



PIARC



INTERNATIONAL SEMINAR ON INTELLIGENT TRANSPORT SYSTEMS (ITS) IN ROAD NETWORK OPERATIONS

The Legend Hotel, Kuala Lumpur, Malaysia
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PROCEEDINGS

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-
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1.0 INTRODUCTION

Relieving traffic congestion is a major challenge throughout the world. The rising level of congestion is prevalent in most transportation modes and directly affects the economies of many nations. The transportation community has been working towards developing a strategy to address this issues in road network operations, by optimizing the efficiency of existing and planned infrastructures.

New technologies, such as Intelligent Transport System (ITS), provide a means to acquire better knowledge of the road network and to apply the latest advancements in highway operation. Integrating such technologies with network operations facilitates the improved efficiency of the transportation.

1.2 ORGANIZERS

The PIARC “ITS in Road Network Operation” Seminar is organized by the PIARC Technical Committee (TC) 1.4 in cooperation with the Ministry of Work Malaysia, Public Work Department Malaysia, Malaysian Highway Authority, Institute of Highways and Transportation (Malaysian Branch), Road Engineering Association of Malaysia and PLUS Expressway Berhad.

1.2 THE THEME

The last few decades have witnessed an increased use of information technology and communication in all sectors of the economy. Transportation has also benefited from this progress, with the provision of improved services for users. The use of road networks is greater than ever and the increase both in travel and transport charges underscores the need to improve the management and operation of existing road networks.

Intelligent Transport System (ITS) draw upon and in integrate advance information processing, telecommunications and electronics technology. ITS result in safer and more efficient transportation systems for both travelers and freight be it in urban centers or rural areas. ITS also provide useful information in real time to motorists commercial operators as well as road network operators.

1.3 SEMINAR OBJECTIVES

The PIARC International Seminars are intended to provide a platform for information exchange within the transportation industry, in particular to identify the needs of developing countries and countries with economies transition.

It is intended that the Seminar in Kuala Lumpur has provided an insight on current best practices internationally with respect to the utilizations of intelligent Transport System (ITS) in road network operation as part of an integrated Transport System. This will serve as a benchmark for future development of ITS usage in network operations within the region.

1.4 SEMINAR FORMAT

The Seminar was held over three days and comprised four Technical Sessions, a Forum and Field trip:

- Two (2) days for the Technical Session and Forum
- One (1) day for Field Trip

An exhibition was held in conjunction with the Seminar.

1. Technical Session

There were four technical Sessions with more than 15 Technical Papers to be presented:

- a. Technical Session 1 - New Ideas For Network Operations
- b. Technical Session 2 - Information Management And The Public Interest
- c. Technical Session 3 - Appropriate Use Of ITS For An Integrated Transport System
- d. Technical Session 4 - Challenges In Implementing ITS

Each technical session has been presided over by a chairperson. The speakers have presented their papers based on the session topic, followed by a Panel Discussion/Question & Answer session. The chairperson has summarized the main conclusions at the end of each session.

2. Forum

For more in-depth discussions, a Forum was followed on from the four Technical sessions. The topic of the Forum will be “ETC: Experience and Lessons Learned”. Dr John C Miles, the Chairman of PIARC TC 1.4 with moderate the discussion and summarized the proceedings at the end of the session.

3. Field Trip

The Field Trip has provided participants with an overview of the current usage of intelligent Transport Systems (ITS) in network operations in Malaysia (Kuala Lumpur Integrated Transport Information System, Malaysian Highway Authority Management Centre, PLUS Expressway Regional Communications Centre and SPRINT Highway Lebuhraya Damansara-Puchong Traffic Control and Surveillance System) as well as an insight in to the country (Putrajaya, Cyberjaya and Karyaneka Handicraft Centre).

4. Exhibition

An exhibition showcasing ITS technologies and products was held in conjunction with the Seminar and interested parties were invited to apply for an exhibition booth. Since the number of booths was limited, allocation was on a first-served basis and confirmation has been given upon full payment.

1.5 Participants

Everyone involved in the transportation industry, including:

- i. International organizations
- ii. National governments
- iii. Regional, local and municipal road and traffic authorities
- iv. Academicians and researchers
- v. ITS project managers, consultants, contractor and suppliers
- vi. ITS users and member organizations

	Total
Local	422
Foreign	35
Total	457

1. Training Session

- **ITS Handbook – Dr. John C Miles and Robert Cone, *United Kingdom***
- **Modelling and Simulation in ITS – basic and sample applications – Dr Andreas Rau, *Germany*.**
- **ITS Benefits and Introduction to IBEG – Patty del Pozo, *United States of America***

Category	Participants
University lecturers	13
University student	15
Representatives from government Agencies / PLUS	21

2. Field Trip

Location	Registered Participants
KL ITIS	35
MHA TMC	29
PLUS RCC	30
SPRINT/LDG TCSS	26

1.6 Venue of Seminar and seminar Dinner

Kuala Lumpur, or KL, as it is popularly known, is a bustling metropolis in Malaysia and the principal centre of commerce, politics, entertainment and international activities. The city's skyline is rapidly changing and presently boasts the magnificent Petronas Twin Towers, at 452m the highest twin towers in the world, as well as the Kuala Lumpur Tower, the world's fourth tallest telecommunications tower.

The Seminar was being hold at the Legend Hotel, Kuala Lumpur, one Malaysia's more highly rated hotels.

2.0 SEMINAR PRESENTATION AND PAPERS

The seminar commenced with a keynote address from Mr Michael Noblett, Chairman of ISO TC 204 followed by the opening ceremony which was graced by the Honorable Minister of Works Malaysia, Dato Seri S, Samy Vellu.

The technical sessions were divided into four technical sessions and a forum session with a total of 17 technical seminar papers and one workshop paper being presented.

During the QnA sessions held after each technical sessions, there was a good participation from the floor and among the key issues raised and discussed were as follows:-

- ✓ ITS application in Wales, Japan USA, Canada, Iran and Malaysia
- ✓ There was a need to have international standards of practice for the ITS industry
- ✓ Regional collaboration and integration of ITS between key agencies to realize it's true potential and benefits
- ✓ Need for Regional Integrated Traffic Management System
- ✓ Use of ITS towards providing better customer satisfaction
- ✓ Cost benefits of ITS
- ✓ Future and potential of ITS
- ✓ Application of ITS in road safety
- ✓ ITS in tunnel management i.e The SMART Tunnel Malaysia
- ✓ Status of ITS Masterplan Study for Malaysia

The two day technical sessions ended with a forum session with the topic entitled "ETC : Experience and Lessons Learned". The forum chaired by Dr John C Miles, Chairman of PIARC TC 1.4, had five distinguished panelist from Germany, Malaysia, Wales, Japan and France sharing their experiences on the various issues and challenges faced by the ETC systems around the world. There was a

very interactive participation from the floor and among the key issues raised and discussed were as follows:-

- ✓ Current ITS application in ETC ~ worldwide practices and approaches
- ✓ Issues on ETC
- ✓ Business opportunities for the ITS
- ✓ Modes of ETC and it's interoperability
- ✓ Road Pricing and the challenges ahead

The seminar concluded with the Organising Chairman's speech followed by a short closing by the PIARC Technical Committee 1.4 Chairman Dr John C Miles.

2.1 SUMMARY OF PAPER PRESENTED FOR TECHNICAL SESSION 1

Speaker 1

Abu Bakar Hashim (Malaysia Highway Authority-Malaysia)

“Improving Traffic Management On Malaysian Tolled Highways Using Intelligent Traffic System(ITS)”

The paper outlines the roles and responsibilities of MHA and the challenges being faced with the growing number of highways within the Malaysian highway network. It also focuses on the implementing of a good and effective tolling system and ways of managing the increasing number of traffic each year bearing in mind the current and future needs.

In line with this, MHA's efforts in setting up it's Traffic Management Centre (TMC) is an achievement and a step forward in having an Intelligent Highway system. This paper outlines the objectives of MHA's TMC of which it's success is much dependable on the cooperation from the highway concessionaires towards having an integrated, comprehensive and effective system.

Speaker 2

Simon Jones (Traffic Wales-United Kingdom)

“Development of an Internet Protocol Based Infrastructure for Traffic Management”

The paper discussed the benefits that have been accrued by the implementation of a converged Internet Protocol (IP) infrastructure for voice, video and data in Wales. It also highlighted the new approaches to the physical cable infrastructure that, when coupled with the converged infrastructure model, have driven down costs and improved flexibility. The improved infrastructure can now be used for providing traditional network management Intelligent Transport System (ITS) services, such as Closed Circuit Television (CCTV) and emergency telephony, and it is also capable of supporting emerging telematic's requirements, such as vehicle to infrastructure communications.

Speaker 3

Setsuo Hirai (Japan Ministry of Land Infrastructure And Transport-Japan)

“Recent Progress of R&D on the Next Generation ITS in Japan”

The paper provides an overview of the next generation of ITS technology which will be an effective tool for solving social issues including traffic congestions and environmental problems.

This second generation ITS has been earmarked to cover three (3) new types of public services, namely :-

- Information provision services along roadways
Timely information by voice provides information and warning to drivers on road hazards and conditions
- Information connection services (such as roadside rest areas)
Information that increases safety and reduces worry where road users have access in cars parked at roadside rest areas, service and parking areas and also provides information about the local region and tourism.
- Public parking lot settlement services
Allows cars to smoothly enter and leave public parking areas by performing cashless fee payments

The study also covers road-vehicle communication functions such as :-

- Command response
- Memory access
- Card access
- Push-type information distribution
- ID communication
- Basic instruction
- Common security

The ‘Smartway Open Field Test Demo 2006’ which was held to publicize the outcomes of the joint research to develop the next-generation road services provision system highlighted above has confirmed that the new DSRC system used for the ETC system is capable in providing services now provided separately by car navigation systems thus lowering the cost of on-board-unit (OBU) through extensive usage and demand. With this technology, applications that connect cars to the internet and that can collect fees using credit cards can be further explored.

With this great leap in technology, the 'world's safest road transportation' goal can be achieved and has been targeted to start operation in 2007.

Speaker 4

John Gaffney (Australia)

"Understanding Network Performance Provided to Road Users"

The objective of this study was to identify performance information that would be understood and used by all road users to make informed road transport decisions and that would assist road managers' to make decisions about the management and operation of the road network.

It involves a finite number of basic measurable parameters which were principally derived from travel time, volume, distance and vehicle occupancy. The measures that were most successfully directly reported were conditions experienced by the traveler, such as travel time and delay. The consistency of travel time and reliability being the important attributes across the three user groups (Commuters, freight and public transport) facilitates a comparison of performance across modes, thereby helping users to make informed travel decisions. The measures that would best meet users' needs were identified to be:

- Actual travel time and complementary information about road conditions, such as delays
- Planned travel time (travel time given a confidence interval or percentile)

Users are generally not receiving network performance information according to their preferences. Road managers shall need to consider how to provide network performance information to enable users to utilize the information to make decisions about the transport of choices that are available to them. The assessment of the preferred performance indicators (Actual Travel Time and Planned Travel Time) against users and road managers' requirements are:

- Users – Relevant to travel decisions relating to different modes, timing and routes, Expressed in minutes, Able to be timely conveyed.
- Road Managers (Analysis Tasks) – Used to determine deficiencies, incidents and service levels, Appropriate across all modes, Scalable, Robust and cost effective.
- Road Managers (Reporting Tasks) – Used to determine the achievement of network objectives, Measures mobility.

- Road Managers (Action Tasks) – Readily applied in project evaluation, Application for a range of projects (eg. HOV, freight lanes, toll roads and bus lanes), Determine impacts from improvements.

This study identified gaps in the Austroads National Performance Indicators (NPIs) and provided suggestion as to how these gaps could be addressed:

<u>Findings/Gaps</u>	<u>Suggestion</u>
a) Methodology Sample size of data collected for NPI is low.	Explore ways to increase sample size such as emergent technologies.
b) Altered NPIs Lane Occupancy NPI does not convey proportion of peak that the lane operates at optimal utilization.	Explore ways how the utilization of road space could be measured, particularly during the peak. Such an example could include the proportion of peak that a lane operates at optimal throughput.
Lane Occupancy NPI does not consider public transport or HOV lanes separately.	Consider whether there should be a separate measure for HOC/public transport lanes.
Speed, travel time variability and congestion NPIs are only applied for cars.	Explore how the existing set of indicators could be applied to public transport and freight.
c) New NPIs There is no NPI that measures the delivery or utilization of timely information.	Consider introducing a new indicator that measures the availability and utilization of timely information with the consideration of characteristic of the various jurisdictions.
There is no NPI that measures the year to year change in the length of the peak due to peak spreading.	Develop an NPI that reports the duration of a peak period to monitor how peak spreading changes over

	time.
There is no NPI that measures accessibility.	Review the merits of the measure following the imminent implementation of such a measure in New Zealand.

Speaker 5

Wayne Berman (US Department of Transportation U.S.A)

“The Benefits of Regional Collaboration in Managing Network Transportation Operations”

This paper illustrates the benefits of regional collaboration between agencies and jurisdictions with respect to transportation network operations in the U.S. Five case studies on this regional collaboration have been presented in the paper namely the Southeast Michigan Snow and Ice Management (SEMSIM), Detroit Metro, AZTech, Kansas City SCOUT and CapWIN. The paper elaborates in detail each of the case study of which showcasing the extensive implementation of the latest technology in the Intelligent Transport System (ITS). The benefits of each of the collaborations and the common benefits of all five have also been discussed at length.

The paper also outlines some of the common challenges to these regional collaborations and the ways they are being dealt with. The performance of the regional collaboration is gauged in terms of congestion improvement, productivity, cost effectiveness safety and the environment. In conclusion, the case studies highlight the importance of regional operations collaboration and coordination in allowing advanced ITS technology to be utilized to its fullest extent.

2.2 SUMMARY OF PAPER PRESENTED FOR TECHNICAL SESSION 2

Speaker 1

Ir Azman Masbah / Azlee Zainal Abidin (Malaysia)

“Intelligent Transport System (ITS) at the PLUS Expressways – Implementation Update)”

This paper takes a look at PLUS (the largest concessionaire in Malaysia) current ITS implementation, strategies used, problems faced and other technical and financial issues. PLUS have adopted a “step-by-step” approach to the upgrading and enhancement of the ITS technology i.e. network, control center, CCTV, VMS, AVDS. This is to ensure future expansion, upgrading and compatibility of the system.

The paper also looked at the assimilation and interconnectivity of the North South Expressway with the other two concessions i.e. ELITE and LINKEDUA and the establishment of one common operator. Other ITS applications touched on are the CCTV surveillance and monitoring system, variable message signage in traffic management and providing real time information, automatic vehicle detection system for traffic data collection, global positioning system for tracking and surveillance and electronic toll system for smoother traffic flow.

Looking ahead the major challenges will be linking all the networks for the entire lengths of the North-South expressway plus integration with ELITE, LINKEDUA, & Penang Bridge and ensuring the stability and fidelity of the entire network system.

Speaker 2

Hans – Joachim Schade (Germany)

“Cooperation in Traffic Management and Traffic Information”

This paper takes a look into traffic management system (TMS) that integrates in the collection and dissemination of traffic data between various agencies performing similar task. The TMS use single platform in the traffic integration, management where the collection of information, control and application from a single platform on the same database.

As the TMS is integrates into a single application, whereby it can provides a cross system traffic strategies and distribution of traffic information on real time basis.

Not only that, the TMS can also apply in the environment traffic management to assess the level of pollution due to traffic flow and improvise strategy to adopt traffic strategy to improved traffic flow in alleviating the pollution.

It emphasis on the joint venture between public and private sector in the deployment of TMS where the data collection were of high accuracy, thus it is able to preserve and integrate existing infrastructure. From the TMS, government agencies can formulate transport policy and guidelines for improvement of mobility and transportation safety.

Speaker 3

Dr Ponlathep Rtworawanich (Thailand)

“Safe-Following Distances based on the Car-Following Model”

This paper takes a look at the rear-end collision and ways to mitigate or reduce the number of road accidents involving rear-end collisions by introducing a safe-following distance. As such, the research develop a methodology to estimate the safe-following distance for a car driving at range of speed from 80 to 120 km/hr, a speed limit that is commonly observed on the national highways of Thailand. The rear-end collision were caused by the insufficient distance between two cars, partly due to human errors where drivers failed to maintain a safe distance which is relative to the speed the car is moving. In addition, it is also caused by sudden deceleration of the first car to avoid some objects or the following car that does not have adequate time to brake and impacts the first car and a third case is where a following car accelerates more rapidly than the lead car all of these lead to rear-end collision.

The research adopt the GM 5th where it provides a better estimates of the following distances as it takes the driver behavior into consideration. In the car-following model where the recommended following distance was developed from a speed ranges from 80 to 120 km/hr.

To further enhance the car-following models for estimating safe following distance the research need to identified the following;

- Conduct extensive data collection on the speeds and flows on the expressway and arterial roads and during congested and uncontested traffic flow.
- Data collection by aerial photograph technique.
- Develop methodology on the calibration of driver reaction time.
- Experiment with “dot” tailgating to evaluated the effectiveness in practice.
- Integrate the findings into future edition of DOH standard after the experiment prove the effectiveness of it.

Speaker 4

Dr Doohee Nam (Korea)

“Integrated Incident Management System For Freeway”

This paper takes a look at the implementation of the Freeway Incident Management System (FIMS) in Korea. The approach is component based eg. incident detection, probability, verifications, duration and management with secondary emphasis on traffic characteristics at the sites (using detectors, lane group and data aggregation interval).

The scope of the paper covers the following areas

- i) Review previous papers.
- ii) Study actual traffic characteristics and analyzing simulated situations.
- iii) Evaluation of Incidents into categories and developing software.
- iv) Estimation of incidents probability.
- v) Modeling for the Incidents duration.
- vi) Establish Integrated Incident Management Program.

It is hoped that the study will help to develop incident probability estimates and response scheme for an effective incident management program.

2.3 SUMMARY OF PAPER PRESENTED FOR TECHNICAL SESSION 3

Speaker 1

Ir Mahfiz bin Omar (Kuala Lumpur City Hall), Malaysia)

“Managing the Kuala Lumpur Road Network with the Integrated Transport Information System”

The Integrated Transport Information System (ITIS) project for the Klang Valley involved, among others, the installation of over 250 CCTV cameras for traffic monitoring at key junctions, 700 video-based vehicle detector stations, 140 variable message signs and 1600 units of vehicle tracking units to serve as dynamic probes, in managing a network comprising over 200kms of roadways. These various systems are to be linked to an Advanced Traffic Management System (ATMS) and an Advanced Traveller Information System (ATIS) which are housed within a new purpose built facility, the Transport Management Center (TMC). Real-time traffic information is currently disseminated to the public via a call center, through the internet (www.itis.com.my), and arrangements with radio media.

The four key areas of ATMS operations in the TMC are as follows:

- Incident management related to detection, validation, monitoring and response
- Inform and advise public of traffic flow conditions
- Management of events with various agencies
- Engineering for Enhanced Safety and Traffic Flows

ITIS has provided the Kuala Lumpur City Hall a wide platform to launch improved services in the areas of planning (and profiling of flow conditions), integration of previously disparate systems and an operational model for smart partnerships between various public and private agencies working under one roof.

The continuing challenges relate to efforts to formulate a common ITS architectural framework that would help create an improved inter-operability environment for various systems to co-exist.

Speaker 2

Tsuneo Kato (Japan)

“Evaluating ITS in the Network Operation Context”

ITS has long surpassed the stage of novelty in the field of network operations. However, it has been difficult to compare it with other tools of the trade, due to lack of evaluation. This paper attempts to summarize various evaluation methods as well as their results, based on representative cases around the world that were summarized as part of the PIARC TC1.4 activity, focusing on the relationship between the purposes of various systems, the tools involved and the evaluation method/results.

The paper attempts to formulate a framework of ITS evaluation, providing the following preliminary recommendations:

- i. Planning for evaluation should be undertaken before a project gets underway, as it is costly and less effective to implement evaluation as an afterthought. This requires a clear objective as well as the immediate outcome expected.
- ii. Initial investment of approximately 3-5% of the total ITS value to gather necessary and complete information prior to implementation can be justified.
- iii. A set of benchmarks on effectiveness of ITS system implementation should be established, possibly by PIARC.
- iv. Further studies required in the evaluation of non-technical aspects, which are gaining importance, towards achieving the objective of ITS implementation.

Speaker 3

Dr Gerhard Ploss (Germany)

“Estimating Real-Time Urban Traffic States in VISUM Online”

There is a variety of detection devices to capture data on traffic state within a road network. Such information, which contribute to the description of the prevailing condition at different points of the network, needs to be combined in an appropriate way to provide a better indication of the total network .

The VISUM Online solves the problem of deriving an estimation of the traffic state in a complete network on the basis of several locally distributed, individual measurement sites and additional information in the form of traffic messages and of calculating its further development in a short-term forecast. The modular and

open system architecture of VISUM Online provide current and forecast traffic conditions, as a core component for traveler information as well as solution for numerous traffic management and telematic projects.

The case study highlighted in the paper is based on the network model implementation of the VMZ Berlin which was developed in year 1999 in which the basic idea was to collect traffic data from a number of detection devices and in using the information to provide a set of services such as dynamic routing through the internet.

Speaker 4

Joseph K.Lam (Canada)

“Innovative Concepts and New Technologies for Regional Multi-jurisdictional Integrated Traffic Management”

The paper expresses concerns over the existing independent and stand- alone ITS management of individual jurisdictions whereas the current economic growth has inevitably compelled a regional approach to traffic management for the benefit of all parties.

As such there is a growing need for seamless transportation links that efficiently move both people and goods across local jurisdictional boundaries, and consequently, a growing need for regional transportation strategies and solutions. Transportation authorities must also look to innovative concepts and new partnerships as well as new technologies for these strategies and solutions.

The speaker provides examples of such initiatives in Los Angeles, USA and Vancouver District, Canada where different agencies, ranging from public transport authority to airport and port authorities, participated.

2.4 SUMMARY OF PAPER PRESENTED FOR TECHNICAL SESSION 4

Speaker 1

Ir Amir Kasim (Malaysia)

“Overview of ITS Development in Malaysia”

First introduced in mid '90s, ITS in Malaysia started off in an ad-hoc manner - tailored to each individual operator requirement and with little co-ordination among operators. However with the ever increasing demand on transportation system that leads to chronic congestion problems on the roads and highways in this country, authorities in Malaysia have since then turned to ITS for efficient use of the road system plus other advantages that could be benefited through the deployment of ITS applications. Hence, the need to provide a framework for planning, integration and implementation of ITS systems in Malaysia.

Road Engineering Association of Malaysia or REAM took a pro-active step by formulating an “ITS Strategic Plan” in 1999 which was later endorsed and adopted in year 2000 by the Government of Malaysia. ITS Council, headed by The Minister of Works was subsequently set-up as a body to co-ordinate and monitor the implementation of ITS in Malaysia.

First Malaysia ITS Master Plan Study was conducted in Year 2003 to develop a comprehensive ‘roadmap’ towards ITS applications for the next 10 years. The study highlighted:

- the need to develop common ITS System Architecture,
- the adoption of 5.8GHz waveband as dedicated short range communication media
- the establishment of ITS bureau and association to ensure success of ITS deployment
- the designation of ITS Corridor
- the ITS deployment plan

Recommendations were also made to use ITS for Traffic Management Systems, Safety Systems, Public Transport Systems, Traveller Information System, Electronic Payment Systems, Commercial Vehicle Operation Systems, Vehicle Control Systems, Emergency Management Systems and Information Warehousing Systems.

To ensure sustainability of ITS in Malaysia, focus will be given to :

- Research and Development

- ITS Outreach Programme
- Professional Development and Training, and
- Market Support and Opportunities

Speaker 2

Moazzem Hossain (Malaysia)

“Integrated Management of Malaysian Road Network Operations through ITS – Issues, Potentials and Challenges”

The regions such as Klang Valley, Penang and Johor Bahru are experiencing the problems of congestion, accidents and air pollution on their highway network due to the growth of car and truck trips. In many developed countries integrated intelligent transport system (ITS) initiatives has been applied and claimed to be successful in alleviating those problems in a cost-effective manner.

There are a number of existing transportation-related organizations in Klang Valley region such as Malaysian Highway Authority (MHA), Dewan Bandaraya Kuala Lumpur (DBKL), local councils and different highway operators. ITS aided integrated road network operation needs institutional and operation level collaboration among public and private agencies. However such collaboration is clearly lacking and missing among them due to different objectives and policies that may generate conflicting interests and hence operation. Therefore, it is required to develop a common platform for multi-agencies collaboration and a cooperative effort that satisfy all involved parties.

Thus, integrated management of regional highway network with the aid of ITS tools may be undertaken for optimum efficient operation of Klang Valley highway network. The significant benefits can be achieved from the ITS aided adaptive system-wide ramp metering, adaptive arterial traffic signal control, emergency / incident management, traffic diversion based on traveler response to VMS information and automated speed enforcement. These ITS applications have huge potential for higher capacity, reduced congestion and improved safety of Klang Valley highway network.

Speaker 3

Martial Chevreuil / Dr Mohamad Issai (France/Iran)

“ITS Development Strategy based on Pilot Project in Developing Countries”

The author presented a paper on an Intelligent Transport System (ITS) pilot project in Iran.

The objectives of the pilot project are to improve the traffic conditions along the selected corridor and to foster the development of the Iranian ITS national strategic plan.

The pilot project is on a highly trafficked road corridor from Karaj, the largest city in the suburb to Tehran, the capital. This corridor was selected due to the many challenges faces, including high level of accidents and daily congestion. There were more than 1,000 accidents on the freeway with about 100 fatalities a year, which are far more than normal. The levels of service on the freeway during peak hours are E or F on many sections.

The design of the ITS project includes features such as speed cameras and CCTV for enforcing traffic rules & automatic incident detection, provision of weather information to road users through integration of meteorological data, increasing the number and creating dedicated patrol teams for road and traffic management.

Variable Message Signs (VMS), intelligent parking system, ramp metering, adaptive or intelligent traffic lights, interfacing with other partner will be implemented.

A Traffic Management Centre (TMC), integrated with facilities such as logbook, GIS database, synoptic map and communication facilities will be implemented to provide traffic management on-line and maintenance and analysis off-line.

This pilot project should serve to devise the future organization of the traffic management system in Iran at different levels such such as local, provincial and national.

Speaker 4

Looi Hong Weei (Malaysia)

“ITS Application at SMART Tunnel”

This paper will describe the intelligence system of the **SMART (Stormwater Management and Road Tunnel)** project in terms of the various components and their functions in relation to managing traffic. The SMART project which covers a 9.7km stormwater tunnel and has a shared 3km motorway at it's centre is an innovative solution to two serious problems in Kuala Lumpur : flooding and traffic congestion. The tunnel design is only for light vehicles not exceeding 3m height. The two major components of the system for this project are Traffic Management and Control System (TMCS) and Flood Detection System (FDS)

The paper also mentioned about **3 principle** modes in the operation of SMART which depends on the flood condition:

- i) **Mode 1**, with no storm or low rainfall. No flood water will be diverted into the SMART. Motorway tunnel operates under normal condition.
- ii) **Mode 2**, SMART system will be activated The motorway section on the upper and lower decks are still open to traffic, while the invert level of the tunnel is filled with water.
- iii) **Mode 3**, the motorway will be closed to traffic .

Further to that, the paper also explains about the Stormwater Components as follows:

1) Flood Detection System and Operation.

- Catchment Monitoring System – rainfall, water level, river flow and etc.
- Tunnel Sensor Monitoring – ultrasonic and gas purge
- Modeling System – Hydrological and Hydrodynamic
- Warning & CCTV Surveillance System
- Radio Transmission Repeater Stations
- Radar System (future)

2) Gates

The paper also describes and speaks about the motorway design which includes features such as Tunnel Ventilation System, Tunnel Lighting System, Tunnel Heat Detection System, Tunnel Redundant Electrical System, Tunnel Fire & Emergency Telephone System, Tunnel Radio Communication and Cellular System, Closed Circuit Television (CCTV), and Traffic Management and Control System (TMCS).

In conclusion the paper provides an overview of how the Smart tunnel would operate in 3 scenarios i.e: Tunnel Closure From Mode 2 to Mode 3, Traffic Accident and If Fire Developed.

The civil works for the SMART motorway tunnel is expected to be completed and ready for usage by early of 2007. The stormwater components will be ready by mid of 2007. The SMART project once commissioned would be able to ease traffic congestion and mitigate flooding at the KL business district center.

2.5 SUMMARY OF 'ETC : EXPERIENCE AND LESSONS LEARNED' FROM FORUM SESSION

Panelist 1

Dr.-Ing Andreas Rau (Technische Universitaet Muenchen, Munich, Germany)

“Electronic Toll Collection: Approaches, Technologies And Experiences”

Electronic Toll Collection (ETC) is increasingly used throughout the world. Various application fields are approached and the number of technologies used as well as system concepts adopted is high. Nevertheless, partial solutions for (electronic) toll collection are meanwhile standardized by international standardization bodies (namely ISO, CEN) and therefore offer – at least partially – the implementation of interoperable and trans-national ETC-applications. Together with the fast technological development within this specific ITS-domain, the public and political interest in ETC is increasing as well, as pricing (in a very broad sense) is increasingly often considered as an appropriate tool for demand management and infrastructure financing.

The respective system architecture used for the different applications may briefly be classified into 2 types, i.e. approach- or entrance-oriented and usage-oriented.

Various technologies are used as part of ETC systems, as a number of tasks are to be solved and the degree of automation strongly influences the choice of the appropriate solution.

The presentation generally shows the development of the various tolling solutions within the last decades, presents the main technologies and system architectures currently used and discusses objectives for ETC-implementation and experiences gained so far.

Panelist 2

Puan Zaida Abdul Aziz (Malaysian Highway Authority)

“Electronic Toll Collection (ETC) Systems Development System In Malaysia”

The ETC has made considerable progress in Malaysia since its introduction in 1994. Since then, several toll concessionaires have introduced numerous type of ETC using various technologies such as microwave, contactless smartcard and infrared.

In efforts to streamline the deployment of ETC and to promote user interoperability, the Government of Malaysia has instructed the use of a single system for the ETC i.e. Touch 'n Go and the SmartTag. This system provides a secure, reliable and accurate ETC system which supports all types of vehicles and can be used for any mode of transport.

In addition, the financial institutions have also played a significant role in providing convenience to the ETC users to reload their pre-paid cards at ATMs and via credit cards.

The effort does not end there. Malaysia is looking at improving the current system into a Multi Lane Free Flow (MLFF) ETC system and targets to implement it nationwide from year 2010 onwards.

Panelist 3

Deborah de Grasse (Highway 407, Canada) [Presented by Dr John C Miles]

"The Implementation Of Free Flow Toll Collection At 407 ETR, Toronto, Canada

Highway 407 is a controlled access highway passing along the northern portion of the Greater Toronto Area (GTA), providing an alternative route to principal freeway, Highway 401. The Highway 407 was built to create additional highway capacity and to ease traffic congestion (mostly daily commuters) at the GTA area.

In doing so, it implemented the world's first all electronic, free flow system whereby car drivers may have the choice of not carrying transponders or opening a tolling account. The system is transponder based with a secondary video imaging system which collects rear license plate information through Optical Character Recognition.

For transponders users, the electronic sensors located on each overhead gantry along the 407, log the entry and exit point. The trip data is then sent to the Operations Centre, where it is later matched for billing. For those vehicles without transponders, the trips are logged by using the license plate recognition system. Nevertheless, by law, transponders are mandatory for heavy vehicles, which have a Registered Gross Vehicle Weight (RGVW) of over 5,000 kilograms (five tonnes).

The system also allows for out of province vehicles through collaboration with virtually all Canadian DOTs and six US states.

The trip costs depend on the range of time (peak or off-peak), vehicle class (light or heavy), distance traveled and transponder/video trip.

Panelist 4

Hideo Tsuji (Highway Industry Development Organization, Japan)

“Electronics Toll Collection System Of Japan”

The development of **Electronic Toll Collection System (ETC)** in Japan has grown rapidly since being introduced in 2001. Currently, ETC system in Japan is embarking on its “Second Stage”. To ensure success in Japan as well as in Asia, three (3) main issues will be addressed:

1. Current ETC prevalence status and standardization of Japan

The usage of ETC OBU throughout Japan has exceeded the 12-million mark and is considered as standard requirement for automobiles. The reduction of cost and introduction of a subsidy system have encouraged the usage of ETC OBU along the expressways. Currently, 60% transactions at tollgates are through the ETC systems, resulting in a substantial reduction of congestion at tollgate sections.

In efforts towards international standardization, a protocol for dedicated short-range communication (DSRC) has been developed in Japan.

2. Future Extended Service ‘Smartway’

The objective of the Smartway is to realize a society of smart mobility through improving the quality of mobility and transportation. Comprising basic services such as vehicle information transmission, fee payment, information provision as well as information and warning, it offers benefits of safety and safe driving, affluence and the environment, and comfort and convenience.

3. ETC for Asian toll road

In order to promote acceptance of DSRC communication protocol in Asian toll roads, the ETC systems must assure effective and efficient modification which meet the specific needs of a chosen country. The basic concept shall allow prepaid transactions with simplified, modified functions to achieve cost reduction. The current works to achieve the system for the Asian market are based on the existing ETC roadside systems deployed domestically.

Panelist 5

Martial Chevreuil, France

“ETC Interoperability In Europe– RCI Project”

The Road Charging Interoperability (RCI) project will develop an open framework enabling road charging interoperability between countries across Europe. Targeting implementation in 2008, the RCI prototype shall be tested during field trials at six sites, namely at Austria (EUROPPASS), France (TIS) Germany (TOLL COLLECT), Italy (TELEPASS), Spain (VIA-T) and Switzerland (LSVA).

The project will demonstrate the ability of the prototyped onboard equipment to produce the required “transaction” data for the service provider and/or contract issuer in each of the field trial sites. RCI will analyze the demonstrations and validate its prototypes and framework. Its validation and lessons learned will as such; contribute to the definition process of the Electronic European Tolling Service (EETS).

The RCI allows different suppliers to manufacture equipment that can be certified against these specifications and that can operate in different contexts (CEN DSRC/CARDME, Autostrade DSRC, ‘Multi technologies’ as in Germany and in Switzerland). It also contributes to the convergence of future tolling systems and the evolution of existing tolling systems as such allowing for a greater re-usability of standard components across different systems. In addition, the RCI is open to any stakeholders including all system suppliers

In order to ensure the widest possible consensus on the proposed solutions, the project has created the RCI Forum. Members of the Forum will have access to all important public documents and will be invited to participate in workshops to discuss and to review draft versions user needs and system requirements, system architecture and interface specifications and the results of the assessment and validation work

Panelist 6

Robert Cone, United Kingdom

“Road User Charging”

The implementation of toll on roads in UK is a sensitive issue especially when history has proven that the implementation of the same has been drastically opposed by the public in general and has even brought down the government at that time.

However, the current government is looking into the possibility of re-introducing the road user charging system in UK in order to address the problems of the growing traffic, the prevailing congestion and the increasing emission of carbon into the environment.

The progress of charging the road users is still at a very preliminary stage. Although public acceptance is still uncertain, the benefits that will be derived from the system as concluded by the road pricing feasibility studies, such as the reduction of congestion by 50% and traffic by 5%, may be able to persuade the public to accept the road user charging system. Several steps have been identified to inform the public and seek their consensus.

3.0 SYNTHESIS OF DISCUSSIONS

The discussions held after each of the four (4) technical sessions provided an opportunity for both participants and speakers to share their experiences and views on the current worldwide practices and approaches of the Intelligent Transport System (ITS), the challenges faced ahead and on the way the ITS might evolve over the next few years especially in the wake of new technologies.

The current application of ITS in countries such as Wales, Japan, USA, Canada, Iran and Malaysia were highlighted through some of the sixteen (16) technical papers presented. Among the views and experiences shared were :-

1. Standards practiced worldwide were different from one country to another. The need to have International Standards of Practice for the ITS industry was necessary to ensure ITS systems developed were efficient and complied with the established standards. The standards would also provide a common platform for the development of ITS worldwide.
2. Regional collaboration and integration of ITS between key agencies such as local authorities, road authorities, police was an area which was lacking in the ITS systems practiced worldwide. Such collaboration and integration is of utmost importance and requires attention if the true potential and benefits of the ITS are to be realized.
3. The paper presented by Mr. Joseph K.Lam from Canada on the "ITS for Regional Multi-Jurisdictional Integrated Traffic Management" provided some direction for the future development of ITS. ITS systems which are capable to integrate regional systems and provide national control would be one of the greatest challenges faced in the future. In this aspect institutional problems would overshadow technical problems and would be the core area which requires attention if integrated ITS regional systems are to be realized.
4. ITS through some of its inventions (i.e Closed Circuit Television Camera, Variable Message Signs, Speed Detectors) have been able to play a key role in road safety such as prevention of road accidents. The use of these inventions provides a new avenue to bring levels of safety to higher standards and should be considered in road design and road safety audit processes.
5. The paper presented by Mr. John Gaffney from Australia on "Understanding Network Performance To Road Users" provides a concept of users perception and tolerance upon which Key Performance Indicators (KPI's) could be established. In the planning of transportation systems, the ITS could be used

as an effective tool to ensure that established Key Performance Indicators were met hence meeting customer satisfaction.

6. A non-technical but very valid point raised was the high fees imposed for the seminar as being a deterrent for greater participation especially those from under-developed and developing countries. It was suggested for PIARC to seriously look into this area to have better participation in future from these under-developed and developing countries.

The panel discussion entitled “ETC – Experience And Lessons Learned” which followed had six (6) eminent transport practitioners providing their views on the subject.

The discussion was commenced by Dr Andreas Rau from Germany through his paper entitled “Electronic Toll Collection: Approaches, Technologies And Experiences”. In his paper, Dr Andreas mentions Electronic Toll Collection (ETC) is increasingly used throughout the world. Various application fields are approached and the number of technologies used as well as system concepts adopted is high. Nevertheless, partial solutions for (electronic) toll collection are meanwhile standardized by international standardization bodies (namely ISO, CEN) and therefore offer – at least partially – the implementation of interoperable and trans-national ETC-applications. Together with the fast technological development within this specific ITS-domain, the public and political interest in ETC is increasing as well, as pricing (in a very broad sense) is increasingly often considered as an appropriate tool for demand management and infrastructure financing.

Dr Andreas mentions the respective system architecture used for the different applications may briefly be classified into 2 types, i.e. approach- or entrance-oriented and usage-oriented. Various technologies are used as part of ETC systems, as a number of tasks are to be solved and the degree of automation strongly influences the choice of the appropriate solution.

Dr Andreas’s also gave an overview on the development of the various tolling solutions within the last decades, presents the main technologies and system architectures currently used and discussed objectives for ETC-implementation and experiences gained so far.

The second panelist, Mrs Zaida Abdul Aziz from Malaysia presented her paper entitled “Electronic Toll Collection (ETC) Systems Development System In Malaysia” In her paper she mentions ETC has made considerable progress in Malaysia since its introduction in 1994. Since then, several toll concessionaires have introduced numerous type of ETC systems using various technologies such as microwave, contactless smartcard and infrared.

Mrs Zaida adds in its efforts to streamline the deployment of ETC and to promote user interoperability, the Government of Malaysia has instructed the use of a single system for the ETC i.e. Touch 'n Go and the SmartTag. This system provides a secure, reliable and accurate ETC system which supports all types of vehicles (does it cover all types of vehicles?) and can be used for any mode of transport. In addition, the financial institutions have also played a significant role in providing convenience to the ETC users to reload their pre-paid cards at Bank's Automated Teller Machines and via credit cards.

In conclusion Mrs Zaida mentions that the efforts do not end there as Malaysia is looking at improving its current system into a Multi Lane Free Flow (MLFF) ETC system and targets to implement it nationwide from year 2010 onwards.

The third panelist, Dr John C. Miles from the United Kingdom, also Chairman of PIARC Technical Committee 1.4, presented a paper entitled "The Implementation Of Free Flow Toll Collection At 407 ETR, Toronto, Canada". In his paper he mentions Highway 407 is a controlled access highway passing along the northern portion of the Greater Toronto Area (GTA), providing an alternative route to principal freeway, Highway 401. The Highway 407 was built to create additional highway capacity and to ease traffic congestion (mostly daily commuters) at the GTA area. In doing so, it implemented the world's first all electronic, free flow system whereby car drivers may have the choice of not carrying transponders or opening a tolling account. The system is transponder based with a secondary video imaging system which collects rear license plate information through Optical Character Recognition.

Dr John C. Miles adds that for transponders users, the electronic sensors located on each overhead gantry along the 407, log the entry and exit point. The trip data is then sent to the Operations Centre, where it is later matched for billing. For those vehicles without transponders, the trips are logged by using the license plate recognition system. Nevertheless, by law, transponders are mandatory for heavy vehicles, which have a Registered Gross Vehicle Weight (RGVW) of over 5,000 kilograms (five tonnes). The system also allows for out of province vehicles through collaboration with virtually all Canadian DOTs and six US states. The trip costs depend on the range of time (peak or off-peak), vehicle class (light or heavy), distance traveled and transponder/video trip.

The fourth panelist Mr Hideo Tsuji from Japan presented his paper entitled "Electronics Toll Collection System Of Japan". In his paper he mentions the development of Electronic Toll Collection System (ETC) in Japan has grown rapidly since being introduced in 2001. Currently, ETC system in Japan is embarking on its "Second Stage". To ensure success in Japan as well as in Asia, three (3) main issues were being addressed as follows:

1. Current ETC prevalence status and standardization of Japan

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The fifth panelist, Mr Martial Chevreuil from France presented his paper entitled “ETC Interoperability In Europe– RCI Project”. In his paper he mentions The Road Charging Interoperability (RCI) project will develop an open framework enabling road charging interoperability between countries across Europe. Targeting implementation in 2008, the RCI prototype shall be tested during field trials at six sites, namely at Austria (EUROPPASS), France (TIS) Germany (TOLL COLLECT), Italy (TELEPASS), Spain (VIA-T) and Switzerland (LSVA). The project will demonstrate the ability of the prototyped onboard equipment to produce the required “transaction” data for the service provider and/or contract issuer in each of the field trial sites. RCI will analyze the demonstrations and validate its prototypes and framework. Its validation and lessons learned will as such; contribute to the definition process of the Electronic European Tolling Service (EETS).

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different contexts (CEN DSRC/CARDME, Autostrade DSRC, 'Multi technologies' as in Germany and in Switzerland). It also contributes to the convergence of future tolling systems and the evolution of existing tolling systems as such allowing for a greater re-usability of standard components across different systems. In addition, the RCI is open to any stakeholders including all system suppliers

In conclusion Mr Martial Chevreuil mentions that in order to ensure the widest possible consensus on the proposed solutions, the project has created the RCI Forum. Members of the Forum will have access to all important public documents and will be invited to participate in workshops to discuss and to review draft versions user needs and system requirements, system architecture and interface specifications and the results of the assessment and validation work

The final panelist, Mr Robert Cone from United Kingdom concluded the session with his paper entitled "Road User Charging". In his paper he mentions the implementation of toll on roads in UK is a sensitive issue especially when history has proven that the implementation of the same has been drastically opposed by the public in general and has even brought down the government at that time. However, the current government is looking into the possibility of re-introducing the road user charging system in UK in order to address the problems of the growing traffic, the prevailing congestion and the increasing emission of carbon into the environment.

Mr Robert Cone adds that the progress of charging the road users is still at a very preliminary stage. Although public acceptance is still uncertain, the benefits that will be derived from the system as concluded by the road pricing feasibility studies, such as the reduction of congestion by 50% and traffic by 5%, may be able to persuade the public to accept the road user charging system. Several steps have been identified to inform the public and seek their consensus.

4.0 TECHNICAL CONCLUSION

The technical conclusions derived from the series of discussion held over the 3 day conference are as follows:-

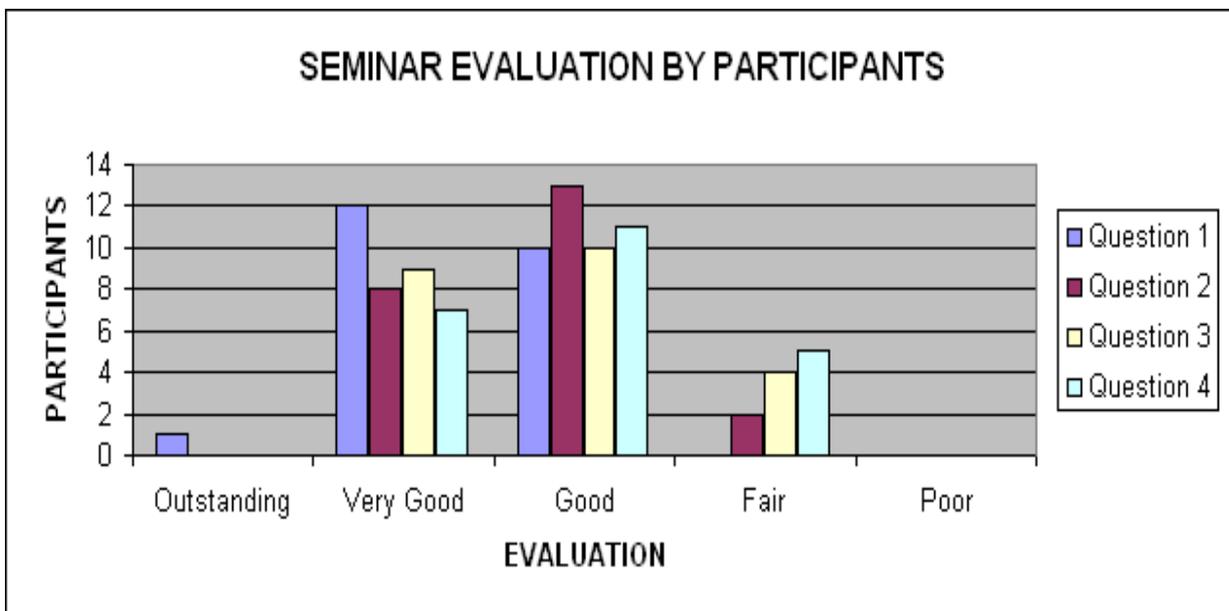
1. A International Standards of Practice be established for ITS to regulate worldwide ITS practices and approaches.
2. Planning of ITS projects to give due consideration for regional collaboration and integration between key agencies and integration between regional multi-jurisdictional traffic management systems.
3. ITS to play a more important role in road safety and achieving KPI's to meet customer satisfaction.
4. PIARC to work towards ensuring better participation from under-developed and developing countries at future seminars and conferences (non-technical comment).
5. The application of ITS in Electronic Toll Collection (ETC) is changing rapidly with the latest being the Multi Lane Free Flow (MLFF) system. Implementers and policy makers must take necessary steps to ensure that systems in place are of the latest technology and do not become obsolete over a short period of time after its implementation.

5.0 SYNTHESIS OF PARTICIPANT EVALUATION

5.1 SEMINAR EVALUATION BY PARTICIPANTS

The feedback obtained by the random survey from the participants in regards to the first four questionnaires is as follows:

No.	Question	Outstanding	Very Good	Good	Fair	Poor
1	What is your overall impression of the seminar?	1	12	10		
2	What do you think of the methodology (presentation, group work, forums etc.) used in seminar?		8	13	2	
3	What do you think of the quality of the presentations?		9	10	4	
4	What do you think of the quality of the discussions?		7	11	5	



1) What is the overall impression of the seminar?

Fifty two percent (52%) of the participants rated highly the seminar with score of "very good" and forty three percent (43%) rated as "good". Five percent of the participants rated the seminar outstanding.

2) What do you think of the methodology (presentation, group workshop, forums etc.) used in the seminar?

Thirty five percent (35%) were very impressed with the way or methodology used in seminar and rated them as "very good". Fifty seven percent (57%) of the participants believed the presentation, group workshop and forums were well carried out and give the rating as "good." The remaining eight percent (8%) rated the methodology as fair.

3) What do you think of the quality of the presentations?

From the random survey, thirty nine percent (39%) believed the quality of the presentation was "very good", with forty three percent (43%) give a score as "good" and the remaining participants, eighteen percent (18%) rated them as fair.

4) What do you think of the quality of the discussion?

Thirty percent (30%) of the participants rated the quality of the discussion as "very good", forty eight percent (48%) rated them as "good" and the remaining rated it as "fair", i.e. twenty two percent (22%).

From the input obtained through the evaluation survey of the PIARC Seminar held in Legend Hotel, participants have the opinioned that the seminar was very good but not outstanding and neither was it poorly organized. Majority of the participants were impressed with the seminar the way it was organised where the quality of the presentation is highly recommendable.

5) What is the best aspect of the seminar?

Networking with participants from various government agencies and private sectors and getting to know the latest products and technology available in the market enable the delegated to have a better perspectives of the ITS industry available in Malaysia. Getting to know what our fellow counterparts doing in other countries in the field of ITS especially in the area of tolling. The exposure to the ideas and system other countries have implemented, sharing of experiences before and after the implementation and what were

the problems encounter so that we too can learned and avoid repeating the same mistakes to mitigate problems in the ITS.

- 6) Has the seminar responded to the preoccupation of your country?
Majority o the delegates believed the seminar has, to a very good extend helps in the above subject matter.
- 7) Do you think that the objectives of the seminar have been attained?
The feedback from the evaluation survey concurred the seminar has helps to broaden the knowledge in the latest development in ITS and other related topics in the area of traffic management and safety aspect. Most of the participants were of the opinion that the seminar will promote a higher area of cooperation and collaboration within the international ITS community that will benefit the country in years to come. The papers presented were of relevant and ideas put forward reveals areas of weakness in our highway operating system especially in ITS.
- 8) Do you have any suggestions or ideas for the follow-up of the seminar?
Several suggestions were raise:
- i. Insufficient time was given for the Q & A.
 - ii. Speakers were not able to provide answers to some of the questions raise.
 - iii. Need to provide additional workshops where the delegates can share their experience and also to learn new innovative ideas from the speakers.
 - iv. Seminar publications should be made available in the PIARC website prior to its commencement.
 - v. Availability of materials in softcopy would be much helpful to the delegates.
 - vi. The papers on how ITS can help in the traffic management and the role it play to minimize accidents and curb fatalities along the highway was most helpful.
- 9) What can be improved in future seminars?
- i. A bigger venue with somewhat bigger area for display booths, tea time to facilitate participants to congregates.
 - ii. The person who is supposed to present the papers should not delegate the presentation to someone who is not well verse in the subject matter. This is greatly felt in the Q & A session where the speaker cannot answer or the answer given is vague.
 - iii. More quality papers is needed to enhance the status of the seminar.

- iv. Speaker should be knowledgeable and carry out indepth researched on the topic that is presented. More time given to present the papers.
 - v. Able to get a charismatic speaker to attract the attention of the audience.
 - vi. Technical site visit is restricted to numbers of participant and they catered mostly to oversee participants. No restriction should be imposed on the number of delegates so as to enable all the participants who are interested be given a fair chance to joint in the site study tour.
- 10) Other remarks?
- i. Generally the seminar was better organized and the field trip to in Putrajaya well coordinated. The seminar helps to pave new areas in ITS and also to explore other ideas in overcoming challenges in the transport industry and highway operation.
 - ii. Some topic are unrelated to the ITS and are seemingly last minute slot in.
 - iii. ITS Malaysia should invite foreign presenters to conduct the audit on the traffic management and ITS implementation in Malaysia.

5.2 CONCLUSION

On the whole, the seminar was a success and majority of the delegates benefited from the papers presented and the Q & A raised and answered. Some setbacks was encountered where in the last minute, some presenters were not available to present their papers due to other commitments. As such, the papers were delegated to its pier to present who might not be well verse or knowledgeable in the subject matter. This leads to the speaker inability to provide satisfactory answers during the Q & A.

A more balance and well research papers would indeed enhance the seminar standing in international community and not a last minute slot in of papers that was not related to ITS.

It is important to select venue that can catered for the prescribed number of delegates register and those from various committee assisting in the seminar as well as the invited guess. Insufficient space for display booths and refreshment were delegates can intermingle and do their networking need to look into it by the organizer for future seminar of this nature.

ANNEX 1 : SEMINAR PROGRAMME

14 AUGUST 2006	
MONDAY	
0900 – 1000	OPENING SESSION
	Welcome address by PIARC First Delegate of Malaysia Dato' Prof. Ir. Dr. Wahid Omar, Malaysia
	Opening Remarks by Chairman of PIARC TC 1.4 Dr. John C Miles, United Kingdom
	Official Opening by Minister of Works Dato' Seri S Samy Vellu, Malaysia
	Launch of and visit to exhibition booths
1000 – 1030	<i>COFFEE BREAK</i>
1030 – 1100	Keynote address by Michael Noblett , Chairman of International Standards Organisation Technical Committee 2004
	TECHNICAL SESSION 1 New Ideas For Network Operations Chairman : Prof. Dr. Fritz Busch, Germany
	Introduction by Chairman of Technical Session 1
	Paper 1 : Improving Traffic Management On Malaysia Tolled Highway Using Intelligent Traffic System (ITS) Abu Bakar Hashim, Malaysia
	Paper 2 : Development Of An Internet Protocol Based Infrastructure For Rtraffic Management Simon Jones, United Kingdom
	Paper 3 : Recent Progress Of R&D On The Next Generation ITS In Japan Setsuo Hirai, Japan
	Paper 4 : Understanding Network Performance Information Provided To Users John Gaffney, Australia
	Paper 5 : The Benefits Of Regional Collaboration In Managing Network Transportation Operations Wayne Berman, United States Of America
	Panel Discussion And Q&A
11.00 – 13.00	
1300 – 1430	<i>LUNCH</i>

	TECHNICAL SESSION 2 Information Management and the Public Interest Chairman : Robert Cone, United Kingdom
	Introduction by Chairman of Technical Session 2
1430 – 1630	Paper 1 : Intelegend Transport System (ITS) At The PLUS Expressway – Pilot Implementation Ir. Azman Masbah, Malaysia
	Paper 2 : Cooperation In Traffic Management And Traffic Information Hans-Joachim Schade, Germany
	Paper 3 : Safe-Following Distance Based On The Car-Following Model Dr. Ponlathep Lertworawanich, Japan
	Paper 4 : Development Of Integreted Incident Mangement System Dr. Doohe Nam, Australia
	Panel Discussion And Q&A
1630 – 1700	<i>TEA</i>
1700 – 1800	WORKSHOP Evaluation Of ITS Projects Patty Del Pozo, United States Of America
1930 – 2200	SEMINAR DINNER

15 AUGUST 2006 TUESDAY		
0900 – 1040	TECHNICAL SESSION 3 Appropriate Use Of ITS For An Integreted Transport System Chairman : Martial Chevreull, France	TRAINING SESSION 1 ITS Handbook Dr. John C Miles / Robert Cone, UK
	Introduction By Chairman Of Technical Session 3	
	Paper 1 : Managing The Kuala Lumpur Road Network With The Integreted Transport Information System Ir. Mahfix Omar, Malaysia	
	Paper 2 : Evaluating ITS In The Network Operation Context Tsuneo Kato, Japan	

	Paper 3 Estimating Real-Time Urban Traffic States In VISUM Online Dr. Gerhard Ploss, Germany	
	Paper 4 : Innovative Concepts And New Technologies For Regional Multi-Jurisdictional Integrated Traffic Management Joseph Lam, Canada	
	Panel Discussion And Q&A	
1040 - 1100	<i>COFFEE BREAK</i>	
1100 - 1300	TECHNICAL SESSION 4 Challenges in implementing ITS Chairman : John Erceg, Australia	
	Introduction by Chairman of Technical Session 4	
	Paper 1 :	Overview Of ITS Development In Malaysia Ir. Md. Amir Kasim, Malaysia
	Paper 2 :	Integrated Management Of Malaysian Road Network Operations Through ITS-Issues, Potential And Challenges Assoc. Prof. Dr. Moazzem Hossain, Malaysia
	Paper 3 :	Overview Of ITS Development In Indonesia
	Paper 4 :	ITS Development Strategy Based On Pilot Project In Developing Countries-Karaj-Tehran Corridor, An Iranian Example Martial Chevreuil, France
	Paper 5 :	ITS Of Stormwater Management And Road Tunnel (SMART) Looi Hong Weei, Malaysia
	Panel Discussion And Q&A	
1300 – 1430	<i>LUNCH</i>	

TRAINING SESSION 2
 Modelling And Simulation In ITS – Basics And Sample Applications
 Prof. Dr. Fritz Busch / Dr. Adreas Rau, TU Munich, Germany

TRAINING SESSION 3 ITS
 Benefits & Introduction To
 IBEC Patty Del Pozzo, USA

1430 – 1630	FORUM Etc : Experience and lessons learned Chairman : Dr. John C Miles, United Kingdom	
	Introduction by Chairman of Technical Session 2	
	Panelist No. 1 :	Prof. Dr. Fritz Busch, Germany. Electronic Toll Collection – Approaches, Technologies And Experiences

	Panelist No. 2 : Zaida Abdul Aziz/ Ir. Ismail Md. Salleh, Malaysia. ETC Development In Malaysia
	Panelist No. 3 : Debbie De Grasse, Canada. The World's All-Electronic, Open Access Toll Highway – 407 Express Toll
	Panelist No. 4 : Mahmoud Saffarzadeh, Iran. Cost-Benefit Analysis Of Electronic Toll Collection (ETC) System In Iranian Freeways (Case Study : Tehran – Qom Freeway)
	Panelist No. 5 : Hideo Tsuji, Japan. Electronic Toll Collection System Of Japan
	Panelist No. 6 : Martial Chevreuil, France. ETC Interoperability In Europe – RCI Project
1700 - 1730	Closing Session – Dr. John C Miles
1730 - 1800	<i>TEA</i>

16 AUGUST 2006	
WEDNESDAY	
	FIELD TRIP
0900 - 1200	Group 1 : (30 pax max) - Kuala Lumpur ITIS
	Group 2 : (30 pax max) - Malaysian Highway Authority TMC
	Group 3 : (30 pax max) - PLUS Expressway RCC
	Group 4 : (30 Pax Max) - SPRINT Highway And Lebuhraya Damansara-Puchong TCSS
1200 - 1430	Groups 1, 2, 3 & 4 (120 pax max) Putrajaya / Cyberjaya
1430 – 1700	Groups 1, 2, 3 & 4 (120 pax max) Kuala Lumpur Craft Cultural Complex

ANNEX 2 : LIST OF PARTICIPANTS

Everyone involved in the transportation industry, including:

- vii. International organizations
- viii. National governments
- ix. Regional, local and municipal road and traffic authorities
- x. Academicians and researchers
- xi. ITS project managers, consultants, contractor and suppliers
- xii. ITS users and member organizations

	Total
Local	422
Foreign	35
Total	457

1. Training Session

- **ITS Handbook – Dr. John C Miles and Robert Cone, *United Kingdom***
- **Modelling and Simulation in ITS – basic and sample applications – Dr Andreas Rau, *Germany*.**
- **ITS Benefits and Introduction to IBEG – Patty del Pozo, *United States of America***

Category	Participants
University lecturers	13
University student	15
Representatives from government Agencies / PLUS	21

3. Field Trip

Location	Registered Participants
KL ITIS	35
MHA TMC	29
PLUS RCC	30
SPRINT/LDG TCSS	26

ANNEX 3 TO THE SEMINAR PROCEEDINGS : SEMINAR SUMMARY SHEET

1.	PIARC Technical Committee	
2.	Host Country	Malaysia
3.	Seminar title	PIARC International Seminar on Intelligent Transport Systems (ITS) In Road Network Operations
4.	Seminar Venue	The Legend Hotel, Kuala Lumpur, Malaysia
5.	Seminar Dates	14 to 16 August 2006
6.	Number of speaker from lower middle income and low income countries	1
7.	Number of speakers from upper middle income countries	6
8.	Number of speakers from high income countries	15
9.	Number of participants (exclusive speakers) from lower middle income and low income countries	11
10.	Number of participants (exclusive speakers) from upper middle income countries	416
11.	Number of participants (exclusive speakers) from high income countries	8
12.	Total participants (sum of Q6-Q11)	457
13.	Total participants from host country	422
14.	Number of lower middle income and low income countries represented	12
15.	Number of upper middle income countries represented	422
16.	Number of high income countries represented	23
17.	Was a PIARC Technical Committee meeting held the same week	Yes.
18.	Was the seminar held in connection with another non-PIARC event? If yes, which event and organisation	No.
19.	Duration of the seminar, include field visit. Was a field visit organized ?	3 days. Field visit was being organized.
20.	Participants fees – (Currency)	<p>1. Participants from high income countries – USD350</p> <p>2. Participants from upper middle income countries – USD250</p> <p>3. Participants from lower middle income and low income countries – USD200</p>