

# APPLYING INTELLIGENT TRANSPORTATION SYSTEMS IN DEVELOPING AND TRANSITIONAL COUNTRIES

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## ABSTRACT

ITS has long been considered to be an “advanced” tool primarily for the wealthy and developed economies. This situation is changing rapidly. The study has reviewed the current status of ITS in numerous developing and transitional countries, to understand the background and requirements of ITS deployment in these regions. It has revealed that the rapidly falling costs of IT equipments, the prevalence of tried and tested “off the shelf” ITS solution has enabled ITS deployment in these regions. Another important aspect was the prevalence of other general purpose IT infrastructure, such as mobile phone networks, and the Internet, and digital road maps, which has allowed new services, or old services to be provided in a different way with much less outlay. On the other hand, there are issues that stem beyond the traffic problems and their technological solutions. Social and organizational issues need to be addressed. The need for constant system updates, maintenance and training needs to be stressed. Another issue is the importance of thinking ITS as a whole, rather than seeing it as a collection of individual systems. Sporadic deployment has sometimes led to conflicts and incompatibility between various system, which may negate the potential benefits of ITS. This can be avoided by proper planning. The study also identifies the institutional arrangements that support the effective deployment of ITS, and summarises the findings into a toolkit that can assist the decision makers to identify the promising solutions and the issues that accompany them.

## KEY WORDS

ITS / DEVELOPING COUNTRIES / DEPLOYMENT / TRANSITIONAL COUNTRIES / OPERATION.

## 1. BACKGROUND

The importance of road transportation has been increasing, especially in the developing and transitional countries where rising income has allowed the explosive increase of motor vehicles. On the other hand, this has created numerous issues for these economies. Major challenges include;

- Meeting the demand for mobility for both people and freight
- Mitigating traffic congestion
- Reducing the environmental impact of cars, trucks, and buses
- Reducing the number of traffic-related deaths and reducing the severity of crashes in general
- Managing the transportation infrastructure

These are also issues for the developed economies, although the severity may vary. Main response to these challenges was to build more roads, but due to limited resources, new constructions have not been able to catch up with the growth of traffic and other problems.

Over the past 10 years, countries around the world have begun to employ a new set of approaches and technologies to meet the challenges of surface transportation, using the rapid advance of information and communication technology (ICT). This approach is often referred to as Intelligent Transport System (ITS), which has seen wide adoption around the world. Although this approach is generally considered as a more “advanced” approach that are mainly reserved for the developed economies, it is rapidly finding its way into developing and transitional economies.

However, there has been little attention to the specific issues concerning the developing and transitional economies. Although there are documents that mention transitional countries as a side issue the issue (PIARC 1999), a specific and comprehensive study regarding these regions was lacking

It is under this background that the World Bank and the Ministry of Land, Infrastructure and Transport, Japan (MLIT) has set out to identify the issues and challenges for ITS deployment in developing and transition countries. The study is designed as a toolkit, which can assist the decision makers to identify the promising solutions and the issues that accompany them.

The study is organized as a toolkit. Instead of simply being a descriptive reference. In addition to providing a comprehensive explanation on various ideas and technologies, it aims to provide a set of tools that can be used in the field, in order to choose the appropriate application/system, and various issues to be addressed can be addressed for those systems are easily understood.

The study focuses mainly on three regions, East Asia, Eastern and Central Europe and Latin America. The findings of the study, however, should be applicable to many other regions as well. This paper summarizes the main results of this study.

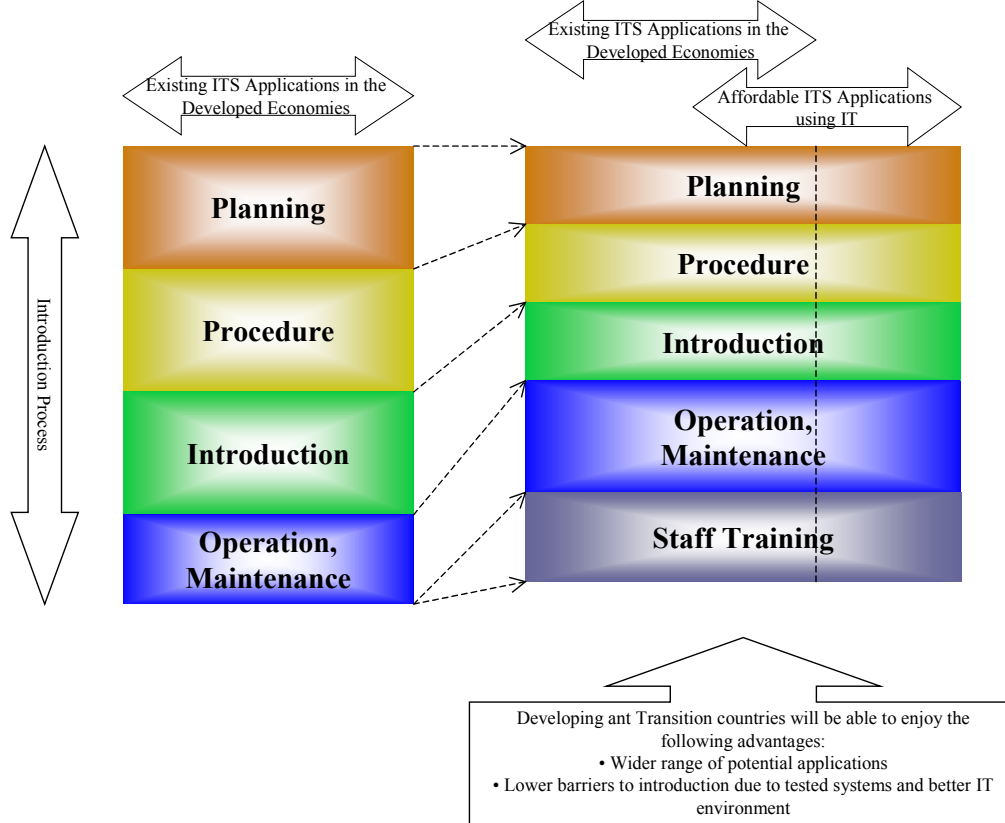
## **2. THE EMERGENCE OF “AFFORDABLE” ITS IN DEVELOPING/TRANSITIONAL ECONOMIES**

The actual applications of ITS in the developing and transitional economies are, in many cases, quite similar to those of the developed countries. However, it should be pointed out that the ease of introduction of such systems have improved significantly. The conditions that made it easier include;

- Latecomer’s advantage: (1) products are now cheaper and more refined than in the past; and (2) developing and economic-transition countries are able to install ITS infrastructure at the same time that physical infrastructure is being, built at a far lower cost than doing these separately (as has mainly been the case in developed countries)
- Rapid spread of IT including cellular phones and the Internet help provides some ITS infrastructure without special investment
- ITS services are available that are particularly beneficial to developing and economic-transition countries

These conditions allow for a different approach to ITS deployment in developing and transitional Economies. ITS introduction has become much easier in terms of cost performance and necessary infrastructure outlay. Improvement of general purpose IT environment (ex. Mobile phones and Internet) has allowed a wider variety of ITS application (Figure 1).

There are also some region specific reasons that push the introduction of ITS in each area. One of the most significant factor is the increased requirement from regional economic integration, such as EU. The continuing wave of privatisation in various road sector activities also play a role. The cost benefits that are afforded by ITS are often significant in various project with private participation, such as BOT projects.



**Figure 1 - Expanded Choice Range of ITS Applications and Simplified ITS Introduction Process in Developing and Economic-transition Countries. Source: World Bank and MLIT 2003.**

### 3. CHARACTERISTICS OF THE “AFORDABLE ITS”

Although the traffic problems faced by developing and transitional economies are similar to those of the developed economies, the environment may be significantly different. Some of the major differences include;

- Underdeveloped road network
- Severe budget restriction
- Explosive urbanization and growth
- Lack of resource for complicated maintenance and operation
- High unemployment / less demand for automation

The survey shows that ITS in the developing and transitional economies seem to function well when they take these conditions into account. The most effective ITS deployment has characteristics such as:

- Deployment is able to proceed in parallel with the development of other road transport infrastructure and public transportation systems.
- Deployment is able to make good use of spreading use of the Internet, mobile phones and digital road maps.
- They are flexible enough to cope with rapid urban development and growth.
- The cost of deployment is moderate
- Functions are basic and simple.
- Maintenance is easy.
- Systems are able to incorporate human work where appropriate and economic.

#### **4. ISSUES TO CONSIDER IN ITS DEPLOYMENT**

Successful ITS deployment cannot focus on technological solutions of traffic problems. ITS has implications that goes beyond the traditional concerns of the road operation. Those implications and issues need to be taken into account. Such issues include social, economic, organizational and operation and maintenance (O&M) issues.

##### **4.1. Social Issues**

For the most part, social issues are concerned with the issue of “fairness.” That is: Does everyone get proportional advantages from ITS? Do some people have to bear a greater burden than others, due to the introduction of ITS? Some systems might provide a disproportional benefit to wealthy people, which may not be desirable. ITS offers great promise for providing greater mobility to disabled, vision-impaired, elderly, and poor citizens. The primary reason for offering these services is to improve their quality of life. It should be noted that improving the mobility of these people also provides them with new and better ways to participate in the overall economy, benefiting everyone. For example, improved public transport can provide access to a wider range of employment opportunities for people who cannot afford their own cars.

##### **4.2. Economic Issues**

ITS offers the potential for great economic and social benefits. However, ITS have been often expensive both to deploy and to operate and maintain, and it sometimes takes a long time for the benefits to be realized. Although the situation has significantly improved recently due to lower cost of IT and the availability of surrounding IT infrastructure such as mobile phone networks, the amount of necessary outlay is still significant nevertheless. Therefore, introducing ITS often requires a significant and ongoing investment.

For ITS deployments to get funded, the public and public officials must be persuaded that ITS is important. They must be persuaded that it is more important to spend money on ITS than on other projects. This requires the proponents of ITS to do careful analyses of costs and benefits and to demonstrate the overall value of ITS to the life and economy of the country.

### 4.3. Organizational Issues

As has been observed many times in this ITS Toolkit, the successful deployment and operation of ITS applications requires cooperation among many organizations. This cooperation can take many forms, within and across agencies and jurisdiction. One important organizational issue is the cooperation between the public and the private sector, since many aspects of ITS require new ways for the public and private sectors to work together, often in new ways. For example, good road surveillance and traffic reporting can involve sensors in the road, surveillance cars operated by radio and TV stations, and in the future, private passenger cars serving as probe vehicles.

### 4.4. Issues of Operation, Maintenance, and Updating

The benefits of ITS are not delivered by equipment, but by the flow of information. The physical equipment of ITS is meaningless in isolation. The importance of ITS lies in the information it gathers, processes, and delivers. The equipment must be operated and maintained so that it can gather and process appropriate information. Updates will also be needed to accommodate changing conditions.

The operation of an ITS system, however, may be different from the traditional operation of roads. It will require new operational budgets and human resource. Consideration for proper training, and budget allocation will be crucial.

Another issue under this category is the concern for future improvements of the ITS services. As ITS services expand, both in variety and regional coverage, the need to integrate services or systems will arise. There will be demands to have different systems to work without interfering with each other.

The actual study carried out by the World Bank and MLIT Japan has created a set of toolkits that would address these issues. It provides schematic procedures for the selection of the systems that are appropriate, steps in planning of ITS, checklists for the institutional arrangements and training/dissemination strategies, which should prove to be beneficial to the decision makers who intend to use ITS as their solution.

## **5. Policy Recommendations for ITS Deployment in Countries with Developing and Transitional Economies**

In order to address the various issues that we have described, several policy recommendations can be made for developing and transitional economies that aim to introduce ITS;

- **Form an ITS Advisory Group**

Good decisions on introducing ITS can only be made if the decision makers are well informed. In many countries, the national government (usually through relevant ministries and departments) convenes a formal advisory group that includes representatives from as many important interest groups as possible. It is probably not practical to invite members of the public to join the advisory group directly, but there will often be associations or advocacy groups that can represent them. If there is no national society of transportation engineers or IT professionals, a few senior members of these professions can be invited to join.

It is not the advisory group's job to set policy and make decisions. This is still the responsibility of the national or local government. The advisory group's job is to make sure that policy makers have the right information on which to base their decisions.

Typically, the advisory group will meet 2-4 times a year to discuss and debate areas of current concern. Between meetings, members of the group may be assigned to do studies, conduct research, or gather information. In developed countries, the participants in such an advisory board typically pay their own expenses for participating, since it is understood that this is an opportunity to advance their own interests. In countries with developing and transitional economies, it may be necessary to subsidize at least some of these expenses to permit a wide range of members to participate. (Even in the U.S., the federal government pays the cost for state and local government representatives to participate.)

- **Encourage the Formation of an ITS Promotion Organization**

The purpose of an ITS promotion organization is to provide opportunities for everyone interested in ITS to share ideas and information and work together to advance ITS. The principal ITS promotion organizations in the developed world are ITS America, ERTICO/ITS Europe, and ITS Japan. In the U.S., many individual states have their own ITS promotion organization, usually affiliated with ITS America. There are similar ITS promotion organization in many individual European countries. Many countries with developing and transitional economies already have ITS promotion organizations as well, including ITS China, ITS Korea, ITS Malaysia, ITS Brazil, ITS Mexico, ITS Chile, and many others.

- **Create a Suitable ITS Architecture**

ITS architecture is a valuable tool for describing the overall structure of how ITS will work in a country and for defining its major building blocks. There are many good ITS architectures already in existence. Therefore, it is not generally necessary for a country to develop its own ITS architecture from scratch. It is far faster and much less expensive to adapt an existing architecture to the country, and developing it step by step according to the requirements of the area.

- **Adopt Relevant ITS Standards**

Standardized technology can be expected to meet clear quality, reliability, and performance requirements. Standardized technology is likely to be available from more than one vendor, helping to keep prices low, and minimizing the risk of having a single vendor go out of business. Standardized technology makes it easier to create systems that are interoperable with adjoining systems, for example across political jurisdictions.

It may not be economic for countries with developing and transitional economies to develop their own standards. In many cases, there are already well established standards that are developed collectively by many countries in existence, that many equipments and systems adhere to. In such cases, it is usually better to simply adopt those standards, unless there is some specific reason that those standards may be insufficient for your requirements. This is the method taken by many developed and developing/transitional countries alike. CEN (Comité Européen de Normalisation) is the European Standards Committee, whose members are all countries in the European Union. ISO (International Organization for Standardization), IEC (International Electrotechnical Commission), and ITU (International Telecommunication Union) are global standards organizations whose membership includes both developed and developing countries.

- **Make ITS Planning and Deployment Part of Mainstream Transportation Planning**

The proponents of ITS will have a harder time introducing ITS if ITS is viewed as separate from the rest of transportation. When ITS is considered to be separate, it looks like a competitor to other transportation interests and it is more likely to be opposed by these interests. In contrast, if ITS can be viewed as another set of tools to help achieve shared transportation goals, it will be much more readily accepted and much easier to promote.

- **Encourage Organizational Cooperation**

Various kinds of organization cooperation are necessary for ITS to succeed. People and agencies may agree in principle that cooperation is helpful. However, such cooperation often has immediate costs, but benefits that appear only later. In addition, good cooperation takes time. People need to get to know and trust the people they need to work with. Therefore, consistent high-level direction can be very helpful, by encouraging (or requiring) cooperation at the appropriate levels. If agencies know that they will be evaluated on how well they work with other agencies, cooperation will come much faster.

- **Provide Incentives for Private Sector ITS Development**

The private sector is the natural place for many kinds of ITS applications to be developed, deployed, and operated. The private sector can often act much more quickly than government, which is very important in a field that depends on rapidly changing IT. The private sector is usually willing to assume some level of risk in opening new markets and establishing new businesses. However, a very new industry like ITS may be more costly and more risky than many business find acceptable. This can have the effect of delaying the introduction of many kinds of ITS applications.

Therefore, it is sometimes appropriate for governments to help reduce the cost and the risk for private businesses to enter the ITS industry. This is especially true where private sector ITS applications can help achieve social goals (reduced pollution, reduced congestion, more mobile population). Some of the ways that government can do this are:

- **Being an Early Adopter.** For example, a government could acquire vehicle location and fleet management technology for its own vehicles to help get this market started.
- **Subsidizing Consumer Purchases.** For example, governments could help pay part of the cost of electronically collected tolls, to encourage use of the ETC system. This is already being done by some countries. Governments could similarly subsidize the cost of public transit fare cards.
- **Providing Loan Guarantees or Low-cost Financing.** Especially where the development of valuable private sector ITS applications is capital intensive, governments can help make loans less expensive to borrowers or less risky to lenders.
- **Offering Tax Incentives.** When a consumer buys a product that helps to reduce air pollution, a tax credit could be given. In countries with income taxes, the portion of a person's income spent for public transport would not be taxed.

By using one or a combination of these methods, governments can encourage ITS applications to be deployed and operated much more rapidly.

It should be noted that the toolkit included in the actual study provides a much more comprehensive description for each of the policy.

## **6. Conclusions**

ITS has great potential for improving surface transportation throughout the world and for delivering benefits to everyone who uses the transportation system. The careful evaluation, selection, introduction, operation, and maintenance of ITS applications is not easy, but it can be of great value at the national level, at regional and city levels, and at a personal level for travellers and for the people responsible for moving freight. The issues pointed out in this study can help policy- and decision-makers in developing countries take advantage of the experience gained elsewhere in the world in introducing ITS, avoid pitfalls and risks, and move forward with ITS quickly and economically.

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