**INTELLIGENT TRANSPORT SYSTEM**

**BY**

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# ABSTRACT

*This seminar on Intelligent Transport System portrays an effective and real-time traffic information network is highly important and could contribute to decreasing traffic volume and costs by reducing fuel consumption and saving time for drivers in reaching their destinations. This seminar paper provides an extensive analysis regarding the drivers’ acceptance levels of the current implementation of the Intelligent Transport System (ITS). The ITS system characteristics, information quality, system quality, and service quality were investigated.*

# INTRODUCTION

An effective traffic information system is highly important and could contribute to creating a balance between the different modes of transport, such as pedestrians, bicycles, motorcycles, vehicles, and public transport. In addition, it could provide security, safety, and optimum service for public roadways and ensure the continuance of mobility, which drives economic development through timely and convenient transportation (Khoo & Ong, 2012).

Long-term solutions such as upgrading public transport systems and introducing city center road toll systems may not be sufficient in reducing traffic jams and preventing congestion by distributing traffic onto different roadways while still reaching the same destination. Therefore, the need for high-quality information in real-time through high-performance traffic management systems can be crucial to the success of city planning and transportation policies (Bergerbow & Kate, 2002).

**Definition of Intelligent Transport System (ITS)**

Intelligent Transport System (ITS) encompasses the application of technology such as communication systems, computers, electronics, and information technology to improve the efficiency and safety of the transportation network. ITS is utilizing synergistic technologies and system engineering concepts to develop and improve transportation systems of all kinds.

The term ITS refers to efforts to add information and communications technology to transport infrastructure and vehicles in an effort to manage factors that typically are at odds with each other, such as vehicles, loads, and routes to improve safety and reduce vehicle wear, transportation times and fuel consumption. Intelligent Transportation Systems (ITS) have been defined as: 'the application of advanced sensor, computer, electronics, and communication technologies and management strategies in an integrated manner to improve the safety and efficiency of the surface transportation system.

Intelligent Transport System activities are four categories of technologies:

1. ***Sensing*** – the ability to note the position and speed of vehicles using the infrastructure (e.g. rail lines, roadways, bridges, tunnels);
2. ***Communicating*** – the ability to send and receive information, between vehicles, between vehicles and infrastructure, and between infrastructure and centralized transportation operations and management centers;
3. ***Computing*** – the ability to process large amounts of data collected and communicated so that conclusions can be drawn and assessments made; and,
4. ***Algorithms*** – computer programs which process information gathered by ITS and develop operating strategies for transportation facilities.

Typically, an Intelligent Transport System includes traveler information in the form of travel times posted on Variable Message Signs (VMS) on major roads to help drivers make more informed decisions about their travel route options. Traveler information, such as travel times, is dependent both on the quality of the prediction algorithms and on the quality of the data cleaning applied to the data used by the prediction algorithms (Megler, 2016).

Therefore, the goal of the present study was to contribute one step to the process of adopting a modern ITS in Malaysia. Evaluating the drivers’ acceptance level of the current system and analyzing the factors that affect the acceptance level will be crucial in the upcoming revised ITS system. ITS is expected to help resolve intractable problems associated with road congestion.

# Telematics and ITS in city logistics

Intelligent Transportation Systems (ITS) are systems characterised by complex architectures, comprising many functionalities and integrating different kinds of technologies and technical solutions. These especially offer the potential to improve safety, to reduce the congestion as well as to increase the economical productivity by utilization of many services, like travel and traffic management, public transportation management, electronic payment, commercial vehicles operations, emergency management, advanced vehicle safety systems, information management, maintenance and construction management (Mikulski, 2011).

**MAIN COMPONENT OF ITS**

**Safety**

ITS can help to reduce injuries and save lives, time and money by making transport safer, help the driver of trucks, busses, and cars avoid getting into crashes and help keep them from running off the road, maintain safe distance between vehicles and safe speeds approaching danger spots, improving visibility for driver, especially at night and in bad weather and also providing information about the work zones, traffic congestion, road conditions, pedestrian crossings and other potential hazards (Abrahamse, 2010).

ITS can detect the crashes that do occur, determine the severity of the crash and likely injuries, and help emergency management services provide assistance. In addition, ITS also will help select the closest and most appropriate rescue unit to respond and adjust traffic signal to clear the way for emergency vehicles. The ITS will connect responding units to medical care facilities to help provide initial care for the injured and help medical care facilities prepare to deliver more complete treatment when injured people arrive (Bergerbow & Kate, 2012).

**Security**

In security aspects, ITS will help prepare for prevent and respond to disaster situations, whether from natural causes, human error or attacks. ITS will also help to keep watch over transport facilities and help to provide personal security for people using the public transport system. Moreover, the ITS will monitor freight especially hazardous materials, through the entire supply chain and help transport and safety/security agencies coordinate their activities and their information so they can respond more effectively to incidents of all kinds. ITS will help identify the best routes for evacuating people at risk and directing emergency services to incidents and disaster sites. The transport system and all the other parts of the economy that depend on transport, to return to normal as rapidly possible following a crisis, through better management of the transport system, more efficiency interagency communications, better and more timely information to the public with the ITS (Bergerbow & Kate, 2012).

**Efficiency/Economy**

According to Buehler (2010), the ITS will save time and money for travelers and the freight industry, because the ITS will deliver fast, accurate and complete travel information to help travelers decide whether to make a trip, when to start, and what travel modes to use. The ITS also will provide information that both prior to a trip and as the trip proceeds. Drivers can select and follow safe, efficient routes to their destination and paying tolls without having to stop with the ITS. ITS will help freight move swiftly and reliably using the right combination of ship, truck, train and plane and enabling its owners to know where it is at all times and when it is due to arrive at its destinations and allowing for better planning and scheduling of critical processes. ITS will enable more reliable and timely commercial vehicle management. The ITS also will automatically keep track of safety-related information about vehicle, its driver and its cargo and also ITS will help to communicate this information to the authorities so that, as appropriate, vehicles can be cleared through checkpoints without stopping.

**Mobility and Access**

ITS provide travel opportunities and traditional travel choices for more people in more ways, whether they live, work and place regardless of age or disability. Travelers can plan and take trips that use the best and more convenient combination of travel modes such as private car, public transport, passenger rail not to forget, walking and cycling too. Opportunities of new employment and recreation can be opened with the ITS and make time travel more productive. Travelers can get where they need to get regardless of age or disability and regardless of where they live. Better information on available services for travelers who choose not to drive including to those who are mobility or sight impaired. ITS also will help make it easier to pay for transport services. The future will include a single electronic payment mechanism to pay for fuel, tolls, public transport fares, parking and a variety of other charges. ITS will convey the needs and interest of transport system customers to the people who manage the system customers to the people who manage the system, helping to ensure a transport system that is responsive to those needs and interests. Management of transport system for safer services and simultaneously available for motorist, cyclists, pedestrians, and users of public transport can be gained with ITS (Davis, 2019).

**The Environment**

ITS can help to make the transport faster and smoother, eliminates unnecessary travel, and reduces time caught in traffic congestions. This is because, the ITS will help to keep traffic flowing in urban freeways, on tolls roads at commercial vehicle checkpoints and elsewhere. Reducing delays due to congestions and incidents means that energy waste, wear and tear, and the pollution caused by stop and go driving are also reduced. ITS will help vehicles operate more efficiently. ITS will provide location specific information about the whether and road conditions. Vehicles can anticipate danger spots and hills and to smoothly adopt appropriate speeds. Preparation of plan efficient routes and guiding the drivers along these routes can be done with the ITS that help to reduce consumption and emissions. Public transport can be more reliable, effective, attractive, providing better information on schedule and connections, and stay in touch with their employers and their families while in transit (Chen, 2007).

**A Transport System for All**

ITS affects the way everyone lives, works and plays and its benefits will increase in the future and helping to make transport services available and affordable for everyone, getting people and goods to their destination safely and efficiently. Customer satisfaction can be improved with transport and help make it more environmentally friendly and more secure. People can manage and operate the transport system to provide better, safer and more responsive service to all its users while helping to safeguards the environment. ITS has been demonstrating its value for over 10years and it is now beginning to mature and meeting its promise to make real difference to society as a whole (Abrahamse, 2010; Chen, 2007).

**THE BENEFITS OF IMPLEMENTING ITS**

The benefits of implementing ITS is reduced as outlined by Jelusic and Anzek (2010), include lag and congestion, fair and efficient treatment of traffic, increased safety, improved planning capability and maintenance for municipalities and overall improved traffic flow. ITS provides the ability to monitor and control traffic light controllers from a control center. However, it was designed such that individual traffic control is still contained at the intersection controller allowing distributed intelligence to provide reliable operation even when communication fails. The ITS control center workstation communicates with controllers, detectors and signs passing control messages, generating control data, collecting and analyzing responses from the controllers and analyzes fault information. Among the main features of ITS are remote real time monitoring and control, data collection, report generation and special features. Provides features such as intersection operation status, current active phase, actual running green time, alarm status, vehicle actuation mode, multi-plan mode, online clock and date settings, green wave link monitoring, police control and remote activation (Jelusic & Anzek, 2010).

**Arterial Management Systems**

Arterial management systems manage traffic along arterial roadways, employing traffic detectors, traffic signals, and various means of communicating information to travelers

**Freeway Management Systems**

Freeway management systems employ traffic detectors, surveillance cameras, and other means of monitoring traffic flow on freeways to support the implementation of traffic management strategies such as ramp meters, lane closures, and variable speed limits (VSL).

**Transit Management Systems**

Transit ITS services include surveillance and communications, such as automated vehicle location (AVL) systems, computer-aided dispatch (CAD) systems, and remote vehicle and facility surveillance cameras, which enable transit agencies to improve the operational efficiency, safety, and security of the nation's public transportation systems.

**Incident Management Systems**

Incident management systems can reduce the effects of incident-related congestion by decreasing the time to detect incidents, the time for responding vehicles to arrive, and the time required for traffic to return to normal conditions. Incident management systems make use of a variety of surveillance technologies, often shared with freeway and arterial management systems, as well as enhanced communications and other technologies that facilitate coordinated response to incidents.

**Emergency Management Systems**

ITS applications in emergency management include hazardous materials management, the deployment of emergency medical services, and large- and small-scale emergency response and evacuation operations.

**Electronic Payment Systems**

Electronic payment systems employ various communication and electronic technologies to facilitate commerce between travelers and transportation agencies, typically for the purpose of paying tolls and transit fares.

**Traveler Information**

Traveler information applications use a variety of technologies, including Internet websites, telephone hotlines, as well as television and radio, to allow users to make more informed decisions regarding trip departures, routes, and mode of travel. Ongoing implementation of the designated 511 telephone number will improve access to traveler information across the country.

**Information Management**

ITS information management supports the archiving and retrieval of data generated by other ITS applications and enables ITS applications that use archived information. Decision support systems, predictive information, and performance monitoring are some ITS applications enabled by ITS information management. In addition, ITS information management systems can assist in transportation planning, research, and safety management activities. As deployment of ITS information management matures, quantitative information on the benefits of these systems should become more readily available.

**Crash Prevention & Safety**

Crash prevention and safety systems make use of sensor technology and active warning signs, including flashers, beacons, and dynamic message signs (DMS), to warn drivers of dangerous curves, excessive speed on downhill road segments, at-grade railroad crossings, and other dangerous conditions.

**Roadway Operations & Maintenance**

ITS applications in operations and maintenance focus on integrated management of maintenance fleets, specialized service vehicles, hazardous road conditions remediation, and work zone mobility and safety. These applications monitor, analyze, and disseminate roadway and infrastructure data for operational, maintenance, and managerial uses. ITS can help secure the safety of workers and travelers in a work zone while facilitating traffic flow through and around the construction area. This is often achieved through the temporary deployment of other ITS services, such as elements of traffic management and incident management programs.

**Road Weather Management**

Road weather management activities include road weather information systems (RWIS), winter maintenance technologies, and coordination of operations within and between state DOTs. ITS applications assist with the monitoring and forecasting of roadway and atmospheric conditions, dissemination of weather-related information to travelers, weather-related traffic control measures such as

**Collision Warning System**

To improve the ability of drivers to avoid accidents, vehicle-mounted collision warning systems (CWS) continue to be tested and deployed. These applications use a variety of sensors to monitor the vehicle's surroundings and alert the driver of conditions that could lead to a collision. Examples include forward collision warning, obstacle detection systems, and road departure warning systems.

**Driver Assistance Systems**

Numerous intelligent vehicle technologies exist to assist the driver in operating the vehicle safely. Systems are available to aid with navigation, while others, such as vision enhancement and speed control systems, are intended to facilitate safe driving during adverse conditions. Other systems assist with difficult driving tasks such as transit and commercial vehicle docking.

**CONCLUSION**

In conclusion, the seminar paper portrayed the various impacts and application of Intelligent Transport System (ITS) solutions enables a significant reduction in negative impacts of road transport on the city environment. Due to increasing the traffic flow and limiting the congestion it is possible to significantly reduce fuel consumption, and consequently pollution. The paper also revealed the usefulness of the system enhanced by the fact that there are more and more solutions using mobile devices.

**RECOMMENDATIONS**

The seminar paper recommends that there is a need for the government to provide a new traffic management approach that provides real-time information and establishes a network for traffic status and control on the roadways, and the traffic information should reach all subscribers in the network in real-time and should be characterized by high quality and accuracy by implementing the use of an Intelligent Transport System.

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