Improving Public Transportation in the Seoul Metropolitan Area

Knowledge Sharing Program

PROJECT DATA

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KDI School of Public Policy and Management

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Executive Summary

The Seoul Metropolitan Area (SMA) suffered from severe congestion and auto-related pollution in the early 2000s. One way to mitigate these problems was to promote mass transit. Public transportation in the SMA consisted of the Metro (subway train) and bus transit. The bus system, however, was functioning poorly; its service quality was deteriorating and it was losing passengers continuously. In 2004, the newly elected mayor, Myung Bak Lee, launched the "Public Transport Reform Program." This case study will examine how this program tackled the important development challenge of improving the bus system throughout the SMA." It will also examine how implementers dealt with delivery challenges, including issues with stakeholder engagement, and implemented a variety of tools of the reform: quasi-public bus operation/management, installation of exclusive median lanes, adoption of Metro-bus integrated T-money fare system, and centrally-controlled bus operation/management system. The city first organized the Bus Reform Citizens Committee (BRCC) to strengthen stakeholder engagement and gain support from various interest groups, including concerned citizens, academia and NGOs. The city government also formed the Public Transport Promotion Task Force as an advisory group; this task force included transportation experts from inside and outside city government, including senior transport planners from the Seoul Institute.

The authors would like to thank Dr. Sung-jik Eum, the former chief of the urban transport policy for the Seoul Metropolitan Government (SMG), and Prof. Kee-yeon Hwang, professor of the Hongik University in Seoul, for the information that they provided during interviews. The information that they shared was critical in identifying delivery challenges faced during the reform of public transportation in the Seoul Metropolitan Area during the project period (2002–2005). Also, the authors acknowledge Dr. Heeyun Jung of the Seoul Institute and Dr. Sangmin Lee of the Korea Transport Institute for their valuable suggestions drawn from their expertise in transportation.

Contributions by the think tank group of the Bus Reform Task Force in the Seoul Institute were particularly critical, as they directly supported the mayor's bus reform team and the BRCC by frequently conducting research studies and disseminating relevant information.

The application of ICT significantly contributed to the successful implementation, particularly the T-money (smart card) and advanced ITS. The smart card helped consolidate the Metro with the bus transit system through an integrated single fare system, while advanced ITS activated the TOPIS (Seoul Transport Operation & Information Service). The combination of the two made it possible to implement the BMS successfully. Finally, the use of both the exclusive median bus lane and colour-coded bus identification scheme significantly contributed to the success of the bus reform; the former helped inter-regional, long distance buses speed up, and the latter allowed citizens to more easily access the bus they needed.

The reform program led to a significant increase in bus speed, as well as substantial increase in bus ridership thanks to improvement in service quality (comfort, convenience, safety, and punctuality, as well as making the bus transit reliable and compatible with the Metro). And both discounted fare and easy inter-modal transfer helped increase Metro ridership as well. The two systems became complementary, rather than substitutes. Accordingly, the number of private automobiles significantly decreased, especially during the rush hours, resulting in substantially attenuating congestion and pollution.

Major success factors for the bus system reform included strong leadership from the mayor, an enabling governance structure, organizational skill and capability, strong use of ICT, and research support to the reform.

Introduction

Providing convenient and sustainable transport systems is one of the most challenging tasks in large cities around the world. Since the 1960s, the population of Seoul, the capital and largest city of the Republic of Korea, has grown at an unprecedented rate, largely due to rural-to-urban migration. The city's population jumped to over 10 million in 2003, doubling within the 30-year period of 1970–2003. Its metropolitan area (formally known as the Seoul Metropolitan Area, or SMA) grew even more from 21 million in 1996 to 23.3 million in 2003.[1] Urban sprawl and suburbanization aggravated the population concentration in the region. The city's population spread and spilled across the surrounding Gyeonggi province and the city of Incheon to the extent that, by the turn of the 21st century, the SMA comprised almost half of the nation's total population.

Accordingly, the daily population flow within the SMA was recorded as 29.4 million in 2003, up from 27.8 million in 1996. The combined effects of rapid urbanization, motorization and industrialization caused the problems of severe traffic congestion and automobile-related pollution within the city and throughout the SMA. The traffic flow from the SMA into and out of Seoul in 2002 reached over 3.15 million cars per day, an increase of 470,000 cars over 1996, totaling 4.37 million cars running within the city each day.[2] The social costs of congestion rapidly soared up from W 4.1 trillion in 1999 to W 6.7 trillion in 2006.[3] But the city's investment in road repair and space expansion was very limited, as low as 0.18 percent of the congestion cost.[4]

However, the public transport system in the SMA couldn't keep pace with the rapidly growing traffic.

1 The Census of Population, Bureau of Statistics, 1995, 2000, 2005, 2010.
2 For change in automobile ownership, refer to "automobile ownership per household," Statistical Yearbook of Construction/Transportation, the Ministry of Construction and Transportation, each year.
3 The Korea Transport Institute, Traffic Congestion Costs, 2001, 2008.
4 "서울시 교통지표 및 통행특성분석 (Transportation Index and Movement Patterns of the Metropolitan City of Seoul)," a report prepared by the Transport Bureau, City of Seoul. It undertook an extensive survey on stratified sample of 162,000 households living in Seoul, Incheon and Gyunggi province in April through July in 2002. The report compiled summarized the outcomes of the survey analyses.

The subway train (hereinafter referred to as the Metro) system covered most of the city's high-density districts and major suburbia to a lesser extent. But the Metro alone could not deal with the growing traffic flow. Its modal share was 26.4 percent as of 2003, far less than the rate that transport planners expected to achieve.[5] Many studies indicated that the Metro system alone was not able to handle the increasing volume of traffic within and beyond the city, unless it were synergistically integrated into the bus system, the other major pillar of public transportation in terms of operational logistics.[6]

The City Government of Seoul, under the newly elected mayor, Myung Bak Lee, launched "the Public Transport Reform Program" in 2004 to mitigate the congestion problem sustainably and resiliently in a relatively short period of time.[7] It emphasized "quasi-public bus management and operation," implying separation of bus operation and management from ownership: bus ownership would be fully guaranteed while the city would be entrusted with the operational and management rights for public interest. The program consisted of seven elements: 1) overhauling the bus operating system and development of its support system; 2) restructuring bus lines and types; 3) electronically controlled/managed bus operation and monitoring system; 4) establishment of city-bus joint business management center (later referred to as Business Management Center: BMC); 5) integration of the bus transit with the Metro system in terms of fare, operating lines and schedules, time intervals, and station locations; 6) installation of regional bus-exclusive median lanes; and 7) securing funds to streamline road space for flexible bus operation and also to compensate bus owners for financial losses that might accrue, in part, from switching bus routes and lines at the city's determination of the public interest.

Context of the Case

Development Challenge: Problems with the Bus Operating System

Prior to reform, the bus operating system was a huge mess and no politician dared to touch this Pandora's Box (City of Seoul 2006, 30–33). The system was organized and run by private bus companies; these were mostly financially insecure and small in size (although until the city built the Metro in 1972 it was the major public transit service available for most citizens). Some of the problems included poor quality of service, congestion, major accidents, and high fares. Bus companies secured profits largely from running on "golden routes," crisscrossing major trunk roads in downtown areas. Securing and maintaining these profitable routes were priorities for the bus companies, because of the revenue loss that would result from not doing so. It was effectively a zero-sum game, and in some cases companies even bribed city officials in a competition to win golden routes.[8] As a result, almost 70 percent of the buses were allowed to pass through the core areas of the downtown, meaning that the trunk roads leading to the city centers were flooded with buses while the many streets away from the downtown rarely saw them. There was a serious demand-supply mismatch.[9]

This kind of bus operation management created severe congestion along main roads as buses intermingled with private automobiles, especially during rush hours. In addition, most buses had diesel engines, adding various pollutants to the air and decreasing air quality. Equally serious was that the bus companies paid little attention to passengers, providing unfriendly, unorderly, unclean, and especially unreliable service. They rarely met schedules and operating intervals. Buses were always crowded and were not equipped with both heating and air conditioning systems, which created considerable passenger discomfort, particularly during summer. And the transportation-poor (including the handicapped, elderly and children), suffered the most. Bus drivers drove too fast and recklessly, causing frequent accidents, which further delayed traffic flow. Nonetheless the bus fare was relatively high and kept rising every year, since the rates were adjusted to the Consumer Price Index.

Consequently, bus transit passengers turned away from using bus services, resulting in a decline in ridership and an increasing deficit in operating revenue for the bus companies. Road congestion hit the bus companies hard as it caused time delays and inefficiency in bus operation. In 2002, the average speed for buses was 18km/h while that of automobiles was 22.5km/h. Eventually a large number of bus

5 Seoul Metropolitan Government Statistical System http://traffic.seoul.go.kr/archives/285.

6 See, for example, Seoul Institute 2003, and MOLIT and KOTI, 2013.

7 See Chosun-il-bo (Daily News), January 5, 2004, which carried out an interview news, titled as "2004 is the first year of Seoul's public transport reform" as declared by the new mayor, Lee Myungbak.

8 City of Seoul. 2006. The City of Seoul Rewrites a New History of Public Transportation, the White Paper (2006).

9 For an account of these problems, see City of Seoul (2006).

companies lost money, and some went bankrupt and out of business. In fact, the number of bus business proprietors decreased drastically from 87 in 1997 to 58 in 2002.[10]

The vicious cycle continued: poor quality of service combined with high bus fares led to a substantial decline in the number of passengers, which resulted in decrease in operating revenue, bankruptcies of many bus companies, and worsening quality of bus transit services. This cycle resulted in a decline in modal share of the bus transit system from 30.1 percent in 1996 to only 26.9 percent in 2002.[11] The bus business would no longer be sustainable unless the city intervened—one way or another—to rationalize the whole bus operating and management system once and for all (White Paper, 2006).

Seoul's Bus Transit Reform Program

The city's public transport reform program was initiated by the newly elected mayor, Myung-bak Lee, who was elected in 2002. During his election campaign, Lee had strongly advocated public transport reform to make the city globally competitive. His first action was to appoint an urban transport expert, Eum Sung-jik, from the major newspaper Joongang Ilbo to serve as chief of the urban transport policy. He was authorized to fully utilize the city's professional staff. Sung-jik then organized the Public Transport Promotion Task Force at city hall and immediately activated the Public Transport Reform Support Team at the Seoul Institute (SI), the city government's think tank. He would seek administrative support from the former, and research/development and technical support from the latter.

In March 2003, the city announced a reform of the bus transit system, with the goal of providing a better transportation system for citizens in the SMA. It aimed for a complete switch from the privately operated and managed bus system to a quasi-public one, calling for many supportive actions to make it work properly. These included: 1) installation of median bus lanes and curbsides; 2) development of a new transportation card—known as a smart card or T-money; 3) provision of high-quality buses—clean and modern, and equipped with safety features and amenities; 4) adoption of the Metro-integrated distance-based fare system; and 5) improvement of road capacity. The city's transport authority wanted to operationalize and test these initiatives in the form of a "pilot project" in Gangbuk District, the northern part of the Han River. This pilot aimed to mitigate prospective congestion in the northern part of the Han River when the Cheonggye elevated highway was removed as part of a different project, the Cheonggye Stream Restoration Project.

The reform basically consisted of four improvement modules as shown in Table 1:

Change in Public Transportation Policy

Bus transit system reform entailed an enormous amount of work for the city, largely because it meant a drastic change in policy from an automobile-oriented/private system to a bus-oriented/public transportation system. It also implied a change from a supply-oriented approach to a demand-oriented approach. The city was accustomed to a supply-side approach in the past, such as a patchwork of road expansion and improvements in the geometric design of road structure when severe congestion occurred on some sections of downtown. This meant that permanent and sustainable solutions were in short supply, but the new mayor was committed to putting an end to such a piecemeal approach.

The goal of the reform in the short term was to maximize people's transportation welfare, providing a mix of decent, but reasonably priced, public transportation services by combining and integrating the Metro with the bus transit system. By so doing, the city would not only enhance public welfare, but reduce congestion and pollution, thereby making Seoul a cleaner and more sustainable city. It would take many actions to achieve this broad range of objectives, but the mayor believed that the first one should be the bus transit system reform.

Delivery Challenges: Stakeholder Engagement

As the pilot project got underway, it was anticipated that conflicting interests among affected stakeholders would surface from the changes in the city's transportation circulation system. Those stakeholders included bus proprietors, autonomous district offices, shop owners, and even bus drivers, not to mention ordinary citizens. The transport authority announced these actions along with the quasi-public bus management and operation scheme and waited for reactions.

10 Seoul Development Institute, Guidelines for implementation of the transportation system reform in Seoul: Policy for public transportation fare, 2003.

11 Seoul Metropolitan Government Statistical System http://traffic.seoul.go.kr/archives/285.

Table 1. Strategies for Bus Reform: Four Improvement Modules

	Problems and Issues	Basic Policy Directions	Policy Measures
Module 1: Improve management	Poor management: lack of transparency and loss in operating revenues	Streamlining management; reforming operational system; beefing up public interest in bus operation and management	Adoption of a quasi-public bus operation/management system; adoption of a route-bidding system; strengthening the city's supervisory function
Module 2: Improve routings	Profit-motivated route selection, causing bypassing, detours and overlapping lines resulting in passenger inconveniences and discomforts	Establishment of demand-oriented route decisions; expansion of new routes; strengthening inter-route linkages	Improvement of routing systems, focusing on trunk vs. feeder lines; establishment of Bus-Metro fully-integrated system
Module 3: Improve punctuality	Lack of punctuality and speed; irregular time intervals; unpredictable arrival times; slow speed and operating time	Recovery of trunk line function; adoption of bus-priority system; streamlining and expansion of bus-exclusive lanes	Adoption of Bus Rapid Transit (BRT) system; installation of bus-exclusive median lanes
Module 4: Improve services	Low level of service quality; deteriorated facilities and vehicles; inadequate operational services; poor bus information services; insufficient bus operation at night; lack of inter-modal linkages	Upgrading and diversifying buses; improving bus information services (BIS); extension of bus operating times and intervals; improve fare system; expansion of bus infrastructures	Introduction of NG and low floor buses; establishment of Bus Management System (BMS) and T-Money system; adoption of distance-based fare system

Source: Seoul Institute, 2003, and City of Seoul White Paper, 2006.

These reactions were not long in coming, and some were indeed characterized by resistance to the changes that the reform entailed. Bus companies claimed that a quasi-public bus operating system might infringe upon their property rights and insisted on retaining the status quo. Bus drivers were worried about job security if, in fact, route adjustments and reduction in bus operations were to take place. District authorities, among others, were concerned about safety regarding the construction of median lanes, resulting in conflict with the city. Citizens living nearby also complained such construction might cause more accidents and pollution. The police agency opposed it for safety reasons too. According to Mr. Eum sung-jik, who headed the Public Transport Reform Team under the mayor, the police agency initially opposed the reform for three reasons: 1) the median lane might bring about noise and other pollutants to nearby communities; 2) it might lead to traffic accidents as it allowed buses to speed up; and 3) the demolition of overpasses, a necessary step for median lane constructs, might cause confusion among drivers and delay traffic movements accordingly. He further noted that the police anticipated lots of complaints from the citizens, particularly those residing closer to the sites where the median lanes were installed.[12]

Negotiating with the bus companies was also a challenge, because of their fears that they might lose money if they agreed with the Metro-integrated fare system. Among the complaints, those of the bus companies were relentless. Bus companies staged demonstrations against the reform initially for a variety of reasons. Some of them had to give up so-called "golden routes" as the new plans for "quasi-public" operation and management of the bus transit system meant that routes would be assigned as best fit the public interest. They were also afraid of losing revenues because of the T-money system that made accounts receivable more transparent. Moreover, they foresaw pressure to abide by the rules that dictated both bus route and line assignments. Bus companies preferred either trunk or loop lines instead of feeder or circular lines. With these interests in mind, they lobbied against the reform and held protests, including holding sit-ins at the city hall and occupations of the mayor's office. They also filed complaints with members of the National Assembly, the Ministry of Construction and Transportation, and the Blue House, as well as members of the City Council.

Nonetheless, bus companies finally went along well with the city. There were two plausible factors that lured them into compromise with the city. For one thing, external oil prices rose quickly at that time, and buses had a negative image because they were serious contributors

12 Author interview, Eum sung-jik, January 30, 2018.

to pollution in urban environments. At the same time, the bus companies were suffering from operating revenue losses. On the other hand, the city also had no option but bus improvement, given the high costs of investing in subway and road expansion. Bus was the only mode of public transport that was relatively cheap, flexible, and easily accessible to ordinary citizens. All-in-all the city could not replace it with any other mode. The bus companies acceded the point and tried to win as many economic gains as possible when negotiating with the city.

It took about one full year for the city's transport authority to resolve all these issues and concerns after undertaking a series of negotiations and compromises with various stakeholders. Upon clarifying and resolving these concerns, by 2004 the city was able to resume, activate, and accelerate the reform process.

Tracing the Implementation Process

Conflict Management and Consensus Building

The pilot project initiated in 2002 was ultimately unsuccessful, with multiple factors and early delivery challenges contributing to the failure. First, bus companies opposed the introduction of the quasi-public bus operation and management scheme and the route-bidding system. They feared that under the system a selected number of companies would profitably run buses, with the rest losing and being driven out of business. So they filed a complaint against the scheme with members of the National Assembly, the Prime Minister's Office, the Ministry of Construction and Transportation, the Blue House, and members of the City Council. Second, bus drivers rallied against the measure, fearing that it might cause them to lose jobs. The Bus Drivers' Union staged walkouts and strikes at City Hall and elsewhere. Third, there was strong opposition from the nearby communities against median lane installation, who feared that it might jeopardize the economy of surrounding neighborhoods by cutting them off from traffic. And finally, the district office[13] joined the opposition because of the possibility that the median lane could distort the smooth flow of traffic, resulting in inconvenience, time delay, and risks of traffic accidents.

The transport authority learned a lot from the failure to proactively recognize the variety of different interests that would come into play in this reform.[14] Most importantly, the transport authority realized how important it would be to create a system for good governance that could involve this diverse group of stakeholders, including bus companies/proprietors, bus drivers, district administrators, police, city council members, ordinary citizens, and business communities. In response, it helped organize the "Bus Reform Citizens' Committee (BRCC)" and strongly encouraged citizen participation in the decision-making process. Prior to the creation of the committee, seven major citizens' organizations—including the Citizens Coalition for Economic Justice, the YMCA Civil Society, the Green Transport Movement, and the Green Consumers Network—announced a joint statement, strongly favoring the reform. The committee, established in August 2003, was made up of four members from civic organizations, three from bus companies, eight from academia working on transport issues, and five from the city council and other related entities (Reforming Public Transporation in Seoul 2014). It started out as an independent, but "inclusive" organization, with representation from almost all the interested parties directly and indirectly involved in the bus reform.[15] The city consulted with the committee whenever it had to work out a set of measures; for example, restructuring the bus routes that could meet the citizens' expectations while guaranteeing financial stability of bus companies at the same time.

The city was persistent in its efforts to come to terms with interested parties. It held workshops with the representatives from bus companies, academics, and local officials when negotiating with bus companies and other entities. Equal attention was paid to bus drivers; official letters were mailed to 16,000 bus drivers, explaining why the reform would be mandatory, how it would take place, and who would from it. The city also offered 27 special training sessions for drivers. Efforts were also made to persuade the police agency that the median lane would be safe. In fact, the city was able to come to an agreement with virtually all the stakeholders. Eventually the city also won support for the reform from

13 Seoul is made up of 24 autonomous districts (wards), each one with its own district office, headed by an elected district head.

14 Author interview, Eum sung-jik, January 30, 2018. See also City of Seoul 2006, 40–51.

15 Interview with Prof. Kee Yeon Hwang.

the Ministry of Land, Infrastructure and Transport (MOLIT), Incheon Metropolitan Government (IMG), Gyunggi Province as well as urban railway operators such as KTX. Compromises and consensus were created with regional governments such as IMG and Gyunggi Province, regarding inter-regional bus operations, fare adjustments, bus-exclusive median lane installations, and other pertinent matters.

One of the key elements of the quasi-public bus operation system was the joint management of operation revenues. The Passenger Transit Business Act had to be amended to allow that to happen. MOLIT expedited the amendment process to secure legal ground for the quasi-public bus operation and management system. As for the contested profitable routes, the city decided to limit the validity of operation licenses for up to six years while introducing an open route-bidding system afterwards. Furthermore, the city realized that without subsidies, the majority of bus companies would withdraw from the system. This was resolved with a critical decision in 2004, when the city promised to provide bus companies with full compensation if they incurred financial losses as a result of the quasi-public bus operation and management system.

Bus proprietors agreed to put fare revenue management in the hands of a centralized-bus operating center that would be jointly managed by the city and the bus owners (later known as the Business Management Center, or BMC). They also pledged to provide high quality services, and clean and non-polluting buses irrespective of profit, in exchange for the city's commitment to what bus proprietors argued would be "just compensation." The bus companies no longer lobbied for profitable routes because they would be compensated in full if financial losses were to occur as a result of unprofitable route assignments. This suggested that the city should secure a large sum of money to subsidize such routes.

Organizational/Professional/R&D Supports

The mayor helped form a task force within city hall, called the "Public Transport Promotion Task Force (PTPTF)." The PTPTF was composed of Seoul city officials and transportation research staff members at the SI, and started its work in June of 2003. Its task was to draft a comprehensive bus reform plan. Under the PTPTF, four working level task force (TF) teams were formed: Traffic Management TF, Traffic Information TF, Traffic Improvement TF, and Traffic Improvement Planning and Controlling TF. Their responsibilities were to feed relevant information into the PTPTF for timely decision making, and if necessary, to simulate outcomes when alternative policy options were brought up and evaluate the impacts of policy interventions on the bus operating system.

Most influential among the organizations that the mayor helped to create was the BRCC. The committee declared that the past bus transportation policy completely failed because it ignored public interests while allowing for unorderly bus schedules, causing inconveniences and inefficiencies. It also pointed out irrational and asymmetrically biased bus fare structures as well as disorderly, winding, and overlapping bus routes, which led to a small number of bus proprietors earning enormous profits. Passengers had to pay a flat fare with every transfer, regardless of the distance they traveled, one of the reasons why short distance passengers avoided bus rides.

At the same time, in July of 2003, another task force team, the Transport System Reform Support Taskforce, was set up at the SI, comprising a wide variety of specializations, including transportation planners, traffic engineers, urban/land use planners, computer analysts, urban geographers, statisticians, and GIS specialists. With the policy goals of reducing congestion and air pollution, increasing road efficiency, and benefiting citizens in mind, the TF conducted a number of studies, beginning in 2003, to elicit various causes of congestion and bottlenecks in and around the city beyond its borderline. They focused on the city's traffic circulation, movements along the major trunk and feeder roads, and inter-regional traffic flows in particular. The task force also studied feasible sites for the bus-exclusive median lanes and ways to integrate the Metro with the bus transit system. The idea of a smart card or T-money was introduced not only as a means to integrate Metro-Bus transit systems, but as a tool to run the quasi-public centralized management/control system of bus operation as a whole. Additionally, it made both the BMS as well as the Bus Information System (BIS) work effectively as it fed real time passenger data into them, especially passenger transfer information. In retrospect the whole system would not have worked well without the smart card. In a way the smart card pulled all the parts together into one big synchronized system.[16]

16 As noted by a high-ranking transportation official in the White Paper, 69.

Seeking Support from Local Politicians and the Community at Large

Another key step in resolving the stakeholder issues and concerns facing the project was to persuade city council members, community leaders, local and national political leaders, and local business and commercial groups that the bus reform was absolutely necessary and the timing was right since bus ridership was in a steep decline, and to ask for their moral and financial support. In fact, the city couldn't move forward without their support in the form of consensus, agreements, and compromises. Some actions, such as expropriations or forced sales of private properties, could be misinterpreted as impinging upon constitutionally guaranteed private property rights. Numerous meetings were held with local politicians and community leaders alike, initiated by either the mayor or the transport reform staff. Simultaneously a number of public hearings took place where both costs/demerits and benefits/merits of the bus transit reform were discussed in great detail (White Paper 23–67).

The support of the city council was also a necessity, as it was required to pass or approve the pieces of legislation—ordinances and bylaws—pertaining to quasi-public bus management and operation. It also created budget appropriations to be set aside to pay compensation to land and other property owners when the city built the bus-exclusive median lanes. A large sum of money was reserved for the city's use to compensate bus proprietors who might suffer from operating revenue losses as a result of reshuffling the bus routes and lines at the city's discretion.

Revision of the Passenger Transport Business Act

In order to implement the reform program, the city had to either enact new laws and regulations or revise the existing ones when necessary, to push forward and activate such necessary initiatives as the quasi-public bus operation management, bus-metro integrated fare, new smart transportation, and a new route tender/bidding system. Equally important was the need for institutionalizing, and putting into practice, new policy instruments, such as median bus lanes, bus operating centers, and the new transportation card system.

Relevant laws were reviewed. One of them was the Passenger Transport Business Act, which was revised in February of 2004 to facilitate functions such as standardized bus operation cost estimation and redistribution of fare revenues collected through joint operation of the transit buses. A subcommittee of the BRCC was authorized to define and determine the standardized operating costs. The MOLIT helped amend the law in an effort to facilitate bus reform, revitalize public transportation, and make public transit businesses eligible for financial subsidies from the government.

New Ordinances and Revision of the Existing Ones

With the Passenger Transport Business Act revised by early 2004, the city enacted an ordinance that allowed financial subsidies. It passed ordinances that authorized the city to limit bus operation licensing rights, necessary to prevent a few bus companies from monopolizing bus operation on major trunk routes. It also revised the existing ordinance in such a way that the competitive bidding/tender system for route assignment would be prudently deployed in limited areas. The new ordinance stipulated that the system could be applied only to four profitable areas—10 major corridors and 19 routes—as specified therein.

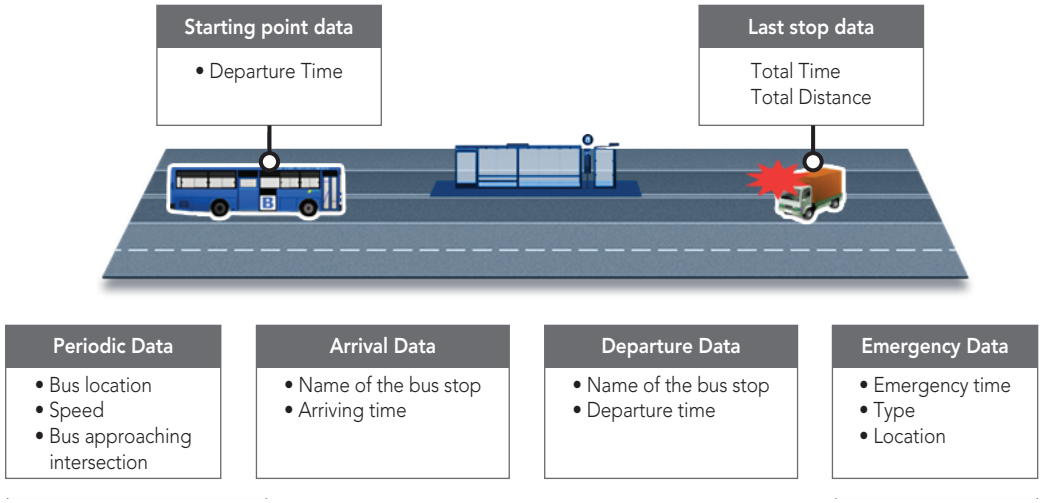
In the past the system was enforced in most of the potentially profitable areas. The bus owners who had held almost permanent operating rights expressed dissatisfaction with such a revision because they had to compete against other bus owners for golden routes under the newly revised tender system. They had to yield their vested interests, so they naturally protested against it, but the unlicensed bus owners outweighed the licensed ones, and eventually all were required to adhere to the revised ordinance.

The city also revised an ordinance regulating establishment and management of the promotional fund for small- and medium-sized businesses (SMEs) so that bus companies were included in the eligibility list for funding. This way, crucially, the city could compensate bus companies when they incurred operating deficits. Essentially the city made this pledge to bus owners in exchange for an agreement on quasi-public bus operation and management.

Adoption of the Smart Card System

An important policy initiative was the adoption of the Smart Card system. Previously a large number of different kinds of transit cards were in use, but none of them were compatible with each other because most were issued by

Figure 1. TOPIS Management System (BMS)



Source: Seoul TOPIS.

different credit agencies with different coding systems. In addition, separate cards were required if a passenger wanted to transfer from bus to subway and trunk line bus to feeder line or community bus. Furthermore, these cards were not designed to allow discounts for senior citizens, students, and other needy individuals. These cards were also susceptible to financial accidents such as copying, because they were not based on ISO technical standards. The multiple card system not only caused inconvenience, discomfort, and confusion from the perspective of the consumers, but also made bus-to-bus and bus-to-subway integration impossible.[17] Many problems arose when the old transportation cards were used: particularly serious were the limited data processing capacity, high costs of maintenance, inflexibility to adjust to changes from flat to distance-based fare system, and technical difficulty to support transfer program between bus and bus on one hand, and bus and Metro on the other. And, importantly, the operating costs alone ran over W 22 billion per year.

The smart card system was developed for both buses and Metros to facilitate implementation of the complex distance-based fare system. When it came out, it led to impressive results, even working wonders according to the Seoul White Paper (2006, 188–193). It helped analyze demand-supply behavior of the passengers using public transit services for 24 hours a day, weekdays and weekends. With this information, planners at the Transportation Operation Information System (TOPIS)[18] could improve bus routes, manage bus schedules, and control timely bus operations. Particularly helpful was that the smart card helped the city/bus partnership to manage operational revenues and profits, which was central to the concept of the quasi-public bus operation system (see Figure 1).

Establishment of an Integrated Single Fare System

One of the most problematic elements under the past bus system was the flat fare. No matter how far one might travel, one paid the same flat fare. This led passengers to avoid bus rides when making short-distance trips, causing a substantial decline in ridership and operational revenue. The distance-based fare system, on the other hand, was accepted as fair and efficient. It helped passengers save both time and money, especially those who had to make either inter-modal transfers or inter-bus line transfers. It meant a considerable welfare gain from the standpoint of passengers, as it allowed them to substantially reduce both time and monetary costs.

17 For a more detailed discussion of this point, refer to City of Seoul, 169–177.

18 The Transportation Operation Information System (TOPIS) is the transportation management center that operates and controls Seoul city's overall transport. Its primary responsibilities include: management of Metro-bus integrated transportation, road traffic information collection, management and dissemination, unmanned traffic law enforcement, traffic forecasting through tools like big data-based analysis, GSP-based scientific bus operation and management. It was founded in 2004 in an effort to effectively implement and technically support the bus operation and management reform program. It has been upgraded as new ICT technologies have evolved and now serves as a platform to help solve transport problems for the city and the region as well.

Prior to these reforms, passengers were required to pay an equal fare each time they switched from a bus line to another and transferred from bus to Metro or vice versa. Currently, those transfers are fully integrated with that of Metro system. The newly integrated single fare system made inter-modal transfers easy, handy, and time-saving, further reinforcing the sense of convenience and fairness as well (Seo Young Wook et al. 2006). Now the bus transit system is complementary to, rather than a substitute for, the Metro subway system. Both have become a mutually inclusive system for integrated public transit.

Expansion of the Intelligent Transportation System (ITS)

Upon reaching agreements with BRCC in April of 2003, the city announced that: 1) the new bus routes would be determined and allocated in accordance with passengers' needs; 2) the bus proprietors yielded their bus operational rights to the centralized public-private partnership/ joint management while maintaining ownership; and 3) revenues and profits be distributed according to the performance of the participating bus operators. Simply put, the city intended not only to manage the transit system under its control to the benefit of the public at large, but to minimize inefficiency by streamlining unreasonably winding and overlapping routes/lines, and rationalizing the transit fare system once and for all. The Business Management Center (BMC) emerged as a powerful agency to resolve all these complex matters. The center was created to handle major issues and problems that the city faced and help resolve them in a timely manner. Because Mayor Lee designated the city's mass transit as a top priority issue, the center was assigned the responsibility to take care of the day-to-day operation and management of the city's transport and traffic affairs.

Despite the progress made, it was clear to staff members working on the bus system reform that the scheme would not work without deploying advanced information and communication technologies (ICT), which would enable effective, efficient operation and management.[19] The system as designed, therefore, leveraged the concept of ITS (Intelligent Transport System) to enable the bus business management system to collect real time data on bus operation and time distance between buses, and to provide real-time information to bus operators and ordinary passengers alike. To make it work, the city installed computer terminals on the buses and put wireless communication systems in place between buses and the BMC. As mentioned, the smart card was incorporated into the ITS system so that both Metro and bus systems could help execute the newly established distance-based fares as well, thus relieving transfer passengers of the inconvenience of paying a flat fare or having to purchase different tickets for each type of service.

Overall the IT industry and the development of a satellite-based integrated transport management system helped solve many technical challenges to the effective implementation of the quasi-public bus operating system, and thus, pushing transportation reform forward. TOPIS was an equal contributor to the system's success.

Setting-Up the Korea Smart Card Company (KSCC)

The company was conceived as a private firm, but jointly funded by the city and private investors. An open bidding process was used when launching the firm. The city held 35 percent of the corporate shares to represent and advocate the public interests. The LG-CNS Consortium was awarded the project, with the condition that 35 percent of corporate shares would go to the city.

The city created the company for two reasons; one, to collect the real time information pertaining to bus operations and fare; and the other, to perform such functions as fare collection, revenue pooling, profit clearance, and fair distribution of the revenues and profits among the participating bus operators. The latter function was deemed to be more important, as the city plays a key role of distributing revenues and profits, fairly and transparently, and by so doing, it can control the bus businesses for the benefit of the public at large.

The information collected also was used to evaluate bus service quality as well as to monitor operational capabilities. Additional information was also available that helped the city estimate and approximate the amount of financial aid necessary to subsidize bus companies that might incur a deficit from the reforms.

Additionally, real time transportation information was also necessary to facilitate continuous rescheduling of the bus routes and bus lines. figure 1 shows in simplified form how the public transit management system worked.

19 Author interview, Eum sung-jik, January 30, 2018. See also City of Seoul 2006, 40–51.

Installation of the Exclusive Median Bus Lanes

The city's traffic congestion aggravated as the city expanded outwardly from both urban sprawl and suburbanization. Most of the newly arrived population worked in Seoul, primarily in the downtown areas north or south of the Han River, generating a heavy volume of daily traffic. In fact, the traffic flow entering Seoul in the morning and leaving for the suburbs in the evening became the crux of Seoul's transportation problem. Most traffic flow occurred on trunk roads, but many were irregularly shaped or too narrow, which created bottlenecks and traffic jams (Ah-RanHwang 2006).

Initially, metropolitan city planners conceived a radial road formation that would be centered in and around the heart of the city. But with the development of new satellite cities in the early 1990s the idea became obsolete. The metropolitan-wide congestion problem would get worse unless additional traffic from these new cities and suburbs were taken into account when planning urban traffic management.

City planners also once considered extensive road construction to mitigate congestion problem. That plan was dropped because it was not only too costly, but could not guarantee efficiency. It was estimated that one kilometer of metro-line construction would cost approximately W 130 billion, but extending road length by one percentage point would cost W three trillion, even disregarding the time and opportunity costs involved in constructing the roads.

As alternatives to new road construction or expansion of the existing road were considered, planners found that an exclusive median bus lane was the least costly means to improve the carrying capacity of existing trunk roads. These road networks were heavily traveled during the rush hours and if they were used exclusively for commuter buses, they would attract many commuters, thus diverting automobile drivers away from the roads. Median lanes were installed with two objectives: 1) to divert rush hour drivers away from trunk roads; and 2) to push for mass transit service use by leaving the remaining trunk road space congested with private automobiles. The plan worked out successfully, helping to shift the mode of transportation from private automobiles to public transit, including bus, Metro, and the rail service provided by the Korea Railroad Corp (formally known as KORAIL).

Bus Identification by Color

One of the drastic measures was that bus routes were divided into trunk lines (arterial) and feeder lines (branch). The former ones were designed to serve inter-regional and medium-to-long distance travelers whereas the latter ones would serve short distance trips within each sub-region or district. It was believed that the clear distinction between the two in bus operations management would help secure smooth operation of the bus transit service and improve travel speed (16.7km/h in 2003 to 22.0 km/h in 2004) and transport efficiency (as measured by number of passengers, which increased 26.8% from December of 2004 to December of 2005).[20]

Particularly noteworthy was that the buses were made easily distinguishable by colors. For example, the long distance and inter-regional buses, running between major cities in the Gyeonggi province and Central Business District (CBD) and sub-centers in downtown, Seoul, were colored in red. City-wide trunk line buses, running mostly major downtown arterial roads, were colored in blue. And there were two types of feeder line buses. One was green, running on short distance branch roads—either circular or linear—in residential areas, and the other was yellow, a kind of shuttle bus, running on circular routes within the city centers or sub-centers (see Figure 2).

The reorganization of the bus lines in this way made any bus easily distinguishable another. It also helped substantially improve mobility, accountability, and convenience of bus services. It helped passengers easily transfer between feeder, circular lines, and trunk lines and increased demand for both inter- and intra- regional bus services. Another contributing factor in terms of transfer was the installation of transfer terminals at major junctions like Cheongryangri and Yoedo where passengers could easily transfer from bus-to-bus and from bus-to-subway almost instantaneously.

Results

The results of the intervention were broadly positive, with improvements in the quality of service, efficiency, and revenue intake.

20 The Ministry of Land, Infrastructure and Transport and Korea Transport Institute. 2013. Best Experiences from Public Transport Reform. 2012 KSP Modularization of Korea's Development Experience. KDI.

Figure 2. Bus Identification with Coloring Device

Source: Seoul Metropolitan Government.

Increase in Speed: The achievements were indeed significant. Most prominent of the improvements was an increase in bus travel speed. Average bus speed rose from 9km/h to 30.8km/h (242 percent increase) in congested area and from 9.1km/h to 17.4km/h (91 percent) in some other areas. The average speed across the system increased by 164 percent from 7.5km/h to 12.9km/h when it was measured by the SI transportation TF team in 2005.

Increase in Bus Ridership: Bus ridership showed a notable increase. The total number of bus riders per day in 2003 amounted 4,006,000, but it gradually rose to 4,509,000 in 2005, to 4,596,000 in 2010, and to 4,647,000 in 2012. A significant increase in ridership was also observed in Metro simultaneously. It stayed at 4,487,000 per day in 2003 but started to increase in 2004, to as many as 4,994,000 per day in 2010 as shown in Figure 3. The results would imply that both transit services are in fact complementary to each other, rather than substitutes for one another.

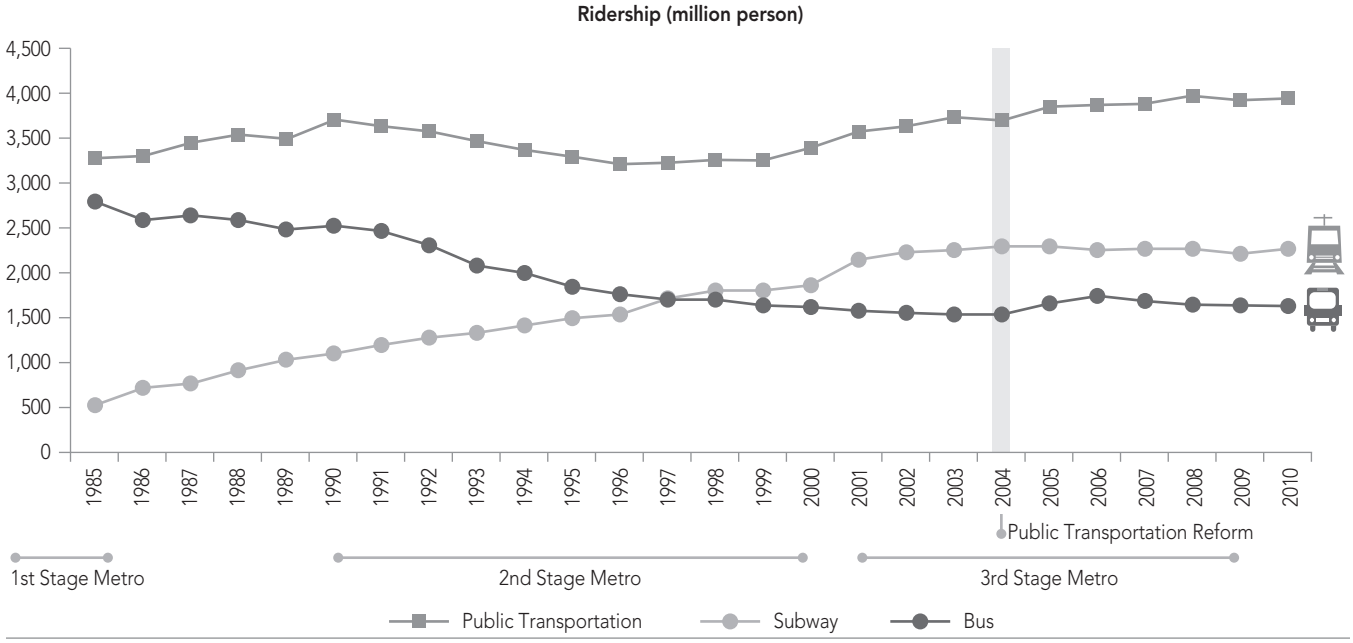
Improvement in Services: Significant improvements were made with respect to bus operating services, resulting from the switch from a supply-oriented to demand-oriented strategy. Improvements were observed in many aspects, including convenience, safety, and comfort as well as travel speed and punctuality, thus making the bus transit system reliable and satisfactory to the users. In fact, according to surveys taken consecutively between 2002 and 2005 by SI, the level of satisfaction increased from 14.2 percent in 2002 to 36.9 percent in 2005, one year after the execution of the bus reform program. The major contributing factors were found to be discounted transfer fares and interconnection between the bus and Metro in terms of operating lines, stations/bus stops, fare integration, bus terminal and transit schedules. Additionally, most buses running on streets were newly manufactured non-polluting ones such as Compressed Natural Gas (CNG) buses, which may have added to the increased levels of satisfaction. Figure 4 demonstrates the changes in degree of satisfaction over the years.

Increase in Transfer Passengers: Bus transit ridership increased tremendously. It surged when the transfer discount service was made. Transfer passengers almost doubled from less than 250,000 in 2002 to over half a million in 2010 (MOLIT and KOTI 2013, 127 and 135; Lee Chang and Jang Ji-eun 2015, 8).

Increase in Operating Revenues: In spite of various demand subsidies—discounted transfer fares, discounts for minors and students as well as the elderly and handicapped—operating revenue doubled from W 500

Figure 3. Increases in Use of Public Transportation from 1985 to 2010

Source: Seoul Metropolitan Government.
Note: These pictures show the change in typical Seoul streets before and after the introduction of Median Bus Lane Operation and the removal of elevated roads. The picture on the left shows a road prior to the intervention; the picture on the right shows the state of the road after the intervention.



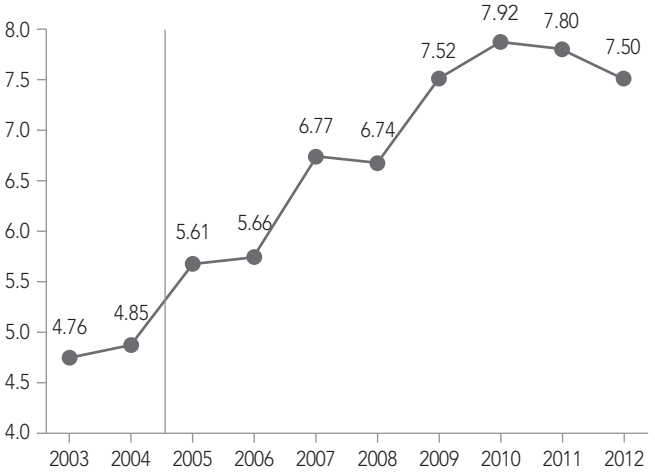
Source: Seoul Metropolitan Government.

billion in 2002 to W 1 trillion in 2005 alone, and increased steadily afterwards (MOLIT and KOTI, 2013, 127, 135; Lee Chang and Jang Ji-eun, 2015, 8).

Increase in Welfare of Bus Drivers: Wages and salaries of bus drivers in Seoul City also increased. They had been paid 37 percent of express bus drivers and 50 percent of Metro drivers. Upon raising their salaries and other benefits commensurate with wages, the city found the quality of bus services very much upgraded and bus rides safer and more comfortable. In fact, the number of complaints received from timetable irregularities decreased from 75 percent to 25 percent between 2002 and 2005 (Park 2010).

Improvement of Urban Environment: The most socially desirable achievement was made in regard to the urban environment. Continuous increase in automobile ownership notwithstanding, private automobiles on the road decreased substantially during the rush hours in particular. Such reduction helped decrease various harmful pollutants. For example, particulate matter (PM) decreased from 75ug/m^3 in 2002 to 44ug/m^3 in 2013, lower than Korea's air quality standard of 50ug/m^3.

Figure 4. Change in Citizen Satisfaction Level



Source: 2012 Seoul Survey.
* Rating is based on a scale of 0 to 10.

However, NO_2 decreased insignificantly from 0.037 ppm in 2002 to 0.033 ppm in 2013 (Best Experiences 2013; Presentation: Urban Transport System in Seoul).

Lessons Learned

There were a number of factors that contributed to the relative success of the bus transit reform program, including a holistic but systematic and organized approach, active participation of high caliber professionals (both as administrators and researchers), and a timely decision-making process.

The holistic approach covered a wide range of "policy tools" simultaneously. All these tools were organically interconnected with each other; the system would not work if one or more of them were missing or malfunctioning. Systematic efforts meant that the managing staff members very much relied on, and adhered to, scientific management tools such as the program evaluation review technique. Reports were made almost daily to the mayor and decisions were made immediately. And the whole working group consisted of elite officers from inside the organization, and highly motivated professionals (university professors and private consultants) from outside the organization. While these factors may be clearly distinguishable from similar unsuccessful projects in the past, several other factors also help explain the causes for the success of the reform effort—leadership, belief, trust, and R&D support.

The Mayor's Strong Belief in Public Transportation

Those who participated in the reform program had a strong belief in public transportation as a means to mitigate congestion and pollution. The mayor's leadership was of utmost importance. He was highly motivated to tackle bus reform directly and urgently. He was confident that the reform would help solve many of the city's transport problems. He also believed that it would be the least costly way to solve this problem and that all the parties—bus companies, citizens, the Metro, and the city alike—would be better off when the reform was carried out successfully. To him it was a plus-sum game. He was also confident that the timing was right because the bus issue had become an urgent one for all the stakeholders.

The mayor had a strong belief in public transportation, and so did the appointed Chief of the City's Transport Policy, Eum Sung-jik. The mayor delegated extensive power and authority to the Transport Policy Chief so that he could exercise his professional expertise and judgments in approaching the reform. The mayor trusted him to the extent that he even commended him when the pilot project failed completely. Afterward the mayor's (and his staff's) confidence in the bus transit system reform and his staff was reinforced, because the pilot project turned a misfortune into a blessing. It reminded him and his staff of the importance of governance.[21]

City-wide discussions and open debates pertaining thereto were quite fulfilling and rewarding.[22] Most of the large civic organizations rendered full-fledged support for the mayor's cause, criticizing what the bus companies had done over the years. These organizations included Citizens' Coalition for Economic Justice, Green Korea, Citizens for Green Transportation, Consumer Advocate, and various community groups. Soon after politicians joined in this support, seeking to help constituents such as students, the elderly, and low-income households. It seems plausible that there were political incentives for politicians to support the reform, knowing that it would help their constituencies significantly reduce

21 See, for example, interview news of Jung-Ang Daily News, June 15, 2002; and regular news on the Seoul City's Bus Reform of Dong-A Daily News, http://news.donga. Com/view?gid=8142281&date=20041223.

22 See White Paper, 51–59, as well as Han-Kuk- Gyung-Je (Daily Economic News), June 23, 2005.

transportation costs while improving convenience, comfort, and safety at the same time. Therefore, they strongly supported the reform measures and sided with the mayor to actively promote the cause. This, in turn, inspired the mayor and the transport staff members working on the reform. This type of atmosphere helped expedite the institutional changes that were necessary to push for the reform on one hand, and secure funds to finance the reform program and various subsidies on the other.

Administrative and Research Supports: The mayor-designated chief of transport policy almost hand-picked his own staff members who were intelligent and well-equipped with administrative skills. They were an achievement-oriented group and wanted to get the things done expeditiously. Their administrative support was helpful in speedy decision making and timely execution as much as quick delivery of actions. They were good negotiators and problem solvers as well.

Equally supportive was the research and development staff of both SI and Korea Transport Institute (KOTI). Most researchers were data-oriented and had strong skills in computer-based analysis. Whenever research outcome and data needs arose, they responded promptly. The kind of information they provided the transport authority was used not only for timely decision making, but for effective program monitoring and evaluation. Various simulations were particularly helpful in determining alternative courses of actions.

Mayor's Strong Leadership: The mayor's strong leadership very likely helped the professional staff transcend the myriad of tasks and responsibilities necessary for successful reform in a short period of time. The top leader's thoughts definitely mattered, but the question was how to translate those thoughts into a set of strategies and action programs. The chief of transport policy spelled them out in a 12-page memorandum. They were neither complex, nor conceptual. Instead, they were straight-forward, practical, results-oriented, and simple enough to gain support from civic organizations, the city's transport administrators, and the citizens at large.

It seems very likely that the whole reform strategy could be arranged under three fundamental pillars with the mayor's leadership in the center: specific action programs, institutional supports, and executive capability. They are illustrated by the simple diagram in Figure 5. Each pillar contains specific programs, projects, actions, guidelines, and directives.

Figure 5. Leadership-Driven Plan-Implementation Framework

Source: Author's framework.

Some Caveats

While the reform delivered results, it was very costly for the city because it was responsible for most of the civil work required to make the new bus system smoothly operate and integrate with the Metro system. Construction of the major transfer centers alone cost W 5 billion in 2004 prices, including the Yoido and Cheongryengri terminals. Installation of the median bus lanes was even more costly. At the same time, the city had to streamline and repair curbsides for safety, security, and maintenance purposes. But the most costly item was the subsidy promised to the bus companies on condition that they agreed to the quasi-public bus operation and management system. Fortunately, installation of the transportation information system was privately financed by LG CNS, which cost W 125 billion in 2004 prices.

One critical issue now is the increasing economic and financial burden on the city as for the promised subsidies. The city set aside a total of W 80 billion for the second half of 2004 alone, but it had to gradually increase the subsidy amount up to W 300 billion per year. As bus companies' operating deficits grew rapidly, so did the subsidy amounts. The total amount of subsidy was W 210 billion for the second half of 2004, and it grew to W 320 billion in 2007. It rose as high as W 550 billion in 2007. It decreased to W 500 billion in 2012, but it is still large and quite a burden on the city.[23]

23 See Lee Chang and Jang Ji-eun, 6–11, for a full discussion on increasing operating deficits, financial burden, and subsidies.

One reason for the increase is that the bus companies are not motivated to make profits under the existing system of subsidy because the city makes up for losses as they occur. There is no incentive for bus companies to run the bus business profitably. The other is that the tender/bidding system is not operating optimally. There are a large number of profitable routes other than the ones identified by the city, and the city may be able to reap a large sum of money if it expands the competitive bidding system over all of them as well.[24]

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24 Ibid., 32.

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