

Implementation of Intelligent Transport System in UPSRTC

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Preface

Rakshak Foundation was founded in 2006 by a group of concerned citizens from India's elite educational institutions working in USA. It was in the manner of giving back in a small way to United States and India, countries that had provided them so much in terms of opportunities. The Foundation seeks to create an informed society, aware of its rights and duties, and attempts to address barriers to an equitable and just society. Rakshak Foundation has been submitting well researched opinions on various bills being considered for presentation to the Indian Parliament. Rakshak Foundation has been invited by the Parliamentary Committees of the Rajya Sabha three times in the past two years to depose before them and present their views on proposed Bills which would affect the whole nation once they are enacted by the Parliament.

The Intern is pursuing undergraduate course in Civil Engineering from Indian Institute of Technology, Delhi and has completed his Fourth Semester. He has a keen interest in research on public policies and social issues and use of technology in it. The intern is grateful to Rakshak Foundation for providing such a platform to young, concerned citizens to be guided by distinguished luminaries and have a participation in the concerned issues.

The project assigned to intern is "Implementation of Intelligent Transport System in UPSRTC". He has tried to explain ITS and bring forth the benefits of implementation of ITS in UPSRTC with a future prospect of improved quality of service delivery to public and more efficient management of corporation. He has tried to find and plug the gaps and loopholes related to technical aspects of the components of the ITS.

Acknowledgements

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I also take this opportunity to express my deep sense of gratitude towards Rakshak Foundation and Shri Sachin Bansal for providing such an excellent opportunity to work with such distinguished luminaries. I would also like to thank the internship coordinators Mr. Jatin Gupta, Mr. Anupam, Mr. Ajay, Mr. Anirudh and Ms. Rashmi Dhandia, Mr. Shobhit Sharma and my co-interns who gave really valuable inputs and suggestion for the project. I would especially like to thank Deepak Kumar and Pahur Jain, my co-interns for their invaluable inputs and support for the completion of the project.

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Executive Summary

Intelligent Transport Systems (ITS) is a term for the integrated application of communications, control and information processing technologies to the transportation system. The main objective of ITS is to evaluate, develop, analyse and integrate new technologies and concepts to improve commuter service, improve decision making, achieve traffic efficiency, enhance safety, save time, conserve energy, improve environment quality and enhance overall performance and profitability of the service provider corporation.

Uttar Pradesh State Road Transport Corporation (UPSRTC) is implementing the Intelligent Transportation Management System (ITMS) under the '**Central assistance for Strengthening Public Transport System in the Country**' scheme by Ministry of Road Transport and Highways (MoRTH). The uniqueness of the project is that it is the 1st project with Integrated Approach in the country. The scope of work revolves around 20 Regions, 115 Depots, 251 bus stations and over 9650 buses of UPSRTC. It aims at improving operational efficiency by better management of fleet, manpower, routes and passenger. Unlike other places the reason for implementation of ITMS project in UPSRTC is not Traffic Congestion but to provide better facility for the commuters with a future prospect of importance of road transport.

With the implementation of State of Art technologies under ITMS in UPSRTC the tarnished image perceived by people for UPSRTC services is bound to improve. On successful completion of this project, it will surely lead to increased use of public transport by reducing use of personal vehicles significantly, also the problem of poor management of fleet till local level is bound to perish. Besides that since the UPSRTC mainly provides long route services keeping in mind the rural population, the economy of Uttar Pradesh will also boost up. As better management of fleet will also improve the connectivity of rural community with markets & farm input suppliers, education & employment opportunities, and health & welfare facilities. Thus having an overall inclusive growth.

The business solution provided under ITMS mainly includes:

- (i) Integrated Ticketing System (ITS)
- (ii) Vehicle Tracking System (VTS)
- (iii) Passenger Information System (PIS)
- (iv) MIS analytics & Decision Support System

The research methodology of the project has been literature search, online surfing of UPSRTC website & VTS portal, then field visits, interview of the staffs and conducting surveys among drivers, conductors and passengers. Having done this the

problems, loopholes and gaps in the implementation of ITMS of have been brought up. Subsequently, the recommendation have been given to address them.

Key Findings:

Although the project had to be completed by 7th May 2014 but due to some unanticipated problems significant delay has occurred. The key achievements of the project till date has been enlisted in detail in the report. A 'Project Implementation Unit (PIU)' needs to be set up for fast implementation of ITS adhering with Functional Requirement Specifications in the project proposal.

ITMS has far reaching socio, economic and environmental benefits. It not only gives benefit to management staffs but also provides innumerable benefits to public in general. Its benefits have been highlighted for each for each of the stakeholders namely, passengers, crew members, and managerial staffs.

One of the main shortcomings of the project was that the stakeholders are not properly trained and hence purpose of many of the components remained defied. Then proper control centres has not come up yet. Due to this single person was becoming overburdened by the additional services provided under ITS.

Also there is a lack of awareness about the ITS project and the enhanced services which would be delivered under ITS to passengers among common citizens. For this there is a need to set up marketing and advertising cell at central and regional levels.

According to the NCRB report on Accidental Deaths in India – 2012 total deaths due to road accidents were 1,39,091 which accounted 35.2% of total accidental deaths. According to a study by planning commission the social cost of road accidents in India was estimated to be Rs. 55,000 crores annually (2000 prices). Seeing these figures expansion of ITS components has been proposed. Two new proposed components under ITS are 'Collision Avoidance System' and 'Side Bus Collision Warning System'. Government should identify institutions and allocate funds for their research and development.

Proposed Action Points

On Fuel Level Sensor: It should be developed and deployed as soon as possible. The algorithm of this float type fuel level sensor can be developed based on the concept of averages i.e. data to be sent be the average of fuel level say of 5 seconds' period and be sent every second. This will give stable and continuous data overcoming the huge fluctuations due to jerking of vehicles. Also several layers of meshing can be provided in fuel tank itself to dampen the movement of fuel due to jerking.

Implementation of ITS to full scale: A separate agency namely "Project Implementation Unit (PIU)" be set up to ensure overall progress of the project and compliance of the implemented applications with Functional Requirements Specifications in project proposal. For evaluation purpose an external third party agency to study the pre- and post- implementation impact "Project Evaluation Agency (PEA)" be set up.

Proper Training of officials, management staffs, and crew members be carried out.

Control centres be set up and proper delegation of work should be carried out as many of the staffs have been overburdened by the increased services under ITS.

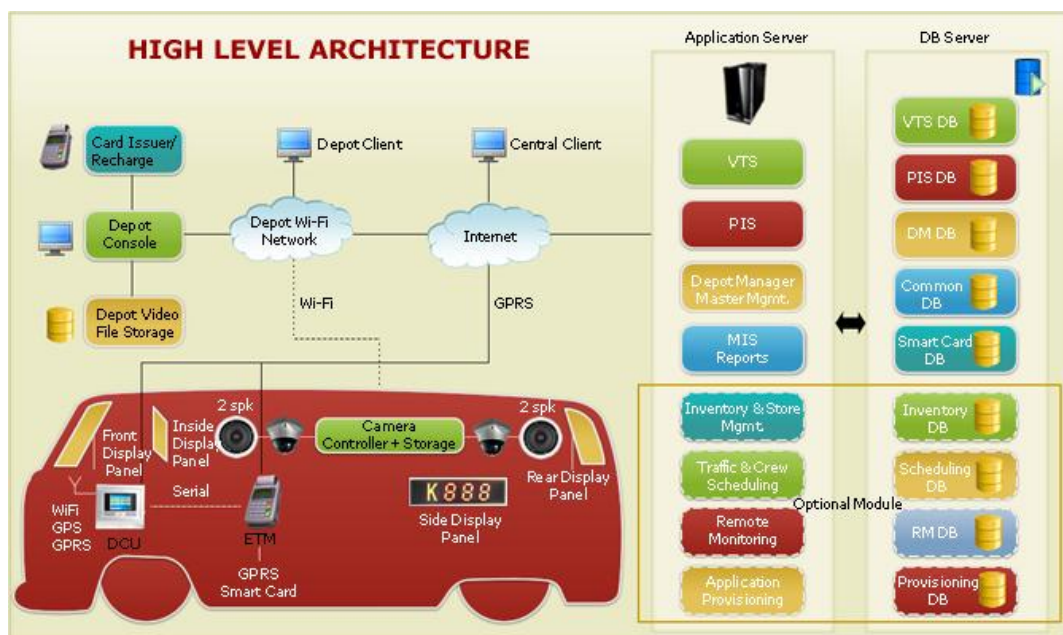
Sensitize among people: Marketing and Advertising cell be set up at central as well as regional level to sensitise ITS, its components and benefits among people. This can also take care about the commercial advertising through various modes of ITS.

Government should allocate some funds and identify institutions for developing newer technology towards road safety. 'Collision Avoidance System' and 'Bus Side Collision Warning System' needs to be researched upon and brought in India.

1. Introduction

1.1 Meaning of Intelligent Transport Systems (ITS)

Intelligent Transport Systems (ITS) is a term for the integrated application of communications, control and information processing technologies to the transportation system.¹ The main objective of ITS is to evaluate, develop, analyse and integrate new technologies and concepts to improve commuter service, improve decision making, achieve traffic efficiency, enhance safety, save time, conserve energy, improve environment quality and enhance overall performance and profitability of the service provider corporation. ITS in general covers all modes of transportation – air, sea, road, rail and considers all elements of the transportation system – the vehicle, the infrastructure, the stake holders and their dynamic interaction. This definition of ITS is very broad and different countries and its subsystems interprets and implements it depending upon their geographical, socio-economic, environmental and operational background.



¹ http://road-network-operations.piarc.org/index.php?option=com_content&task=view&id=39&Itemid=71&lang=en

1.2 ITS in UPSRTC

Uttar Pradesh State Road Transport Corporation (UPSRTC) is implementing the Intelligent Transportation Management System (ITMS) under the '**Central assistance for Strengthening Public Transport System in the Country**' scheme by Ministry of Road Transport and Highways (MoRTH). The uniqueness of the project is that it is the 1st project with Integrated Approach in the country. The scope of work revolves around 20 Regions, 115 Depots, 251 bus stations and over 9650 buses of UPSRTC. It aims at improving operational efficiency by better management of fleet, manpower, routes and passenger. Unlike other places the reason for implementation of ITMS project in UPSRTC is not Traffic Congestion but to provide better facility for the commuters with a future prospect of importance of road transport.

The sanctioned project has a capital cost of Rs. 38.25 crores of which 50% (Rs. 19.125 crores) is being funded by Govt. of India as grant. Balance capital cost of Rs. 19.125 crores shall be met by the Systems Integrator on BOOT (Build-Operate-Own-Transfer) basis on behalf of UPSRTC. Further, the operating cost of the project (including equipment maintenance, manpower training & outsourcing, site preparation, rentals of GSM sim cards, etc.) for a 5 year span shall amount to around Rs. 70 crores. This shall also be met by the Systems Integrator on BOOT basis on behalf of UPSRTC. These investments by SI shall be recovered as per ticket cost under a 5 year contract. The contract been finalized at 44 paisa per ticket cost under a 5 year contract to SI 'M/s Trimax IT Infrastructure, Mumbai'. UPSRTC soon introduced a 50 paisa IT Cess to fund this project from out of fare box with no burden on its profitability. Also the SI shall be monitored against a rigorous Service Level Agreement (SLA) and shall be subjected to graded penalty system for delays.

As per the agreement the implementation work of project has to be started on 10th April, 2013 and has to be completed in 56 weeks i.e. by 7th May, 2014.

1.3 ITMS Overview

The business solution provided under ITMS mainly includes:

- (i) Integrated Ticketing System (ITS)
- (ii) Vehicle Tracking System (VTS)
- (iii) Passenger Information System (PIS)
- (iv) MIS analytics & Decision Support System

Each of the components will be explained subsequently one by one in detail.

1.3.1 Integrated Ticketing System

The integrated ticketing system includes ETM ticketing, counter ticketing and Online Reservation System.

1.3.1.1 ETM Ticketing:

The ETM stands for Electronic Ticketing Machine. These are the handheld devices which can be carried on buses by the UPSRTC bus crew and is used to issue tickets to the passengers. The ETMs are capable to print tickets as per specified format having relevant details like type of ticket, route number, source & destination, time & date stamp, bus ID, fare etc. These are also capable of reading RFID based smart cards (Monthly Seasonal Ticket and Open Ended Travel Card) and generate tickets for the same. The ETMs proposed are GPRS based and will have capability to send ticketing data without data loss to the central ticketing database at the data centre.

1.3.1.2 Counter Ticketing:

Currently UPSRTC does not have counter booking facility at the bus stations. UPSRTC shall start with counter booking facility for its passengers under this project. The counters will be setup and operated by the SI. Civil and electrical infrastructure shall be provided by UPSRTC. The counters will also provide facility for:

- Normal Ticket: The passengers will be able to buy tickets to any destination where service is available from the counter at a bus station where ticket counters are setup. These tickets shall not have any seat number or reservation. The passenger can board any bus which goes to the same destination for which he has purchased the ticket.
- Current Booking: The passengers will be able to buy ticket with a confirmed seat number from these counters. Initially the confirmed seat ticket issuing facility will only be available for buses that originate from the issuing bus station. The facility can be expanded to other bus stations which come in a route.
- Advance reservation: The facility of making an advance reservation for buses will be available from the counters apart from the Online Reservation system for the buses covered under the online reservation system.
- Monthly Season Ticket: UPSRTC also issues monthly season tickets (MST) to passengers who travel frequently on a route. The MST cards are currently paper based cards and are renewed every month. Under the ITMS project the MST passes will be replaced by RFID based cards. These RFID cards shall be

issued from the counters. The ETM machines in the buses will be able to validate the authenticity of the cards.

- **Prepaid Travel Card:** RFID based prepaid travel cards facility shall also be provided at the bus station counters. The purchaser of the card will be issued an RFID card. Depending on the value of the card, the passenger will be authorised to travel using UPSRTC's bus services for a definite kilometres. Every time the passenger boards a bus with the prepaid travel card, the conductor shall validate the card and issue a paper ticket after reducing the appropriate kilometres from the card. The passenger will be allowed to recharge/renew this card from any of the UPSRTC bus station counters.

1.3.1.3 Online Reservation System (ORS)

Online Reservation System will also be provided as a part of the ITMS. Passengers of UPSRTC will be able to book their tickets online through UPSRTC portal for ticket booking. This facility will only be available for certain high end bus services; however UPSRTC in future include more buses and bus services under the ORS system. The online reservation system will send an SMS and an e-mail to the passenger to confirm the ticket along with the PNR and seat number allotted. When the passenger boards a bus, he/she is required to produce the SMS or e-mail confirmation or a print out of the ticket to the bus conductor. The bus conductor will input the PNR into the ETM and this data will be updated on the server. The facility to book tickets of UPSRTC buses will also be available on other Online Travel Agent websites. Initially the ORS system will cater to approximately 150-200 buses.

The SI shall be required to setup a 24X7 call centre service for the users of the ORS system.

1.3.2 Vehicle Tracking System

Vehicle tracking systems are commonly used by fleet operators for fleet management functions such as fleet tracking, routing, dispatching, on-board information and security. VTS utilises a vehicle tracking device which tracks the precise location of buses through GIS (Geographic Information System) based GPS system and transmits the data on real time basis to Regional and Main Data Centres (DC) at fixed intervals of time. Other than tracking location of buses it gives other information like how many times the emergency SOS button is pressed, how many times the vehicle has over-spiced, or harshly accelerated or braked and many other useful information.

The VTS system shall have the following components:

- **Central and Regional Control Centres:** The Head Office and Regional Offices will be able to monitor the bus location and activity through the Central and Regional Control Centres. The central control centre will be setup at the Head Office and the Regional Control Centres shall be setup at the Regional Offices. The control centres shall have large LCD display terminals where the buses can be monitored on digital maps. The ETA and ETD information of the buses can also be monitored from the control centres. Some of the key parameters than can be tracked using the Vehicle tracking system are locations of the bus, speed of the bus, path followed by the bus etc. This data from the vehicle tracking system is fed to the Passenger Information System to calculate the Expected Time of Arrival and Departure of the buses. Speed tracking of the bus is an important feature that the GPS technology provides. Alerts for over-speeding and sudden deceleration or accidents can be generated. This will allow the management to ensure safety of the on-board passengers and adopt necessary actions in the case of an emergency situation. The VTS system shall enable the driver or conductor of the bus to send a SOS signal to the respective Control Centre in case of an emergency.
- **Fuel Level Sensor:** The in-built fuel gauge in the buses will be connected to the VTS device and the fuel level data will be continuously fed to the data logger in the VTS device. The GPRS module shall keep sending fuel data to the DC. In case of a sudden change in the fuel level, alerts shall be generated and the respective RO Control Centre and the HO Control Centre shall be intimated for appropriate action. The SI shall initial check the accuracy of these in built fuel gauge in the all the buses and make replacements at its own cost from time to time throughout the contract period. The SI shall be responsible to maintain the fuel gauge by carrying out periodic checks.

This data gathered from the VTS system will be an input to the passenger information system which will provide information on bus arrival departure time.

1.3.3 **Passenger Information System (PIS) and Passenger Announcement System (PAS).**

Passenger Information System is the third component which provides the passenger and management the information about the bus's performance against time. The PIS is an application which receives the input from the following systems:

- **Vehicle Tracking System:** The GPS data of current location of the bus is continuously fed to the PIS system. The PIS system uses the current location of bus, speed, and distance to estimate the arrival time of the bus at the next bus stations.
- **Bus In/Out Tracking:** The bus in/out system is a simple mechanism to electronically record arrival of a bus at the bus station using RFID card and

card reader. Each bus is provided with a passive RFID card which is an electronic identity of the bus. As a bus arrives at the bus station, the driver / conductor swipes/punches the RFID card to the card reader. The PIS system is informed that the bus has arrived. The bus station staff does the scheduling of the bus and appropriate departure time is updated in the system. Once the departure time is recorded, the automated announcement system makes announcement about the departure time of the bus at the bus stations.

- **Advertisement Content:** The PIS system will also support advertisements. Advertisement content as provided by UPSRTC shall be advertised as per UPSRTC's requirements on all mediums of the PIS system like LCD Screens at bus stations, Announcement Systems, Ticket Booking Portal, IVRS number, Push / Pull SMS etc.

The PIS system is meant for providing information about the buses to the passengers by various mediums. The ITMS project envisages Passenger Information to be provided to passenger by the following medium:

- **Automatic Announcement System:** UPSRTC currently has manual announcement systems at all major bus stations which are used to make announcements regarding bus arrival and departures. ITMS project envisages an automated announcement system which gets data from the various systems, and the announcement system automatically triggers announcements based on the rules set in it. However it is understood that automatic announcements cannot completely replace manual announcements, hence the current system of manual announcement shall co-exist to make ad-hoc announcements.
- **LCD Displays:** All major bus stations will be equipped with LCD displays to show arrival and departure status of the buses. The information shall be fed from the PIS system. The LCD displays will be capable displaying multimedia advertisement as scrolling text or as video.
- **Call Centre:** UPSRTC currently has a 24X7 help-line which is situated at the head office. With the implementation of the ITMS system, the passengers will be able to get information about the expected arrival and departure time of the buses by calling the help line number. The SI shall integrate the PIS system with the help-line system to make available the PIS data at the call centre.
- **IVRS:** Another component of the PIS system would be Interactive voice response system. The passengers shall be able to get information about the bus arrival departure and availability. The details of the functionality shall be worked out during requirement gathering.
- **Push / Pull SMS:** The bus arrival and departure status should also be available through pull SMS. The passengers should be able to retrieve information about the ETA/ETD about the buses by sending an SMS to a common number.

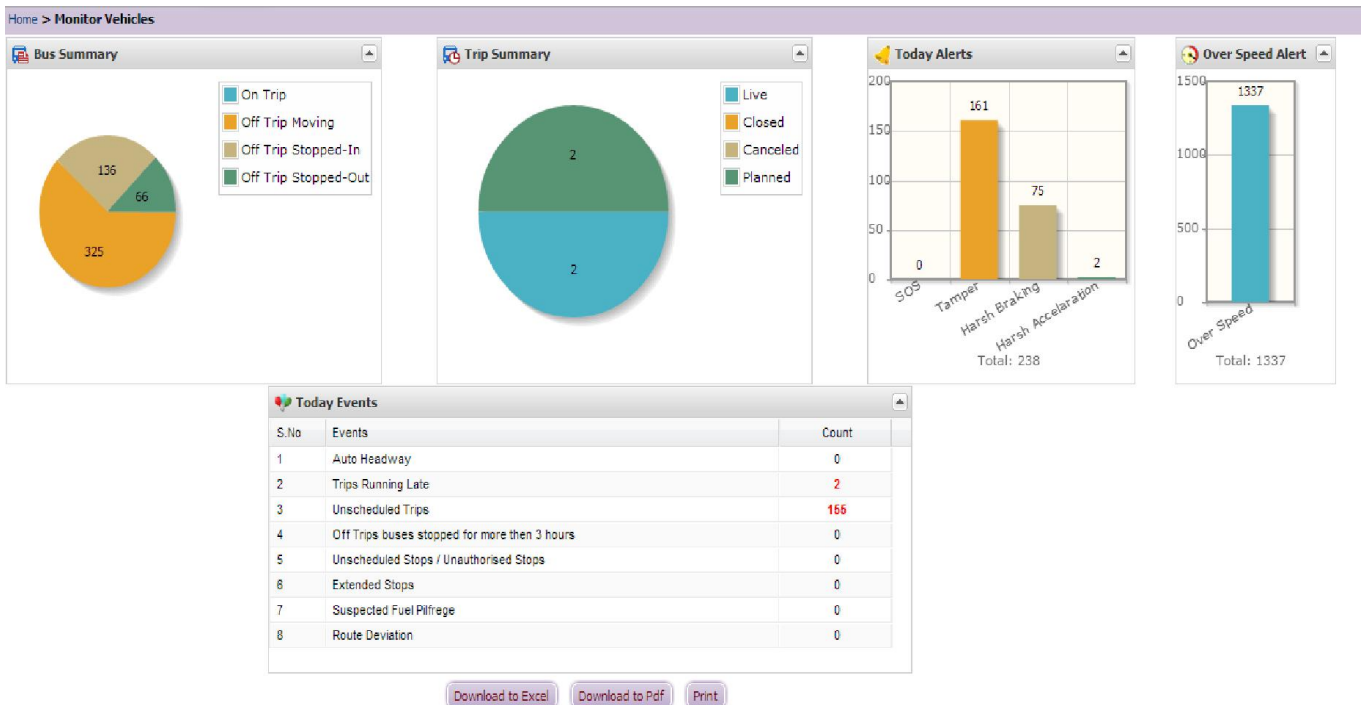
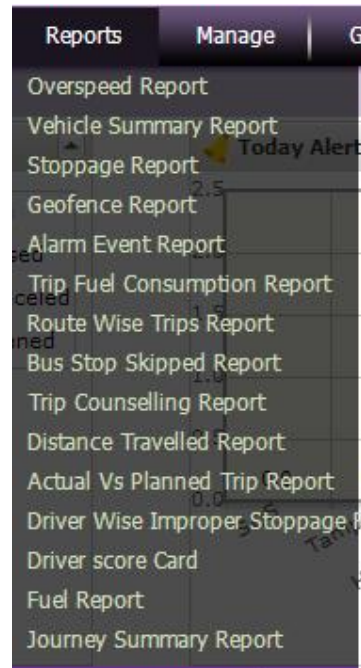
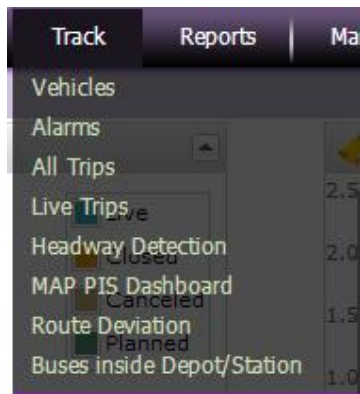
The Pull SMS service shall be initially available for only those buses which are covered under the ORS system. However UPSRTC shall extend the same service to other bus services later. Push SMS service will be used to update the passenger who has made a reservation on a bus and there is an expected delay or change in the bus timing etc. Push SMS service shall also apply to ORS passengers only. Push SMS shall also be used to inform the MST and Prepaid Travel Card holders to intimate them about expiry of their card and alert them to renew the same. If required by UPSRTC SMS service may be used to provide advertisements along with the SMS sent to the passengers. Internet: The UPSRTC website shall also provide information about the bus timings and route information. The ORS passengers would also be able to track the status of their bus on the website. The ORS portal will be designed with appropriate advertisement space and options. The advertisement space on the ORS portal shall be updated by the SI as per UPSRTC's requirements.

1.3.4 MIS Analytics and Decision Support System

The last and the most important component of the system is the "MIS, Analytics and Decision Support System". This module uses the data available at the DC in various modules discussed above. This system generates various automated reports for daily, weekly, monthly monitoring. This also provides provision for data analytics required for managing operations and improving performance. The decision support system helps the management by providing the required data at one place to the management to help them take decisions.

All these information are made available to management officials on the Dash board provided for VTS. They can login and find the relevant details. This easy of assess to all the information online helps a lot in better management of the fleet by them and take necessary decisions quickly.

The screenshots of information provide accessed on VTS portal:



Route Planning and Optimization: The route planner / optimizer software system at the Central Control Station shall transform the transactional data into useful information and feed the same into the decision support engine for route planning & optimization. The route planner / optimizer software shall include optimization of load factor on different routes and differential scheduling based on actual trip completion times.

1.4 Infrastructure Setup

1.4.1 Data Centre

The most important component of the infrastructure layer is the Data Centre ('DC'). The Data Centre is a highly secure and reliable infrastructure that houses the servers, applications, databases and network equipment to ensure continuity of business. All the major software applications and databases would be hosted at the DC. The DC will also provide facility of network and server monitoring for the complete setup. The hardware for DC shall be supplied by the SI and will be hosted at a tier 3 facility. The DC facility is to be proposed by the SI. The management and monitoring of the DC equipment shall be the responsibility of the SI. The SI should plan the Data Centre hardware for up to next 10 years of operations.

1.4.2 DR Centre

To ensure continuity of business in an unforeseen circumstance when the DC has to stop operations, a Disaster Recovery (DR) centre is required. The DR would have the similar specifications as the DC. The required area may vary depending on the applications / services that are to be hosted at the DR. The DR would be configured in a manner that the critical applications and databases shall be of the same capacity as in the DC, however some of the non-critical applications would be of a lower capacity of the DC. All ticketing related application and databases at DR will be 100% replica of the DC. All other applications and databases shall be 50% replica of the DC. The DR shall also be hosted at a tier 3 DC facility in a different seismic zone which will be proposed by the SI. The hardware for DR shall be supplied by the SI and will be hosted at a tier 3 facility. The DR facility is to be proposed by the SI. The management and monitoring of the DR equipment shall be the responsibility of the SI.

1.4.3 Network Components

The DC and DR will be connected through redundant MPLS links using routers and switches to ensure reliable connectivity. The DC will be connected to the Head Office, through an MPLS connection to enable reliable connectivity. All real-time and batch data transmitted by any device connected to this network will be sent to the DC and will be updated to the database. The bus station and the bus depots will have broadband connection from two different service providers or different technology to ensure redundancy. Ticketing data and vehicle location data generated in the buses can be directly transmitted to the DC using the GPRS connection in the bus

1.4.4 Structured LAN Cabling

The SI shall provide structured LAN cabling required at various locations. The Head Office and Regional Offices already have LAN cabling, however the SI should assess the status of the same and provide extra cabling wherever required during the requirement gathering phase of the project. The SI shall carry out LAN cabling at the bus stations and bus depots for the IT infrastructure supplied in this project.

1.5 Key Achievements of the Project till date:

1.5.1 Online Reservation System (ORS)

- Implemented since February 2013 with a payment gateway to ensure that ticket revenue goes to UPSRTC bank account directly.
- Available for Volvo & High End services and 200 Goldline & prestigious ordinary services.
- Sub contracts for ticketing by leading 3rd party website - makemytrip, redbus, hermes, travelyaari & busindia.
- Mobile based apps for ticketing implemented.

1.5.2 Counter Ticketing

- 150 counters have been set up and are operational for current ticket issue - all infrastructure, software and manpower provided by SI. Daily cash receipts are deposited at UPSRTC depots.
- Further, 84 counters out of 100 required have been setup for Smart Card registration and issue. Three types of cards would made available:
 - Monthly Seasonal Ticket (MST): A non-transferable card with user photo that is valid for a designated route for one month. It allows a 60

trips journey (2 trips per day) on a 36 trip price, for routes up to 100km for general users and 35 km for students.

- Open Ended Travel Card (E-Wallet): Personalised non – transferable Smart cards with user photo issued for use on any bus, any time. Cards are denomination based and the discount is topped up on issue as in prepaid mobile SIM cards.
- Both the above cards also have magnetic strip for being for being used as simple prepaid cards at any merchant establishments for shopping, in collaboration with ICICI bank. Applicant can deposit any amount from Rs. 100 to Rs. 1000 in this General Purpose Wallet and can use it as required. This can be done at any designated counter and does not require the applicant to have an account with ICICI.
- Concession Cards: Smart cards shall be issued to concession travellers with the information of the paying department pre-loaded in the card so that the authorisation process for conductors becomes easier and journey details are captured directly by Electronic Ticketing Machine shall be used for reconciliation and billing.
- The Smart Cards have to be obtained by filling an application form made available against a one-time payment of Rs 50 as the KYC norms of banks require the filling of the form.

1.5.3 Electronic Ticketing Machines (ETMs)

- Old existing ETMs replaced with 11153 new GPRS ETMs with simcards in all Regions and implemented in all depots.

1.5.4 Vehicle Tracking System (VTS)

- GPS has been installed in over 5780 buses. Installation is targeted to get completed in all buses by May 2014. The application software is functional and some small customization & stabilization processes are underway to make it more useful and user friendly. The information forms a feed for Passenger information system & Control rooms.

1.5.5 Central and Regional Control Centres

- Control rooms set up at 3 Regions and shall be completed in all other regions along with completion of installation of VTS.

1.5.6 Passenger Information System (PIS)

- 100 LCD screens (40") and automated passenger announcement system set up at bus stations of 8 Regions. Installation to be completed by May, 2014.

1.5.7 Data Centre and Disaster Recovery Centre

- Data Center at Mumbai & Disaster Recovery center at Bangalore with requisite infrastructure has been set up and is functional.

1.5.8 24X7 call centre service

- For help / grievance redressal of users of ticketing setup at HQ by SI. IVRS and web application for the same is being customized and shall be implemented soon.

1.6 Utility and Benefits of ITS and its components

There are ample benefits of ITMS and these can be better explained in perspective of the different stakeholders and different components of ITS associated with them.

The main group of stakeholders being benefited from ITMS are – the passengers, the management officials of corporation and the crew members of UPSRTC which includes drivers, conductors and other ground duty staffs.

1.6.1 Passengers: The main stake holders of the services are passengers. Annually 526 million people travel by the Uttar Pradesh state road transport bus. The passengers by the introduction of ITMS are mainly targeted to benefit from it.

Integrated ticketing system: ETMs have led to a great speed and saving of time in getting tickets. It is also very much reliable. Then introduction of RFID based smart card has brought the comfort of passengers to another level. UPSRTC has introduced both MST and Open ended pre-paid travel card with considerable discounts to encourage its use. This not only increases the speed but also ensures the security. Then the Online Reservation system which enables a passenger to plan and book the bus ticket in advance according to their convenience.

Vehicle Tracking System: With the introduction of VTS there is an increase in safety and security of passengers. The SOS or panic button provided with the VTS enables the quick delivery of help in case of any emergency situation. This will make the passengers confident while travelling of their security especially on high-end buses which cover larger distances.

PIS and PAS: Passenger information system integrated with VTS helps the passengers in getting more reliable time table and schedule of buses. There is a reduction in uncertainty while waiting for bus, reduction in travel time,

reliable information for the proper planning of journey, comfort in acquiring information about the schedules of bus.

1.6.2 The management officials of the corporation:

Integrated Ticketing System: The introduction of ETM has brought a significant reduction in loss of traffic revenue. This has further improved the accuracy in accounting. Through the use of it they are able to get better MIS reports thus enhancing the decision making process more accurate and efficient. The introduction of smart card has enhanced better cash management relieving the burden of conductors.

VTS: VTS enables the management officials to get various information like location of bus, over speeding, harsh acceleration, harsh deceleration, tampering, SOS button usage, live trips, scheduled and unscheduled trips etc. The benefits to them is that they can now have better monitoring over the activities of bus, drivers, conductors and take necessary actions against them if they are doing something wrong. Now it is very easy to restrict unwanted activities by the drivers like stoppages at unauthorised Dhabas, skipping bus stations, following different route, pilferage of fuel. Also the schedules of bus can be planned efficiently enhancing the utilisation of the fleet and manpower. It also enables them to provide quick help in case of any emergency.

PIS and PAS: With the ITS integrated PAS it is now easier to make reliable automatic announcement. This can also reduce the usage of manpower for making manual announcement. This can also lead to increase in revenue by advertising. PIS can also be efficiently be used to make people aware about the developments on ITMS which is very much necessary.

MIS Analytics and Decision Support system: With the availability of all the relevant information in well-structured and segregated way the planning part has become very efficient. Planning includes route planning and optimisation, planning of usage of manpower, the fares, and other different services.

1.6.3 The crew members (Drivers, Conductors, ticket booking staffs):

Integrated ticketing System: ETM has enhanced the efficiency of conductors by rapid issue of tickets. Also their burden is reduced by the introduction of smart cards as they will have to carry lesser and lesser amount of cash while on travel.

VTS: It can bring a sense of security in the mind of drivers and conductors. Also they will restrict themselves from the unwanted activities. This will also improve their driving sense as they will avoid harsh breaking, harsh acceleration etc. thus improving their own safety along with the passengers’.

Smart card based Bus In/Out facility: This will improve the accountability of both drivers and conductors.

1.6.4 Overall Benefit:

- Increase in productivity and better utilisation of fleet
- Improved frequency and travel time
- Patronage of Public Transport system
- Reduction in congestion
- Reduction in accidents and injuries
- Reduction in emission levels
- Increase in tourist satisfaction
- Increase in revenue via multiple sources
- Reduction in fuel consumption
- Reduction in fuel pilferages and manipulations
- Enhanced reliability and punctuality of bus system
- Real-time information
- Encouragement for modal shift to public transport
- Better management

1.5 Goals and Objectives

The main objective of the project is to do a quick study of the Scope of Work & Functional Requirements specified in the Request for Proposal (RFP) and testing/confirming compliance in the implemented applications deployed under the project implementation of ITMS in UPSRTC. Project also brings out the gaps if any and suggesting methodology for its quick redressal – error correction, remedial measures and suggested timelines. The project also aims at assessment of the quality of the deliverables and suggest improvement of quality of the delivered solution with a view to maximise public benefit and organizational goals. Further what more can be done within the current scope of the project to fit in the gamut of the ITMS project has also been suggested.

2. Methodology

2.1 Literature Search

The project required a thorough study of the functional requirement specifications (FRS) and detailed project report (DPR) documents of the solutions delivered under the ITMS project. It also required a study of request for proposal (RFP) of the project to the System Integrators. These documents were made available to the intern by the Managing Director of UPSRTC. Apart from these, the technical aspects of each of the components had to be studied from internet. For this the intern took the support of Wikipedia. The quality of some of the components provided by different companies in India and also across the world was studied from internet. Then a quick study of the user manual provided by the Trimax Infrastructure (SI) was done to understand the usage of the facilities and information provided under Intelligent Transport System. Further a thorough assessment of the UPSRTC official website was done where the intern came across various documents. The intern had done a quick study of them to see their relevance. Finally the assessment of the online portals of VTS monitoring, online waybills through GPRS and revenue detail was done by logging in to the system and scrutinising it thoroughly.

Apart from these a report on 'Accidental Deaths in India' by National Crime Records Bureau (NCRB) was done to study what is the share of public road transport in overall accidental deaths. The World Report on Road Traffic Injury Prevention by World Health Organisation was studied to see the need of newer efforts and newer initiatives to be put in by government seeing the present and forecasted scenario of road traffic deaths worldwide. The report of 'Sundar Committee on Road Safety and Traffic Management - 2007' was studied to analyse the scenario of road safety in India and governmental efforts towards it.

A news report from "The wall Street Journal" under the headline 'U.S. to Propose Vehicle-to-Vehicle, Crash-Avoidance-System' incentivised to expand the scope of project for introduction of new technology in ITMS. It reported that U.S. cars and Trucks need to compulsorily have Crash avoidance system.²

"Collision avoidance system" of various vehicles and a report on "Performance Specification for transit bus Side-Collision Warning System"³ was studied to see their scope in ITMS project.

² <http://online.wsj.com/news/articles/SB10001424052702303942404579360972335289080>

³ https://www.ri.cmu.edu/pub_files/pub3/mcneil_sue_2002_1/mcneil_sue_2002_1.pdf

2.2 Field Visits

Seven field visits were conducted in total during the course of internship to various bus depots, bus stations of UPSRTC, bus depot of private operator and some organisations like ASRTU office. Field visits to bus depots and bus stations were mainly aimed to get an on-site assessment of the delivered solutions under ITMS, the progress of its implementation and to find the problems. Most of the field visits to bus depots and stations were done in the Ghaziabad region of UPSRTC which is a pilot region for the ITMS project. It included Kaushambi, Sahibabad and Ghaziabad bus depots and Sahibabad bus station. One field visit was done in Meerut region to Meerut bus depot to see the well talked off training centre of drivers. During field visit substantial interaction was done with Regional Manager of Ghaziabad, assistant regional managers of various depots, technical and clerical staffs, conductors, drivers and passengers. During these interaction the practical aspects of ITS came out and the issues and problems pertaining with it came out. Technical know-how of various stakeholders was also assessed. One field visit was undertaken to attend a training workshop at Ghaziabad hosted by Trimax Infrastructure, the system integrator of the ITMS project for UPSRTC, for managerial staff of four west zone regions namely Ghaziabad, Agra, Meerut and Noida. In the training workshop several concerns regarding the project were raised by the managerial staffs and subsequently those were addressed by Trimax employees. But many problems remained unsolved and needed proper solution which has been tried to address in this project. Finally a visit was conducted to ASRTU office to recognise their role and efforts in implementation of such programs in various STUs, especially the ITMS project in UPSRTC.

2.3 Surveys

Surveys were mainly conducted to know that whether stakeholders are actually benefited by implementation of ITMS. It also aimed at gathering information whether or not they are acquainted with the technology. Surveys were conducted among bus drivers, bus conductors, and passengers. Three questionnaires were drafted, one for each stakeholder. The questionnaires can be found in appendix B. The main problem that surfaced in compiling surveys was: a very small sample size. The main reasons behind this roadblock was lack of time, resources (manpower) and willing respondents. In surveying conductors and drivers, help was provided by the additional regional managers. Since only four depots could be visited, a sample size of 20 conductors and 15 drivers could be gathered as there wasn't much staff available that was off duty.

Considerable impediments were faced in surveying passengers. UPSRTC caters mainly to rural population who was largely apprehensive/ disinterested in responding. Also the time that was made available for surveys was afternoon, during which there was very little footfall at bus depots due to scorching heat. Due to these hindering factors a sample size of 25 passengers was gathered. Sample size being a limiting factor in surveys, a broad range of views could not be collected. Also generalisation/ extrapolation would not be possible on the basis of the collected sample. Nevertheless, some general trends and observations were indeed observed and are worthy of being listed. The same are listed in the findings section.

2.4 Meetings and Interviews

Date	Name	Designation	Institution	Topic of Discussion
31-5-14	Mr Pallav Bose	Regional Manager, Ghaziabad	UPSRTC	ITMS
31-5-14	Mr TK Singh Visen	Assistant Regional Manager, Kaushambi	UPSRTC	ITMS
31-5-14	Mr FR Francis	Assistant Regional Manager (Finance), Kaushambi	UPSRTC	Financial Benefit from ITMS
5-6-2014	Mr Atul Shrotriya	Assistant Regional Manager, Ghaziabad	UPSRTC	Implementation roadblocks for ITMS
5-6-2014	Mr. Sajid	Computer Operator	Trimax Infrastructure	Process of issuance of ETMs and problems faced
5-6-2014	Mr. Subham Tyagi	Computer Operator (Window Booking)	Trimax Infrastructure	Frequent problems of printer cartridge
5-6-2014	Mr. Lucky Srivastav	Computer Operator (MST Issuer)	Pioneer Software solutions	Problems faced by him
7-6-2014	Mr. Anil Kumar	Assistant Regional Manager, Sahibabad	UPSRTC	Infrastructure at UPSRTC, the accessibility of online dashboard of VTS
7-6-2014	Mr. TK Singh Visen	Assistant Regional Manager, Kaushambi	UPSRTC	Organisation structure of UPSRTC, delegation
9-6-2014	Mr. Subhash Chand	Station Superintendent, Meerut	UPSRTC	Depot Operations

9-6-2014	Mr. Ranveer Singh	Senior Instructor	UPSRTC	Driver training
9-6-2014	Mr. Vipul Chaudhary	Computer Operator (Window Booking), Meerut	Trimax	About his duty and problems faced
9-6-2014	Mr. Varish Ahmed	VTS tools man	Trimax	Tampering of VTS
2-7-2014	Mr. TK Singh Visen	Assistant Regional Manager, Kaushambi	UPSRTC	The menace of private operators
3-7-2014	Mr. P Ananda Rao	Executive Director	ASRTU	Role of ASRTU
3-7-2014	Mr. Ullas Babu	Assistant Director (Technical)	ASRTU	ITMS in different SRTUs

3. Results and Discussions

3.1 Findings from the literature

From the literature search the main objective of implementation of ITMS in UPSRTC became clear. Unlike other places, where ITS mainly is deployed because of traffic congestion, ITS in UPSRTC aims at providing better facilities to passengers (safety and comfort) and improve management. It has also been found that ITS has very wide ranging benefits if implemented to full scale and people use it efficiently. It has very bright future prospects.

The components of Intelligent Transport Systems have already been described in the introduction section. Also the key achievements and its benefits have also been thoroughly discoursed in the introduction section.

From the report on 'Accidental Deaths in India' 2012 by NCRB⁴ it was found that a total of 3,94,982 accidental deaths were reported in the country in the year 2012. Out of which 1,39,091 were due to road accidents which accounted for 35.2 % of total accidental deaths. Also a total of 4,73,416 'traffic accidents' cases were reported during the year compromising 4,40,042 'road accidents' cases and 31,612 'other railway accidents' cases. Buses accounted for 13,076 deaths all over India.

Number of deaths due to road accident in Uttar Pradesh is 15,109. The number of persons who died of 'truck/lorry' accidents was highest in Uttar Pradesh (13.4%) followed by Andhra Pradesh (12.9%) and Tamil Nadu (11.3%). 16.8 % of victims in Tamil Nadu followed by Uttar Pradesh (13.6%) and Andhra Pradesh (10.5%) were due to 'Bus Accidents'.

The World Report on Road Traffic Injury Prevention⁵ - 2004 of World Health Organization (WHO) stated that road traffic injuries are a major but neglected global public health problem, requiring concerted efforts for effective and sustainable prevention. Of all the systems that people have to deal with on a daily basis, road transport is the most complex and most unsafe mode of transportation. The report forecasts that **without any increased effort and new initiatives**, the total number of road traffic injuries and deaths worldwide would rise by 65% between 2000 and 2020 whereas in low -income and middle income countries, deaths are expected to increase by as much as 80%. The majority of such deaths are currently among "vulnerable road users" – pedestrians, pedal cyclists and motorcyclists. The objective of the report was to create a greater level of awareness, commitment and

⁴ <http://ncrb.gov.in/CD-ADSI-2012/accidental-deaths-11.pdf>

⁵ <http://whqlibdoc.who.int/publications/2004/9241562609.pdf?ua=1>

informed decision-making at all levels, so that strategies scientifically proven to be effective in preventing road injuries can be implemented.

The Sundar Committee report on Road Safety and Traffic Management – 2007⁶ clearly delineates the duties and functions of each of the organisations responsible for road safety, its regulation and advancement in India. However, it mentions that there is no coordination among the different agencies. Besides, the agencies lacked skilled professionals dedicated to road safety. Research issues are not being identified keeping in view the conditions in India and research is not being funded adequately. Furthermore, crash investigations are not carried out using modern technology and a scientific approach. The data on road accidents, injuries and mortality is both inadequate and scattered. The data is also not analysed systematically to provide a basis for policy. Final conclusions of the report was that:

- Existing institutions are not fully equipped to deal with the increasing traffic on the roads or to adopt the advancements made in the techniques and technology that would promote road safety.
- Responsibility for road safety is diffused and there is no single agency to deal with a range of problems associated with road safety. There is also no effective mechanism for coordinating the activities of the different agencies dealing with road safety.
- The role of key ministries and public sector agencies in improving road safety is peripheral. It is not a priority area in their agenda for development.
- The NRSC does not have adequate statutory backing, budgetary resources or the mandate to be an effective organization for executing road safety plans in a missionary mode.

From the above findings it becomes need of the time for increased governmental and institutional efforts towards introduction and deployment of more advanced technologies for safety and prevention against road accidents. For this sufficient fund should be allotted for research work and their deployment. Also it needs a coordinated efforts from all the organisations which is clearly missing in India.

3.2 Finding from the field visits and impact on the theoretical focus of the project

Although the project had to be completed by 7th May 2014, it has not yet finished till date completely even in one of the pilot regions i.e. Ghaziabad. This is one of the

⁶ http://morth.nic.in/writereaddata/linkimages/SL_Road_Safety_sundar_report4006852610.pdf

main problems of the project. Moreover the stakeholders are not properly trained about the applications. Our survey results, although having very less sample size, clearly confirms that there is a lack of training and technical know-how. Then discussion with different technical staffs put light on many other problems. There are innumerable problems which came into limelight during field visit and discussion and it is very difficult to enlist all of them. Yet some broader problems are enlisted below:

1. Lack of training to conductors and drivers.
2. Lack of training to management staffs.
3. Lack of awareness among passengers about even very crucial components of ITS like use of SOS panic button, complain system, VTS and all.
4. Delays in issuing of smart card, due to third party involvement, here ICICI bank.
5. Lack of technical know-how of manpower.
6. Frequent tampering of the systems like VTS.

Categorising the main problems:

1. With management staff
 - a. They have not been yet fully trained to get acquainted with the system
 - b. There is lack of delegation of power and work, as a single person is assigned with several work.
 - c. Huge amount of information is given by the VTS portal which makes it difficult to segregate important ones.
 - d. There is often the problem of internet connectivity.
 - e. There are petty problems of printer cartridge being filled from headquarters.
 - f. There is substantial delay in issuance of smart card because of third party involvement. Here ICICI bank is making delays in issuing them.
2. With drivers
 - a. No training about the implemented system.
 - b. Are even not aware about the systems that are being implemented.
 - c. Had a negative feeling about the advancing technology, they felt that these are done just to keep an eye on them and not to ensure their safety.
3. With Conductors
 - a. No regular training about the updated technology.
 - b. They are unaware of many of the components of ITS like, don't know about VTS, SOS panic button etc.

- c. The ETMs provided has low battery backup, which do not lasts till the end of journey on long routes.
- d. As mentioned by some of the conductors that many a times the ETM hangs up and takes a lot of time in resuming, creating uncomfortable scene with passengers.
- e. Quick help is not provided by the management in case of emergency.

On the visit to ASRTU office it was found out that officials were concerned about introduction and integration of new and advanced technologies in SRTUs. There was a proposal of common mobility card which can be used country-wide by passengers travelling in SRTU buses. They were also trying to find solution to the issue of revenue distribution to the respective SRTUs which would arise due to common mobility card.

But the disappointing thing was that they were not aware about the ITMS project of UPSRTC. We had to tell them that UPSRTC is implementing the project under which they have already installed GPRS based ETMs so that revenue collection is made more efficient and fair. With the GPRS based ETMs the revenue collected is transferred to right SRTU or region, which common mobility card system will have as one of its requirement.

A field visit to a private bus depot and UPSRTC bus depot brought in the contrast of the facilities provided by them. The condition of the private bus operator was pathetic. They had no amenities like booking counter, enquiry counter, waiting shelters, toilets, medical facilities, drinking water, etc. It was in complete dilapidated condition. This private bus station has been functional for around two years and yet no development had taken place. While the UPSRTC bus station had all the amenities like ETM and Waybill generating room, waiting shelter with proper chairs and fans, Enquiry Counter, Drinking water, medicine shop, Bus boarding pedestal, booking counter, toilets and food stalls. Comparing the conditions it can be ascertained that if advertised properly corporation can attract many more passengers and increase its profit by many folds and also benefit common public.

3.3 Gap analysis

Sl. no.	Gaps	Remedies
1.	Training not provided	Initiate the training process as soon as possible on a regular basis.
2.	People not aware of the developments	Sensitize among people through advertisements
3.	No real time information, i.e. get delayed results of VTS due to connectivity problem	Procure a separate bandwidth for better internet connection
4.	LCDs not working	Reprimand the system integrator
5.	No use of SOS button	Aware people
6.	VTS often being tampered	Drivers and conductor don't know that even after tampering it keeps on giving information for about 10 hours.
7.	No advertisements on LCDs	First make the LCDs in working condition then contact organisations for advertisements. (Also encourage local level involvement in attracting advertisers)
8.	ETMs battery gets discharged half a way during journey	Provide charging point / socket on bus itself.
9.	Passive monitoring of the activities through VTS	Start a 24 X 7 control room for active monitoring at each of the regions
10.	Delays in issuing smart card, here ICICI bank is making delays	Remove third party involvement, (can imitate the model of Delhi metro smart card)
11.	Too much information on VTS portal for a single person to monitor	Assign separate person for exclusively monitoring it
12.	Delivery of help in emergency situation	Rescue vehicle at each region and (24 X 7) coordinated with control centre.

4. Recommendations, Scope and Strategy for Implementation

4.1 Recommendations:

The ITMS project deployment poses many issues with the following groups of stakeholders:

- System Integrator (SI), Trimax IT Infrastructure & Services Limited.
- Owner and operators of transport network i.e. UPSRTC officials and staffs
- Crew members – Drivers and conductors
- Individual Travellers

Addressing each of them individually giving suggestions or rather demanding to fulfil suggested expectations, on behalf of UPSRTC:

For System Integrator:

1. Fuel Level Sensor: The SI have still not come up with a proper Fuel-level sensors for buses, stating that it is still under research. The fuel level sensor is float type and it gives random results owing to jerking of vehicles on these poor roads. But in the meantime a quick algorithm can always be developed based on the concept of 'average over a small period of time'. The sensor can send data calculating the average of fuel level for say, last 5 seconds' period and sends it every second rather than sending instantaneous data. This would overcome the sudden changes in fuel-level due to jerking of vehicles.

Also several layers of meshing could be provided in the tank to dampen the movement of fuel due to jerking of vehicle. This will help fuel sensor to give more stable data.

2. ETM:
 - There were a lot of complaints about ETM battery. So either it can be replaced with more powerful batteries or provide bus with a charging socket.
 - The issue of misuse of simcards in GPRS based ETMs have been taken care of by the SI, but its fast retrieval should be done so as to bear minimum loss and assess quick information.
 - The ETMs take a lot of time from restoring from Stand-by mode. So the coding of the program should be updated with necessary changes to take care of it.

3. VTS:

- There is a frequent tampering of VTS device mostly by unplugging the wires from battery. But the VTS keeps on giving information for next 10 hours with its internal battery power supply even after unplugging which drivers and conductors are unaware of. So, this information should be provided on VTS device itself, by just sticking a sticker having the required information. Knowing this there will be significant reduction in tampering of VTS by drivers and conductors.

4. VTS Dashboard/portal for HO/RO:

- The portal should have the facility of locating all the buses at a time all over the state. This should also give schedule for all the buses. And a program should be there to optimise their operation. This is suggested because I have learnt from one of the ARMs that many a times it happens that a UPSRTC bus of one region compete with a UPSRTC bus of another region to increase their region-wise profit but overall it is uneconomical for the corporation.

This suggestion is not to be confused with the auto-headway detection. Auto-headway detection is a dynamic feature which works on live status of bus services. While this planning and route optimisation can be done beforehand if the portal were to give the route-map of all the buses all over Uttar Pradesh.

- As VTS portal gives the real-time location of bus to RO and HO, it can also make some provisions to let the passengers know about the location of buses. This can be done both on UPSRTC website and by developing mobile apps just like online booking.

5. Separate bandwidth for faster and reliable internet access should be acquired so as to get uninterrupted and real-time data. As there have been complaints regarding this that information comes late varying from a few minutes to several hours.

6. Properly trained manpower and materials should be available for the better training of crew members. Also their assessment should also be done after training. Otherwise it happens that people do not pay attention to the trainer.

For UPSRTC management staffs and Officials:

1. Proper training schedule of the drivers and conductors should be made.
2. Also the training schedule of the managerial staffs should be made. Certain practical and theoretical tests and quizzes should be kept to check the understanding of the system by them.
3. An optimised schedule/fixture of the buses of all over the state should be developed with the help of the VTS portal. A separate temporary committee should be made which with the help of SI using the VTS and MIS analytics portal should optimise the fixtures of buses.
4. Control Rooms at Regional and Central level be set-up without any delay so as to make use of the provided system. Otherwise ITS will not only prove to be useless but also the managerial staffs will become overburdened and inefficient.
5. Training centres for crew members be setup in each region as Meerut's Driver Training Centre and regular training be provided there. Because ITMS needs a lot of awareness and especially these semi-skilled workers needs them mainly.
6. To stop the stoppages of buses at certain unauthorised places like dhabas, firstly proper authorised dhabas be made available. Then certain places can be red marked depending on the frequency of the unauthorised stoppages on VTS portal. If the buses stop there for a considerable amount of time thereafter then immediately the crew members can be called on mobiles and be scolded.
7. Marketing and Advertising cell be set-up at central and regional level. This should not only take care about commercial advertising but should also take care of advertising ITS and it's components among people. Many things have been done under ITMS, so it is very necessary to get publicize it to get multi-fold benefits. First of all the people will be made aware about the ITS and its components. Once they know about it they will use it. This will also attract many other people, who hesitate travelling in buses, if they see the safety, reliability and comfort provided by ITS. Moreover, through advertisements additional revenue can always be generated. Effective use of LCDs could be devised by them. Advertising at the back of ticket rolls should also come under their ambit. Finding the right costumer for advertising will be an important task.

Other logistical and miscellaneous issues (including issues related with crew members and passengers)

1. Involvement of third party for issuing smart cards be removed. It not only makes delays but also will also repel many passengers from using it. Delhi Metro value based Smart card system could be imitated for issuance of it.
2. A problem was raised by one of the UPSRTC officials during their training that if ETM fails during journey then what can be done with smart card holders. GM addressed the problem saying that the passenger will have to pay in cash for the travel. A better suggestion could be that the smart card number can be noted down manually by the conductor and later it can be fed manually on to the system.
3. LCDs should be put to use for displaying time tables and also advertising about the ITMS progress and facilities provided by UPSRTC.
4. STD codes of all the bus stations be provided on UPSRTC website, as it is necessary for the use of IVRS (Interactive voice response system). Also the codes be made available at bus depots and stations either on LCDs or on printed pamphlets pasted on walls. This would ease the use of IVRS as most of the passengers don't know the codes of bus stations.
5. Printer cartridge be filled at regional level rather than at Head Quarters, Lucknow. The delay due to cartridge paralyzes services of many of the bus stations and bus depots causing hassles to both passengers and management staffs.

4.2 Further Scope of the ITMS project

Although the ITMS project of UPSRTC includes most of the important components aiming to achieve the objective of improving operational efficiency and better management. But adding one more component aiming the safety could really save many lives. It has been discussed in literature findings that some improvements be made necessarily to stop the increasing number of road accidents and deaths. The component being talked here is “**Collision Avoidance System**” and “**Bus Side Collision Warning System**”.

Collision avoidance system is an automobile safety system designed to reduce the severity of an accident. Also known as pre-crash system, forward collision warning system or collision mitigating system, it uses radar and sometimes laser and camera sensors to detect an imminent crash. Once the detection is done, these systems

either provide a warning to the driver when there is an imminent collision or take action autonomously without any driver input (by braking or steering or both).⁷

Bus Side Collision Warning System are mainly for transit buses which usually drive at low speeds and are exposed to a great variety of targets, like pedestrians, bicycles riders, other two wheelers and three wheelers, cars etc. It uses radars and cameras to detect objects at very short distances and sends an alarm to driver or in case of imminent collision applies the brake.

Both these technologies are being used in many countries and can be replicated in India too. The cost of implementation should not be an issue as it ensures the safety of many lives. Also insurance companies can fund for their deployment as the use of these systems will reduce the damage of the vehicles thus benefiting them. A study by Planning Commission in 2002 estimated that the social cost of road accidents in India is Rs. 55,000 crores annually and that to according year 2000 prices, now its 2014. So, seeing these figures of accidents, deaths and cost incurred it wouldn't a bad idea to spend some chunk of national fund towards research and development of newer technologies.

4.3 Strategy

To achieve the desired objective of ITMS project the first and the foremost step which should be taken is to give proper training to all the staffs and officials of UPSRTC.

Then second most important step is to hasten up the implementation process. As due to delays in its implementation many subordinate systems even after being implemented is of no use. Also separate apex level agencies should be set up to ensure the overall progress of the project since the project covers whole of Uttar Pradesh. To ensure the overall proper progress sticking with FRS "Project Implementation Unit (PIU)" can be set up by UPSRTC. For evaluation purpose an external third party agency to study pre- and post- implementation impact "Project Evaluation Agency (PEA)" can be set up.

Then third most important step is to sensitize the program among people. For this Marketing and Advertising cell be set-up at central and regional level. This should not only take care about commercial advertising but should also take care of advertising ITS and it's components among people.

If these steps are taken care of then most of the problems will get sorted out.

⁷ http://en.wikipedia.org/wiki/Collision_avoidance_system

5. Suggestions for future work

Since the project has not been implemented to full scale the impacts and benefits cannot be evaluated appropriately at this point of time. So once the project become fully operational an extensive survey can be conducted among the stakeholders to study its impact. Among the surveys conducted, the survey of passengers would be important as it is for them these facilities have been incorporated.

Also a project can be undertaken as to how to make people aware about the ITMS components and its benefit. It is important as the UPSRTC mainly encounters rural population who are not much acquainted with new technology. Also there is a need to attract middle class population who if given satisfactory facilities will surely prefer buses but presently not doing so.

6. Conclusion

Implementing Intelligent Transport System (ITS) in UPSRTC is surely going to improve the level of the quality of the services delivered. For corporation, ITS not only leads to better management and operational efficiency but it also helps to reduce operational cost by better management of fleet, manpower, routes and passengers. Also the pilferages and illegal activities can be better controlled with the help of ITS. In addition to these it can also bring in additional revenue through advertisements on LCDs and ticket paper-rolls.

With the implementation of State of Art technologies under ITS in UPSRTC the tarnished image perceived by the people for governmental services is also bound to improve. This will in turn lead to increased use of public transport, reducing the use of personal vehicle. Better transit facility will improve the connectivity of rural community with markets & farm input suppliers, education & employment opportunities, and health & welfare facilities. Thus having an overall inclusive growth socially, economically and environmentally.

ITS has been implemented to a good scale but has yet a lot to implemented keeping in mind the shortcomings and problems in the project. Also there is a need for increased governmental effort toward research and development of such projects in India. UPSRTC model can be set as an example in front of other SRTUs since the project caters whole of Uttar Pradesh state.

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Appendix A

Meetings and Interviews

1. Mr. Pallav Bose, Regional Manager, Ghaziabad

Date: May 31, 2014

Time: 11:40 AM

Duration of Discussion: 50 minutes

Discussion:

1. We talked about why this ITMS program been launched, what is its main objective. So he told that their prime objective behind its implementation was safety of passengers as many accidents occur and proves to be fatal due to the lack of management and infrastructure. So the VTS is mainly to locate the buses facing emergency situation so that help reaches them as fast as possible.
2. The secondary reason was to have efficient and transparent management of the services provided by them.
3. Then we talked about number of buses been covered under this VTS program. And I got to know that almost all buses have been installed with the system. But there has been several cases of tampering of the system by the drivers and conductors which RM Sir was able to see in his system. In fact every regional office has a dash board and by logging into the system they could see all the activities like how many times the SOS button is pressed, how many times the VTS has been tampered with, how many times the vehicle has over-speeded and all. And I was told that regular offenders are called and being counselled by the ARM but there is no penalty system in place.
4. About online reservation system (ORS), till now only around 250 bus services have been covered but it is proposed that all the buses will be covered under it soon.
5. RFID cards for conductors and drivers are to be launched soon.
6. What are the roadblocks or impediments to its implementation? Since the technology is new very few people know to operate it. Workshops are being organized for regular training of the staffs of all level. A workshop will be conducted on 12th June and we are being invited to see the procedure and conduct a survey and ask questionnaires to both SI people and UPSRTC people.

7. Other impeding factor is that the private organizations are slow in delivering solutions. Like ICICI bank is delaying in delivering smart cards, Trimax (SI) is making delays in providing reliable fuel level sensors etc.

2. Mr. TK Singh Visen, ARM, Kaushambi

Date: May 31, 2014

Time: 12:30 to 2:30 PM

Duration of Discussion: 40 minutes, for the rest of the time, he showed us the working of the systems

Discussion:

1. We talked about the implementation of RFID based MST or Smart card. I got to know that this process has just been started. There were only 15 applications till date and their cards were yet to be issued. The main problem theirs was that ICICI Bank which has been assigned to supply the cards was making delays.
2. Then we talked how the use of ETM has benefited them. There I got to know that the management has become more efficient and reliable with the ETM machines. The data is being uploaded after every complete trip of bus. The way-bill is been generated and tallied with the amount of fare collected during the journey. Bus in-out and driver in-out information is still been taken manually. But soon to be recorded by RFID cards.
3. Kaushambi Bus Station was in a dilapidated condition. After been asked about this they told that it was being developed under PPP model so still decision has not been taken that who has to take the responsibility of maintaining it. But still the ARM had taken few steps towards its improvement on behalf of UPSRTC like providing basic amenities: a toilet and a temporary gate.

3. Mr. FR Francis, ARM, Finance, Ghaziabad

Date: May 31, 2014

Time: 2:30 to 3:10 PM

Duration of Discussion: 40 Min

Discussion:

1. He talked about lack of co-ordination between Systems Integrator and UPSRTC that was causing delays in starting of the Go-Live phase of the project.

2. He talked about mismanagement in supply chain, how due to faulty supply chain management, depots were often running out of printer cartridges.

4. Mr. Atul Shrotriya, ARM, Ghaziabad

Date: June 5, 2014

Time: 150 Min (12:00 – 2:30PM) and 50 Min (3:40 to 4:30 PM)

Duration of Discussion: 200 Min

Discussion:

1. We talked about the implementation of RFID based MST or Smart card. He gave us documents that delineated the procedure and types of smart cards to be issued. He talked about lack of technical know-how and skilled manpower as the main reason behind the delay in implementation of ITMS. He explained in detail the three phases of ITMS: Phase 1: Installation of VTS and ETM, Phase 2: Counter booking and phase 3 which is yet to be implemented: RFID cards for conductors and drivers. He also talked about loopholes in the ITMS system, especially the frequent disruption in working of printers as the cartridge filling centre in based in Lucknow which causes supply backlogs.

2. He talked about the benefits of ITMS to the management and passengers, but also talked about areas in which more work needs to be done: attendance of conductors, preparation of cash receipts, counting and record keeping of cash are operations that are still being done manually, if these operations are computerized, it will benefit UPSRTC by increasing efficiency, reducing stationery costs and reducing clerical staff.

3. He talked about cost cutting measures undertaken like: no new recruitments of class 4 staff, contracting of some services like cleaning of bus stations to private entities, employing clerical staff from DOEACC to reduce pay roll expenditures.

4. Talking about difficulties faced by UPSRTC, his main concern was that the state government wants UPSRTC to give profits like a private corporation while operating as a government agencies. He said UPSRTC has no option but to ply on non-profitable routes as well, if given state directive, but no funds are allocated to UPSRTC by the state. He also talked about the need to uplift bus stations to attract more clientele.

5. Mr. Anil Kumar, ARM, Sahibabad

Date: June 7, 2014

Time: 11:00 AM to 1: PM

Duration of Discussion: 120 Min

Discussion:

1. He talked about the lack of basic infrastructure at UPSRTC depots, as his depot had very poor building infrastructure and there was no water supply. They used water from tankers even for drinking purposes. The running room for staff was in a deplorable state.

2. He admitted that the workers are being exploited but the management's hands are tied due to financial crunch.

3. He complained about the long-drawn and cumbersome complaint redressal mechanism and the lack of adequate power to ARMs to do complete justice in cases where top level management was involved. He said that some passengers were even misusing this service by blowing incidents out of proportion and giving conflicting statements at different levels of enquiry.

4. He talked about corrective actions being taken to resolve technical issues being faced by bus staff, like installation of chargers in buses that ply on long routes as Electronic Ticketing Machines often run out of battery.

6. Mr. TK Singh Visen, ARM, Kaushambi

Date: June 7, 2014

Time: 3:00 to 3:30 PM

Duration of Discussion: 30 Min

Discussion:

1. He said that there was lack of delegation of powers due to which the ARMs were often overworked and this resulted in inefficiencies.

2. He talked about lack of divisions within the corporation for efficient handling of departments. He said that there should be marketing, planning, personnel and financial cells that have well defined roles to play.

3. He said that sometimes, they have to run buses on non-profitable routes if directed by the local political leader. He said that this is because the Regional Manager has the power to sanction new bus routes. He said this task should be performed centrally, at head quarter where a planning division conducts passenger mapping surveys and then only decide whether a service is to be provided at a location.

4. He talked about the necessity of a provision to promote contract workers into regular workers. This he said will help in curbing corruption while recruitments and also give incentives to contract workers to perform well.

7. Mr. Subash Chand, Station Superintendent, Meerut

Date: June 9, 2014

Time: 12:30 to 1:30 PM

Duration of Discussion: 60 Min

Discussion:

1. He delineated his duties which were: fixing timetable, supervising pay-rolls, purchase of diesel, duty allotment, and deposit collected cash in the bank.
2. He talked about the financial crunch faced by UPSRTC due to lack of help from the state government, rising diesel prices and inflexible fares.
3. He talked about the measures taken by TK Singh, former ARM, Meerut, to keep staff motivated. Measures like arranging medical check-ups for staff, putting up a roster for best and worst performers, putting up flexes for the convenience of passengers, setting up an enquiry counter were taken up by him.
4. He showed us the various departments of the depot: pay-roll, record keeping, and supervising.

8. Mr. Ranveer Singh, Senior Instructor, Meerut

Date: June 9, 2014

Time: 3:00 to 3:30 PM

Duration of Discussion: 30 Min

Discussion:

1. He is the senior instructor who trains drivers and inspects vehicles for faults. He showed us the training centre which was one of its kind, as Meerut is the only region except Kanpur to have a training centre.
2. He told us that due to orders, or rather lack of them, the centre was not functional for a year but in the meanwhile, he gave field training to drivers.

3. He emphasized on the necessity to have a training centre in each region for better management of vehicles by drivers.

9. Mr. Varish Ahmed, VTS tools man, Meerut

Date: June 9, 2014

Time: 2:55 pm to 3:05 pm

Duration of Discussion: 10 min

Discussion:

1. He talked about the tampering of VTS device by the on-bus crew staffs. He mentioned that as many as 200 tampered VTS has been repaired by him in just 3 days. He said that tampering is done by unplugging the wires of VTS from battery.

10. Mr. TK Singh, ARM Kaushambi

Date: July 2, 2014

Time: 12:30 to 1:30

Duration of discussion: 60 min

Discussion:

1. He told us that recently there was an attack on them by private bus operators. Private bus operators were blocking the out gate of Kaushambi bus depot and when the RTO officer was called, a group of private drivers attacked the depot staff and one of them had to be hospitalized. They even threatened further action if stopped.

2. He told us that private operators pay taxes for contract carriage whose tariff is much less than the passenger tax paid by stage carriers and they illegally operate as stage carriers. He said while tax for contract carriage is just 5000 rupees per month, the passenger tax they pay is to the tune of 35000 rupees per month.

3. He told us that private operators had formed a cartel and also bribed GDA officials and police to take their side. That is why Ghaziabad Development Authority advised UPSRTC to shut down the out gate of Kaushambi bus depot.

4. He told us that if the out gate is shut down, it will create a chaotic situation inside the depot and their business will suffer heavily and private operators will gain.

5. On implementation of ITMS he said that PIS work is still in progress while they have started sensitizing passengers about smart cards and fares by pasting advertisements inside buses. He said recently a conductor was suspended for overcharging a passenger with the help of these stickers.

6. He said that the ARM now had the additional responsibility of tallying the cash collection as showed by ETMs on the revenue portal and cash actually deposited by the conductors. He stressed the need for delegation of duties and powers for more efficient delivery as one ARM could not handle staff issues, VTS, inspection, account tallying, bus issues, emergencies and many other duties single handedly. He said that ITMS will be truly beneficial only if utilized properly and for that skilled manpower is necessary. He also said that DOEACC staff who are responsible for technical handling of systems were leaving because of non-payment on wages and things were being stalled.

11. Mr. P Ananda Rao, Executive Director, ASRTU

Date: July 3, 2014

Time: 1:00 to 1:30 PM

Duration of discussion: 30 Min

Discussion:

1. We informed him about ITMS in UPSRTC and discussed about the various new features and components of ITMS that were being used by UPSRTC. The main discussion was on GPRS enabled Electronic Ticketing Machines and its uses.

2. He told that the MD of Himachal Pradesh SRTC had made a proposal of a Common Mobility Card, which could be used country wide by passengers travelling in SRTU buses. Such a card would be only feasible if SRTUs used GPRS based ETMs as only then revenue distribution could be done accordingly within SRTUs. I informed him that UPSRTC is already using GPRS enabled ETMs and had started issuing monthly seasonal ticket and open ended smart cards through tie ups with ICICI Bank.

3. We discussed the pros and cons of transferable v/s non-transferable smart cards. While non-transferable cards involved hassles of filing up applications and giving photos and KYCs, but at the same time are more secure. Transferable cards offered ease of obtainability and could be used by more than one person but this feature could also be easily misused if such a card is lost. Therefore, he said that Delhi Metro like smart cards could not be feasible for use in SRTUs as they might be lost and

would generally contain large sums of money specially if being used for long distance travel.

4. He introduced us to Mr. Ullas Babu and told us to make any further correspondence to him and collect the data that we require from him.

5. He told his subordinates to contact companies who could provide GPRS based ETMs and Smart Card services throughout the country. Trimax Infrastructure, the Systems Integrator for UPSRTC was also being considered for the same. He told us to contact Lumiplan, a company that provides ITMS solutions for furthering our study.

12. Mr. Ullas Babu, Assistant Director (Technical), ASRTU

Date: July 3, 2014

Time: 2:00 pm – 2:30 pm

Duration of discussion: 30 min

Discussion:

1. We talked about the best practices followed by various SRTUs. He said that Bangalore Metropolitan Transport Corporation and Karnataka SRTC are the best corporation as of now which were following advanced practices and were having maximum number of Volvos on their fleet. He also mentioned that BMTC has almost eliminated the need for taxis in Bangalore.

2. He said that fuel cost is the main concern of the SRTUs, as they have been declared as the Bulk Purchasers and have to buy diesel from oil marketing companies which are not subsidised.

3. When I asked what role does ASRTU has to play in deployment if such advanced technologies, he said that ASRTU is just an advisory body and it cannot force any SRTU to undertake such kind of projects. That's why it had no role to play in the implementation of ITMS project of UPSRTC. Only they can coordinate and make recommendations.

Appendix B

1. Survey for Passengers using UPSRTC Services

1. Name:
2. Age: Gender:
3. Purpose of travel:
 - Work •Vacation
 - Education
 - Other (please specify)
4. Type of service being used: ordinary, Goldline, Volvo
5. Is ORS available for your journey?
 - Yes • No
 - Don't know
6. If the answer to above question is yes, have you ever used ORS?
 - Yes • No
7. If the answer to question 10 is yes, how convenient was using ORS?
 - Very convenient
 - Neither good nor bad
 - Inconvenient
8. How closely does the bus service run to schedule?
 - Generally late
 - Generally early
 - On time
 - No comment
9. Since the last five months have you travelled without a ticket even once?
 - Yes • No
10. If the answer to the above question is yes, were you caught?
 - Yes • No
11. If the answer to question 14 is yes, did you pay a fine?
 - Yes • No
12. How would you rate the helpfulness and attitude of staff (conductor/ driver/ station staff) on board your last bus journey?
 - Very good
 - Fairly good
 - Neither good nor poor
 - Fairly poor
 - Very poor
13. How satisfied were you overall with the last journey you made by UPSRTC bus?
 - Very satisfied
 - Fairly satisfied
 - Neither good nor poor
 - Fairly dissatisfied
 - Very poor
14. What do you think about the fare charged?

- Very high
 - High
 - Neither high nor low
 - Low
 - Too Low
15. Are you willing to pay more for better services?
- Up to 10%
 - Up to 5%
 - No
16. Time taken for issuance of tickets has:
- Reduced
 - Increased
 - No change
17. What mode ticketing do you prefer?
- Daily ticket
 - Monthly pass/ MST Card
18. Have you applied for MST card?
- Yes
 - No
19. How easy is to get a seat during rush season?
- Very easy
 - Fairly easy
 - Not at all easy
20. Are LCD screens of any help?
- Yes
 - No
21. Do you pay attention to advertisements displayed on screens, buses, and tickets?
- Yes
 - No
22. How far do you have to travel from your place to take a bus?
- Up to 2km
 - Between 2-5 km
 - Between 5-10 km
 - More than 10 km
23. Do you know that a vehicle tracking system is installed in the bus?
- Yes
 - No
24. Have you ever registered a complaint on the number provided in the bus?
- Yes
 - No
25. If the answer to above question is yes, was it addressed satisfactorily?
- Yes
 - No
26. Any problems faced and suggestions for improvement of services:

Survey results:

Survey for passengers: number of respondents: 25

1. Average age of respondent: 29.8 years
2. Gender distribution:
 - a. Male: 16
 - b. Female: 9
3. Purpose of travelling:
 - a. 12: work
 - b. 8 : education
 - c. 3: vacation
 - d. 2: other
4. Service being used:
 - a. ordinary: 20
 - b. goldline: 5
5. ORS availability:
 - a. don't know: 16
 - b. No: 9 ** no Volvo buses at visited places
6. Schedule:
 - a. 9: generally late
 - b. 8 : on time
 - c. 7 : no comment
7. Travelled without ticket: 5 said yes
8. Caught : out of 5 only 2 were caught
9. Fine: 1 of them paid fine
10. Helpfulness of staff:
 - a. very good: none
 - b. fairly good: 2
 - c. neither good nor poor: 9
 - d. fairly poor: 6
 - e. very poor: 7
11. Satisfaction with overall journey:
 - a. very satisfied: none
 - b. fairly satisfied: 5
 - c. indifferent: 16
 - d. fairly dissatisfied: 3
 - e. very dissatisfied: 1
12. Fare
 - a. very high: none
 - b. high: 2
 - c. neither high nor low: 20
 - d. low: 2
 - e. very low: 1
13. Willingness to pay more for better services:
 - a. 6: yes, up to 10% more
 - b. 11: yes up to 5% more
 - c. 8: no

14. Time taken for issuance of tickets: 10:
- Reduced: 10
 - no change/ indifferent
15. Mode of ticket:
- Regular ticket: 21
 - MST: 4
16. Applied for MST: 8 said yes
17. Seat availability
- Not at all easy: 13
 - Fairly easy: 8
 - Very easy: 4
18. LCD Screen:
- Didn't know about them: 8
 - Never seen them working: 13
 - No comment: 4
19. Pay heed to advertisements
- Yes: 10
 - No: 15
20. distance travelled to take a us:
- up to 2 km: 12
 - 2-5 km: 6
 - 5-10 km: 3
 - more than 10 km: 4
21. About VTS: none knew
22. Complaint registered:
- Never: 22
 - Once : 1
 - More than once: 2
23. Redressed satisfactorily: 1 said yes
24. Problems and suggestions:
- Rude staff behaviour
 - No schedule
 - Bus depot not clean
 - More public amenities required
 - Women not getting reserved seats
 - Picking up passengers from roadside
 - Dilapidated buses
 - Require more leg space in buses
 - Willing to pay more if AC buses made available

2. Survey for conductors:

1. Name :
2. Routes of operation:
3. Number of working hours:
4. Were you provided training for the use of ETM?
 - Yes
 - No
5. What is the average time taken to issue an ETM?
6. Has the introduction of counter booking reduced your burden?
 - Yes
 - No
7. Do you know about VTS?
 - Yes
 - No
8. If yes, why do you think it has been installed?
9. Have you ever tampered with the VTS?
 - Yes
 - No
10. Have you been called to the office for misconduct?
 - Yes
 - No
11. Normally how many people manage to travel without a ticket?
 - 0
 - 1-5
 - 6-10
 - More than 10
12. Have you ever been robbed off cash during the journey before VTS, ETM and counter ticketing were introduced?
 - Yes
 - No
13. After introduction of ETMs and VTS have you lost cash?
 - Yes
 - No
14. Have you ever made use of the SOS button during emergency?
 - Yes
 - No
15. Usually after how much time is help provided in emergency?
16. Problems faced and suggestions for improvement in UPSRTC services?

Survey Results:

Number of respondents: 20, regular employees: 8; on contract basis: 12

1. Average number of working hours: 12.5 hours
2. Training for using ETM: 20 respondents said yes
3. Average time taken to issue ETM: generally: 10-15 minutes, in case of power failure: 30 min to 1 hour
4. Views on counter booking: 18 respondents opposed counter booking as they were unaware of the fact that the revenue collection from counter ticketing will be added to their way-bills.
5. Awareness about VTS: 17 respondents replied that they were aware about VTS
6. Reasons for installation: all those who were aware of VTS in the buses thought it was installed to know their location.
7. Tampering with VTS: All respondents replied NO
8. Reprimanded for misconduct: 2 out of 20 respondents
9. Number of people managing to travel without ticket: 2 respondents replied, usually 1-5 people, others: nil
10. Looting of cash: just two respondents had been looted, both while their buses were parked. The lost cash was recovered from them.
11. SOS button: All respondents unaware of the SOS button.
12. Time taken for help to reach in emergency/ breakdown: In case of accidents: 2-3 hours, breakdown: huge variation: 4 hours to 4 days.
13. Problems faced:

The following were some general problems that surfaced during conversation with the conductors:

- ETM has insufficient battery backup
- ETM hangs frequently
- Insurance being deducted from their pays, but conductors not aware of existence of its proof
- Not being given the chance to have a say in matters relating to disciplinary action against them
- Lack of UPSRTC authorised eating stops
- Having to pay out of own pocket for food
- UPSRTC eating stops ill-treating them
- Lack of amenities at bus depots
- For contract workers: late payment of wages

3. Survey for Drivers:

1. Name:
2. Routes they operate:
3. No. of hours they work:
4. Do you know that your buses are being tracked?
 - Yes • No
5. Why your buses are being tracked?
 - Help in emergency situations like accident, looting
 - To invigilate them and keep a watch on you
6. If you know then when it has been installed?
7. Have you crossed speed limit after installation of VTS?
 - Yes • No
8. Have you got any training for its use?
 - Yes • No
9. Reasons for being late
 - Traffic
 - No. of passengers
 - Petrol/ Diesel issue
 - Other reasons
10. Have you ever tried to tamper with the VTS system?
 - Yes • No
11. Have you ever been scolded or called by ARM or any official?
 - Due to any misconduct
 - For being late
 - To report their concerns
12. Have they got any benefit from ETM?
 - Less time consumption
 - Better management of passengers
13. Have you used SOS button?
 - Yes • No
14. How is bus in/out data being collected?
15. Problems faced and suggestions for UPSRTC:

Survey Results:

Number of Respondents: 15, Regular employees: 4, contractual: 11

1. Working Hour: varied between 12 to 16 hours
2. Everybody knew that they are been tracked (15/15).
3. Reasons
 - To keep a watch on their location -7
 - To ensure their safety – 5
 - Don't care – 3
4. Average time of installation of VTS: about a year ago
5. Nobody crossed speed limit (15/ 15)
6. Nobody got any sort of training relating to functions and use of VTS/ SOS button.
7. Reasons for being late:
 - Delays in receiving buses from workshop – 5
 - No fix timetable – 4
 - Traffic – 6
8. Nobody ever tried to tamper with the VTS. (15/15).
9. Called for misconduct: none
10. Benefit by VTS
 - Yes – 8
 - No opinion – 7
11. Nobody knew about or used SOS button. (15/15).
12. Bus in/out:
 - Manual
 - Had to do only at some places.
13. Problems:
 - Poor bus condition
 - Route not fixed
 - Contractual drivers paid very less (Quoted it is Exploitation of Youth)
 - Not provided with Insurance slip
 - No immediate help in case of emergency. Help reaches very late
 - They get their wages late
 - Delays in issue of buses from workshop
 - No fixed working hour
 - Ill treatment at UPSRTC authorized dhabas
 - Lack of amenities at bus depots

“The highest measure of democracy is neither the
‘extent of freedom’ nor the ‘extent of equality’ but
rather the highest measure of participation.”

- A.D. Benoist

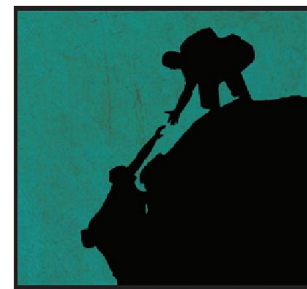
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