regions to dualize the function of buses. They were further categorized and bus lines were systematized to four categories of inter-regional, trunk,

feeder, and circular routes based on their function. Furthermore, the colors of the categories were varied to distinguish the types more easily. The inter-regional and trunk routes were formed in linear roads and reduced, to decrease overlapping lines, thereby focusing on enhancing the efficiency of operation, and the formation of the feeder and circular lines were focused on enhancing accessibility and transfer with the inter-regional line.

As a policy for physical integration, transfer centers were installed to assist with convenient transfers between buses and between buses and the subway, at main regions including Cheongryang-ri. Policies that represent information integration include the Seoul Metropolitan Government's TOPIS (traffic management center), BMS (bus management system or bus control room), and BIS (bus information system). The Seoul Metropolitan Government constructed a real-time integrated information system for bus operators and users upon reforming the public transportation system, and combined all traffic-related information to establish a traffic management center that monitors all transportation information. Among which, the BIS policy is covered as an element of this policy package under the title of 'consumer-focused traffic information'.

Public transportation fare integration, specifically, the entire payment system for payment, collection, and distribution, was digitized, which allowed the collection of real-time bus operation data, one of the most important sub-effects. Bus users touch the terminal once upon boarding the bus and once again upon departing the bus for correct calculation and payment of the fare. This has resulted in the accurate and uniform recording of data related to bus usage patterns that had not been expected previously. With the use of the accurate and detailed data on transportation usage behavior, the accurate demand for each route, region, and time was then more fully-understood, and information on the traffic flow at each time period was apprehended, in order for bus corporations to form demand-focused scheduling in response to the demands. Furthermore, the efficiency of route operation increased in order to enhance profitability. Since such data is already digitized, it is possible to perform data mining and profit optimized modeling (profit maximization model based on the wait time and other constraints). That is, the smart card constructed in order to achieve integrated modal fare is able to greatly contribute to providing direct feedback and increasing the efficiency of bus operations through the collection and the use of big data.

5. Policy Objectives

The goals of fare integration using the smart card can largely be divided into four aspects:

1) Contribution to the minimization of transfer penalties

- Reduction of transfer time by allowing integrated payment of the fare regardless of transferring, by integrating the fare between bus-bus and bus-subway.
- Reduction of transfer time by digitizing the payment and collection of fares.

2) Increased usage of buses by enhancing the efficiency of transferring

3) Reducing traffic congestion caused by the improved modal split

4) Encouraging safe driving by removing the incentive of optimizing the number of passengers as in the past distance-based fare system

6. Main Policy Contents

1) Introduction of the distance-based fare system and reallocating the right of determining the fare to the city

In the past, where a passenger used more than one form of public transportation service (*i.e.*, bus-subway on two or more bus lines, or subway and bus on two lines, and other various combinations), the passenger had to pay the fare of each public transportation service, and the fare was fixed regardless of the travelled distance. Thus, the passenger had to pay the entire fare for traveling one station, whereas with the integrated fare system, the total fare is calculated proportionate to the travelled distance irrelevant of the number or transportation modes used. That is, transfer between transportation means is free, and the passenger is only required to pay the fare for the distance travelled on public transportation. As shown in Fig. 1 below, compared to the formula that was applied to past calculations of individual fares for traveling the same distance, the new system is devised to calculate less fare, and so to decrease the average public transportation fare by 30%.

Fare imposition method Bus Subway	Before enforcement	After enforcement
5km (bus) + 4km (bus)	900 + 900 = 1,800 won	900 won (basic fare for distance less than 10km)
5km (bus) + 7km (subway)	900 + 900 = 1,800 won	Basic fare + 100won (additional fare for 10km-15km) = 1,000won
6km (bus) + 8km (subway) + 4km (bus)	900 + 900 + 900 = 2,700 won	Basic fare + 200won (additional fare for 10km-20km) = 1,100won

Fig. 2. Comparison of fares before and after enforcing the public transportation unity fare system

Source: Ko, J. H. (2015)

2) Joint transportation agreement on the joint management of profits between bus operation corporations.

Unlike the individual operation of bus lines and management of profits by each transportation

corporation under the former privatized operation system, the operation of buses and the management of profits therefrom were separated under the integrated fare system. To achieve this, the Seoul Metropolitan Government and the Bus Operation Business Cooperative concluded an agreement for the joint management of profits on February 4, 2004. At the time, the Bus Operation Cooperative comprising 68 members, and the city jointly managed the profit. This agreement includes terms on the guarantee of a set profit based on the standard transportation prime cost, a reasonable reward on surplus vehicles based on the reform of the bus operation system, amendment of the ordinance for financial support for loss, enforcement of the bidding system on the 10 main routes, and the guarantee of the existing business license of the 57 bus corporations.

3) Establishment of the transportation card company to construct the smart card system, so as to realize integrated fares between transportation means

First, it was decided that the policy would be initiated in the form of a joint investment by the city and a private corporation, where the corporation was selected through a public competitive bidding. As a result, LG CNS Consortium was selected as the company to be transferred 35% of the shares from the Seoul Metropolitan Government at no cost.

On October 6, 2003, a corporate body, Korea Smart Card Co., Ltd. was jointly established by the Seoul Metropolitan Government and LG CNS Consortium to commence the development of the traffic card and the traffic card terminals.

Thereafter, Korea Smart Card Co., Ltd. came to perform the role of the profit calculation and management center, where all profit was collected so as to compare the total profits and transportation costs of all bus corporations' profitability of bus routes, and support any losses. Any surplus was also collected.

4) The Seoul Metropolitan Government implemented a route plan by supplying subsidies and managing the profits.

5) Bus operation consulting bodies

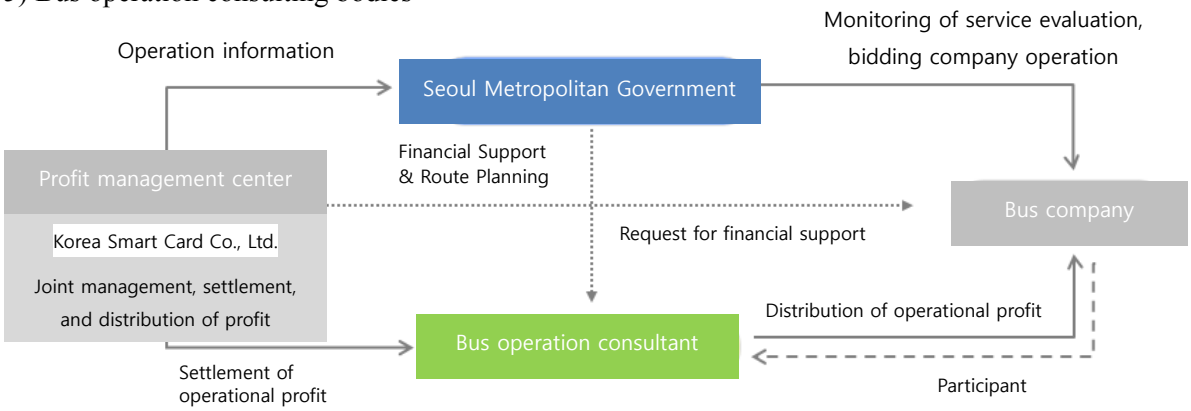


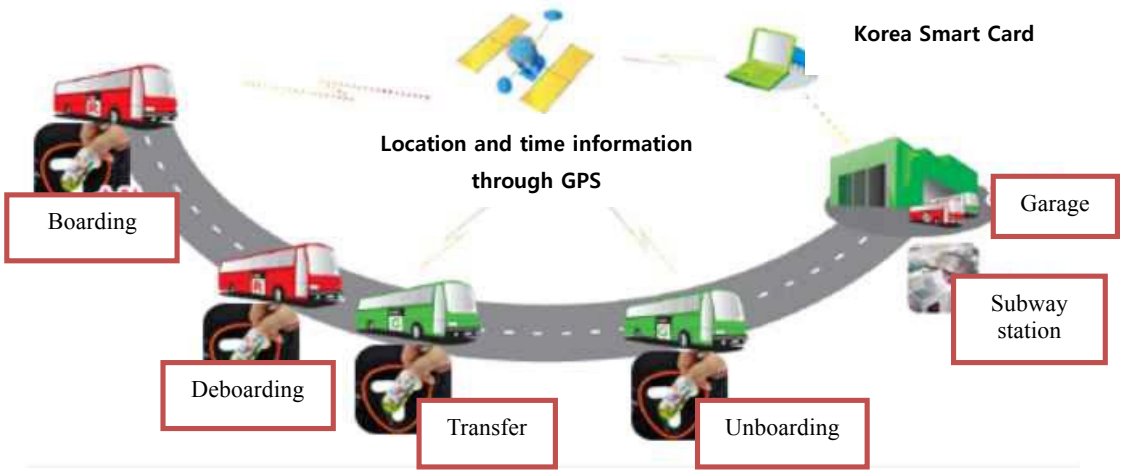
Fig. 3. Construction of a cooperative system required for the integrated fare of public transportation

Source: Ko, J. H. (2015)

7. Technical Details – T-money

The T-money card is used to pay transportation fare. When a t-money card embedded with a smart chip is brought into contact with a terminal (card reader), the terminal immediately receives the locational information from a satellite. Through radio frequency (RF) communication with the card reader, information is received and sent, such as the location of boarding and whether any transfers were made, thereby completing payment of the fare.

Furthermore, when the bus approaches a certain distance of the garage, the payment statements are wirelessly transmitted to a bus aggregation system by a wireless access point (AP) and an aggregation PC. For subways, the payment statements are stored within the card reader. All statements are transferred to and managed by the calculation system at Korea Smart Card, Co., Ltd. for the calculation of fares.



* Boarding: The location and time information is received through GSP to be stored with the fare information on the terminal(card reader)

* Deboarding: The location and time of deboarding is stored on the card reader, and the time of deboarding is recorded on the card.

* Transfer: The deboarding time recorded on the card is reviewed to apply a discounted fare for transfers made within 30 minutes.

* Subway station: The operation information and boarding/deboarding information are collected from the subway station terminal and transmitted to the aggregation PC.

* Garage: The operation information and boarding/deboarding information are transmitted from the bus card reader to the aggregation PC.

Meanwhile, the statements of the T-money card used in various places are collected at the calculation center of Korea Smart Card Co., Ltd. from each transportation organization and distributor, which is then calculated each day to generate and provide the current profits and

other additional information categorized into each vehicle, route, company, and location of payment.

The T-money card is Korea's first non-contact smart transportation card realized in accordance with the international standard (ISO 14443), having the specifications of central processing unit (CPU) and memory within the card, operation system, and communication module. Within the card, an RF chip and an RF antenna are embedded for close range radio frequency (RF) with the card reader. Accordingly, when the card is charged, the amount is stored on the RF chip, and the RF chip makes the payment of the fare via communication with the card reader through the RF antenna. When the RF chip or RF antenna are damaged, communication becomes impossible, and the card can no longer be used.

T-money is largely divided into prepaid and post-payment forms. The prepaid form allows the user to charge a certain amount using cash or a credit card, and when the charged amount is used, the card is additionally charged. Meanwhile, the post-payment form involves embedding a traffic card chip on an existing credit card, which adds the payment function of transportation fares. The amount used for a month is paid at the end of the month in a lump sum.

Table 1. Currently available products

Type of Card	Basic Function
Basic Card (market/special)	- Prepaid standard/student/children card - Various forms (standard card, mini card, accessory)
Internet T-money	- Can be charged/paid on the internet by connecting the device to a PC through an USB connector
Mobile T-money	- Financial USIM allowing the use of t-money is embedded into a mobile phone - Standard charging, mobile charging, automatic charging - Internet payment, mobile payment - Issuing organizations: SKT, KT, LG Telecom
Corporate Taxi Card	- Taxi payment card for the purpose of business - Operated as an affiliated form with corporations
Automatically charging T-money card	- When the charged amount falls below a certain amount, a set amount is automatically charged at the next use of a card reader. The card is automatically charged within the set maximum monthly chargeable amount. Issued by affiliate financial organizations (Shinhan Bank, Post Office, Nonghyup, Foreign Exchange Bank)
Corporate Taxi T-money	- Card exclusively for taxi payments for the purpose of business - Operated under affiliation with a corporation
Disposal Traffic Card	- Card allowing use of the subway one time
Free Pass T-money Card	- Replaces the former free MS pass (free subway, paid bus ride) - For veterans, disabled, elderly passengers - Issued by The Seoul Metropolitan Government/Incheon City

Seoul Metropolitan Government Pass Plus	- Joint use of the standard card infrastructure - Discounted fare on the Seoul Metropolitan Government tour bus - Discounted payment of the main tourism landmarks in Seoul
Affiliate Prepaid Card	- T-money function added to affiliate cards
Affiliate Post-payment Card	- Post-paid t-money function embedded to a card - Issued by affiliate credit card companies
Subway Regular Pass	- 60 rides within a month. Cards are divided into Seoul line cards and distance proportionate cards - Purchase/charging/refunds can be made at each subway station
Traffic Exclusive Card	- Only allows traffic payments
Public Transportation Security Card	- Card that secures the remaining amount upon misplacement or theft of card

The T-money card could be used throughout the country. Traffic cards of a region had previously been limited to the region, but the traffic cards have become compatible in 60 cities throughout the country.

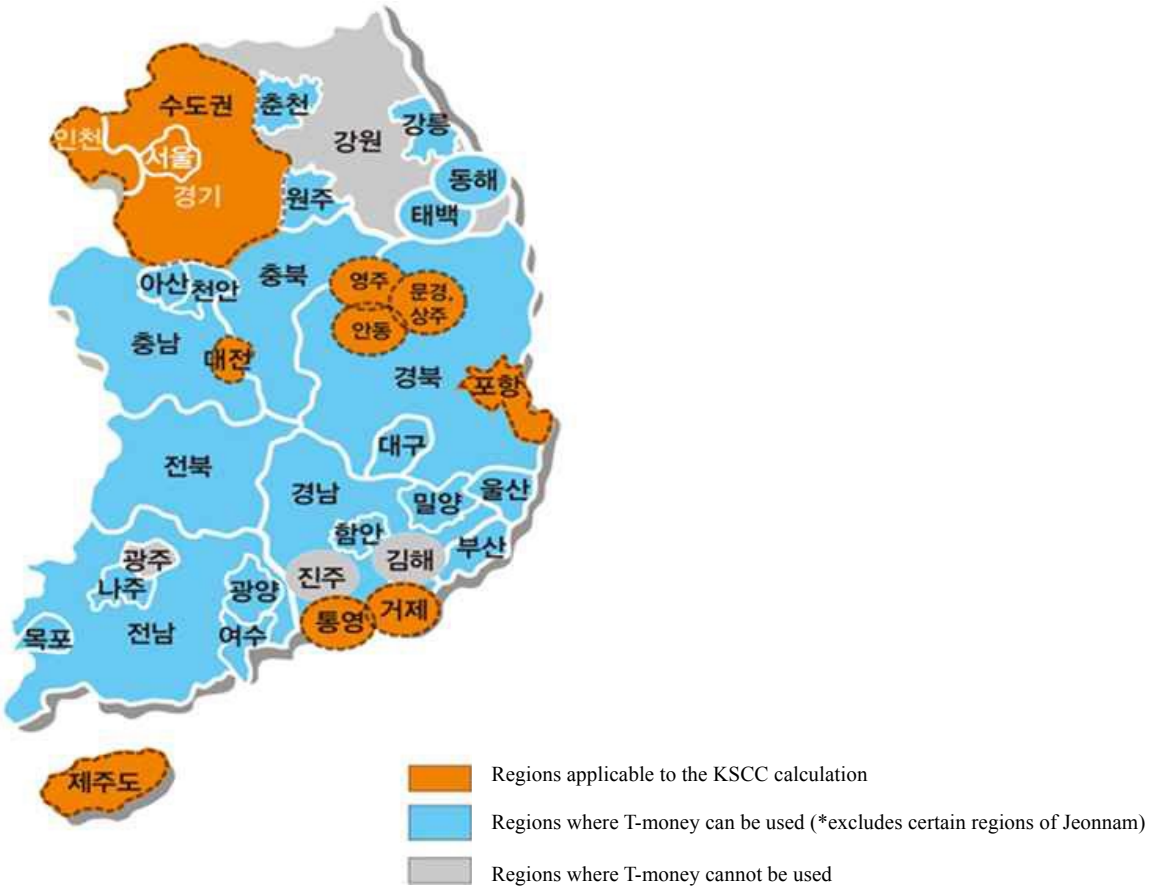


Figure 4. Regions where T-money could be used

The T-money card can be used to make payments for various services other than payment and calculation of the transit fare.

First, there are various charging services. Cash charges can be made at T-money distributing convenience stores, street stalls, unmanned subway charging stations, and bank ATMs in the amount of 1,000 won units, from 1,000 won to 90,000 won each time (up to 50,000 won at GS25, CU, and Seven Eleven convenience stores). The maximum amount that can be charged is 500,000 won. The mileage can also be used to charge the card when there are more than 1,000 points of T-mileage. The card can be charged using mileage in 1,000 point units at Seoul Metro (Lines 1 to 4) station offices and Metropolitan Rapid Transit (Lines 5 to 8) I-center and NICE cash dispensers, bank ATMs, and mobile environments using the T-money application. When the cash balance runs out below a certain amount, T-money could be automatically charged a certain amount of moneh with credit card you registered before. If you use mobile T-money, it could be chargedwith mobile cash payments, internet banking, and the credit card payments. Meanwhile, the card can also be used on the internet charging terminal T.P.O.P or through a USB internet card.

Second, there are payment services which utilize the T-money card. Based on the compatible use between traffic cards, the T-money card can also be used in public transportation means and taxis in 60 cities around the country. In other words, T-money could be used for the subway, bus, taxi and distribution payment service. Particularly through the distribution payment service, payments can be made using the T-money card at 60,000 distributors around the world at affiliate convenience stores, large supermarkets, and various franchise stores, public parking lots and unmanned devices.

Meanwhile, refund services are also provided, wherein the remaining balance on a damaged or misplaced card, or a usable card is refunded. Specifically, with respect to refunding the remaining amount on a usable card, when the remaining amount is less than 20,000 won, the amount can be refunded at a T-money affiliate convenience store. When the remaining amount is less than 50,000 won, the balance can be refunded at a subway customer service center. In order to receive a refund of more than 50,000 won, a bank account refund must be applied at a bank ATM, and in such case, the amount excluding a commission of 500 won is refunded. When the remaining amount of a damaged card cannot be checked on a terminal, a refund cannot be made at the terminal. In such cases, the user can request a refund by submitting the card and an envelope with a return address. The remaining amount on the card is checked using the card number, and the remaining amount is refunded into the customer's bank account. Furthermore, if the damaged cards were purchased in 2 years, a refund could be made on the remaining amount as well as the cost of any damaged cards .

All payments made with the T-money card are subject to the same income tax deductions of credit cards by registering the T-money card as an income tax deductible card on the T-money website or smart phone t-money application. All payments made with cards registered for the income tax deduction service are added up to be reported with the National Tax Service once a year. In the case of wage earners, income tax deduction is applied to 25% of payments made with the T-money card, which exceeds 25% of the total wage, along with the usage of credit

cards and debit cards during the year-end tax adjustment. Also, payments made with a popular card are calculated with the amount of cash receipt.

Any points gained by using public transportation or converting points saved at affiliate distributors with T-money into mileage are known as T-mileage. The mileage can also be used as cash by charging the card. After registering the T-money card as a mileage card on the T-money website or smart phone T-money application, points equating to 0.2% of the payment are saved bimonthly when using public transportation. The points obtained from the 1st to the 15th of every month are accumulated on the 1st of the following month, and the points obtained from the 16th to the last day of every month are accumulated on the 16th of the following month. Furthermore, any affiliate points of a T-money website member can be converted into T-mileage, which may impose a fee upon conversion based on the affiliate's policy. The mileage can be used at minimum 1,000 point units, and can be charged after registering pin number at the T-money website. T-mileage can be given to other users registered in the mileage service, which may impose a fee. There is also a public benefit program that donates the mileage to underprivileged youth or children of the deceased from car accidents, where the donated T-mileage is converted to cash, and donated to the Beautiful Foundation each quarter.

Meanwhile, the remainder transfer service is also provided, which refunds all remaining balance in, for instance, card "A" to charge card "B". This service is in a form that can charge a specific card without paying an additional fee. This service can be used at Seoul Metro (Lines 1 to 4) station offices, Metropolitan Rapid Transit (Lines 5 to 8) I-Center, GS25 and Korea Smart Card Co., Ltd. headquarters.

There is also a service that registers changes on a non-divisional card that is categorized as neither standard, nor student, nor children card. If a non-divisional card has been charged into student or children's card, the card must be registered on the T-money website to receive student or children discounts. This service can be used at Seoul Metro (Lines 1 to 4) station offices, Metropolitan Rapid Transit (Lines 5 to 8) I-Center, T-money affiliate convenience stores or the Korea Smart Card Co., Ltd. headquarters.

8. Policy Effects

The Integrated modal fare system can be summarized as the having achieved the following five effects:

1) Reduced public transportation costs for users

2) Increased efficiency in operation due to reduced times in the payment of bus fares

3) Enhanced connectivity between public transportation means

4) Increased number of public transportation users

5) Increased user satisfaction of public transportation services

Since the integrated modal fare system has been promoted along with other policies such as bus routes integration and the exclusive median bus lanes in the large context of the public transportation reform, it is difficult to single out the effects of the integrated fare system from overall improvements. Given the difficulties, we need to consider the following quantitative indices represent the comprehensive effects of the public transportation reform.

- Jan to May, 2005 increased bus passengers: 1,000,000 per day
- Jan to Mar 2005 bus-related accidents: reduction from 669 to 468
- Jan to Mar 2005 bus-related injuries: reduction from 993 to 694Dec 2004 travel speed of bus on main roads: increased by 33-50% (direct effect of the median bus lanes system)

Table 2. Bus accidents by year (December 2015)

	2009	2010	2011	2012	2013	2014	2015
Accidents	1,119	1,080	1,030	983	1,090	877	709
Injured	1,527	1,581	1,452	1,419	1,624	1,197	992
Deaths	26	17	12	21	13	19	13

Source: Koroad, Korea Transportation Safety Authority

9. Main Challenges and Solutions

1) Objections of Seoul bus corporations

The integrated modal fare in Seoul faced extreme objections from related parties as a policy that was enforced within a large context of the public transportation reform – including the change in the ownership of bus operation corporations and the operation system.

Seoul bus corporations presented opposing positions saying the reformviolated private property rights. Bus drivers also voiced strong opposition to the construction and effect of the median bus lanes, which were a main element of the reform. These parties expressed their opposition and resistance using various methods, such as filing petitions, appearing in media, appointment of lawyers, spreading propaganda, and protesting. The regional residents, local districts, and the National Policy Agency also expressed their objections based on the effects of the median bus lanes and changes in the bus usage pattern.

Thus, the Seoul Metropolitan Government held overnight workshops by gathering Seoul Institute (‘Seoul Development Institute’ at the time) members, representatives of bus corporations and the bus cooperatives, to persuade, mediate, and finally to build consensus. Ultimately, an agreement was concluded on February 4, 2004 between the Seoul Metropolitan Government and the Bus Transportation Business Cooperative for the joint management of

profits.

2) Conflict with public transportation corporations of other metropolitan cities

The residential zone of Seoul is a broad concept that covers the city of Incheon, Gyeonggi-do and their adjacent cities. Thus, the integrated modal fare of Seoul in its true sense needed to include the buses and railway of these cities. Furthermore, the railway service in Seoul is supplied by many corporations, including Seoul Metro, Metropolitan Rapid Transit, and Korea Railroad Corporation. Accordingly, the Seoul integrated modal fare required the consent of multiple organizations, including The Seoul Metropolitan Government bus companies, Seoul Metro, Metropolitan Rapid Transit, Korea Railroad Corporation, Incheon City bus organisations, Gyeonggi-do bus organisations, and the Incheon Subway Corporation.

In order to enforce the integrated modal fare system, there was a need for an increase in the standard fare. According to the principle of the public transportation economy, increased fare signifiies reduced demand. The Korea Railroad Corporation initially expressed objections toward the integrated fare for this reason. In contrast, the Incheon Subway Corporation indicated that the fare for long-distance passengers will increase, if the fare system is changed to a distance-based fare system. Ultimately, through persistent persuasion and negotiations, the Seoul Metropolitan Government was able to obtain the consent of the Korea Railroad Corporation and the Incheon Subway Corporation. However, the consent of Gyeonggi Bus and Incheon Bus was achieved under the condition of enforcing the integrated fare in phases. It was negotiated that the Seoul Metropolitan Government would apply the integrated fare only within the Seoul area in July 2004, which would later be expanded to the Gyeonggi-do region in July 2007, and then to the Incheon region in 2009.

3) Legal Issues

Bus corporations initially objected to the integrated fare system. However, through the process of persuasion and mediation, the bus corporations ultimately consented. The most persuasive advantage was that a reasonable profit was guaranteed to allow stable operation regardless of the number of passengers, through the joint management of profit under the new system. The guarantee of reasonable profit was possible only through the city's subsidies. However, at the time, the 'Passenger Transport Service Act' regulated that public financial support could only be provided to the operation of unprofitable lines. The Seoul Metropolitan Government requested a legal amendment from the central government, and the central government expressed a view that it would be difficult to reflect the specificity of the Seoul Metropolitan Government to national law. Under the integrated modal fare system, through persistent persuasion and discussion, the SMG could offer subsidies to bus corporations regardless of profitability of the bus routes by adding 'where the bus transportation system is improved to activate public transportation' to the scope of financial support within the 'Passenger Transport Service Act.'
The joint management of profits was necessary to implement integrated modal fare system. Furthermore, the standardization of the fare was also an essential prerequisite for the joint management system which distributes profit according to individual performance and operation expenses. At the time, it was determined that the standard prime cost would be decided through

discussions between the Seoul Metropolitan Government and the bus cooperatives after calculating prime cost. However, there were difficulties in negotiating such cost. Thus, the third party of the subcommittee of the Bus Reform Citizen Committee ultimately determined the standard transportation prime cost. The Citizen Committee for Bus Reform (CCBR) was formed on August 26, 2003 for fear that opportunity to improve transportation system could disappear faced with severe opposition from the relevant stakeholder groups. Committee comprised 4 people from civic groups, 8 scholars or professionals, 3 from bus-related corporations, and 5 representatives of the provincial assembly and related organizations.