Chapter Five

International Practices for Toll Collection

A study based on the secondary data obtained through internet has revealed that Most of the developed countries have implemented Electronic Toll Collection (ETC) system. A beginning of installation of ETC system has been done in India also and all the toll plazas under NHAI have ETC facility along with manual payment and smart cards provisions. The findings of the study on ETC use in some countries are discussed herein under-

5.1 Malaysia:

Malaysia has embarked upon a project to fully implement ECS[27] throughout the nation by 2018. As on April 1, 2016, 51 out of total 177 toll plazas have implemented ETC. By fully implementing this project Malaysia is targeting to reduce traffic congestion by 30 to 50%.

The Malaysian Government has future plans that by 2018, cash payment for tolls will not be allowed and after a full conversion of the ETC system on all highways, the single lane free flow system will be introduced graduating to multi-lane free flow (MLFF) system in 2020. Once the MLFF (Also known as Open Road Tolling in West) is introduced, it would signal end to the toll plazas. Under this system, a gadget or sticker will have to be installed on the windscreen of vehicles. The toll will be calculated using the Radio Frequency Identification or RFID system. There will also be a CCTV network installed on the overhead gantries. The system will be able to tell the amount that needed to be

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[27] Source: http://www.nst.com.my/news/2016/04/141876/multi-lane-free-flow-system-highways-2020-says-works-ministry

deducted electronically from the vehicle owner's account registered with the concessionaire. With MLFF, the cashless payment will be carried out at high speed as it will not have any plaza booths with barricades

Multi-Lane free flow (MLFF) system is an electronic tolling system used in many expressway networks worldwide. Currently, full electronic toll payment system is being extensively implemented in countries such as Australia, USA, Chile and Canada.

MLFF Implementation: Issues and Challenges

Despite the distinct advantages of MLFF in terms of fast payments, more traffic through put and consequent enhanced economic activities, the task of implementation as envisaged by Malaysian Government is not free from challenges and limitations of implementation. The key challenge is migrating from the current ETC to a full-scale multi-lane free flow. The key issues to be faced will be mostly related to legislative and contractual, public education and acceptance, and MLFF operations, technical and maintenance management.

Enforcement Issue

The existing legal frameworks are not suitable for MLFF implementation as it is not efficient in handling toll violators. Thus, the most critical task for MLFF is to first establish a comprehensive legislative framework and infrastructure for enforcement of violations.

The Service Provider and toll operator will also be facing challenges in integrating vital information of various agencies to facilitate enforcement management and prosecution of toll violators.

Funding for MLFF Infrastructure

Migration from existing ETC system to MLFF requires new investment for infrastructures. As in any investments, detailed justifications on the cost and the MLFF benefits to the investors.

Public Acceptance

The nationwide ETC penetration is around 50% of total toll collection and various efforts are being made to increase the penetration rate. There is a need for concerted efforts from all parties to boost for higher ETC penetration rate to ensure success of MLFF implementation.

The challenge here is to provide reliable ETC devices at affordable price and ensure availability and excellent customer service and support to consumer.

5.2 USA:

Some fast facts about Tolling in USA[28] are presented below-

► 35 Number of US states and territories are with at least one tolled highway, bridge or tunnel.

► $13 billion Toll revenues were collected by US toll agencies in 2013.

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[28]**Source**: http://ibtta.org/sites/default/files/documents/MAF/2015_FactsInBrief_Final.pdf

- An average of 5.7 billion Number of trips per year are made on tolled roads and crossings in the United States

- USA has 5,932 Miles of total tolled roads

- Total $14 billion Capital investment was made , over three years ,by the top 40 US toll facilities operators

- The Fatality rate on tolled roads is one third of that on the normal US roads (0.50 per 100 million vehicle miles traveled versus 1.47)

- 37 million Number of transponders are being used for electronic tolling in the US

- 84 Percentage of Americans feel tolls should be considered as a primary source of transportation revenue or on a project-by-project basis and

- 33 states and Puerto Rico support toll roads with public-private partnership in highway finance.

Three systems of toll roads exist in USA: open (with mainline barrier toll plazas); closed (with entry/exit tolls) and open road (no toll booths, only electronic toll collection gantries at entrances and exits, or at strategic locations on the mainline of the road). Modern toll roads often use a combination of the three, with various entry and exit tollssupplemented by occasional mainline tolls: for example the Pennsylvania Turnpike and the New York State Thruway implement both systems in different sections.

On an open toll system, all vehicles stop at various locations along the highway to pay a toll as is the practice in India also. (Open toll system should not be confused with "open road tolling", where no vehicles stop to pay toll). While this may save money from the lack of need to construct toll booths at every exit, it can cause traffic congestion while traffic queues at the mainline toll plazas (toll barriers). It is also possible for motorists to

enter an 'open toll road' after one toll barrier and exit before the next one, thus travelling on the toll road toll-free. Most open toll roads have ramp tolls or partial access junctions to prevent this practice, known in the U.S. as "shunpiking".

With a closed system, vehicles collect a ticket when entering the highway. In some cases, the ticket displays the toll to be paid on exit. Upon exit, the user must pay the amount listed for the given exit. Should the ticket be lost, theuser must typically pay the maximum amount possible for travel on that highway. Short toll roads with no intermediate entries or exits may have only one toll plaza at one end, with motorists traveling in either direction paying a flat fee either when they enter or when they exit the toll road. In a variant of the closed toll system, mainline barriers are present at the two endpoints of the toll road, and each interchange has a ramp toll that is paid upon exit or entry. In this case, a motorist pays a flat fee at the ramp toll and another flat fee at the end of the toll road; no ticket is necessary. In addition, with most systems, motorists may only pay tolls with cash and/or change; debit and credit cards are not accepted. However, some toll roads may have travel plazas with ATMs so motorists can stop and withdraw cash for the tolls.The toll is calculated by the distance travelled on the toll road or the specific exit chosen. In the United States, for instance, the Kansas Turnpike, Ohio Turnpike, Pennsylvania Turnpike, New Jersey Turnpike, most of the Indiana Toll Road, New York Thruway, and Florida's Turnpike currently implement closed systems.

The first major deployment of an RFID electronic toll collection system in the United States was on the Dallas North Tollway in 1989. In the same year, the Telepass active transponder RFID system was introduced across Italy.

Throughout most of the East Coast of the United States, **E-ZPass** (operated under the brand **I-Pass** in Illinois) is accepted on almost all toll roads. Similar systems include **SunPass** in Florida, **FasTrak** in California, **Good   to   go** in Washington State, and **ExpressToll** in Colorado. The systems use a small radio transponder mounted in or on a customer's vehicle to deduct toll fares from a pre-paid account as the vehicle passes through the toll barrier. This reduces manpower at toll booths and increases traffic flow and fuel efficiency by reducing the need for complete stops to pay tolls at these locations.

E-ZPass is an electronic toll collection system used on most tolled roads, bridges, and tunnels in the mid-western and northeastern United States, traveling as far south as North Carolina and as far west as Illinois. The E-ZPass Inter Agency Group (IAG) consists of 37 member agencies in operation within 16 states, which use the same technology and allow travelers to use the same transponder on toll roads throughout the network. Since its creation in 1987, various independent systems that use the same technology have been folded into the E-ZPass system, including the I-Pass in Illinois and the NC Quick Pass in North Carolina.

The U.S. state of Texas is testing a system on a stretch of Texas 121 that has no toll booths. Drivers without a TollTag have their license plate photographed automatically and the registered owner will receive a monthly bill, at a higher rate than those vehicles with TollTags.

The first all-electronic toll (Also called Open RoadTolling) road was opened in October 2006 in Illinois USA. In the eastern United States, the InterCounty Connector (Maryland Route 200) was partially opened to traffic in February 2011, and the final

segment was completed in November 2014. The first section of another all-electronic toll road, the Triangle Expressway, opened at the beginning of 2012 in North Carolina.

5.3 Canada:

The Electronic Toll Collection (ETC) system used in Canada is known as the Canada 407 Express toll route (ETR)[29]. It is one of the most sophisticated toll roads in the world. The 407 uses a system of cameras and transponders to toll vehicles automatically. There are no toll booths, hence the name "Express Toll Route" (ETR). It is one of the earliest examples of a highway that exclusively uses open road tolling. Highway 407 is designed as a normal freeway with interchanges connecting directly to surface streets, without the need for toll booth intermediaries (typically via a trumpet interchange) which could otherwise take up significant land. A radio antenna detects when a vehicle with a transponder has entered and exited the highway, calculating the toll rate. For vehicles without a transponder, an automatic number plate recognition system is used. Monthly statements are mailed to users. A small electronic 'transponder' is attached to the windscreen behind the rear-view mirror. The system automatically matches transactions at entry and exit ramps to form 'trips' supporting a distance-based tolling policy. The electronic sensors located on each overhead gantry log the 407 ETR entry and exit point. On exit, a green light on the transponder and four short beeps indicate the toll transaction has been successfully completed. In this system, cameras are equipped with Optical

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[29]**Source**: 1. https://www.407etr.com/en/index.html

    2. https://www.wral.com/traffic/story/10554492/

    3..https://www.baltimoresun.com/bs-mtblog-2009-04-getting_there_begin_the_bloggi-story.html

Character Recognition (OCR). The OCR cameras are used to photograph license plate numbers of vehicles that do not have transponders. The toll bill is sent directly to the registered address of the vehicle owners. Other than that, two laser beam scanners are placed above the roadway to detect the types of vehicles passing through the gantries. The tolling system being efficient and hassle free involves huge infrastructure expenditure that would eventually be passed on to the road users only in the form of enhanced toll fee.

5.4 SINGAPORE:

Electronic Road Pricing (ERP) was the key to managing the road infrastructure of today's cities. Since its introduction in the mid-1980s, it has gained increasing popularity as a potential means of combating traffic congestion while minimizing environmental pollution. Not only does it provide an effective mechanism for demand management and the collection of toll payments, it also offers updated information on traffic conditions and road usage.

How the ERP System Works:

The ERP system is a Smart card-based multi-lane automatic toll collection system; an efficient and convenient way to charge motorists the cost of using the roads. Under this system, all vehicles will be fitted with a Smart card reader, called the in-vehicle unit (IU), which accepts a stored-value Smart card. Upon entering a Pricing Zone, the ERP system will automatically transact with the Smart card reader using Radio Frequency (RF) communications to debit the appropriate value. To assist law enforcement, the system also includes a camera unit to capture the image of violators' vehicles.

Features

 • In-vehicle unit (IU) with stored-value Smart card for prepayment purposes.

• lUs complete with liquid crystal display to show the value of each charge and the remaining value of the stored-value card.

• IUs powered by batteries or the vehicle's own power supply.

 • Vehicle Detection System (VDS) providing precise vehicle location and detection through a state-of-the-art optical method of measuring vehicle separation, size and speed.

 •Enforcement camera system incorporating advanced technology image processing and data compression techniques linked to the Central Computer System for transaction, violation and operations data processing.

Advantages

 • Multi-lane operation with unrestricted vehicle movement.

 • Operates for vehicle speeds of up to 150km/hr

 • Easy installation of lUs for all types of vehicles

 • Smart card technology provides secure and fraud proof revenue   collection.

5.5 China:

China[30] has about 70 percent of the world's total length of tolled roads, and also has the distinction tohave built an Expressway network of such scale in such a short

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[30]Source: China ETC (Electronic Toll Collection) Report 2015-2019, Jan, 2016

period of time. Indeed its construction has been an impressive road-building initiative unmatched since the building of the U.S. Interstate Highway System, which, though of similar scale, was delivered without tolls only over a much longer time-frame.

By the end of 2014, the mileage of toll highways in China amounted to 162,600 km, including 106,700 km of toll expressways, accounting for 65.7%; there were 1,665 mainline toll stations on toll highways nationwide, 696 of which were the ones on expressways, making up 41.8%.

In 2013 while China has 260 million vehicles, only around 13 million users paid toll fees using the ETC system. This was much like present Indian scenario as the ETC penetration in India is also very low due to unwillingness on the part of users to install OBU on their vehicles.

China Government decided to implement a unified national ETC system. Oncethis systemwas put in place by the end 2015, about 25 percent of passenger cars were expected to be equipped with transponders and all the toll stations along major expressways would be covered. By the end of Oct 2015, China had had 25.15 million ETC users; except for Hainan and Tibet, 29 provinces across the country had realized the networking of expressway ETC and cumulatively built 12,772 ETC lanes with 98.8% of mainline toll stations equipped with ETC lanes and 89.2% of ramp toll stations with ETC lanes.

As per Government's estimates, after the unified ETC system is established, the logistics cost has declined, with an estimated 87 percent of expenditures on toll station and an estimated 20 percent of service cost has beensaved.In addition, around 20 percent of fuel has been saved and carbon dioxide emission has been cut by 50 percent compared with the traditional manual toll collection method.