"A CASE STUDY OF COLLISION AVOIDANCE SYSTEM AND DRIVER DROWSINESS SYSTEM AT TNSTC –THE MANAGEMENT LESSONS TO LEARN"

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1. Introduction

This research paper discuss and try to find solution to driver Drowsiness that usually happens while driving high ways and long distance travels in night and is one of the major causes of grave accidents on the roads. This paper tries to take up the study in the form of a case study based on the "Collision Avoidance System and Driver Drowsiness System" developed at TNSTC (Tamil Nadu State Transport Corporation) .

2. Objectives of the research :

The objectives of this paper is to find and suggest solutions for through case study analysis of the present innovative system of accidence avoidance system on the high ways in case of **"**driver Drowsiness that usually happens while driving high ways and long distance travels in night and is are becoming one of the major causes of grave accidents on the roads", because of lack drivers interference and effort required in long straight four way lanes, six way lanes and corridor high ways. This paper discusses the case study from TNSTC (Tamil Nadu State Transport Corporation) **which has designed a new Collision Avoidance System and Driver Drowsiness System and has implemented the same in some selected buses in their fleets .**

3. Case study of Collision Avoidance System and Driver Drowsiness System at TNSTC (Tamil Nadu State Transport Corporation) **:**
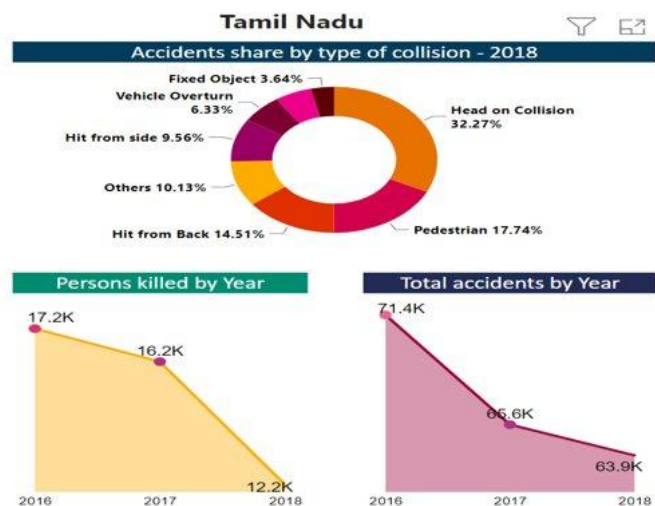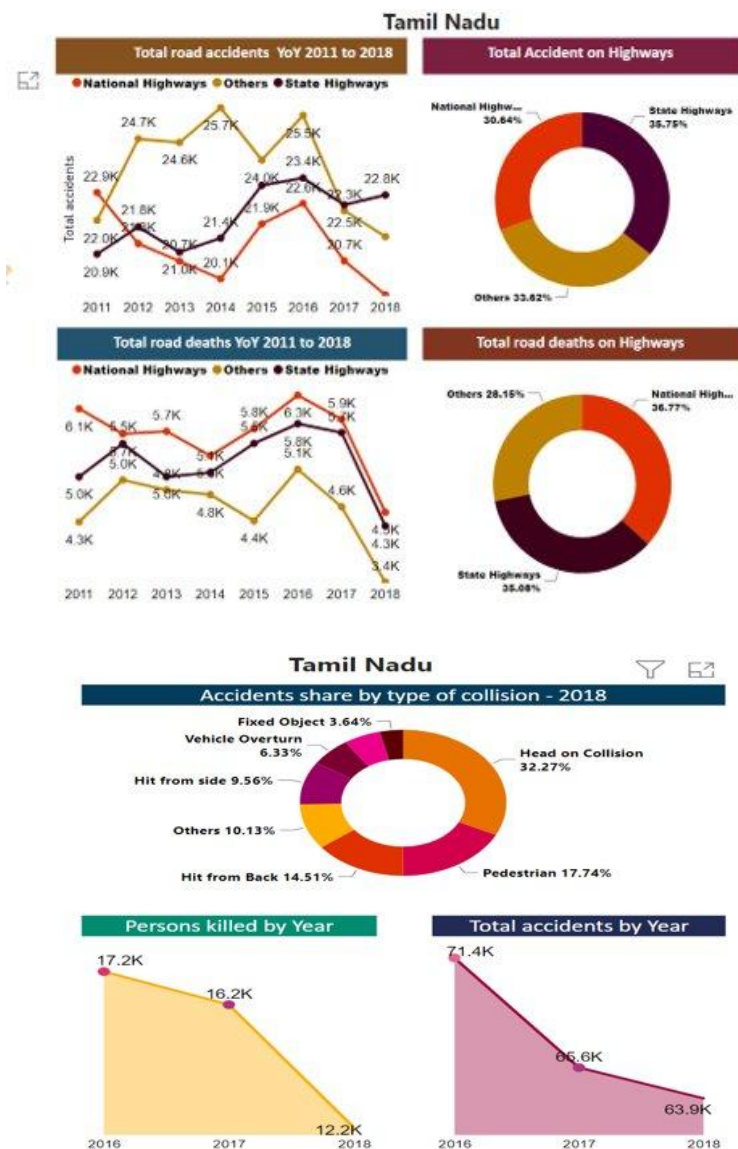
3.1 Introduction

Even though road travel is indispensable in India's social and economic fabric, mishaps & accidents are a common place robbing people of happiness & safety with a permanent loss of life &/or disablement causing severe stress to livelihood. India accounts for 12% of the global road accident fatalities with just 1% of world's vehicles. Every year more than 1 million people are affected by road accidents. They either suffer physical disability or an unfortunate death. Globally it has been demonstrated that collision avoidance technology can play a major role in reducing road accidents through timely accurate alerts to drivers.

3.2 Customer Profile

Tamil Nadu State Transport Corporation (TNSTC) TNSTC is fully owned and operated by the Government of Tamil Nadu. TNSTC has started online booking facilities to book bus tickets between major cities served by TNSTC. It caters to all the districts within Tamil Nadu and also operates services to neighboring states of Andhra Pradesh, Karnataka, Kerala and union territory of Puduchery. TNSTC owns 321 depots and five workshops with a combined fleet strength of 21,678 buses. TNSTC also offers contract and tourist services. Every bus owned by the corporation displays a portrait of Tamil poet Thiruvalluvar along with a two-line verse from Thirukkural inside the bus.

TNSTC is one of the largest government bus transport corporation in India also biggest corporation in the world

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Tamil Nadu

Total road accidents YoY 2011 to 2018

● National Highways ● Others ● State Highways

Total Accident on Highways

National Highw... 30.64%
State Highways 35.75%
Others 33.62%

Total road deaths YoY 2011 to 2018

● National Highways ● Others ● State Highways

Total road deaths on Highways

Others 28.15%
National High... 36.77%
State Highways 35.08%

Tamil Nadu

Accidents share by type of collision - 2018

Fixed Object 3.64%
Vehicle Overturn 6.33%
Hit from side 9.56%
Others 10.13%
Hit from Back 14.51%
Head on Collision 32.27%
Pedestrian 17.74%

Persons killed by Year

17.2K
16.2K
12.2K

2016 2017 2018

Total accidents by Year

71.4K
65.6K
63.9K

2016 2017 2018

3.3 Accidents in Tamil Nadu : key statistics :

Nearly Rs.22,200 crore is lost annually in Tamil Nadu in terms of cost to the victims and families like medical cost, loss of work, productivity, income besides physiological and psychological suffering, cost in terms of damage to the property

https://www.tnhighways.tn.gov.in/en/roadsafety

3.4 Customer Objectives & Pain Points

TNSTC, as part of their road Safety initiatives is committed to Zero Accidents involving state vehicles and to this effect, the State Transport Undertakings have implemented many measures like Automatic Door Closing, Additional Mirrors to address issue of Blind spots in Buses, Driver Training, Driving Simulators.

In line with the above initiatives, it highly recommended that recommended that TNSTC implements an AI-based Collision Warning System to reduce number of accidents on road and the related losses.

3.5 Key Objectives:

•   **Reduce the occurrence of probable accident events** by providing the drivers with real time audio-visual alerts prior to an impending accidental event.
•   Develop driver profiles and **categorize drivers into high, medium and low risk driver's** basis data from Intel's collision avoidance and telematics solution.
•   Leverage driver profiles to **design driver level training and incentive modules**.
•   In summary, drive actionable driver training/sensitisation programs to enable a high level of safety consciousness amongst the total fleet drivers covering aspects like **lane discipline**, **speed limit** &**safe tailgating** distance adherence that ensures inculcation of overall road safety conscience/own

3.6 Accident Prevention and Driver Drowsiness System

AI-driven Collision Avoidance (ADAS) and Driver Drowsiness (DDS) features along with a cloud-based portal provides actionable insights, analytics and reports for fleet managers. With this solution, commercial fleets can improve safety, predictability, reliability and reduce total cost of ownership. The solution includes best in class collision avoidance system (ADAS) and Driver Drowsiness System (DDS).
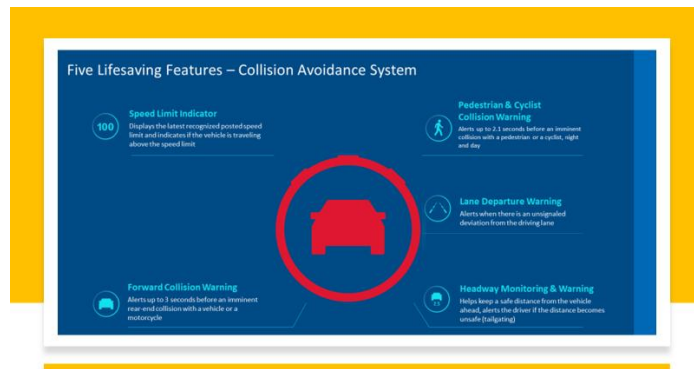
3.7 Collision Avoidance System

CAS is an Artificial Intelligence powered, aftermarket collision avoidance system that helps both prevent collisions and improve driver performance. Camera scans a roadhead and uses complex algorithm to keep track of potential risk to safety. If system determines you are at risk of collision, you will be alerted with both Audio and visual alerts.

3.8 Driver Drowsiness System

Driver Drowsiness System helps drivers remain attentive by monitoring their fatigue and inattentiveness through effective on-time alerts thereby preventing accidents.

3.8.1 Pilot Scope:

- • **Number of Vehicles:** The pilot will be conducted on a total of 10 vehicles
- • **Duration:** A total period of 1month and will involve the following:
- o Collision Avoidance Real time alerts and analytics through the system

3.8.2 Roles and Responsibilities

- • **TNSTC**
- o Will be responsible for identifying the vehicles for the pilot along with designated drivers
- o Will help ensure the vehicles are available for the installation and the pilot effort
- o Will be responsible for the safety of systems/devices
- o Will be responsible for appointing a SPOC for the pilot project
- • **Implementation Agency**
- o Will be responsible for the installation, activation, monitoring troubleshooting of the solution and analysis & reporting of the pilot outcomes.
- o Will be responsible for quantifying the outcomes and establishing benefits from the solution.

3.8.2. Pilot KPIs

These would be monitored, recorded, analyzed and reported with before and after comparisons clearly quantifying the benefits for **TNSTC.**
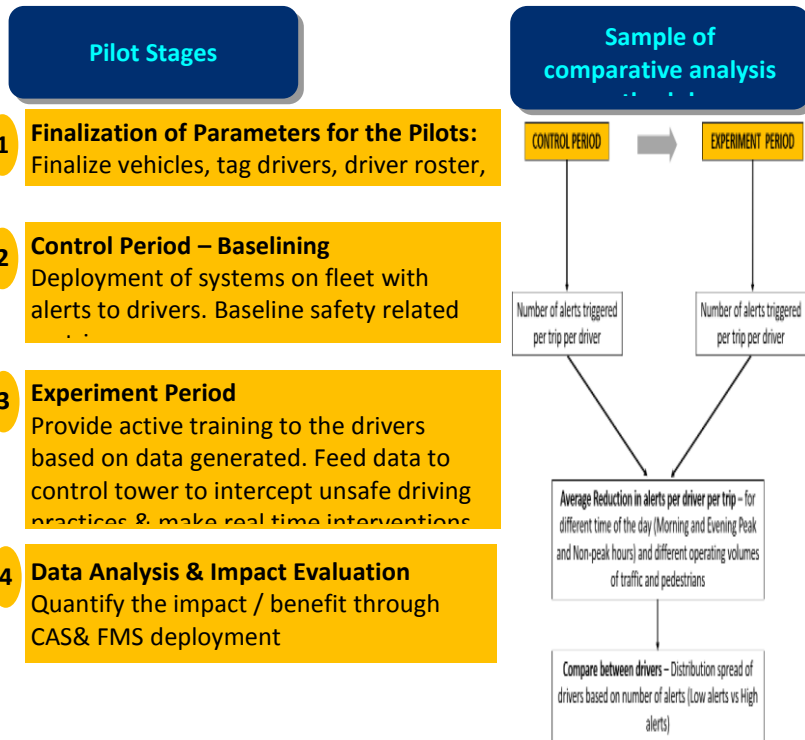
- • Functioning of the system
- • Alerts from the system
- • Reports and Analytics

3.9. Pilot Execution Construct

3.10   Overall methodology

The overall methodology for the pilot begins with the finalization of parameters for the pilot, in terms of the routes, vehicles and the drivers. The pilot routes may be deployed based on few the select external environment attributes. The route characteristics may be decided based on a certain percentage of each of the chosen parameter in a route. The drivers may be randomly selected from a stratified sample of age group and with varied customer reviews based on driving factors.

3.11   Pilot Timelines

The overall timeline for the pilot will be 4 weeks from the kick-off date. The control period of the pilot (baselining) will be for 2 weeks and the experiment period will be for 2 weeks after the control period.

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Pilot Stages

Sample of comparative analysis

CONTROL PERIOD → EXPERIMENT PERIOD

1 **Finalization of Parameters for the Pilots:**
Finalize vehicles, tag drivers, driver roster,

2 **Control Period – Baselining**
Deployment of systems on fleet with alerts to drivers. Baseline safety related

3 **Experiment Period**
Provide active training to the drivers based on data generated. Feed data to control tower to intercept unsafe driving practices & make real time interventions

4 **Data Analysis & Impact Evaluation**
Quantify the impact / benefit through CAS& FMS deployment

Number of alerts triggered per trip per driver

Number of alerts triggered per trip per driver

Average Reduction in alerts per driver per trip – for different time of the day (Morning and Evening Peak and Non-peak hours) and different operating volumes of traffic and pedestrians

Compare between drivers – Distribution spread of drivers based on number of alerts (Low alerts vs High alerts)

	Pilot Stages	Milestones	W0	W1	W2	W3	W4
1	Pilot parameter selection	Finalize vehicles, driver tagging by vehicle, trip schedule	�				
2	Deployment of devices	Delivery at location, installation and calibration of devices		�			
3	Experiment period	Alert activated for drivers | Driver Sensitization |Continuous capture of alerts		�	�	�	
4	Data analysis	| Driver scores | Quantification of Data				� 	
5	Pilot Results Presentation	Presentation of Results to the Management					▀

3.12 Reports & Analytics :
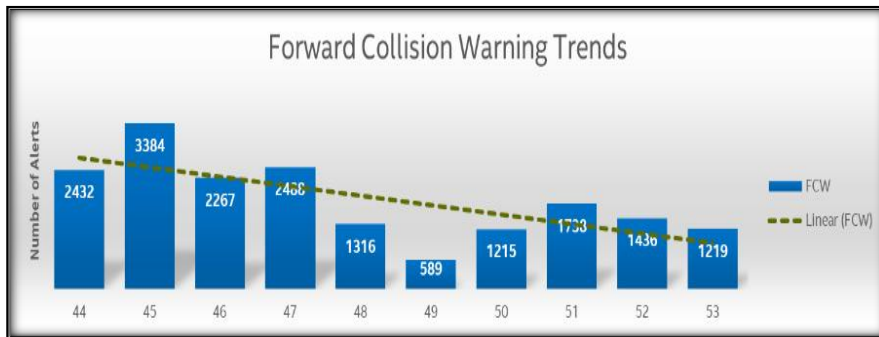
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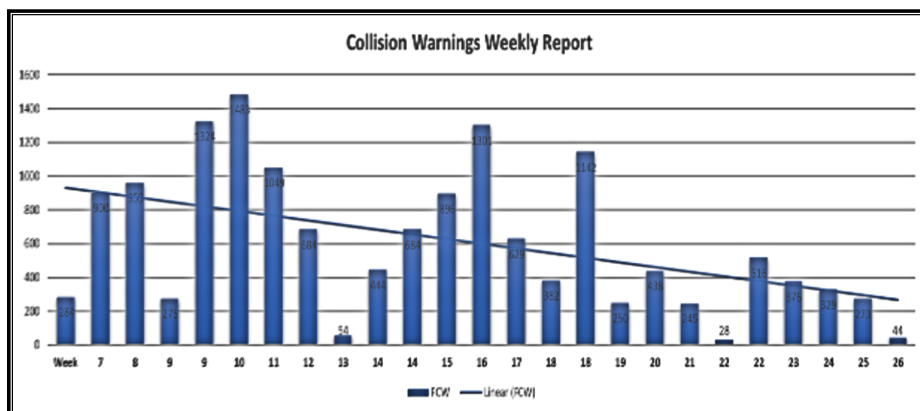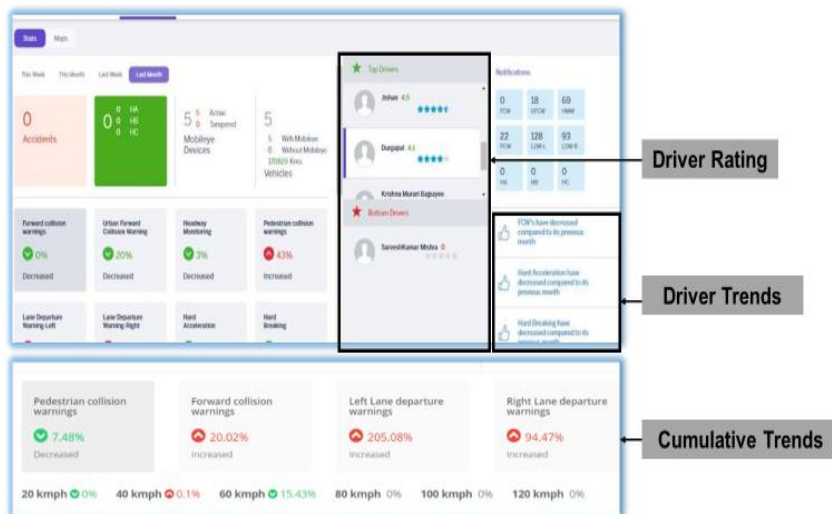
The above graphs and bar charts explain the importance of the new system

4. Conclusions : The paper conclude that this system is partially useful as this has not been fully implemented in large number of buses , which make a good reliable sample to conclude that this " Collision Avoidance System and Driver Drowsiness System" designed and adopted in TNSTC will definitely avoid accidents on high ways due to driver drowsiness (there are many more reasons for road accidents). But this system definitely useful as there is no other alternative to help driver in such high ways drowsiness situations. This paper appreciate the effort from **Tamil Nadu State Transport Corporation (TNSTC)** .

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