

**Utility and barrier to adoption of
Rfid/GPS technology in Transportation industry**

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Abstract

The report studies the latest technology that can be used to streamline the logistics system in terms of its utilities and its barriers to usage. For the same various stakeholders were identified which would be beneficiaries of the technology and a series of questions were asked in order to understand their responses towards the adoption to this technology. The research findings can be used to create a system which would be suitable for everyone and hence beneficial to all stakeholders.

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Introduction

Indian economy has been growing at a phenomenal pace before recession because of its combined growth in all sectors of economy. Currently we are recovering from post recession blues but still a lot needs to be done in order to achieve the earlier rates and more importantly sustain it for longer duration.

The break up shows below that only 10 percent of the cost in the Logistic is because related to order processing and administrative activities. Hence it shows a lot of cost can be reduced by simply streamlining other activities like transportation, warehousing, packaging and inventory management.

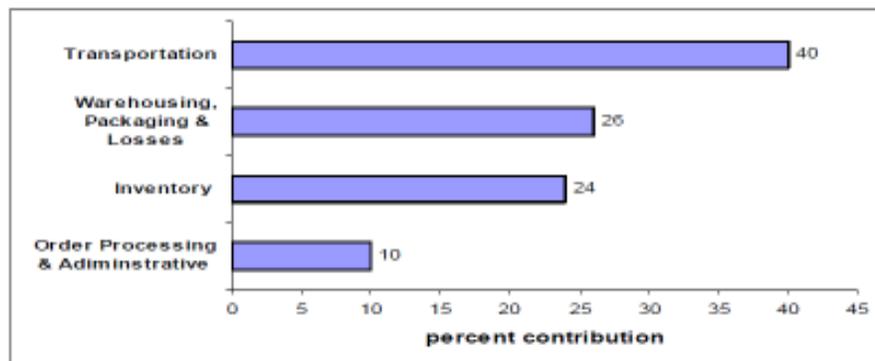


Figure 1: Elements of Logistics Cost in India

| Sector | Logistics Cost Components (in US \$ mn) | Transportation | Inventory holding | Warehousing, packaging & losses | Order processing & administrative | Total Logistics cost |
|-------------------|---|----------------|-------------------|---------------------------------|-----------------------------------|----------------------|
| Auto | 2000-01 | 285.0 | 171.0 | 185.3 | 71.3 | 712.6 |
| | 2005-06 | 406.5 | 243.9 | 264.3 | 101.6 | 1016.4 |
| | Avg. Change | 20.3 | 12.2 | 13.2 | 5.1 | 50.6 |
| Cement | 2000-01 | 50.6 | 30.4 | 32.9 | 12.7 | 126.5 |
| | 2005-06 | 55.4 | 33.3 | 36.0 | 13.8 | 138.5 |
| | Avg. Change | 4.8 | 2.9 | 3.1 | 1.2 | 12.0 |
| Consumer Durables | 2000-01 | 331.9 | 199.1 | 215.7 | 83.0 | 829.6 |
| | 2005-06 | 398.9 | 239.3 | 259.3 | 99.7 | 997.3 |
| | Avg. Change | 11.2 | 6.7 | 7.3 | 2.8 | 27.9 |
| FMCG | 2000-01 | 201.5 | 120.9 | 131.0 | 50.4 | 503.8 |
| | 2005-06 | 280.7 | 168.4 | 182.5 | 70.2 | 701.8 |
| | Avg. Change | 13.2 | 7.9 | 8.6 | 3.3 | 33.0 |
| Food | 2000-01 | 398.7 | 239.3 | 259.2 | 99.7 | 996.8 |
| | 2005-06 | 524.5 | 314.7 | 340.9 | 131.1 | 1311.2 |
| | Avg. Change | 21.0 | 12.6 | 13.6 | 5.2 | 52.4 |
| Garment | 2000-01 | 337.3 | 202.4 | 219.2 | 84.3 | 843.2 |
| | 2005-06 | 454.4 | 272.6 | 295.3 | 113.6 | 1135.9 |
| | Avg. Change | 19.5 | 11.7 | 12.7 | 4.9 | 48.8 |
| Pharmaceutical | 2000-01 | 174.0 | 104.4 | 113.1 | 43.5 | 434.9 |
| | 2005-06 | 310.0 | 186.0 | 201.5 | 77.5 | 775.0 |
| | Avg. Change | 22.7 | 13.6 | 14.7 | 5.7 | 56.7 |
| Steel | 2000-01 | 438.3 | 263.0 | 284.9 | 109.6 | 1095.7 |
| | 2005-06 | 693.6 | 416.1 | 450.8 | 173.4 | 1734.0 |
| | Avg. Change | 42.5 | 25.5 | 27.7 | 10.6 | 106.4 |

Table 1 : Distribution of Logistics Costs across some sectors (2000-2005) source IAEIS

Table 2 shows the importance of road transport.

| | Rail | Road | Sea |
|--|--|---|---|
| Number (wagons, trucks, ships) | 214760 | 3487538* | 806 |
| Freight Capacity(mn ton) | 10.66 | 5.12* | 7.9 |
| Route Length (mn km) /Number of major ports | 0.11 | 3.34 | 12 |
| Freight Revenue (US \$ bn) | 7.00 | 38.64 | 4304 |
| Major Products | coal, steel, petroleum, primary metals | automobile, electronic items, garments etc. | iron ore, coal, petroleum (and industrial and consumer products on the outbound export) |

Table 2: Comparison for Various Modes

Source : IAEIS, 2005-2006

Research Objective:

The aim is to evaluate the utility of adapting Rfid technology in the trucking industry in order to keep a track of the vehicles, hence increasing their utilisation. Also a thorough cost analysis needs to be done regarding the feasibility of technology along with analyzing different barriers to adoption.

WHAT IS GPS TRACKING SYSTEM?

A GPS tracking unit is a device that uses the Global Positioning System to determine the precise location of a vehicle, person, or other asset to which it is attached and to record the position of the asset at regular intervals. The recorded location data can be stored within the tracking unit, or it may be transmitted to a central location data base, or internet-connected computer, using a cellular (GPRS), radio, or satellite modem embedded in the unit. This allows the asset's location to be displayed against a map backdrop either in real-time or when analysing the track later, using customized software.

A GPS tracking system uses the GNSS (Global Navigation Satellite System) network. This network incorporates a range of satellites that use microwave signals which are transmitted to GPS devices to give information on location, vehicle speed, time and direction. So, a GPS tracking system can potentially give both real-time and historic navigation data on any kind of journey.

A GPS tracking system can work in various ways. From a commercial perspective, GPS devices are generally used to record the position of vehicles as they make their journeys.

Some systems will store the data within the GPS tracking system itself (known as passive tracking) and some send the information to a centralized database or system via a modem within the GPS system unit on a regular basis (known as active tracking).

- A PASSIVE GPS TRACKING SYSTEM will monitor location and will store its data on journeys based on certain types of events. So, for example, this kind of GPS system may log data such as turning the ignition on or off or opening and closing doors. The data stored on this kind of GPS tracking system is usually stored in internal memory or on a memory card which can then be downloaded to a computer at a later date for analysis. In some cases the data can be sent automatically for wireless download at predetermined points/times or can be requested at specific points during the journey.
- AN ACTIVE GPS TRACKING SYSTEM is also known as a real-time system as this method automatically sends the information on the GPS system to a central computer or system in real-time as it happens. This kind of system is usually a better option for commercial purposes such as fleet tracking and individual vehicle tracking as it allows the company to know exactly where their vehicles are, whether they are on time and whether they are where they are supposed to be during a journey. This is also a useful way of monitoring the behavior of employees as they carry out their work and of streamlining internal processes and procedures for delivery fleets.

FEATURES OF THE GPS TRACKING SYSTEM

Generally all of the GPS Tracking System has some of the common features that are listed below:-

- GSM/Gprs Module - It is used to send the location to the user online. In some case, if the user wants the location through the internet then this module is very useful. By the help of the GSM/GPRS module, we can send data real time. It can be seen on the internet enabled any device as a PC, mobile phone, PDA etc.
- Track Playback - Animates the driver's daily driven route so that he can follow every move. The track animation line is color coded to indicate the speed the driver was traveling during his route.
- Idle Time Report - Gives an accurate report detailing when driver was stopped and has left the engine running on the vehicle. This report was designed with input from existing customers who were concerned about high fuel bills.
- Track Detail - Provides with a split screen view when reviewing driver's route. Stop and transit times, as well as speed information, are displayed in the bottom pane. It can easily toggle between stops by clicking the stop number on the track detail pane.

In Figure 2, as the zoom increases, so does map detail. Street names are listed as well as geographic markers (schools, airports, creeks, railways, parks, etc.). At the street level, we can clearly see stops marked by a red stop sign. Clicking on these stops pops up a summary of the stop: stop number, time, location, and duration. This makes it a breeze to determine where and when your employees were at certain locations.



Figure 2 Giving live location points

- Speed Bar - Driver's route is color coded when it is displayed on the map. The colors represent a 10 MPH or 5 MPH speed range. This allows to see how fast driver was driving in a specific area.

In the figure 3, we have an example of a zoom in progress, also notice the speed bar and the color coded route. Determining employee speeds is extremely easy to accomplish.



Figure 3 Zoom feature of the product

- Mileage By State - Breaks down mileage by state boundaries to assist with DOT reporting.

- Group Reporting - Allows to set vehicles up into groups for faster and easier reporting.
- Geo Fencing – It allows to limit some region of area and if the vehicle go beyond the boundary of that region then urgent message will be send by the system to the manager to control the driver. So that the time and money can be saved by this system.
- Ignition ON/OFF detection – The system can save the information about the engine that it is in working condition or stop by ignition ON/OFF detection so that the manager can know for how many times the driver stopped the fleet and for how many time. So much time can be saved.
- SMS / GPRS Communication - The location about the fleet or the person can be send by SMS or email by this facility.
- On-Line and Off-Line tracking – Every user has different requirement and as per the requirement the data can be viewed realtime or it can be saved in the unit and when the vehicle reach to its manager, manager can download data and see the route of the vehicle and every other detail that can be seen by the realtime.
- Buzzer for alerting the driver – Some system uses the buzzer system to alert the driver that he is going out of the boundary or the speed is very high,or anything that is restricted. So that the driver is able to know that he is going wrong.

- Monitoring digital events – It helps to know when a piece of machinery was turned On/Off or when a door was Open/Shut, this system will provide you with best options.
- Reports – start stop report, standard report, aggressive driving report, excessive idling report, vehicle mileage report etc reports can be generated by the system to help understand the driver's behaviour and to improve it.

VEHICLE TRACKING SYSTEM is aimed for man who owns a four wheeler and will gain the benefits of real-time location and speed along with the land mark. He can check the details any time through Internet or mobile SMS. He can put a Geo Fence to the vehicle, with which he can put fencing of 200 mts, 500 meters, 1 km etc. The moment the vehicle goes out of this geo fence area he will get an alert on his mobile phone which will help him to understand whether his vehicle is towed away from his residence and if it has been stolen. He can immobilise/stop the vehicle by sending sms and the ignition, fuel and power will be immediately off. After immobilisation his vehicle will not move a single inch. He can inform police and recover his vehicle. He can also take the Over speed alert by putting a cap on the speed as 60 km per hour, the moment driver over speeds he will get a alert in form of sms. This will be useful for large fleet owners to cut their cost by tracking the movement of the drivers. In case a driver is in a problem, he can press the panic button which will send the alert to the owner that the driver is in a problem/emergency. It will be useful for banks which carry large amount of cash.

Methodology and Context

The main purchase decision makers over here are the organisations which use truck fleet for moving goods. Information to be gathered from different stakeholders which can be in form of questioner or in depth interviews. The various stakeholders in this case would be the transport company who provide the trucks on lease, the companies which use the truck fleet system for transporting their goods and companies which are involved with the hardware and the software aspect of this technology. The various parties/stakeholders were divided in terms of role played by them in the sector and a set of questions were asked to them in order to gauge their views on this research topic.

| Stakeholders | Role |
|---|---|
| Transport company | They would be interested in keeping a track of the performance of their employees (truck drivers) as to how efficiently they drive, delay time etc. It would help them in aligning the compensation on similar lines. |
| Companies hiring truck fleet | They would want to make sure that their goods are delivered on time and would like to hire a vendor (truck fleet system) which shows consistency. |
| Companies designing the hardware and software | Educating other stakeholders about the intricacies of the system and the advantages of the system. |
| Shippers/Third part logistics | The company sending goods can track their goods by having Rfid tags placed in their shipment even if the truck fleet does not have the tracking technology |

Research Questions:

- What are the current methods being followed by truck companies in order to track their fleet?
- What is the cost involved in the present system?
- What changes are required to adopt the Rfid system for tracking?
- What are the different types of RFID systems and business models adopted by the technology companies?
- What are the factors that can prevent companies from adapting the new technology?
- What is the response of the companies which have adopted the tracking system?

Companies belonging to each of these specific roles were interviewed and asked the set of research questions and their responses were noted.

Research Findings

Transport company

Lalji Mulji Transport Company was approached in order to get their views about technology integration from their perspective. Lalji Mulji Transport Co. has one of the largest network with more than 180 offices, covering almost all the cities and towns of the country especially Gujarat. They cater to a wide array of customers from sectors like FMCG, Automobile, Engineering, Pharma, Chemicals, Consumer Goods, Raw Materials etc , which are Indian as well as Multi National Corporations on repetitive basis. They handle over 4 lacs tons of cargo every year. Their acquaintance to the technology is limited to fully computerization and interconnection of different branches using latest technology.

In order to track consignments/trucks they already have offices at a gap of 50km and hence they do not feel any need to have a real time tracking tools installed on their vehicles.

The cost involved in the current system mainly pertains to the offices rent which are located in their roots. They don't consider it a direct cost since the offices serve several other objectives like dealing with the client, taking parcels etc.

Upon asked if they were to adopt the Rfid/GPS system the changes would be required on several fronts

Hardware and software – Since the transport company already had computerised systems in place the software needs to be installed on their systems along with fitting each of the vehicles with the tracking device.

Training and Guidance – Since this is a completely new type of system in Indian perspective the employees and most importantly the truck drivers need to be trined upon the proper usage of the system. Another concern that was raised (by some independent truck drivers) was that they were not entirely comfortable in working along with the presence of such a system. There was a sense of uneasiness among them and they felt that may be the organisation does not have faith in them.

The company official had a feeling that even though the system had a lot of positive points but implementing them won't be easy due to several factors.

Cost – The software was not that expensive but the hardware which was to be installed in each of the trucks and warehouses would mean that installing the system would be an expensive affair.

Employees- It was felt that the system was a bit complicated and educating the employees about it would not be an easy job.

Companies hiring truck fleet

This segment of companies mainly included clients of the transport company who would use transport companies to ship their goods from one place to another. Some of these companies included Apollo tyres, Crompton Greaves, Castrol India, Excel Industries, Finolex cables etc. They would hire trucks based on the amount of goods to be transported and pay on the bases of truck load. They set the timeline or date of delivery in consultation with the transport operators and are not really concerned about tracking it in between.

The cost involved for the companies is mainly based on the number of trucks they hire and they charge a penalty for delayed shipment.

Some of the companies didn't mind being provided with a value added services like giving a real time feedback on the position of their consignment and were even willing to pay a premium for the services. Certain companies which rely on perishable food items like eliance retail, Big bazaar (Food bazaar) might be interested in having that system. (The above inference is based on discussion with the transport company)

Mahindra initially used to depend upon third party logistics (3PL) to transfer its cargo but it has now developed its own e logistical system (which will be discussed later)

Companies designing the hardware and software – Bonrix Track and Trace GPS system

The working of the system has already been discussed in a very lucid manner along with different set of utilities. A similar system which is entirely based upon RFid system has been developed by Infosys to reduce the inefficiencies in the existing supply chain management. They use SAP RfiD and SAP Event management tools to accomplish the objective.

Track & Trace in subcontracting scenario

The figure below depicts an RFID-enabled subcontracting scenario for a typical third party repair process. Defective items are sent by the manufacturer to the subcontractor using RFID enabled outbound delivery. Simultaneously, advance shipment notification is generated and sent to the subcontractor who has portal access to register the events associated with the status of the item. These events are captured in the SAP Event Management system to track the item.

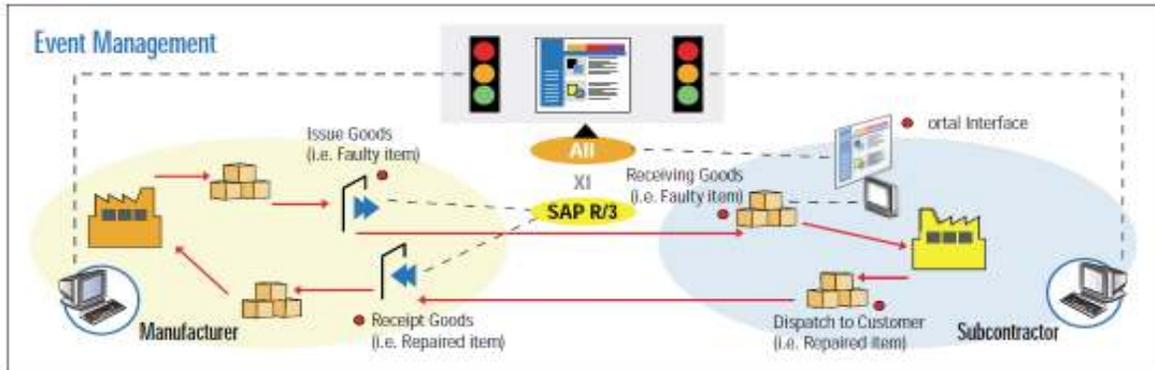


Figure 4 Track and Trace system by Infosys

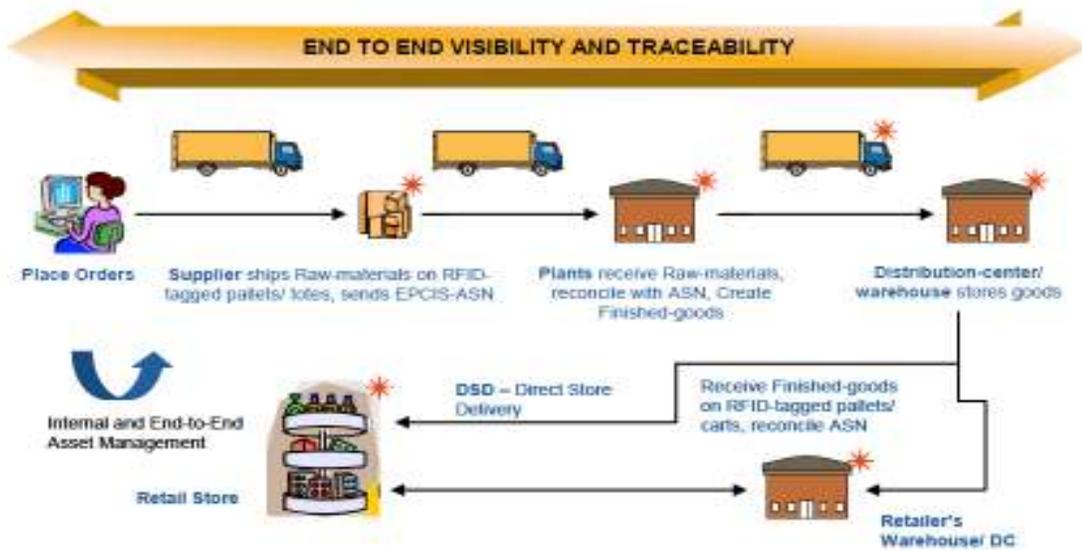


Figure 5 Rfid enabled supply chain

Tacking systems and business models

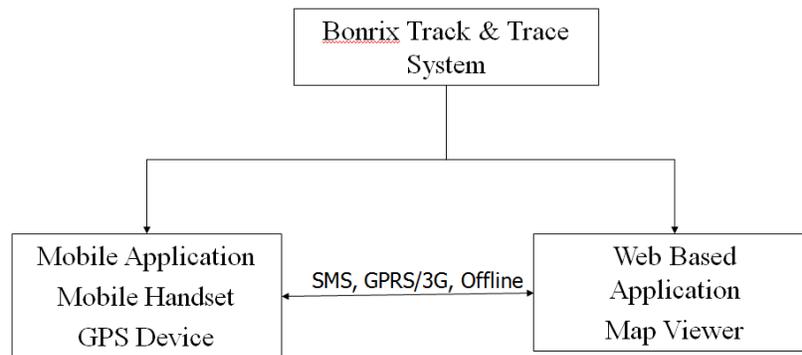


Figure 6 System components

- ▶ Bonrix Track & Trace System is an application which consists of a web based application and mobile application which can be used to track any person or vehicle.
- ▶ In mobile application, he/she has to select one of the three options i.e. Online mode, Offline mode, SMS mode.
- ▶ In online mode, data comes from GPS device i.e. latitude, longitude, date, time, distance and send to the server at regular time period.
- ▶ In offline mode, data comes from GPS device and its regularly stored in mobile itself in CSV format.

Shippers/third party logistics – Third party logistics like Federal Express and DHL and domestic companies like Gati and Shreyas Shipping are adopting new methods in terms of technology in order to transform their business.

| Firms | Investment Details/ Plans (2007-08) (in US \$ mn) |
|------------------------------------|--|
| DHL | 260 |
| TNT | 115 |
| Gati | 200 |
| *Shreyas Shipping and Logistics | 350 |

Source: Baxi (2006), Sanjai (2006a)

Table 3: Investment decisions by major shippers

Source: Baxi (2006), Sanjai (2006a)

Gati operates one of the largest road networks linking 594 districts out of a total of 602 districts in India at a turnover of \$104mn in 2005-2006. It covers 3.2 lakh⁴ -km every day with a fleet size of 2000 trucks. Its automated shipment tracking ability has brought it closer to the customers – for example, the SMS based tracking system has allowed the customers to continuously get an update on the status of their consignment. Another feature also enables customers to get email based conformation of any delivery. Gati has also transformed the warehouse management practices in India with its modern system, WMS - a web based warehouse management system that provides both functionality and flexibility to customers in managing their warehouse operations. WMS enables Gati and its customers to track inventory status in real time. [excerpts from logistics challenges in India]

Similarly others operators like Bluedart DHL has adopted various tracking algorithms in order to manage their inventory and keep the customers updated about their consignment. Hemant Dhalkar of blue dart says that they track their consignments but not on a real time basis i.e. they have digital checkpoints and as the consignments pass through the points its

location is registered so if a user enquires about his consignment at any given point of time he would be informed about the latest check point which may not be its actual position at that time.

Currently no real time tracking of the shipments is done by companies. The cargo is tracked at various check points and their status is updated on the websites.

There is not much cost involved in the above system as the cargo/parcel has barcodes which stores information about the product details and a simple hand held device is used to read the details (and update) at each of the check point.

Since a lot of cargo/parcel moves together the concept of dynamic tracking can be applied for bulk shipments and not individual parcels. A GPS receiver can be set along with the bulk shipment which would help in dynamically tracking the consignments. For individual parcels RfiD tags can be used to track them.

Mahindra Integrated Transport Management system

An important case with regard to adoption of this latest technology in the logistics sector include the Mahindra Logistics system

The several features of the system are:

Transaction Management system - It keeps a track of the sales data and transfer it to the servers thereby reducing the errors in recording data

Hand held device – The devices help in recording data and with the help of GPRS system the data routed to the central servers

Vehicle Tracking system – It gives out details about the route followed by the vehicle

Outing and scheduling system – It helps in generating optimised routes so that the logistics process can be made more efficient.

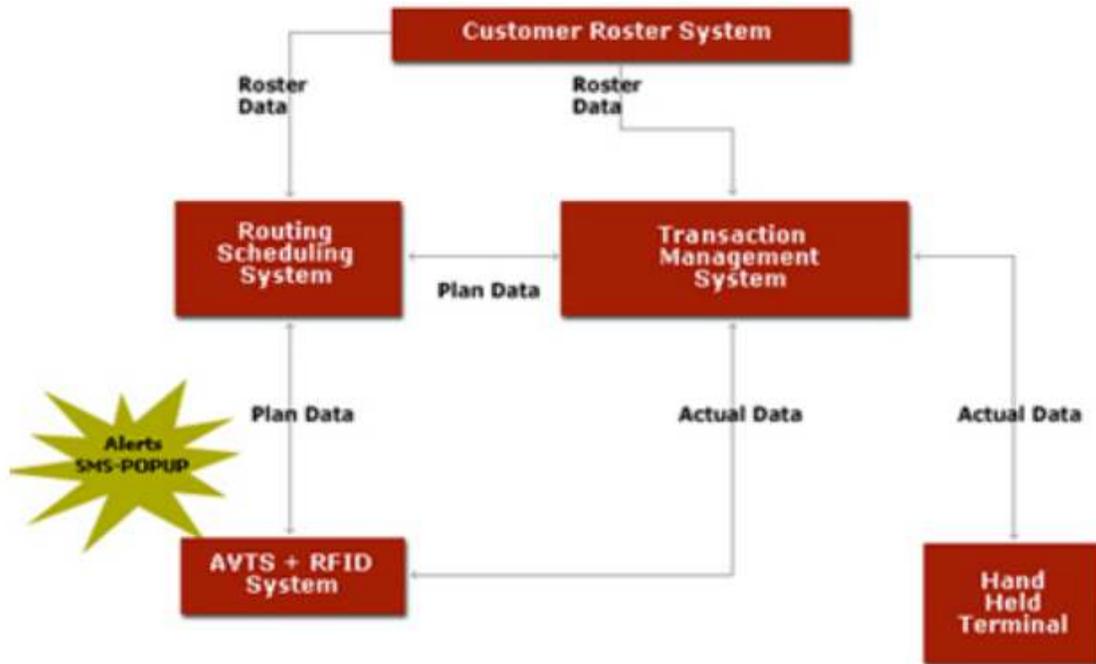


Figure 7 Flow diagram about working of the system