The Smart Transportation Card (T-Money): Integrating Public Transit Systems to Improve Citizen Mobility in Seoul, 1996–2004

Executive Summary

In the 1990s, Seoul suffered from transportation problems such as traffic congestion, poor bus services, and uncoordinated transit systems. To address those issues, newly elected mayor Myung Bak Lee launched a large-scale public transportation reform program in 2004. The reforms included a new smart card run by a public-private partnership, a quasi-public transit management system, and a set of integrated distance-based fares. To manage conflicts among stakeholders such as bus and railway companies, government agencies, and civil society groups, reformers created a citizens committee that represented all parties.

Seoul’s transportation reforms benefited both passengers and carriers. Bus and transit ridership increased, citizens reported higher levels of service and satisfaction, and bankruptcies plus unsafe and unethical practices among bus companies declined. Seoul became a global model of “Mobility as a Service,” thus improving citizen mobility by integrating city transport services. As an unexpected benefit, the system generated transport data useful for addressing other urban issues such as crime and tracking COVID-19 cases during the 2020 pandemic.

Introduction

“Seoul had miserable traffic problems back in the 1990s,” said Gyeng Chul Kim, who was the director general of the Transport Reform Department in the
Seoul Metropolitan Government in 2002. "Automobiles occupied most of the road spaces, and the sky was full of smog. Cars were moving so slowly in rush hour that walking was faster than driving" (Kim 2020).  

In 2004, Seoul—the capital and economic center of the Republic of Korea—was one of the world’s most populous metro areas, with more than 10 million residents in an area of 605.4 square kilometers (234 square miles) (SMG 2017). The city suffered from automobile dependence, urban pollution, and traffic congestion. After decades of rapid population growth, roads became increasingly crowded. The Seoul government began to expand subway service in the 1970s to encourage public transit, but car usage continued to increase and accounted for 72 percent of Seoul traffic by the early 2000s (Lee and Hur 2017).  

Seoul also had a complex and sprawling transit system. Unlike other Korean cities, Seoul had two corporations operating its public railways: the Seoul Metro and the Seoul Metropolitan Rapid Transit Corporation (Ministry of Land and KOTI 2013). By providing rail service, the Seoul government cooperated with the local governments of neighboring province, Gyeonggi, and the city, Incheon, to increase connectivity and share financial resources from the central government (Kim 2020; Song 2020).  

Poorly managed, privately owned bus networks made Seoul’s traffic problems worse. The bus companies’ low service quality led to a vicious cycle of decreasing usage that reduced revenue and bankrupted many bus companies. After the number of bus operators in Seoul reduced from 103 to 57 in 1997 (Lee and Hur 2017), the remaining bus companies struggled to stay afloat, which further worsened service quality (Kim 2019). Issues in the bus system included unsanitary facilities, systematic corruption in fare collection such as under-reporting of cash revenue, unreasonable fare hikes, reckless driving, and frequent accidents (Kim 2020; Song 2020).  

Bus companies competed and lobbied for access to lucrative “golden routes” in the central city while neglecting outer areas, which overcentralized the network and cut intermodal connections. For example, dozens of buses went to the transportation hub of Chyungyang-ri station, but very few buses served the outskirts of Seoul (Song 2020). As a result, the modal share of buses continued to decrease from 30.7 percent in 1996 to 26.7 percent in 2002, worsening traffic congestion and depriving many outer-area residents of bus service (See figure 1 [Lee and Hur 2017].)  

The Seoul transit system needed an innovative solution to improve subway and bus ticket systems. Since the introduction of the first paper bus ticket in 1954, Korea’s transport ticket had evolved from pre-printed tickets, to tokens, to magnetic tickets. Those conventional tickets were costly, inefficient, and prone to fraud. Because the tickets were valid for only a single trip, passengers had to purchase another ticket to transfer. Tickets were purchased with cash, and it was hard for Seoul or transport operators to track and monitor them.  

In 1995, Transportation Policy Division officials were researching transport cards in use worldwide to find ways to improve payment and to simplify bus management. Division director Ta Young Jae and official Doo Suk Song saw a new “smart card” system in a French transport magazine and wanted to investigate the feasibility of adopting the technology in Seoul. The two officials and three other team members went to a conference of the International Association of Public Transport in Paris, where they saw a demonstration of a new technology known as the “electronic wallet” at the booth of the Autonomous Parisian Transportation Administration.  

1 Author’s interview with Gyeng Chul Kim, June 14, 2020.  
2 Gyeonggi is the satellite province surrounding Seoul. Incheon is the country’s third-largest city and is on the province’s coast. Both the province and Incheon are connected to Seoul by bus and subway services. As of 2011, Seoul’s railway was linked to 12 railways, thus connecting Seoul to various regions in the capital area.  
3 Author’s interview with Doo Suk Song, July 2, 2020. Author interview with Gyeng Chul Kim, June 14, 2020.  
4 Author’s interview with Doo Suk Song, July 2, 2020.  
5 The original name of the International Associate of Public Transport (UITP) is the Union Internationale des Transports Publics. Learn more about the association at https://www.uitp.org/.
The team also met with an Austrian company that had patented a technology that combined a credit card with a transportation card. Seeing the new technologies, the team met the head of a Korean tech company at the conference and discussed the feasibility of developing a transportation card for Seoul’s bus system. Song said, “I was confident that this technology can bring a new system for [a] future transportation card in our city” (Song 2020).

After members of the team researched and developed the technology in Korea, Jae led them to implement the system into bus lines in Seoul. The transportation card was first introduced in 1996, and it significantly improved the transparency of the bus revenue management (Jae 2020). However, it also had limited data capacity, expensive maintenance costs, and incompatibility with other transportation systems. The pilot effort laid the foundation for the Seoul government’s Transportation Policy Division to continue developing the card technology.

In 2002, newly elected mayor Myung Bak Lee began to plan a massive public transit reform program. Citizens and civil society organizations including the Green Transport Movement had requested better transportation services, and the Green Transport Movement had published a study showing that citizen satisfaction with the system scored only 42.78 out of 100 (City of Seoul 2006). Seven major civil organizations publicly expressed frustration with continuous delays of transit reform. According to Sam Jin Lim, the previous secretary general of the Green Transport Movement, the organizations were very disappointed that policy makers were giving up on a reform first developed in 1996 (Lim 2020).

With support from civil society, the reform included two major interventions: (a) the introduction of a quasi-public bus operation system and (b) an efficient, transparent, and integrated smart card payment system. The practitioners believed the change would strengthen the public service functions of the buses. The new system featured a joint management scheme for routes, revenues, and vehicles. For the joint management of revenues, the Seoul government pooled all fare revenues from buses and allocated them depending on operational performance (Ministry of Land and KOTI 2013).

The smart card system was the core technology operating the joint management of revenue because it collected essential data to calculate the fare. The practitioners also introduced a distance-based fare scheme that resolved the issue of excessive payment when using a combination of ride types such as bus and subway. With the smart card, passengers could transfer freely between bus and subway with fares based on the total distance traveled. This change was especially beneficial for underserved residents such as those who lived far from railway stations or had low incomes (Ministry of Land and KOTI 2013).

The interventions were designed to enhance citizens’ convenience, to improve the management system, and to make the bus and subway systems compatible with each other. However, policy leaders knew the reforms could be socially and economically disruptive (Song 2020). Right after the reform was announced, bus company personnel staged a public demonstration and protest in front of the city hall. They also filed complaints to the central government through the National Assembly, the Ministry of Construction and Transportation, and the presidency (Kim 2019). As Seoul government leaders had expected, interest groups such as bus and railway unions and leadership, who were benefiting from the haphazard existing system, resisted the reform. Although the reformers knew that they would face difficulties and opposition, they decided to push the reform to make the payment for public transportation services more convenient, transparent, and cost-effective.

**Delivery Challenges**

**Lack of Consensus**

The 2004 transportation reform affected all public transit providers in Seoul, including four public railway companies and at least 57 bus companies. The Seoul government also had to work with the Ministry of Land, Infrastructure, and Transport on legal changes.

Practitioners anticipated disagreements from service providers, especially the Bus Operation Business Cooperative, which comprised 68 members representing 57 bus companies. The cooperative argued that the...
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quasi-public operation system violated their property rights. They were also afraid of losing control over operations and revenue because the integrated fare system would directly monitor and distribute collected fares.

The railway companies were easier to persuade because they were public corporations that were partially under the control of the Seoul government. However, they were also worried about the government’s taking full control over the railway system.

The powerful subway workers’ union was another barrier, because the adoption of automated smart cards would result in layoffs of ticket agents. Ultimately, more than 2,000 of the 4,400 ticket agents working for the Seoul Metro lost jobs because of the reform (Kim 2020).

11 Author’s interview with Gyeng Chul Kim, June 14, 2020.

Stakeholder Engagement

The government aimed to improve transit convenience for passengers to make the system more people-centered. Anticipating public confusion about changes to public transportation operations, fares, and payment, the government officials planned a public education campaign. However, unexpected system errors that occurred when the reform was released resulted in citizen complaint calls and negative media coverage, making it even harder to win over the public.

Examining Strategic Planning and the Pilot Project

The mayor’s first step in planning the reform was to form the Public Transportation Promotion Task Force, which has with members recruited from the transport division of the Seoul government. The mayor directed the task force to initiate a full-scale review and to create a comprehensive reform plan under the clear goal of solving urban transport problems through improved mobility and advanced technology (Kim 2020). The task force became the engine of the reform.

Song (2020) explained that the task force team lacked the traditional hierarchic structure of a public organization. Members were free to share opinions and to propose ideas. The transport experts and professionals on the task force were excited to try out innovative transport policies (Song 2020). The task force held a meeting with the mayor at least twice a week, in which they reviewed the quasi-public operation system and the integrated fare system. The task force also received assistance from the Public Transport Reform Support Team of the Seoul Institute, which is the official think tank of the Seoul government and which worked on policy reports, research, and action plans (City of Seoul 2006).

Kim, one of the task force leaders, recalled, “Each member of the team was so smart and proactive. We worked from 5 a.m. to 11 p.m. almost every day, but it was a very meaningful time and [a] precious opportunity” (Kim 2020).

In January 2003, the mayor and the task force traveled to six cities in the United States and Brazil to learn the best methods for running transport systems. During those field visits, the team tested the transport systems and spoke with local experts and operators (City of Seoul 2006). The team was especially inspired by the way the Brazilian city of Curitiba promoted its bus-centric public transit system. Across Curitiba, dedicated bus lanes in the middle of major roads helped buses maintain their speed—even during rush hour. Seoul had also implemented a dedicated bus lane in one region called Cheonho-dong, but Curitiba’s model

12 Author’s interview with Gyeng Chul Kim, June 14, 2020.
13 Author’s interview with Doo Suk Song, July 2, 2020.
14 Author’s interview with Gyeng Chul Kim, June 14, 2020.
15 The six cities include Los Angeles, New York, Boston, Providence, San Paulo, and Curitiba.
inspired the mayor to expand bus lanes to more Seoul areas (Kim 2020).

Members of the task force created a transportation master plan based on their research and designed a pilot project for northeastern Seoul the following spring. However, after a public briefing of the pilot project, the members faced immediate and severe opposition from bus companies concerned about loss of revenue and control. The companies engaged in public demonstrations, submitted legal petitions, and conducted a media campaign (City of Seoul 2006).

Despite having the support of the general public and many civil society organizations, the pilot project failed without the agreement of the service providers. However, reformers gained invaluable lessons from the pilot project’s failure. They learned that they would need cooperation from all transportation stakeholders, a strategic persuasion plan with clear benefits, and more time. The mayor delayed the project until July 1, 2004 (City of Seoul 2006).

Establishing a Citizens Committee

In June 2003, seven major civil society organizations and several experts formally requested the Seoul government to jointly promote bus reform so they could reach a social consensus. In response, the government formed the Bus Reform Citizens Committee (Kim 2020; Song, Kim, and Kim 2014). Lim, who advised the committee, explained that the government created the committee (a) to show that the government was not the sole actor in the decision-making process and (b) to provide a platform for civil society to work with government experts (Lim 2020).

Established in August 2003, the committee consisted of 20 individuals chosen on the basis of civil society recommendations, as well as transport experts, an accountant, and a lawyer. The organizations represented in the committee included the Seoul National Police Agency, the Seoul Bus Transport Association, the Seoul Metropolitan S-town Corporation, and the Seoul Bus Labor Union (Song, Kim, and Kim 2014). The committee played a significant role in negotiating agreements with service providers by mediating differing views on route management, fare calculation, and revenue distribution. Service providers mistrusted the government because of the potential for shifts in leadership or policy, but they trusted the decisions made by the committee because of the service providers’ own participation among diverse stakeholders. This structure was especially helpful for finding mutually beneficial solutions to improve the transportation system for all citizens (Park 2020).

Several operational aspects of the committee meetings enhanced their efficiency. First, formal meetings, smaller subcommittees, and group discussions gave everyone ample opportunity to express their views. Second, the committee emphasized the importance of creating a collegial atmosphere and listening respectfully. Third, the government used the agreements made in the committee as criteria for the policy implementation, which directly involved the committee’s work. Finally, the committee had access to credible information from each stakeholder, so members could understand each other’s interests (Song, Kim, and Kim 2014).

Inaugurating the Korea Smart Card Company

In October 2003, the Seoul government announced an open-bidding process to establish Korea Smart Card Co. Ltd, a transportation card company that would operate the smart card system. LG CNS and Samsung SDS, which are Korean global companies that focus on digital information technologies, were the two most prominent bidders. After reviewing the bids, the evaluation team—consisting of nine management experts and seven technological specialists—selected LG CNS Consortium because of its promise to transfer 35 percent of the shares to the Seoul government at no cost (Park and Kim 2013). The government had the largest stake in the company, but other investors included the Korea Transport Cooperative Union, credit card companies, and mobile carriers.

Creating T-Money

The company’s responsibilities included card system operations, data processing, development of devices, and card issuance. For the operation system, the company planned to adopt an Intelligent Transportation System
and Automated Fare Collection. Furthermore, the company successfully developed a contactless smart card named T-Money. The card was embedded with a chip that could execute arithmetic functions with 8 kilobytes of memory and a communication speed of 0.25 seconds, thus addressing the memory limits of the old transit card. A security algorithm protected the card against unauthorized replication.

The smart card could accommodate various fare policies. For example, the system automatically calculated reduced fare for eligible users such as children or seniors (Ministry of Land and KOTI 2013). When a user tapped a card reader with a T-Money card at a terminal, it instantly conveyed that user’s location and time information (see figure 2). The card’s technology also collected information on boarding, exit, transfers, and total distance of travel to complete the payment (Ministry of Land and KOTI 2013). Collected data went to the company’s data management center, then to the Seoul Traffic Information Center for the management of the quasi-public bus operation system.

The smart card company and the information center used collected data in various ways to expedite the overall transportation system in Seoul. After analyzing usage data and demand patterns, the company and center adjusted bus routes and intervals between buses to enhance passengers’ convenience. They also sent real-time traffic information such as bus location and arrival time to each station so passengers could plan trips more efficiently (Park 2020). Finally, they shared information with bus companies so those companies could evaluate and improve their service.

T-Money was designed to be compatible with transport systems nationwide. The card could accommodate various Secure Access Modules for enhanced security performance in devices and contactless smart cards. This function enabled integration with different modes of transportation and even different regions (Ministry of Land and KOTI 2013).

Reaching Consensus

Achieving agreements among all service providers and stakeholders was the most challenging part of the entire policy implementation process and took about one year. The task force organized discussions, meetings, and public hearings with citizens and stakeholders. The task force tried different methods to deal with railway and bus companies, including organizing a two-day group negotiation workshop with all railway and bus companies from Seoul, Gyeonggi, and Incheon. Government transport officials, the Seoul Institute, and members of the Seoul Bus Transport Association also participated in the workshop.

According to Jong Hun Park, who was the director of the Transport Information Department, the task force
team found small group discussions to be most effective because participants were more comfortable sharing their opinions and interests in a small group setting. Reaching consensus with one group also eased discussions with others. Park added that the workshop allowed participants to build mutual trust and understanding (Park 2020).

The mayor and task force also appealed directly to the drivers to explain how the policy would benefit them and improve their work environment. Kim said, “The union members had poor working conditions. They worked for 16 hours daily and earned less than 2 million KRW (US$1,700) a month” (Kim 2020).

The Seoul government promised to improve the level of wages for drivers gradually over multiple years and urged the bus companies to develop evaluation guidelines so workers could receive performance-based incentives determined by safety and passenger satisfaction. The guidelines and new benefits improved work efficiency, flexible shift management, and drivers’ attitudes toward customers.

In August 2003, the task force created the first draft agreement for the joint management of revenue for the quasi-public management system, a creation that was based on consultations with transport experts and lawyers. After six months of sensitive negotiations, the government and the citizens committee signed the agreement in February 2004 (see box 1) (Ministry of Land and KOTI 2013). The joint management of the profit system put the government in charge of route planning, service, and cost evaluation, while the Korea Smart Card Company took charge of clearing and settling the fare revenues on the basis of data analysis of operational performance by the smart card system. The citizens committee played a critical role in mediating sensitive issues such as the distribution of the total revenue to bus companies and the settlement of route expenses. All parties agreed that the committee should allocate and manage bus routes so they could fairly distribute the most profitable “golden routes” among bus companies.

Providing Subsidies

The Seoul government made a crucial decision to subsidize all bus companies for revenue shortfalls so it could prevent bankruptcies and excessive competition for golden routes. The task force believed that financial support would stabilize the management of the bus companies by guaranteeing their income (Ministry of Land and KOTI 2013). Kim 2020 explained that the government believed the subsidies would pay for themselves in the long run, as public transit improvements reduced the need for costly road construction. In fact, bus company subsidies totaled less than 30 percent of the cost of road construction expenditures, to accommodate the rapid growth in private cars (Kim 2020).

Kim 2020 said that free transfers with the smart card also helped raise subway ridership, thus leading to an increase in fare revenue that partially compensated for the cost of bus subsidies.

Providing subsidies to all bus companies in Seoul regardless of their ridership required revisions to the Passenger Transport Service Act, which had allowed public subsidies only for unprofitable bus lines (Ko 2020).

The task force initially approached the Ministry of Land, Infrastructure, and Transport for legal amendment in mid-2003, but the ministry refused that request because it did not want to change the national law for Seoul’s specific circumstances.

In late 2003, the ministry began to cooperate with the Seoul government to process the amendment after seeing the progress that the government was making in reaching consensus with other stakeholders (City of Seoul 2006). The supporting voice of civil society also helped pressure

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25 Author’s interview with Jong Hun Park, June 18, 2020.
26 Author’s interview with Gyeng Chul Kim, June 14, 2020.
27 Author’s interview with Gyeng Chul Kim, August 7, 2020.
28 Author’s interview with Gyeng Chul Kim, August 7, 2020.
29 Author’s interview with Joon Ho Ko, June 24, 2020.
the national government to cooperate (Kim 2020). In the end, the government reached an agreement with the ministry to revise the ordinance by adding the clause, “where the bus transportation system is improved to activate public transportation” to the scope of financial support within the Passenger Transport Service Act. The act was amended in February 2004 (Lee and Hur 2017).

Installing the Infrastructure

Bus companies’ concerns about details of fare management regulations and transfer discounts delayed the signing process for the agreement worked out by the task force until a few days before the release date of July 1, 2004.

Opposition among transportation companies also delayed the test trials, which finished only 15 days before the release date. As a result of the opposition, only one bus company allowed card readers to be installed on its buses for the test trials. One unionized railway worker even stole a test device at Sa-Dang station (Kim 2020).

Park (2020), who was in charge of the smart card system, reflected that this was the most difficult time in the entire process. He explained that the Seoul bus and railway companies agreed to install the devices only a month before the release date, the Gyeonggi and Incheon railway companies agreed two weeks before the date, and the KORAIL companies agreed only three days before the date (Park 2020). Park said, “There was no plan B. We knew they would eventually allow us to install the system to create social good for citizens. I also knew that they wanted to keep delaying the process to maximize their own interests” (Park 2020).

Park and his team had to install devices into more than 8,000 buses in a short period. The day before the release date, about 2,000 staff members from the Seoul government’s transport division and the smart card company gathered in the Seoul station to install the new program into as many buses as possible. They also had to finalize passenger announcements and signs at all stations during the overnight break in bus service, which began at midnight and lasted only four hours.

Planning the System Launch and Stabilization

The release date brought surprises and unexpected obstacles. The device installation team successfully downloaded the new program—with the transfer feature and new fare calculation system—wirelessly into the devices on buses in their garages. However, the team had overlooked that 20 percent of buses were parked elsewhere. Therefore, only 80 percent of buses got the new program installed.

The new system had many technical errors on the first day, which confused riders. They did not know how and when to tap the card reader with their cards. If passengers did not tap card readers both on entry and exit, the system charged a penalty of 1,000 KRW (US$0.80). The Seoul government’s transport division received complaints from riders and news media all day long, but the team was busy dealing with problems on site. Park described the day as “a nightmare” and explained that almost all officials at the transport division went to the bus garages to check and download the program into each bus again (Park 2020).

The system took about two weeks to stabilize. The media blamed the Seoul government for system errors and rider confusion. One headline on MBC News read: “The first day of bus reform has been chaotic due to Seoul’s lack of preparation” (Huh 2004). Park responded to critics by providing accurate data collected by the smart card. Within a few weeks, the error rate decreased below 0.3 percent.

Park (2020) said that university students played a critical role in spreading awareness of the benefits of the distance-based fare system by sharing stories online of how the transfer discount system allowed them to travel farther for less money. He also credited the high literacy rate and ability of the Korean people to adapt to a new system (Park 2020).

Additionally, civil society support for the reform helped defend against media attacks. Lim, who represented the civil society organizations, conducted media interviews to support the reform after the launch. Knowing that it would be more difficult for government officials to defend themselves in the media, he spoke about the system with the media more than a hundred times.

30 Author’s interview with Gyeng Chul Kim, June 14, 2020.
31 Author’s interview with Gyeng Chul Kim, June 14, 2020.
32 Author’s interview with Jong Hun Park, June 18, 2020.
33 Author’s interview with Jong Hun Park, June 18, 2020.
34 Author’s interview with Jong Hun Park, June 18, 2020.
35 Author’s interview with Jong Hun Park, June 18, 2020.
times in July (Lim 2020). The post-launch problems took the task force, public officials, smart card company staff members, and civil society supporters by surprise, but together they promptly resolved issues and mitigated inconveniences.

**Outcomes**

The new smart card system and related transport reforms resulted in economic benefits for passengers and operators, higher public satisfaction, smoother traffic flow, and better data to improve urban policies.

The distance-based fare system reduced the average fare per trip by 4.5 percent from 620 KRW (US$0.56) to 592 KRW (US$0.53) (Ministry of Land and KOTI 2014). The Seoul government estimated that transfer discounts saved riders 200 billion KRW (US$170 million) a year (Kim and Kim 2012). The policy also increased revenue for operators. The bus reform expanded revenue by 2.6 percent from 1,089.4 billion KRW (US$925 million) to 1,118.3 billion KRW (US$950 million). In the subway sector, the revenue jumped about 16.8 percent from 989.2 billion KRW (US$840 million) to 1,155.5 billion KRW (US$981 million) (Kim and Kim 2012).

Smart card usage rate reached 88.9 percent in December 2004, which was 11.5 percent higher than a year earlier (Ministry of Land and KOTI 2014). The rate rose to 91.6 percent by 2005 and 96.1 percent in 2011 (Park and Kim 2013). Increased usage made revenue more transparent and trackable, thereby making it harder for bus companies to hide their revenue. Kim said that the transfer discount was the main reason people switched to the smart card (Park 2020).

According to the Seoul Survey, citizen satisfaction with the public transit system rose from 4.7 out of 10 in 2003 to 7.5 of 10 in 2012 (Koo 2014). The smart card system helped passengers save time and reduced congestion. Tapping a smart card was much faster than paying with cash, which meant that buses spent less time picking up passengers. Transport experts explained that faster-moving buses could speed up traffic flow significantly (Ko 2020). Increasing public transportation ridership and reducing private car use also decreased traffic congestion (see figure 3).

Furthermore, performance incentives reduced bus drivers’ poor service and reckless driving. Lim said that he was especially happy with the decline in traffic accidents involving buses; accidents decreased 10.66 percent during the first year of implementation (Kim and Kim 2012).

The integrated fare and digitization system enabled data collection to improve future service. Through real-time data processing, the Seoul government collected information about demand trends, transfer frequency, traveling patterns, and route usage. The government analyzed those data to optimize transportation routes and schedules (Lee 2020). Over time, the smart card company built its experiential knowledge with data management. When there was a device error on one of the city’s roughly 30,000 smart card readers, the automated system made the operational center aware of the issue even before the station staff notified users, thus enabling engineers to make prompt repairs (Park 2020).

Smart card technology contributed to the building of smart city transport infrastructure and promoted the smart card industry in Korea.

The collected data also revealed mobility trends. According to Kim (2020), transport officials learned by analyzing the transport data that many passengers traveled to Dobongsan Mountain during weekends. After learning that riders traveled frequently to certain supermarkets during the weekdays for grocery shopping,

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36. Author’s interview with Sam Jin Lim, June 22, 2020.
37. Author’s interview with Jong Hun Park, June 18, 2020.
38. Author’s interview with Joon Ho Ko, June 24, 2020.
40. Author’s interview with Jong Hun Park, June 18, 2020.
transport officials increased bus frequency to meet demand (Kim 2020). By understanding people’s activities and patterns of transportation use, the government learned that more than 70 percent of Seoul citizens used public transportation service. It also used the data for other purposes such as crime prevention and tracking COVID-19 patients during the 2020 pandemic (Ko 2020).

The mayor and the team’s successful efforts were recognized. The mayor received the International Association of Public Transport Award in 2005, which acknowledged Seoul’s successful reform of the transportation system that promoted sustainable urban transport development (City of Seoul 2006). This recognition was meaningful because the reform had begun with the 1995 trip to an International Association of Public Transport conference by five Seoul government transportation officials to learn about smart cards.

The reform helped Seoul gain recognition as a leading city of the transportation sector in the early 21st century (SMG n.d.). The introduction of the smart card system provided a model for sustainable smart cities by orienting policies around people rather than machines (Lee 2020).

The practitioners’ main regret was the failure to plan an effective advertisement campaign when the new system launched, despite the delayed approval from service providers to install the new devices. The task force had advertised the change in service through traffic broadcasting websites, TV programs, and 16 newspapers. The task force had also put up flyers in every station informing riders of route changes and fare guidelines (City of Seoul 2006). However, the advertisements focused on explaining the reasons for the reform rather than detailing how it would affect users. According to Park (2020), it could have been more efficient to design a practical advertisement explaining how to use the system from the riders’ perspective. A better information campaign may have reduced initial public confusion and frustration.

T-Money’s available product has evolved to cover various functions and advanced features, giving users different options including the standard card, single-use card, auto-charging card, and mobile T-money (a virtual card for smartphones). T-Money also became a payment method similar to cash or a debit card and is usable in taxis, convenience stores, event venues, vending machines, and university cafeterias (T-Money Co., Ltd. n.d.). T-Money introduced a “Korea Tour Card” that is exclusively for foreigners and provides discount benefits for shopping, food, entertainment, and cultural performances on top of its basic function as a transport card (Korea Tour Card n.d.).

Lessons Learned
Technology and policy design must be adapted to the unique needs of a city.

Seoul’s problems required solutions that accounted for local environment, population, and existing systems. The practitioners had strong research support from inside and outside; the government’s transport division, the Seoul Institute, and the Korea Transport Institute had made continuous research efforts since the 1990s. Using the information from the mayor and the task force’s field visit to the United States and Brazil, the members focused on specific ideas and features that could be improved and adapted to Seoul, rather than trying to import the whole system.

The task force and the support team researched and devised a unique quasi-public operation system and made the transition from a private-run bus system to a joint management system. The government developed the most efficient model to integrate bus and subway services. The private companies improved the quality of service for customers and the welfare of their employees. The public sector ensured bus service throughout the city with links to the subway system so it could enhance mobility.

Additionally, the government focused on future-oriented solutions. The practitioners wanted to invest in data-driven methodologies that enabled scientific management of transport systems (Kim 2020). In an effort to build a public-private partnership, the government selected a partner, LG CNS, with the financial and technical capacity to establish the smart card company together and to build essential infrastructure.

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41 Author’s interview with Gyeng Chul Kim, August 7, 2020.
42 Author’s interview with Joon Ho Ko, June 24, 2020.
43 Author’s interview with Dong Min Lee, June 15, 2020.
46 Author’s Interview with Gyeong Chul Kim, June 14, 2020.
for the new system. T-Money cards, devices, and data processing technologies were all created to serve and suit the new system.

**Civil society can help build social consensus.**

Civil society groups played an important role throughout the reform process. Many civil transport organizations had raised the issues of public transportation problems since the 1990s. Their criticisms and monitoring reports helped to drive implementation. Creation of the citizens committee served as a turning point because the Seoul government alone could not break the deadlock between stakeholders. The lack of trust among stakeholders required a third-party mediator to objectively examine different interests, policy measures, and potential impacts on each actor. If the government had pushed unilateral decisions, it would have faced escalating opposition that could have delayed or derailed the reform.

Lim (2020) said, “The partnership between civil societies and policy experts created a cooperative relationship so they could find many solutions that citizens really needed” (Lim 2020). He also mentioned that the relationship balanced the incentive structure of the reform, so they were able to serve the common good (Lim 2020). Civil society participation in the implementation process helped ensure that policies prioritized the interests of everyday citizens (Lee 2020).

**Practitioners should anticipate and promptly respond to problems when a reform is released.**

As the practitioners anticipated, the launch of the new system was not the final stage but just the beginning. The practitioners took immediate action on site to address technical problems rather than speaking to numerous complaint calls. Quickly resolving problems on the ground was a more practical way to remove the root cause and to lower the riders’ confusion levels. Thus, being flexible and working on the field helped fix problems more quickly. When responding to media attacks, the government used accurate data and numbers to show system improvement, while civil society representatives urged for patience and defended the government.

**Systemic reform requires high-level support, dedication, and openness to innovation.**

The main drivers of the policy were the mayor, Myung Bak Lee, and officials at the transport division. The mayor promoted the reform with persuasion and patience and was directly involved with the decision-making process from the planning stage to the implementation in July 2004. To manage conflicts with various stakeholders, he convened lectures and conferences to meet with bus company personnel and union workers.

Like the mayor, the officials and the task force had clear goals and motivations that contributed to the successful policy implementation. Song and Jae credited city transportation officials with their dedication to finding creative approaches despite limited resources; they also used new technologies and the best international methods. When they realized the feasibility of a smart card system, they took immediate action to test and implement it. “This is what public officials ought to do,” Jae said. “They should learn about the world and bring innovative solutions to our city” (Jae 2020).

The task force that implemented the policy from 2002 to 2004 was devoted to the success of the policy. Professor Ko said, “The Seoul government had a talented group of people with capacity. They were ready to try a new approach and accept changes” (Ko 2020).

Members of the task force reflected that the period was highly stressful, but it was an invaluable opportunity to work for citizens. Kim said, “I lost eight kilograms during the two years, but the project was like a gift to me” (Kim 2020).

Park (2020) added, “I’m an engineer. The opportunity to introduce new information technology for improving the transport service was a great pleasure for me. Whenever I see the passengers use the smart card in everyday life, I tell myself that ‘You did good, and you were the best engineer you could be’” (Park 2020).

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47 Author’s interview with Sam Jin Lim, June 22, 2020.
48 Author’s interview with Sam Jin Lim, June 22, 2020.
49 Author’s interview with Dong Min Lee, June 15, 2020.
50 Author’s interview with Ta Young Jae, June 26, 2020.
51 Author’s interview with Joon Ho Ko, June 24, 2020.
52 Author’s interview with Gyeng Chul Kim, June 14, 2020.
53 Author’s interview with Jong Hun Park, June 18, 2020.
References


