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Road Accident Prevention Solution

RAPS - Future of Road Safety Audit

Project By Vagneta

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FOREWORD

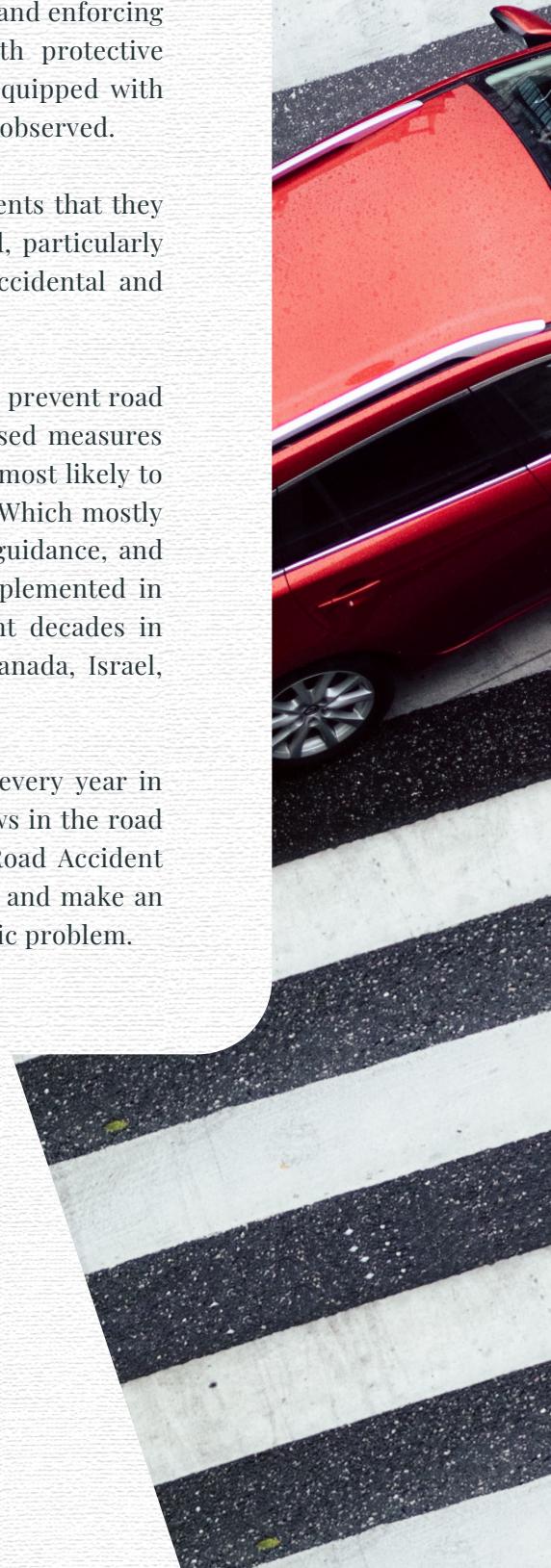
To reduce road traffic death and injuries by 50% by 2020 was one of the agenda for Sustainable development for 2030. It's already 2022, while the government has made so many efforts during the decade of 2011-2020, like adopting and enforcing new road safety rules such as speeding, redesigning roads with protective infrastructure such as sidewalks, and ensuring that vehicles are equipped with life-saving technology, etc. but still, no significant results have been observed.

To achieve this target government will have to fulfill the commitments that they have repeatedly made and to overcome challenges they have faced, particularly fatalism, the misconstrued notion that road traffic crashes are accidental and nothing can be done to prevent them.

Road Safety Audit is a technical process and a proactive approach to prevent road crashes. In this process, the auditor will identify, key evidence-based measures listed by many of the world's leading road safety experts which are most likely to impact road traffic deaths and injuries in the short and long term. Which mostly are related to speed management, infrastructure design, positive guidance, and road environment. by identifying those measures which when implemented in combination, have saved hundreds of thousands of lives in recent decades in many high-income countries in Europe as well as in Australia, Canada, Israel, Japan, and New Zealand, among others.

If still today nearly 1,54,000 people die from road traffic crashes every year in India, and millions more are injured, the reason might be some flaws in the road safety audit system adopted in India. In this document, "RAPS - Road Accident Prevention Solution" an idea is introduced to overcome these flaws and make an efficient, robust system that will help India overcome the catastrophic problem.

Jainish Chaudhari
Founder
Vegneta





I. GRAVITY OF ROAD CRASHES

INTRODUCTION

There is a phone call or a knock on the door that we all dread, in which we are told that a loved one has been killed or seriously injured in a road traffic crash. Road accidents are an unfortunate reality of our lives. The daily news reports generally contain at least one incident of a road accident. Road traffic injuries cause considerable economic losses to individuals, their families, and to nations as a whole. These losses arise from the cost of treatment as well as lost productivity for those killed or disabled by their injuries, and for family members who need to take time off from work or school to care for the injured.

STATISTICS

As per the World Health Organization, accident-related deaths are the eighth leading cause of death and the first most significant cause of death among children of age 5–14 and adults of age 15–29. Globally, 54% of accident-related deaths are pedestrians, cyclists, and motorcyclists. These accidents result in considerable economic losses to the individuals and their families and the nation.

Every year the lives of approximately 1.3 million people are cut short due to a road traffic crash. Also, about 20 to 50 million people suffer non-fatal injuries, with many incurring a disability due to their injury.

In India, 4,49,002 road accidents have been reported by States and Union Territories (UTs) in the calendar year 2019, claiming 1,51,113 lives and causing injuries to 4,51,361 persons.

UN study has found that India's GDP takes a 3% hit every year due to road accidents, equivalent to over \$58 billion in terms of value in the year 2016.

Take away from the chapter

Approximately 1.3 million people die each year as a result of road traffic crashes.

Road traffic injuries are the leading cause of death for children and young adults aged 5–29 years.

Road traffic crashes cost most countries 3% of their gross domestic product.

PERSPECTIVE COMPARISION

In the year 2020 alone, 1,57,000 people between the ages of 45-80 died due to the COVID- 19, leading to an economic setback for the country. One might find these numbers uncanny, but in India, almost 1,50,000 deaths and more than 4,50,00 injuries occur between 15-45 years old due to just road crashes.

Based on current data, 15-17 people will die in the next hour in India due to a road crash.

Putting this into perspective, the number of people who died due to road crashes in India in a single year is far more than the number of people killed in all our wars put together.



Graph 1: No. Of death in a year for different age group

9 to 10 people just died worldwide, while you were reading this chapter.

ROAD CRASH SCENARIO IN INDIA

Road accidents continue to be the leading cause of death, disability, and hospitalization despite our dedication and efforts. India ranks first in the number of road accident deaths in 199 countries and accounts for about 11% of the world's crash-related deaths in 2018.

The report published by the world bank said, "India has the highest number of road deaths and injuries in the world. It has one percent of the world's traffic but accounts for 11 percent of road deaths, with 53 road accidents occurring every hour; one person dies every four minutes."

National highways, which comprise 2.03 percent of the total road network, accounted for an unequal percentage of 35.7 percent of deaths in 2019. State Highways which account for 3.01% of road lengths, accounted for 24.8 percent of the deaths. Other Roads comprising approximately 95 percent of the total roads caused 39% consecutive deaths.

In addition, NHAI-controlled National Roads accounted for 66 percent of road-related deaths, followed by State PWD National Road, which accounted for 25 percent of road deaths. National Highways take the remaining 9 percent of road deaths under other departments.

The 18 - 60-year working-age group accounted for 84 percent of all road deaths. The share of men in the total accident rate was 86%, and the proportion of women increased to 14% in 2019.

In 2019, the Department focused on identifying and redeveloping black areas and identified 5583 black areas in the country in 2018.

In terms of those killed in 2019, Delhi retains its first rank, followed by Jaipur, Chennai, Bengaluru, and Kanpur, among the million-plus cities. The State of Tamil Nadu recorded the highest number of road accidents in 2019, and the number of persons killed in road accidents was the highest in Uttar Pradesh in 2019.



2. ROAD SAFETY AUDIT

PREAMBLE

The Government of India is deeply concerned about the enormous increase in road crashes, injuries, and fatalities in recent years. It recognizes that road accidents have become a critical public health issue, and the victims are mainly the poor and vulnerable road users. It also recognizes that as these accidents involve roads, motor vehicles, and human beings, road safety needs to be addressed holistically.

In the light of this, the Government of India, through its National Road Safety Policy, states its commitment to bring about a significant reduction in mortality and morbidity resulting from road accidents. And "Road Safety Audit" is one of the steps taken by the government of India to overcome this issue.

INTRODUCTION

Imagine living in a skyscraper in Mumbai city and having a balcony on the 168th floor. Instead of putting a warning sign indicating - "Danger Ahead," you just put a railing at the end of the balcony to prevent accidents. Similarly, in the road safety audit concept, the forgiven system is developed so that even if road users make any mistakes, casualties and fatalities will be minimal.

Road Safety Audit (RSA) is a review of a project to assess and identify the safety concerns of road users. In this RSA process, the emphasis is to improve safety for vulnerable road users such as pedestrians and cyclists. RSA is carried out in the following cases:

- i) To evaluate the safety of an existing road or an infrastructure.
- ii) To identify the safety concerns of proposed road infrastructure during the planning, design, and implementation stages.

Take away from the Chapter

The Government is deeply concerned about current road crash scenario and has recognized how big of a problem road crashes is. and thus to prevent this, Road Safety Audit is one of the many steps taken by government.

Road safety Audit is proactive approach to prevent road crash, in which auditor will assess the road and will identify the safety concerns of road user.

PURPOSE OF ROAD SAFETY AUDIT

The purpose of a road safety audit is to manage safety by identifying and addressing risks associated with road safety deficiencies. For example, auditing at different stages of a project, starting from the planning stage, can lead to the timely elimination of problems and minimize the time and costs of retrofitting roads/transport infrastructure to improve safety at a later stage.

The purposes of conducting a road safety audit are:

- a. Identification of potentially unsafe locations along a road.
- b. Reducing the severity and likelihood of road accidents.
- c. Reducing the need for costly remedial work by rationalizing the design.
- d. Minimizing the project's total cost to the community by preventing accidents, disruption, and trauma.

NEED OF ROAD SAFETY AUDIT

Often, the safety considerations are ignored while planning transport projects, which later prove to have high socio-economic costs. E.g., the death of an earning member of a household would impact his/her family in many different ways. Injuries may reduce the productivity of an individual or may result in the loss of livelihood of the family. To prevent these, Road Safety Audits are being conducted, and the following are the needs of RSA.

- Most of the road safety steps are taken when the number of accidents at a place increases significantly. This is called the reactive approach. RSA, a proactive approach, ensures that safety steps should be taken before an accident scenario becomes critical and saves a life.
- Around 3 to 4 percent of the country's GDP gets affected due to accidents because the government has to compensate for each accident. RSA decreases the number of accidents and hence improves the country's GDP.
- The likelihood of crashes can be reduced at the site and on nearby roads. Thus the severity of crashes can be reduced.
- The need for costly remedial work and whole of life project costs are reduced.



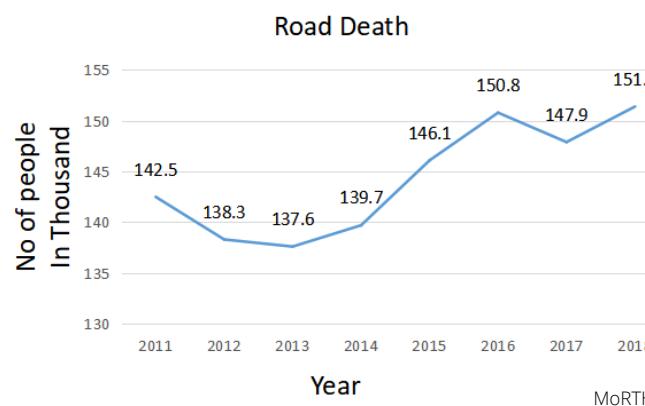


PREAMBLE

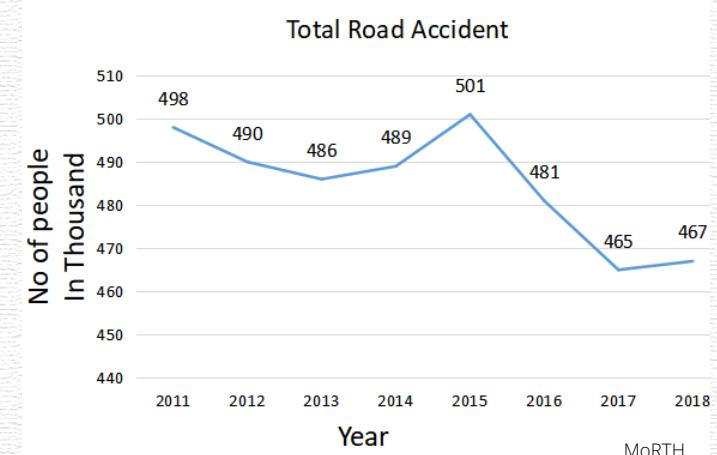
Several initiatives have been taken by the Ministry, which continues to implement a multi-pronged road safety strategy based on Education, Engineering (both of roads and vehicles), Enforcement, and Emergency Care, inter alia, consisting of setting up driver training schools, creating awareness, strengthening automobile safety standards, improving the, etc. road infrastructure, carrying out road safety audit, etc

India has committed at the third global high-level conference on Road Safety in Stockholm held in 2020 to halving deaths and injuries from accidents by 2030.

The Indian government has been actively solving this problem for the last decade, but as you can see from the graph that the number of road death is increasing and there is no significant decrease in the number of road accidents.



Graph 3: Year wise total no of person killed in road accident in India



Graph 2: year wise total road accident in India

At this rate, it would be hard to achieve a goal of halving road death and injuries by 2030. The following might be the possible reasons which may have led to a decrease in the efficiency of the road safety audit.

1. Lack of capability to perform most efficient RSA
2. Picking up only maintenance Defects
3. Client picking up auditors who tend to find minor faults
4. Poor quality / hard to follow report
5. Risk prioritization matrix

To overcome this and to help India achieve this target of halving the number of road accidents, the best solution might be, " To automate the process of road safety audit using cutting edge technology and computer software."

INTRODUCTION

We live in a technologically advanced world. Technological advancement plays a vital role in developing human civilization and cultural change. Technology provides innovative ways of doing work in various smart and innovative ways. Technology has reduced effort and time. It has increased efficiency in so many fields. This technology can also be useful to automate the process of road safety audits. In every step of the road safety audit, how technology can be helpful is described below.

In Step 1. Experts and laborers will go on the field and collect video-graphic survey data for visual faults; they will also conduct speed studies for safe speed comparison; they will do a topography survey to find geometric faults and record all the data manually. Taking devices for a survey to the field, performing all these surveys manually for KMS of road, is a very time-consuming and inefficient method.

The same geographic survey can be done with cutting-edge technology like LiDAR, Drone, IoT, and Machine Learning with much more accuracy within an hour.

In Step 2, A group of field experts with profound knowledge of IRC codes(Safety standard code for road design, furniture, and environment), traffic engineering, road user psychology, and highway engineering will be gathered for Road Safety Audit.

The software can be trained the same as a field expert, do the same analysis with more efficiency, low cost, and in less time.

In Steps 3 and 4, The video graphic data will be analyzed repeatedly hundreds of times, from the point of view of thousands of reasons that can create potential hazard situations; it is like watching the same movie 60-70 times, how insane is that? Then a complex manual calculation for safe speed and tons of safe geographic elements will be carried out.

The same can be done with computing power and technologies like image recognition and machine learning in just a matter of minutes, with a considerable high amount of efficiency.

In Step 5, After finding visual faults manually, one will take a screenshot --> edit it in paint --> paste it in word report --> write a summary for that. Furthermore, one will repeat the same hundreds of times for every fault found. Then, one will make an auto cad drawing to solve all the geographic faults.

An editable, sort-able, and easily manageable automatic detailed project report can be generated using sophisticated computer software, saving an enormous amount of time, with considerable efficiency.



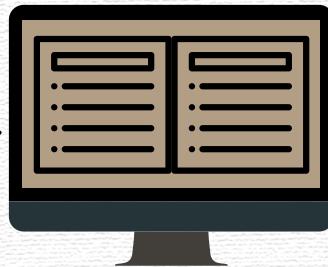
Conclusion

To Conclude we can say that, By making This whole process of Road Safety Audit, Data collection - Analysis - Report generation, Automated we can save thousands of life much faster than the conventional one. By Automating this process we can develop a much more efficient and reliable system to achieve a much more efficient outcome.

WORKING

The software will use complex and sophisticated algorithms and technology in the backend. But in the front end, a smooth and easy-to-use interface will be designed so that anyone with a transportation background can carry out a road safety audit. The tentative workflow of software is described below.

O1 —



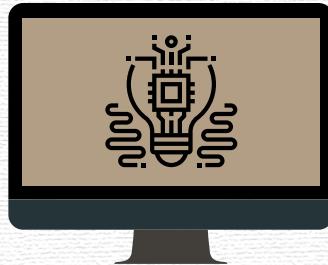
The computer will have all the information about the different causes of accidents, the safety parameter to be checked, and what their standards are. Also, it will list the number of possible solutions for each problem found in its database.

The user will have to provide all the raw data required to conduct a road safety audit like videography, geography, type of terrain, coefficient friction, etc.,

O2 —



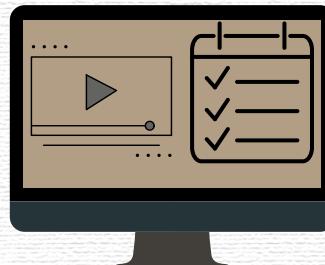
O3 —



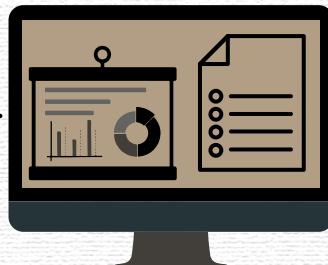
After the computer identifies and checks safety concerns, the auditor will have total control over whether to accept it or not; he can even see the calculations. The auditor can also perform manual auditing for necessary checks

The software will be trained using cutting-edge technology to identify safety concerns and its best possible solution using this database. It will highlight the findings and will give its solution.

O4 —



O5 —



If the auditor approves the safety findings, risk priority factor will be assigned to it, and it will be added to the Detailed Project Report where he can filter and sort according to his need on the bases of chainage, type, risk, etc., he can also check how the finding can cause an accident for his understanding.

ADVANTAGES

As automating the process of the road safety audit, using cutting-edge technology requires an enormous amount of time, effort, and money. So if one is going to automate this process, significance and a considerable amount of advantages should be there. Following are the major advantages of automating this process,

Efficiency:- There are thousands of reasons that can lead to a road crash. One needs to Identify all of these reasons and to check all the safety aspects for each reason to achieve better efficiency. Still, the human brain is limited to comprehending and analyzing data to a specific limit. So it is humanly impossible to consider all safety-related aspects, Which is possible to do so using computing power resulting in great efficiency.

Fast:- Safety auditor needs to audit the road from all the points of view that can lead to road crashes. Now there are thousands of reasons that can lead to a road crash, as a human one can not check all the points all at once, one needs to go over and over again to do an efficient road safety audit, but a computer can consider all the points at once resulting into the very fast process.

Accessibility:- India holds the world record for fastest road construction and also have one of the world's largest road network. Compared to this, India has a limited number of persons who can perform RSA, But the software will be designed so that any person with a transportation background will be able to do a safety audit efficiently as most of the tasks will be carried out by software.

Data-Driven:- When a human performs any task, it is driven by its individuality/personality and their presence of mind at that time, resulting in imprecise outcomes. Road safety is a problem of national concern, so its results should be standardized and data-driven, which are not affected by human limitations. Gladly, a computer can achieve such type of reliable result.

Uniformity:- One of the significant points that led to an inefficient RSA-conventional system was the hard-to-follow report. There will be uniformity in the detailed project reports by using the software. The client will have the option to filter and sort reports according to chainage, risk, type, etc., which was not an option in the conventional processes.

Adaptability:- Suppose a new technique /solution has been discovered that can help to prevent certain types of road crashes. Now educate all the safety auditors and give them information about this. To consider this solution while auditing roads. It will take years. And every time some discovery happens and an update needs to be made; this problem will occur. However, with software, you need to add this in the central database, and with a few lines of code, it will reach out to all the safety auditors all at once. The same is also applicable when there is a change in IRC standards according to the present condition.

Risk Prioritization:- Another major flaw found in the conventional method of RSA was that once the auditor submits the report, the client will have a limited budget to implement everything mentioned in the report. In software, there will be a facility that will prioritize findings considering the type of traffic, weather condition, locality, geographic condition, etc. This will help the client allocate the budget accordingly and implement higher priority things.

Semi-Simulated result:- One of the flaws found in the conventional method of RSA was that human tends to pick up only maintenance faults. This means it is possible to miss the faults that are not visible(e.g., provision of the informative board for positive guidance, or considering the weather or light effect when a survey was conducted in a different type of condition, etc.). With software, it will be possible to consider all these situations, as the partial simulation will be there.

Easy to understand-lack of client understanding:- Information regarding fault and accident correlation can be stored in the database, Which will be directly linked with the project report. The problem in the conventional method of RSA was a lack of client understanding which may affect the implementation. That problem can be solved with the software.