EFFECTIVE POLICY OF ITS FOR SEOUL KOREA

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Abstract: The purpose of this paper is to examine the process of planning and implementing ITS in major urban areas and to concentrate in particular on the interaction between central and local government1[)]. The central theme of the paper is that cooperation between central and local governments in implementing ITS can create "technology platforms," and that these platforms can be used as a basis for further interagency activities. Examining previous research on institutional issues in implementing ITS in Seoul tested this theme. The major ITS implement program in Seoul such as: Traffic signal control systems, Freeway management system(Olympic Expressway), Transit management systems (Advanced Public Transportation System), Bus arrival information systems, Electronic fare systems (Congestion pricing, Namsan 1,3 Tunnel), Traffic Broadcasting System ,Bus fare automatic collection System (Integrated Card System) are discussed.

Key Words: ITS Policy, Inter-government, Seoul, Korea

1. INTRODUCTION

Limited resources, environmental concerns, quality of life issues, and emerging technologies are leading those central and local government officials as well as transportation professionals to believe that it is not possible to deal with ever increasing travel demands1[)] and transportation safety1[)] issues by relying solely on the construction of new facilities, especially in recent economic and financial crisis period in Korea.

Rather, the focus has turned to making the most effective use of existing facilities. Intelligent Transportation Systems (ITS) is a techniques being used throughout the world to manage traffic congestion and safety issues. Intelligent transportation systems have been defined as "the use of advanced computer, electronics and communications technologies to increase the effectiveness of the entire surface transportation system".1[)]

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[1]) Government responsible is Ministry of Construction and Transportation (MOCT).
[2]) Recent estimation by Korean Transport Institute indicated that travel demand increased about 3 times in year 2011 compared to 1997.
[3]) Korea is among the highest nations for transportation accidents record.
[4]) The 5th ITS world Intelligent Transportation Systems (ITS) congress was held in Seoul, Korea from October 12 to 16, 1998.

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2. WHAT IS "TRANSPORT TELEMATICS?"

Within the European Community, the term "transport telemetric" is used more frequently than "ITS," although ITS is widely recognized. According to the Daimler-Benz Group, a leading automobile manufacturer in Europe, telemetric reproduces and services that reflect the partnership of telecommunications and "informatics."

Telecommunications refers to the transmission of data, whereas informatics refers to how that data is intelligently processed and distributed. The most important distinction between telemetric and ITS is how they are initiated. It illuminates which agencies in the European Commission and the United States government is responsible for implementing these programs.

ITS initially were developed by automobile and highway communities, and later by other transportation modes, such as public transportation, which had a stake in intermodal surface transportation. Telemetric, initiated by the telecommunications community, are applications of information or communication technologies across many areas, including libraries, environment, education, healthcare and transport.

In the United States, transportation agencies responsible for implementing this technology are the federal DOT, state DOTs, and public and local transit authorities. In Europe, transport telemetric projects tend to crosscut sectors or agencies, because they can originate from areas outside of the Directorate General (DG) VII (Transport), such as DG XIII (Telecommunications, Information Market and Exploitation of Research), DG XI (Environment, Nuclear Safety) and DG XVII (Energy).

The European Road Transport Telemetric Implementation Coordination Organization (ERTICO), the public/private advocate for transport telemetric, has identified six sectors which form these systems: traffic management, pre-trip information, on-trip information, vehicle control, freight and fleet management, and automation of toll collection systems. Each of these sectors includes practical applications. For example, in traffic management the applications are pollution monitoring, ambient weather condition monitoring, road status monitoring, traffic monitoring, accident detection, general and urban traffic control, and public transport management, parking management and rescue services.

3. INTERGOVERNMENT COOPERATION IN ITS

The traveler views the transportation system as an integrated whole, and expects to get similar levels of service, accurate information and ease of transfer between modes, regardless of governmental, institutional and jurisdictional barriers. With the explosion of information sources becoming available on almost every subject, the traveler's expectation of accurate travel information from various sources increases1).

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[5]) Government responsible is Ministry of Construction and Transportation (MOCT).

[6]) Information sources such as Transportation Broadcasting System (Radio), Internet and ARS.

In fact, in some of Seoul urban areas there are active Internet sites that do provide accurate, timely travel information.

The success of employing advanced technologies, or ITS, relies on cooperation and coordination among various levels of government. There are, therefore, tremendous opportunities to use the development of Intelligent Transportation Systems to improve that cooperation, both from a customer service focus and as a cost-effective transportation strategy. While the use of technology to solve transportation problems is not new, a concentrated central government effort to implement ITS came with the Master Plan for Korea ITS which is conducted by Korea Transport Institute for first stage and Korea Society of Transportation for 2nd stage and KHRIS for 3rd stages starting from early 1993.

The goal of Korea ITS master plan is to encourage implementation of "a national system of travel-support technology, smoothly coordinated among modes and jurisdictions to promote safe, expeditious and economic movement of goods and people". To attain a smooth coordinated system on a national level, a framework needed to be developed to guide implementation and manufacturers. The national framework is the Korea ITS Architecture that was recently completed. The national architecture defines basic subsystems required to implement ITS. It also identifies the interface between subsystems for which standards must be developed1).

The central government has a concern for developing a compatible national system as well as providing the necessary research and support for the development of tools to solve local problems. Local governments such as cities of Seoul and Pusan are looking at the same issues at the regional level. The interaction between these various levels of government complicates the process of the implementation of Intelligent Transportation Systems, but also creates opportunities for inter-governmental cooperation.

Early success stories in implementing ITS and in creating technology platforms in Seoul have been documented by Seoul Development Institute.1)

4. INTELLIGENT TRANSPORTATION INFRASTRUCTURE OF SEOUL

In 1998, during his keynote speech prime minister of Korea announced a nationwide initiative to install the Intelligent Transportation Infrastructure (ITI) in the largest urban areas within the next 10 years1).

The major ITS implement program in Seoul

Traffic signal control systems
Freeway management systems (Olympic Expressway)
Transit management systems (Advanced Public Transportation System)
Bus arrival information systems
Electronic fare systems (Congestion pricing, Namsan 1,3 Tunnel)
Traffic Broadcasting System

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7) Ministry of Construction and Transportation, "*National ITS Comprehensive Plan*," 1997.9.
8) SDI Forum "Implementing ITS for Seoul', Vol. 5, No. 6, pp. 46-51.
9) The 5th ITS World Congress in Seoul, Korea, October 12, 1998.

Bus fare automatic collection System (Integrated Card System)

The following three major ITS related

Studies conducted by SDI (Seoul Development Institute) have documented the potential benefits of the individual component systems; however, the theory of implementing the ITI is that combinations of systems can yield benefits greater than the sum of individual benefits.

This theory will be the subject of further researc^h^, but intuitively it is felt that the integration of component systems will yield both quantitative benefits (travel time savings, accident reduction, congestion reduction, etc.) and qualitative benefits (traveler information, customer satisfaction, quality of life, etc). Such integration creates additional opportunities for intergovernmental cooperation between state and local governments. This opportunity could build ITS technology platforms that can be used as a basis for future cooperative efforts.

An example of integrating individual components is the traffic signal control system, which is usually operated by a city or local government, coordinated with the freeway management system, which is usually state operated. Integration could be accomplished by combining both component systems in one building with a single point operating and maintaining responsibility, as in Houston; alternatively, there may be agreement to share information between two control centers as is done in Los Angeles and Seattle.

The benefits of integration could include cost efficiencies in collecting system-wide traffic information, coordinated response to incidents or emergencies on either system, and comprehensive information to travelers on system-wide traffic conditions. When combined with information from the transit management system, information could be available to the transit operator on traffic conditions that may affect transit service, and the traveling public could have the opportunity to make a modal choice of the morning trip to work based on real-time travel information.

The Ministry of Construction and Transportation of Korea (MOCT) lists nine examples of benefits or synergies derived from integration of user services and use of common system components for multiple purposes1)

Network Surveillance:

The information provided from network surveillance equipment (e.g. traffic counts and speeds) can be used for many purposes, including control and management of the traffic signals, incident management, demand management, emissions management and traveler information (including route guidance). The surveillance information can also be saved as historical data for planning purposes or for evaluating the effectiveness of previous system enhancements. Probe surveillance information can be used for many of the same purposes.

Toll Tags:

Vehicles equipped with toll tags can be used as traffic probes (for flow monitoring). Toll tags could also be used for demand management strategies such as congestion pricing.

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[10]) See details for the Ministry of Construction and Transportation, "*National ITS Comprehensive Plan*," and "*National ITS Standardization Program*," 1997.10.

Communications Channels:

Each of the communication interconnect channels of the architecture is structured to support data messages pertaining to multiple user services. For example, the two-way wide-area cell-based communication system supports messages relating to traveler information, route guidance, emergency notification (mayday), probe surveillance, yellow pages, etc.

TBS (Traffic Broadcasting System) had been providing traffic information depending on the reports of about 3,500 correspondents. To meet patrons needs for the more customized personal service. TBS sought for the system that makes it possible to provide better traffic and travel information. In this context, TBS implemented ARS (Automatic Response System) with 40 image sensors. Data are collected for 472 strategic points with those 40 image sensors. Besides the image sensors, 76 CCTV, 4 local posts, 3,500 correspondents, etc is used as a source of information. In center both mechanical and manual data are processed at every 10 minutes and the processed information is transformed to voice messages. Now ARS service is provided for 21 roadways of 363 km from 7 a.m. to 9 p.m. at local call charge. Due to deficiency of image sensors, reliability and consistency of the produced information is limited. Therefore, TBS plans to expand image-sensing system and makes an effort to produce more reliable information for a whole section rather than just for a spot.

Traffic Management Subsystems (TMS):

The traffic management subsystem (TMS) allows for many functions to be performed at a single location, enabling the beneficial sharing of equipment, facilities, and information across multiple user services, including traffic control, incident management, travel demand management, and en-route driver information.

The Olympic Expressway is one of the major arterials running from East to West along the Han River. It suffers from frequent accidents and all day long delay. A Freeway Traffic Management System for 18km section of the Olympic Expressway was implemented. Real-time traffic data are collected through 34 image sensors and 2 CCTV and processed at Kang-Nam Traffic Control Center. Information is provided through various media such as 8 Variable Messages Signs, Automatic Response System, FAX, Internet etc. Beside them, RMS (Ramp Metering System) is installed at 2 sites. However, to operate the RMS needs to develop more sophisticated algorithm and to enhance the system adaptability to the field to tune up the system.1)

Vehicle Location Determination:

Vehicle location equipment (e.g., a GPS receiver) has many uses within the architecture: vehicle tracking for navigation/route guidance, probe data collection, emergency notification and personal security.

Map Databases:

Map databases in a particular subsystem should be capable of supporting multiple user

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[11]) Bongsoo Son, Kwang-Hoon Lee, and Taehyung Kim, "Freeway Traffic Management Systems (FTMS) in Seoul", The 5th ITS World Congress, Seoul, Korea, 1998.

services. For example, a single map database in a personal vehicle subsystem supports route guidance, en-route driver information, and pre-trip travel information. More important for ITI, map databases are an important part of emergency and transit management.

Transit Vehicle Tracking:

Transit vehicle tracking provides several useful functions: facilitating more efficient public transportation management (including dynamic route modification and personalized public transit), providing data useful for travel information purposes (schedule adherence data), and enhancing public travel security (location information can be provided to the police in an emergency or incident).

Electronic Fare Payment:

A single electronic fare payment medium can be used to provide financial transactions for several surface transportation modes (tolls, transit fares, parking charges) as well as non-transportation purposes.

City of Seoul decided to collect toll for Tunnel #1 and #3 for congestion pricing, and at the same time, called proposal for non-stop toll system in December 1995. Among the 10 System Integrators submitted their proposals, SMG let 4 System Integrators set their own systems up at an unopened freeway section and had evaluated the performances of each system for 1 month in terms of accuracy and acquisition rate of violators. 3 systems were passed and the other was failed. Now standardization of non-stop toll system of Seoul is undergoing for the successful 3 systems. However, cash has collected tolls for the Tunnel #1 and #3 till the standardization is completed1[)].

Advanced Freight System:

A tag and Dedicated Short Range Communication (DSRC) system on board commercial vehicles can support multiple services such as electronic clearance, international border clearance, and safety monitoring which is integrated in Korean Integrated Logistics Information Systems (ILIS)1[)].

5. THE PLANNING AND IMPLEMENTATION PROCESS FOR ITS

Every public project goes through a project development process. Depending on the cost and complexity of the project, the process can be relatively simple or extremely complex. The implementation of ITS projects requires the same steps as other more traditional capital projects, namely planning, funding, design and construction, operations and maintenance.

The concern for compatibility between subsystems at the central and local levels requires consideration for a consistent architecture and compatible standards. Benefits are derived from both individual components and the integration of components, which requires greater interagency coordination. There is a greater emphasis on operations and maintenance issues.

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[12]) Inwon Lee and Eunmi Park, "The Win-Win Solution Of Seoul For Mobility And Environmental Quality" The 5th ITS World Congress, Seoul, Korea, 1998

[13]) See details for "The Master Plan for the Intrgrated Logistics Informations System (ILIS)", Korea Transport Institute, 1997

Procurement practices are different. Technologies are continually changing and evolving.

Recognizing these factors, the Ministry of Construction and Transportation is in the process of developing an ITS Handbook. The Handbook is currently in draft form and is under review by KHRIS. While the handbook is lengthy, it is recommended as a basic guide and resource document for local officials interested in implementing ITS. The theme of the handbook is that ITS is not a separate and distinct element, but an integral element of all types of solutions to transportation problems, and that ITS planning should be integrated into the comprehensive transportation planning process. ITS projects should be used as tools to implement the transportation policies of the region. For example, if the policy of a region is to reduce single occupant vehicle travel by encouraging the use of transit and multiple occupant vehicles, the ITS system for that area should reflect this policy and assist in meeting the goals.

Important Issues of Integration"

ITS can represent both direct operational initiatives (e.g., freeway and network traffic control systems and incident management systems) and actions that support other strategies (e.g., user services that support ridesharing and transit operations).

ITS strategies interact with other transportation strategies in impacting traffic congestion and mobility (e.g., an HOV ramp meter bypass system needs to interact and coordinate with the provision of transit service and ridesharing efforts).

ITS may sometimes need to be considered as a competing alternative to other transportation strategies.

In a planning environment with constrained resources, ITS needs to be considered for its investment merits along with other strategies.

There are elements of ITS that are unique and that need to be considered at a regional level independent of other transportation strategies in establishing cost-effective systems. For example, a communications system or traveler information system should be thought through at a regional level to provide for economies of scale, consistency among geographic areas, and coordination among agencies.

6. FACTORS INFLUENCING SUCCESS OR FAILURE OF ITS IN SEOUL

6.1. The Authorizing Environment

There is an authorizing environment at each level of government that allows for implementation of ITS projects. Central government funds are distributed to the city and province for authorize project.

6.2 Jurisdictional Responsibility for Highways in the Urban Area

In almost all areas the jurisdictional responsibility for highways is split among many jurisdictions: central, province, city, and special authorities such as Korean Highway Administration. Obviously, if the jurisdiction of major facilities is split among many agencies, the ability to develop a coordinated ITS program is more difficult.

Generally, a province has jurisdiction over limited access facilities and some major arterials in urban areas. Cities and counties are responsible for most of the remaining major arterials, other than those owned and operated by special authorities or agencies.

6.3. Other Transportation Organizations

Many province and areas have agencies or authorities with transportation responsibilities, and in many instances, with their own authorizing environment independent of line transportation agencies. The most prevalent are highway and bridge toll authorities such as Korean Highway Administration, transit authorities such as Seoul Subway authorities. To the degree that these agencies have their own revenue sources, their own boards of directors, different political accountability from line transportation agencies, and in some cases, legislative restrictions and bond covenants limiting involvement in joint activities, the ability to develop a comprehensive ITS program becomes more difficult.

6.4. Funding for ITS

Needless to say, funding for ITS is a critical factor, both in how existing funding decisions are made, and also in the structure of delivery of funds to the implementation agency. Because of its initial stage of ITS program, Korea doesn't have concrete funding programs, so following are experiences of ITS funding program for U. S. A.

The Allocation and Decision-Making Process for Regular Federal Funding.

Surface Transportation Program (STP) and Congestion Management and Air Quality (CMAQ) funds are the most regularly used funds available to local agencies for implementing ITS projects. Some states and MPO's sub-allocate these funds to jurisdictions within an urban area, while others require all types of projects to compete for funding, regardless of jurisdictional split important issues on the future of federal funding for ITS.

Special ITS Funding..

The ITS program is somewhat unique in that the Federal Highway Administration (FHWA) has been authorized approximately $660 million for ITS programs and the federal government has the responsibility for allocating these funds rather than the states. This issue is also discussed further in the federal legislation section, but those interviewed were unanimous in agreeing that the availability of special federal funding has greatly enhanced the success of ITS programs.

State and Local Funding Sources:

Almost all states have a trust fund for highways and in some cases for other modes of transportation. The existence of state funding over and above that required for matching federal funding was viewed as a factor influencing the success of implementing the ITI. Houston and Los Angeles and to some degree New York have state pots of funds available to increase mobility. The availability of state funding also has some issues. Some transportation trust funds are highly leveraged through the use of bonds.

6.5 Working Relationships with a University

Successful ITS programs often have a direct working relationship with a university transportation program. Since much of ITS is still in the research and operational testing phase, association with a university gives participants the ability to call on research talent on a continuous basis and to supplement agency staffing.

For example, in U.S.A., the usual association with universities is between a state DOT and a major state university, however, the City of New York has created an association between the city and Polytechnic University, a private university.

6.6. Public-private partnerships

The existence of public-private partnerships does not appear to be an important factor in establishing the ITI. Successful public-private partnerships are in evidence in operational tests, and the support of the private sector, including local ITS programs, is cited as being helpful in securing public support.

6.7 Crises, Special Events, or Major Projects

It is often said that government responds only to crises or unusual events, and that successfully dealing with a crisis or special event can build lasting relationships or technology platforms for future actions. The summer Olympics in Seoul, Korea in 1988, had positive effects in advancing technology on a cooperative basis.

6.8. Champions

There was agreement that the existence of a champion or champions was critical to successful ITS programs and that the lack of a strong champion was inhibiting the implementation of the ITI in areas struggling with the ITS program.

6.9 Politics

Obviously transportation is a subset of a larger complicated public decision process that affects the success of the ITS program. None of those interviewed felt that large political issues such as the relationship between a governor and mayor created additional constraints to the implementation of the ITI. The ITS program still seems to be under the political radar screen.

Transportation congestion and safety problems sufficient to attract political attention. Creating interagency coordination mechanisms necessary to jointly establish standards and protocols, resolve problems, and sustain progress.

The existence of a strong linkage with a university or universities to supplement agency research efforts. The policy and leadership of agencies toward ITS implementation, including level of state jurisdiction for urban highways, allocation of funding for urban areas, availability of state funding to supplement federal funding, level of decentralized decision-making to the region or district level, and level of technical expertise on advanced technologies.

At the local level, key factors are: a degree of training, education and expertise on advanced technologies; severity of traffic congestion and safety problems; condition of the basic transportation infrastructure; and jurisdictional responsibility for transportation.

Policies that require that provision of the ITI be investigated in conjunction with each major highway capital project, i.e., reconstruction of a highway should consider placement of monitoring equipment and communications facilities.

Developing a process for implementing ITI that allows sufficient time and effort to work with other agencies and that provides for adequate education and training of state and local officials. One state has used its money to fund travel expenses to training sessions and ITS tours for local officials.

Flexibility in dealing with different municipalities in establishing the ITS. Some municipalities may be willing to share operating responsibility and subsequent costs, while others are only willing, at least at the outset, to share information. Both approaches can be accommodated to create technology platforms.

In addition to the converse of the factors listed above, difficulties cited in the implementation of ITI include:

The existence of multiple agencies with transportation responsibilities without an appropriate mechanism for coordination. Continual disagreements over technical issues such as standards without an adequate, timely dispute resolution mechanism. Differences over objectives of the ITS.

Lack of political and public understanding and support for ITS. Competition between highway and transit agencies for riders and funds. Lack of operating and maintenance funding at both the state and local level. Lack of federal and state interest in applying advanced technologies to problems of local interest such as parking management systems and local revenue collection systems for traffic fines. Lack of interest, authorization or experience in innovative design construction and procurement practices such as design/build, design/ build /operate /maintain, etc.

7. CONCLUSION

Intelligent Transportation Systems and implementation of the Intelligent Transportation Infrastructure has created and will continue to create significant opportunities for intra- and inter-jurisdictional cooperation. Many technology platforms are already available to serve as the foundation for these opportunities.

In order to immediate implement successful ITS policy in Seoul, following important issues have to be considered.

ENVIRONMENTAL MANAGEMENT SYSTEMS

These systems extensively demonstrate the usefulness of sustainable ITS solutions for protecting and improving the environment. These systems also have been integrated with traffic management and control systems. Decisions about dynamic route guidance, public transit priority, road and parking pricing systems and the selection of transportation modes could be influenced by the information gathered from these systems.

PARKING INFORMATION SYSTEMS

The systems give drivers approaching the city information on parking. Drivers read displays indicating "full," "partially full," or "free" areas and displays indicating the number of spaces available. Vehicle miles traveled and congestion are reduced when drivers no longer needlessly circle in search of parking. Some studies have shown that drivers looking for parking cause a significant percentage of traffic congestion.

TRANSIT PRIORITY AT SIGNALIZED INTERSECTIONS

Giving priority to buses and trams over other traffic enhances the reliability of public transport and reduces journey times. Using this system, reliability and regularity both increase, and in certain cases, operating costs can be reduced and revenues increased. The benefits of public transport become more apparent to motorists.

REAL-TIME PUBLIC TRANSIT PASSENGER INFORMATION SYSTEMS

These systems provide traveler information for planning a journey, waiting for a bus or subway, and once onboard. It is common in European cities to see real-time displays showing route numbers and expected arrival times for approaching transit. Many onboard displays show the next stop, as well. Studies have shown that placing these systems at key locations, such as shopping centers and transit terminals, can positively influence travel behavior.

ACCESS CONTROL SYSTEMS FOR CITY CENTERS

Access control systems using automatic vehicle identification have been tested in worldwide. The systems use technology based on digital images and license plate readers. Some cities use infrared technology that identifies the license plate, checks it against a "white" or "black" list, and judges whether a vehicle can enter a designated zone.

INTEGRATED SMART CARDS

Smart cards are an electronic debit card embedded with a readable computer chip. They can be used on different transportation modes, taking a traveler from bus to tram to subway via the same card. Passengers who use public transport or alternative modes during rush hour can be rewarded with rebates to their cards.

The Seoul Bus Association decided to put an end to this immense waste of human resources by adopting a bus contact less card system that collects fares electronically. The card system consists of 6 parts including the bus card itself, the bus card validator (reader), the recharger, the card issuer, the bus company's computation system and the Seoul Bus Association's computation system. Trails for the bus card system began on September 1995. Validators installed in the buses were tested to see how they coped with realistic road conditions and whether they functioned quickly and accurately. Upon meeting all requirements the new bus card system was put into full-scale operation on March 1996 by 24 bus companies, which comprised 65 routes on 1,173 buses.1)

14) Jongho Rhee and Seunghwoon Oh, "Evaluation Of Contactless Bus Card System In Seoul", The

SMART BICYCLE AND CAR RENTAL SYSTEMS

In Rotterdam and several other cities in Holland, information technology facilitates bicycle and car rentals through a locker system at public transport facilities. Using a smart card purchased from a kiosk machine, the user opens a locker containing the car keys. Locked bicycles for rent can be accessed using a smart card, too.

TRANSIT PARK AND RIDE INFORMATION SYSTEMS

These systems offer advance and route information through variable message signs (VMS) and similar means to help motorists find park-and-ride lots and direct them to available parking spaces. They also are used to reduce traffic and parking problems in the central city and show motorist's alternatives to the automobile.

ROAD PRICING

Road-pricing systems apply fixed or variable charges to vehicles electronically, based on time of day, class of vehicle, congestion level, environmental factors, and purpose of journey, high/low vehicle occupancy (HOV) and other access rights. In Europe, the definition of "road-pricing" varies. In some countries it refers to highway tolls without factoring the external economic, environmental and social costs. For example, many toll booths and private companies operate highways in Italy.

To make a road pricing system acceptable, one must produce a "Win-Win" proposition to the public. Road pricing must be seen as more than another scheme to burden the driver. A road pricing system must also be packaged with an overall government policy to control congestion. This may mean concessions on annual licensing fees (ALF), road taxes and fuel taxes. It may also mean the bundling of road pricing with other congestion alternatives such as park-and-ride schemes integrated with public transport. Lastly, road pricing should be presented as part of the government's complete approach to ITS. Road pricing can play a major role in optimizing and ITS solution while providing motorists and public transport "real-time" information for avoidance of incidents and route guidance. Properly packaged with the above, road pricing may be more publicly acceptable.1)

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