

SUMMER REPORT

By

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PART – A

SECONDARY RESEARCH WORK DONE ON

ANALYSIS OF ACCIDENTS IN THE STATE OF KERALA, INDIA

PART – B

ONLINE COURSE WORK DONE ON

FUNDAMENTALS OF PROJECT PLANNING AND MANAGEMENT

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“I am grateful to all the placement committee heads and members for timely providing guidelines and Department heads and staffs, without their active co-operation the study would not have been completed.”

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LIST OF ABBREVIATIONS

<i>WHO</i>	“ WORLD HEALTH ORGANIZATION”
<i>SDG</i>	“SUSTAINABLE DEVELOPMENT GOALS”
<i>MV</i>	“MOTOR VEHICLE”
<i>PWD</i>	“PUBLIC WORKS DEVELOPMENT”
<i>MI</i>	“MILES”
<i>HR</i>	“HAZARD RATIOS”
<i>SMR</i>	“STANDARDIZED MORTALITY RATIOS”
<i>RTA</i>	“ROAD TRAFFIC ACCIDENTS”
<i>POP</i>	“POPULATION”

PART – A

1. INTRODUCTION

1.0 THE GLOBAL CONTEXT

The number of deaths that are caused due to “Road Traffic Accidents” continue to rise consistently, that has touched 1.35 million in 2016. However, death rate in relation to the population has remained the same. When taken in consideration to the ever increasing global population and rapid motorization the current measures that have been adopted to reduce total deaths and accidents are only pushing the situation to the worse. It also indicates that the progress to attain “SDG target 3.6 – that calls for a 50% reduction in the number of road traffic deaths by 2020 – which still remains far from sufficient.”

As per WHO, “Accident related deaths are known to be the eighth leading cause of death and injury and is a major public health concern, and the first largest cause of death in children aged 5-14 and adults in the age of 15-29. Globally, 54% of accident related deaths are pedestrians, cyclists and motor cyclists. This results in economic losses not only to individuals, their families but also nation as a whole.”

India has signed to the second global high level Conference on “Road safety held in Brazil in 2015, referred popularly as the Brasilia declaration”, which has been formed to reduce the deaths and injuries from accidents to half of the present by 2020 and which will also include this target in 2030 agenda for “Sustainable Development Goals.”

Road transport is the most preferred mode of transport for both passengers as well as transport of goods and other raw materials. In this era of rapid increase in the population and high rate of motorization with increase in Urban population has made humans more susceptible to road accidents that often results in death, injuries/disabilities.

Countries across the world have succeeded in curbing down the accidents over the last few years, but the progress is significantly different in different regions and countries. There still seems to be a very high association between the risk of road traffic accident and the income level of the country or region. “Having an average rate of 27.5 deaths per 100,000 population, the risk of a road traffic death is more than three times higher in low-income countries than in high-income countries where the average rate is 8.3 deaths per 100,000 population.”

Road accidents in India kills about 1.5 lakh people every year. For which, India accounts for almost 11% of the accident related deaths in the world. Nearly 1.3 million people die every year on the world's roads, and up to 50 million are injured.

1.1THE INDIAN CONTEXT

Road length in India has increased from about 4 lakh kilometres in the 1950s to about 58 lakh kilometres as of 31 March 2017. India has the second largest road network in the world after United States. Major growth in the road networks has been in rural roads and the roads that are constructed by the “PWD”. The Rural roads in India account for 61%, and the “PWD” roads for about 20% of the total road length. Compared to this, the Urban roads have a share of 9% in the road network. This growth in rural roads may be due to the schemes such as the Pradhan Mantri Gram Sadak Yojana, which was launched in 2000 which aimed to improve the road connectivity in rural areas.

National Highways constitute 2% and State Highways 3% of the total road length. Since 2000 the road network in India has grown by 39%, while the number of registered vehicles has grown by about 158%. While the growth in road networks will be limited but the increase in the motor vehicles on the roads may increase congestion (due to physical limitations) and fatalities on the roads.

“National Highways comprise 2% of the total road network, but witness 28% of the road accidents.”

Both the State as well as National Highways comprise for about 5% of the total road connection system but they see a 52% of the total accidents. An increase in the number of accidents in the highways is may be due to the high motor vehicle speeds and higher amount of traffic on these roads.

Road standards, maintenance and construction is determined by the authority under whose jurisdiction the road falls. Various expert committees have noted that the responsibility for road safety is diffused across various bodies, and there is lack of effective coordination between these bodies.

CONTRIBUTING FACTORS:

The “GlobSatatus Report on Road Safety published by the WHO identified the major causes of traffic collisions as

1. Driving over Speed limit.
2. Driving under the influence.
3. Non usage of helmets and seat belts.
4. Failure to maintain lanes.
5. Yield to oncoming traffic when turning.

The report revealed that the users of motorcycles and three-wheelers motor vehicles constitute the second largest group of traffic collision deaths.”

1.2 THE KERALA STATE CONTEXT

Kerala is located on the southwestern coast of Malabar in India. With a population of 33,387,677 as per 2011 census, Kerala is the thirteenth largest Indian state by population.

It is divided into 14 districts with the capital being Thiruvananthapuram.

“Kerala has 145,704 kilometres (90,536 mi) of roads, that holds for 4.2% of India's total. This gives to about 4.62 kilometres (2.87 mi) of road per thousand people, compared to an average of 2.59 kilometres (1.61 mi) in the country. Roads in Kerala include 1,524 kilometres (947 mi) of national highway; 2.6% of the nation's total, 4,341.6 kilometres (2,697.7 mi) of state highway and 18,900 kilometres (11,700 mi) of district roads.”

The “Department of Public Works” is responsible for maintaining and increasing the State highways system and major district roads.

Despite various awareness campaigns on road safety yielding results, the state witnessed higher number of road accidents in 2018 compared to the year 2017.



2. RESEARCH PROBLEM

In India, the main biggest cause of unnatural deaths is Road Accidents. Kerala being the 12th most populous state in India is still struggling hard to reduce the number of accidents. Kerala has the second highest accidents per million population after Goa.

3.AIM

The aim is to study the accident trends in the state of Kerala for the year 2015 to 2019 and to identify the reasons behind the high accident rate in the state.

4. RESEARCH QUESTION

1. What are the Accident Trends in the State of Kerala for the year 2015-2019?
- 2.What are the General Observations of the above trends?
- 3.What are the recommendations to reduce the overall road accidents in the state of Kerala?

5. RESEARCH OBJECTIVES

- 1.To Determine the Accident Trends in the State of Kerala for the year 2015-2019.
- 2.To draw General Observations of the Accident Trends.
- 3.To generate recommendations to reduce the overall road accidents in the State of Kerala.

6. RESEARCH METHODOLOGY

- **Study Design**

This is a retrospective, descriptive type of study.

A retrospective study looks backwards and examines exposures to suspected risks or protection factors in relation to an outcome. Here the Accident and Death data is collected of the previous five years (2015-2019).

A descriptive study is the one in which the information is collected without changing the environment (i.e., nothing is manipulated). It is used to obtain information concerning the current status of the phenomenon to describe “what exists” with respect to variables or conditions in a situation.

- **Type of Research**

Hybrid research (Qualitative and Quantitative).

- **Sources of Data**

Secondary data was collected by the various government data sources like censusindia, morth.nic.in, keralapolice, and various data sources sites like research gate, pubmed, google scholar for the review of literature.

- **Type of data**

Secondary data collection.

- **Exclusion Criteria**

Vehicles registered in these five years are not included.

7. LITERATURE REVIEW

There is extensive literature within the area of fatalities associated with traffic. Firstly, there are research papers from the western countries then research articles of that of India because the vehicle types and traffic conditions are significantly different in both the contexts.

Clarke et al. (2010) This article “studied a sample of 1,185 fatal accidents in 10 police jurisdictions in UK during the years 1994- 2005. They showed that the first causes of accidents were excessive speeding and drunken driving with the drivers having alcohol levels beyond the permissible limit. Additionally, the young age of the drivers, driving within the night, and therefore the failure to wear safety belt are contributors to those fatalities.”

Gierde et al. (2011) This article “studied 204 fatally injured drivers in South-eastern Norway from 2003–2008. The danger for fatal injury during a road traffic accident was estimated using logistic regression adjusting for gender, age, season of the year, and time of the week. They showed that the danger for fatal accidents was high with intake of multiple drugs or alcohol by the drivers.”

Spoerri, Egger, and Von (2011) This article “examined the geographical determinants and socio-demographic of road traffic accident mortality in Switzerland by linking 2000 census data to the mortality records from 2000–2005. Data from 5.5 million residents aged 18–94 years, 1,744 study areas, and 1,620 accidental deaths were analysed, including 978 deaths (61.2 per cent) among automobile occupants, 254 (15.89 per cent) among motorcyclists, 107 (6.69 per cent) among cyclists, and 259 (16.21 per cent) among pedestrians. Weibull survival models and Bayesian methods were used to calculate hazard ratios (HR) and standardized mortality ratios (SMR) across study areas. They showed a *u*-shaped relationship with age in automobile vehicle occupants and motorcyclists. For cyclists and pedestrians, mortality increased after the age of 55 years. Mortality as a function of education (primary, tertiary) and civil status (single, married) was also discussed. They suggested that preventive efforts should aim to scale back inequities across socio-demographic and academic groups, and across geographical areas, with interventions targeted at high-risk groups.”

Ayuso, Guillen and Alcaniz (2010) This article “used multinomial logistic regression to analyse accidents with victims and calculate the influence of various sorts of traffic violations on the probability of getting a significant or casualty accident, compared to a smaller accident. The information for this study was supported on accidents that occurred in Spain from 2003 to 2005. The typical cost per victim and therefore the average number of victims per accident were then used to find the estimated cost of an accident with victims, given the knowledge on the sort of traffic violation incurred. They presented some recommendations on the severity of penalties, and suggested that regulators penalize the occurrences of some specific combinations of traffic violations more rigorously.”

Dalbir Singh, Satinder P. Singh, Kumaran. M, Sonu Goel (2016) This study “analyses 709 RTA related deaths in children (≤ 18 years) who became the victims of RTA and who dies during the course of the treatment. The postmortem and the hospital records of the victims were used to collect the epidemiological data regarding age, sex, area of residence, etc. Out of 709 RTA deaths in children about 16% were reported in the year 1974-78 and this proportion decreased to 9.4% during the block year of 1984–88 and has remained almost constant since then. A high number of deaths was reported in the rural areas.”

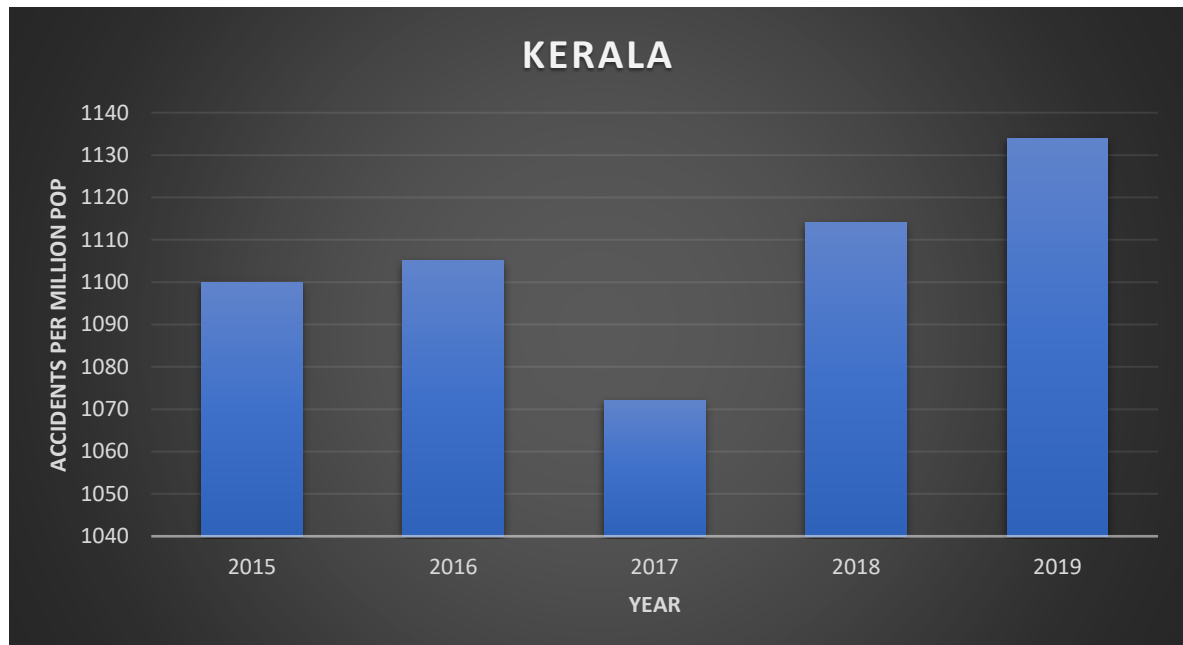
Ramesh Bollapragada, Sudesh Poduval, Chetty Bingi. S, Bhoomi Brahmbhatt (2016) This article “uses forecasting models to verify the existence of traffic problem in the State of Kerala. The varied reasons of accidents were enumerated and classified. Using regression models, the connection between the number of accidents, deaths and injured were obtained. Additionally, the connection between the number of accidents and therefore the number of vehicles on road were examined alongside the sort of vehicle, design of the roads, the planning of traffic, and the design of road network.”

Shalini Rankavat, Geetam Tiwari (2016) This paper “explored the pedestrian perception of risk in getting involved in a traffic accidents in different locations and the role of environment features in risk perception of pedestrians. Pedestrian perceptions of risk at forty-five actual crash sites were collected through questionnaire survey. Risk perception of pedestrians of built environment features were analyzed on the basis of pedestrian demographic characteristics. Ordered logit model was used to examine the influence of these variables on risk perception of respondent’s neighborhood and of the location where the survey was conducted.”

8. RESULTS AND DISCUSSION

ACCIDENT ANALYSIS OVERVIEW

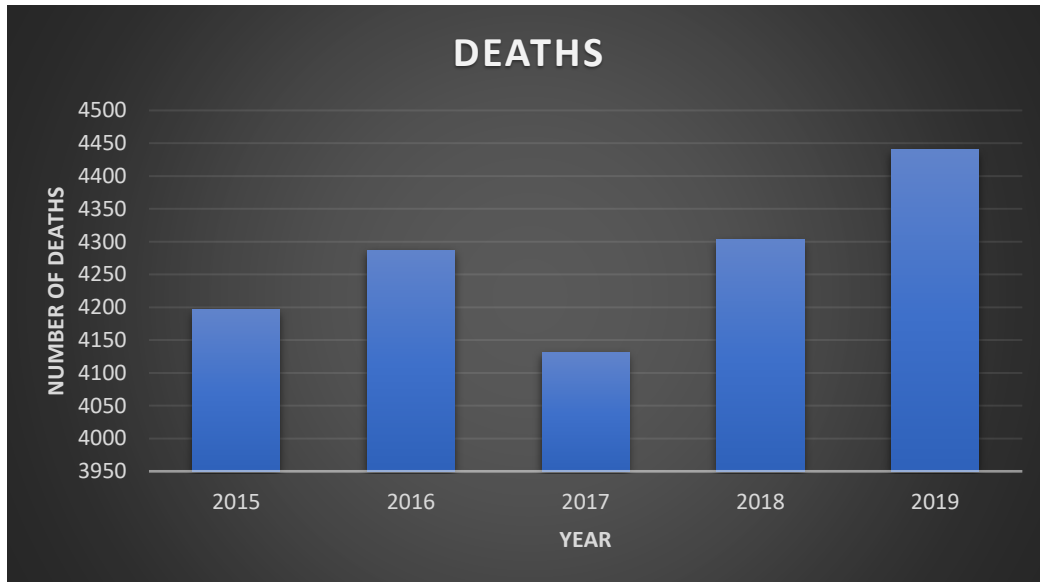
GRAPH 1: ACCIDENTS PER MILLION POPULATION FOR T HE YEAR 2015 - 2019



Kerala ranks 13th in India in terms of population with a projected population to be around 3.5 crores in 2015 to 2019 and the number of accidents when compared to the rest of the states also ranks at 13. But , when accidents are calculated per million population it ranks second after Goa, which is a matter of concern.

According to the graph, The Y- axis reveals the accidents per million population in the state and X- axis shows the years 2015 to 2019. It is clearly evident from the above graph that Accidents per million population has only risen over the years and the only year that showed a drop was in the year 2017. Even after measures that has been taken by the state government the accidents are only rising over the years more stricter measures should be adopted by the state in order to reduce the accidents and fatatlities.

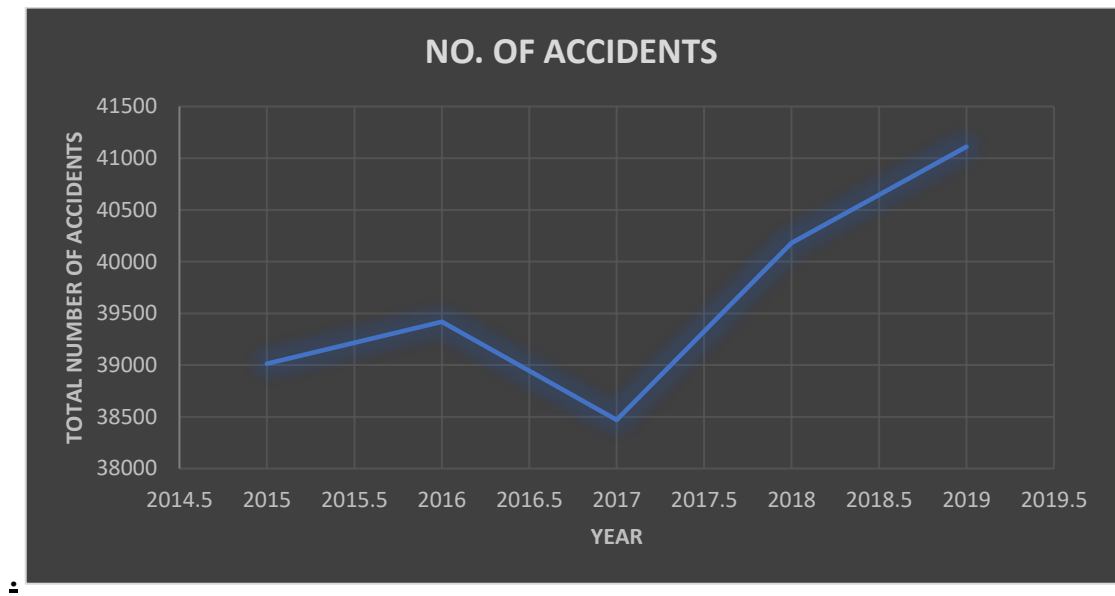
GRAPH 2: NUMBER OF DEATHS THAT HAVE TAKEN PLACE DUE THE ROAD ACCIDENTS IN THE YEAR 2015 - 2019



Accidents often result either minor injuries, major injuries and fatalities and sometimes no injury at all. Among that fatality is often seen in many to wheelers due to over speeding and the not following traffic rules. The fatalities have only been increasing which is a major issue to handle. In spite of measures taken by the Kerala government it still struggles to keep the death rate low. The highest has been seen in the year 2019 with 4440 deaths.

From the graph above its clearly seen that number of deaths has only increased over the years and with a drop in the year 2017 because of lesser number of accidents during that year.

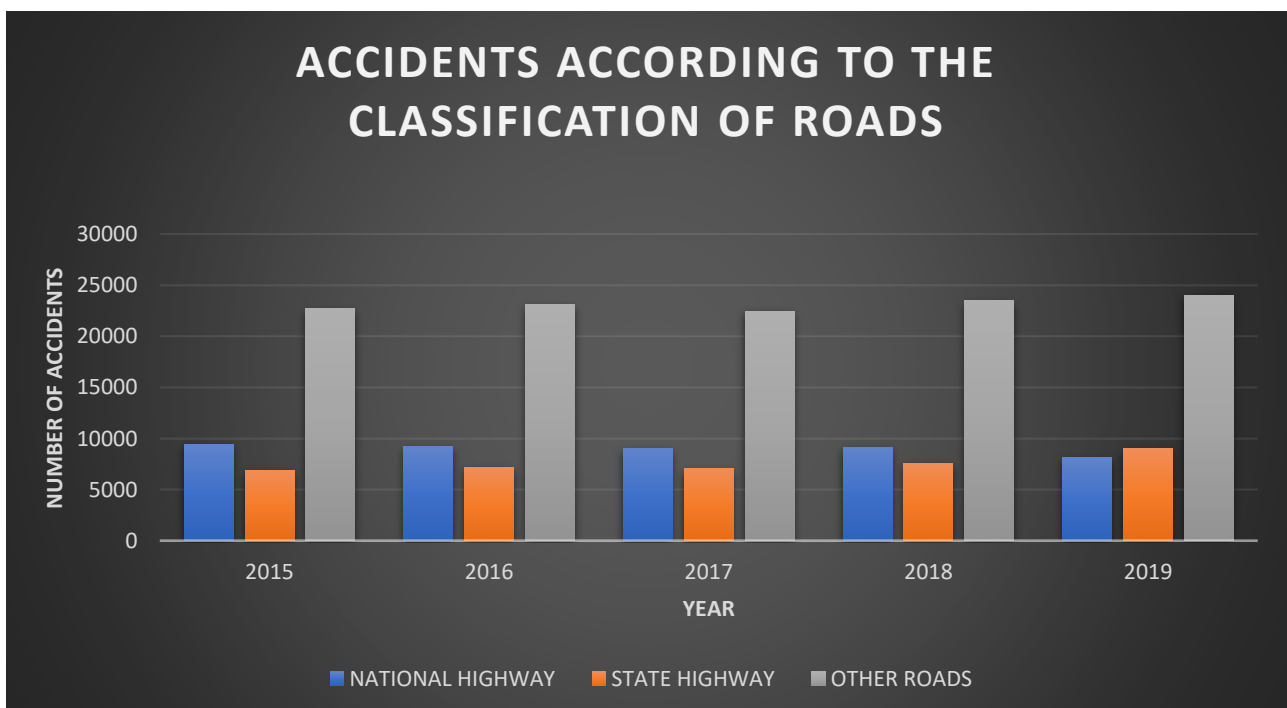
GRAPH 3 : TOTAL NUMBER OF ACCIDENTS THAT HAVE OCCURED IN THE YEAR 2015 – 2019.



The accidents in the state of Kerala has only spiked up over the years. “Urbanization, overdependence on personal motor vehicles for speedy mobility and mismatch between the growth in motor vehicles and the augmentation of roads have resulted in traffic congestion and increasing road accidents.” Kerala’s chances to achieve the target set in the road safety vision to reduce fatalities and road accidents by 50% in 2020 are far with the present pace of measures and enforcement.

According to the graph, number of accidents has only increased with a drop only in the year 2017.

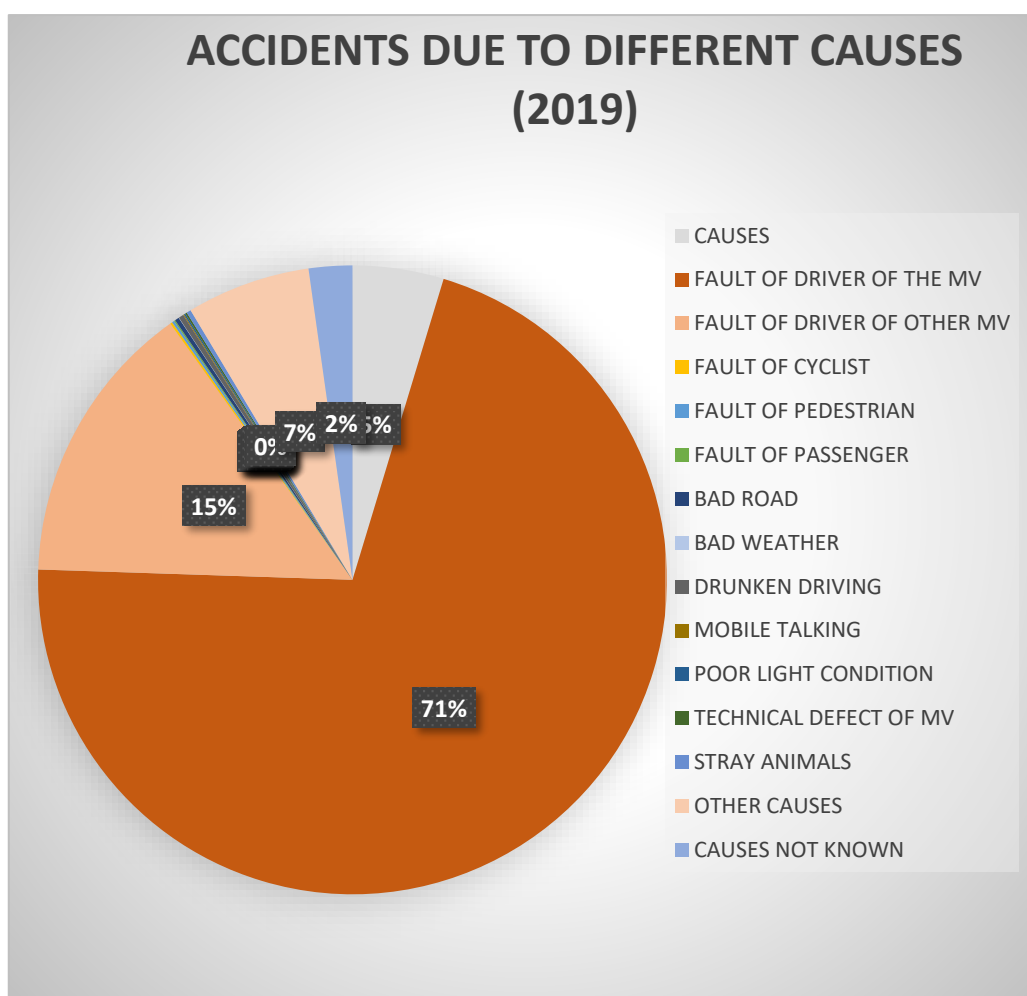
GRAPH 4 : ACCIDENTS THAT HAVE OCCURRED ON DIFFERENT ROADS IN THE STATE OF KERALA.



It has been seen that most of the accidents are on the other roads not on the highways. Generally accidents in the Highways are mostly due to over speeding of the motor vehicle or dependence on alcohol or any other substance abuse but when accidents are mostly on the roads other than the National and State Highways are mostly in the rural areas of Kerala where roads are not repaired or in most places there is no provision for proper roads. Due to bad roads most of the accidents occur on these roads.

According to the graph, the number of accidents are highest on the roads other than the highways and then followed by National Highways and State Highways.

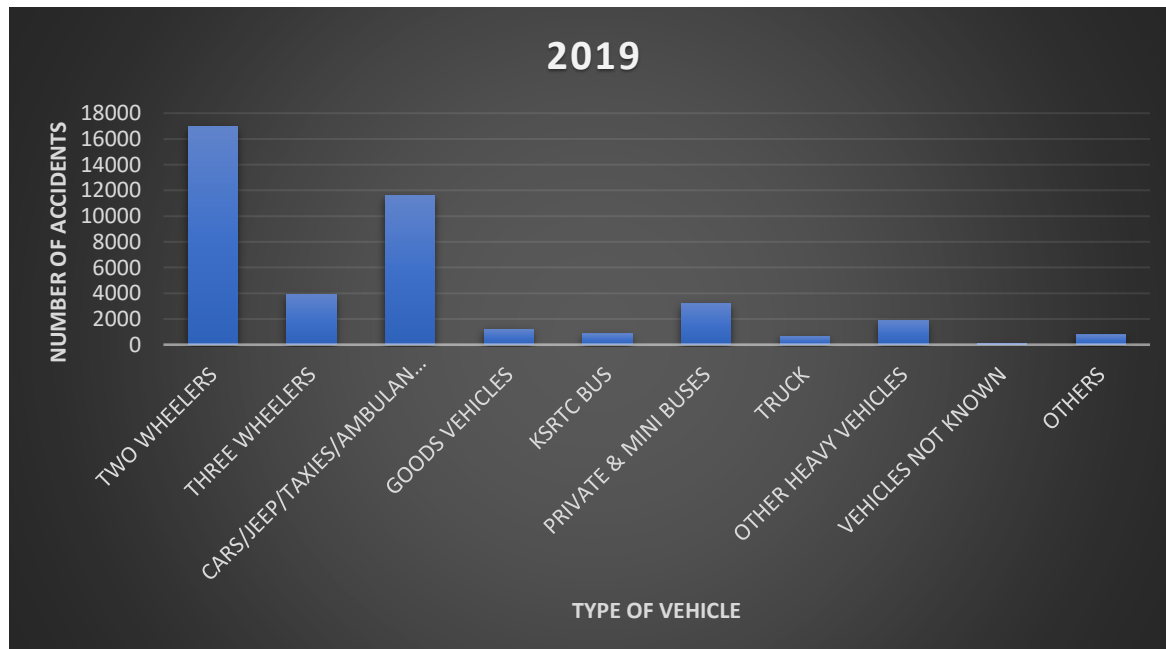
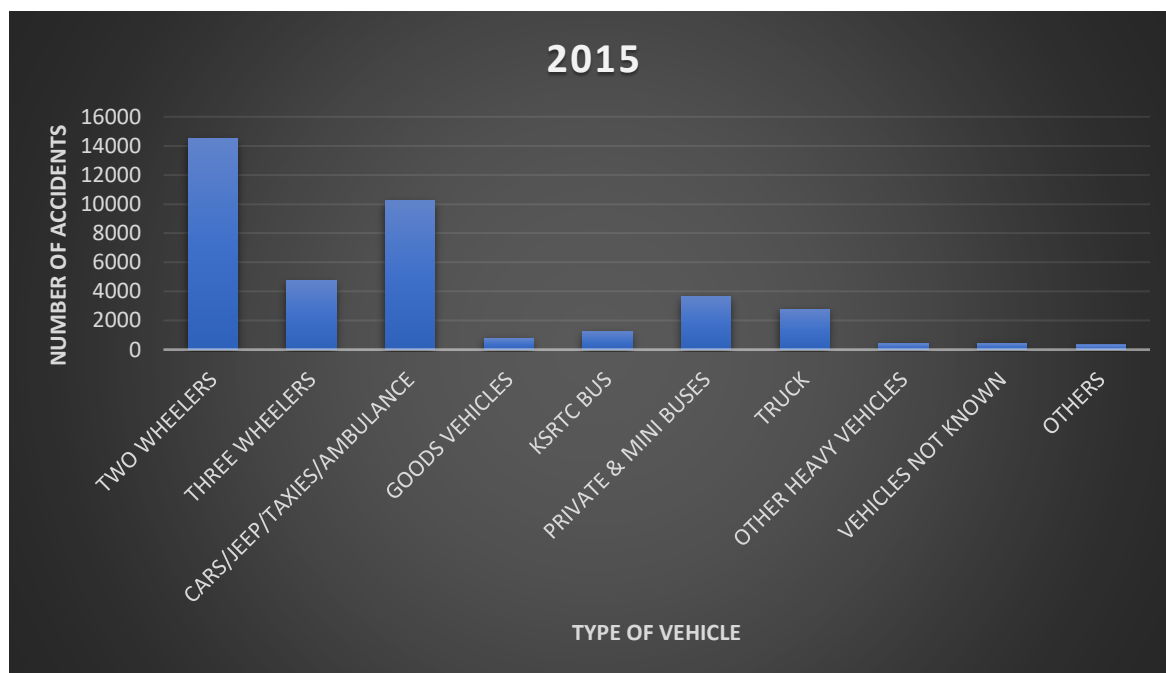
GRAPH 5 : ACCIDENTS THAT HAVE OCCURRED DUE TO DIFFERENT CAUSES FOR THE YEAR 2019.



The major causes that has been listed are fault of the driver, fault of the driver of other motor vehicle, fault of the cyclist, fault of the pedestrian, fault of passenger, bad roads, bad weather, drunken driving, mobile talking, poor light condition, technical defect of motor vehicle, stray animals, other causes and causes not known. These causes have been responsible for the accidents in this state. Out of which the fault of the driver of the motor vehicle is seen to be the highest.

According to the graph, the major cause of accidents is because of the fault of the driver of the motor vehicle and then followed by the fault of the driver of the other motor vehicle.

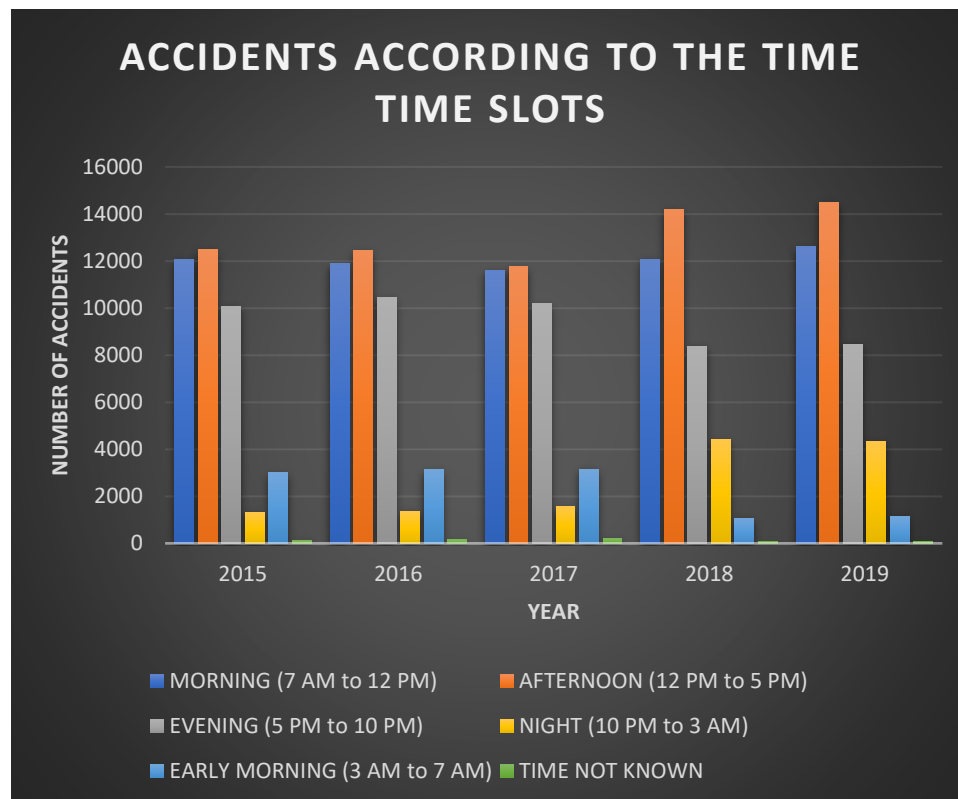
GRAPH 6 : ACCIDENTS ON DIFFERENT TYPE OF VEHICLES (2015 and 2019)



Two- Wheelers have been seen causing the maximum number of accidents and fatalities in the state. Most of the two wheelers are bike riders and around 50% of the total two wheelers that have caused maximum accidents is due to bikes. And most of them have died on the spot . Non usage of helmets for both the drivers as well as the pillion is utmost important as most of the accidents lead to direct injury to the head which is often serious and leads to death immediately.

In Comparison to the year 2015 and 2019, Both the graphs show that major vehicular accidents are because of two wheelers followed by cars, jeep, ambulance and taxis and then the three wheelers.

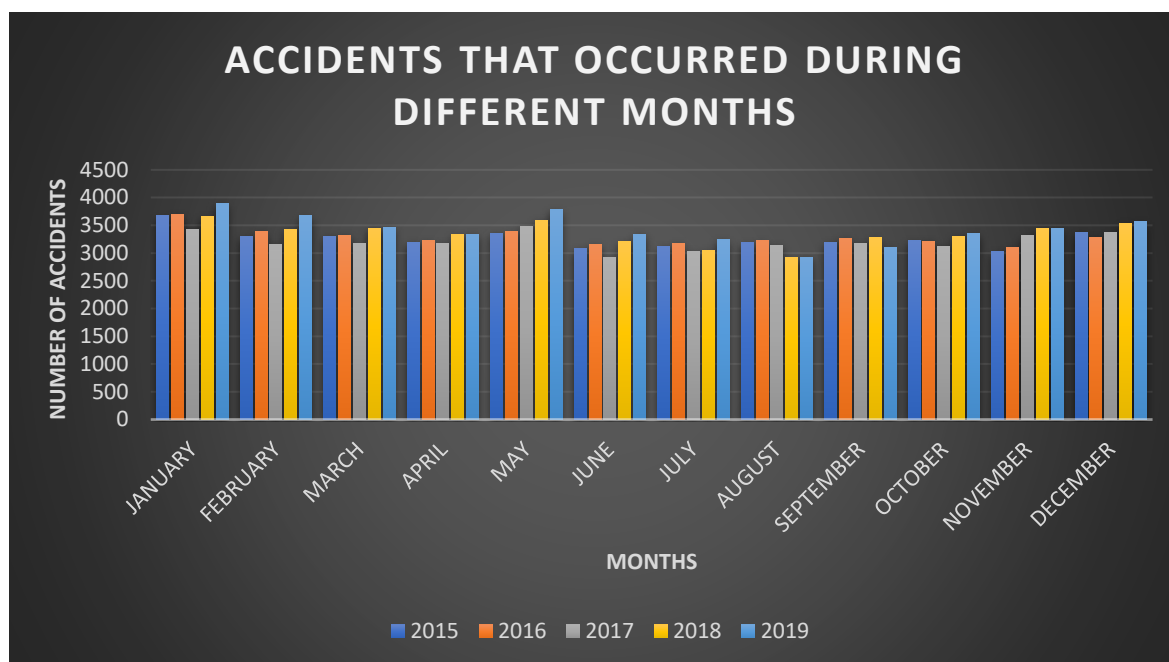
GRAPH 7 : ACCIDENTS THAT HAVE OCCURRED DURING THE VARIOUS TIME SLOTS



Accidents depend upon the vehicular density on the roads and it is clearly evident that the accidents are mostly in the rush hour of the day. During the five years starting from 2015 to 2019. It is seen that the accidents have occurred the least during the night in the years 2015 to 2017 but they have increased in the rest of the two years 2018 and 2019. The maximum has seen during the rush hours in all the years. The fatalities have also seen during this time.

From the above graph, its clearly evident that the highest number of accidents are in the time interval between 12 pm to 5 pm, which is actually not the rush hour, followed by the morning time (i.e, 7 am to 12 pm) which is matter of concern.

GRAPH 8 : ACCIDENTS DURING THE DIFFERENT MONTHS IN THE YEAR 2015 – 2019.



Accidents have occurred in almost all the months in all the years 2015 to 2019. Starting from January till December accidents have occurred in almost all the months.

According to the graph, accidents are more or less constant during all the months.

ACCIDENTS THAT HAVE OCCURRED IN THE URBAN AND RURAL REGIONS IN THE STATE.

URBAN

YEAR	ACCIDENTS
2018	13,312.00
2017	14,133.00
2016	14,521.00
2015	15,216.00

RURAL

YEAR	ACCIDENTS
2018	26,869.00
2017	24,337.00
2016	24,899.00
2015	23,798.00

Rural areas of this state has seen more accidents than the urban all because of the poor development of roads. Sometimes even poor lighting of the roads are also the causes of the accidents in the rural regions. Even poor health care in rural areas are also cause of fatalities and the time is longer from the time of accident occurred to the health access also result in more fatalities in that state.

From the above data, Accidents are more often occurring in the rural areas rather than Urban areas of the Kerala state.

DISCUSSION

This study analyses accidents in the state of Kerala. In 2018, “there were around 15,000 deaths due to road accidents in India. One of the most contributing factors could be increasing vehicular population. In the last decade road network across the country grew about one third of its original length. Vehicle registrations increased by almost three times. The majority of the accidents involved are two wheelers, that also dominate the Indian automobile industry in terms of sales and production. Over speeding was another significant contributor to road accidents in India. And then, driving under the influence of alcohol and substance abuse, hit and run cases, and general traffic violations resulted in almost 80 percent of the accidents being the driver’s fault. Citizens aged between 18 and 45 years were involved in about 70 percent of the road accidents.”

In Kerala, the accident per million population is the highest in India and the most number of accidents have been in rural areas of the state where facilities have not been proper with low knowledge of the people about traffic rules and how important it is to maintain lanes while driving as well as using helmets even if it is for a shorter distance. Improper roads have also been the causes of road accidents in the state with most accidents happening on the roads other than the National and State Highways. The fatalities and greivous injuries have also increased in the years from 2015 to 2019. The government has also taken measures to control road accidents such as safe Kerala project wherein 24x7 enforcement squads, an RTO grade officer will be appointed state nodal officer of the safe Kerala project under the supervision of the Joint Transport Commissioner. It is the duty of 24x7 squads to make sure that the accident victims receive medical attention within the ‘golden hour’- the immediate one hour that follows a road accident. Kerala aims to curb down the traffic accidents to 50% of the current level by 2020 and to maintain zero growth level further.

This study has not included the ages where accidents are maximum and which age group is more vulnerable and further studies can be taken up with in the same area and a deeper analysis can be done.

GENERAL OBSERVATIONS

The General Observations are :

1. Kerala has the second highest accidents per million population after Goa.
2. Most number of accidents have occurred on the other roads. Mostly in rural areas the roads are severely damaged and are not repaired on time . Since, the road accidents are maximum occurring in rural and other roads.
3. The most number of accidents have occurred during the time 12 pm to 5 pm during all the years.
4. The highest number of accidents have occurred among two- wheelers.
5. The main cause of accidents is because of the fault of the driver of the motor vehicle.
6. The number of accidents as well as deaths due to those accidents have only increased over the years seeing a drop in the year 2017.

9. CONCLUSION AND RECOMMENDATIONS

1. Road Management is a principle hotspot for monetary obligation. Reckless driving prompts to rush situation, loss of economic goods and accidents.
2. This study evaluated the total number of road accidents from 2015 to 2019 but still death rate has only rose as compared to these years. This portrays the significance of spurring the road management activities and affects to economic development. And further, it leads to loss of human life and damage to the environment and also collapse to service sector.
3. This study highlighted the other roads accidents are happening intensely as compared to National Highways and State Highways. The other rural areas are having poor roads and this in turn leads to road accidents. Therefore, the Government should take steps to reform the roads and to control road accidents in rural other roads.
4. The traffic safety management should confirm the directions of road safety developments in the future. So, effective concrete policies and measures should be taken and should make the traffic safety management perfect.
5. The traffic situation in this state is severe. The traffic safety management should carefully harmonize the relation between road, traffic flow, and the administrators, controlling the start of the traffic accident of the road, and digitalize the safety management of both the urban as well as the rural roads.
6. Shoulder widening can significantly reduce the head on type collision and running off road.

7. Provision of Median with flared openings and provision of pedestrian lane will not only ensure safety of the pedestrians as well as even reduce the severity of accidents. It will ensure long term solution to combat the accidents in Kerala.
8. Well-built service roads on either sides of highways and installation of road signs, markings keeping in mind the rural areas of Kerala and protective raised walking and crossing facility.
9. Providing additional depiction as well as advance warning signs with advisory speed through sharp horizontal curves.
10. A formal road safety audit process could recommend desirable modifications in highway designs and working aspects.
11. Proper training of heavy vehicles drivers by authorized centres.
12. Special facilities on improving accessibility to pre hospital and hospital trauma care for road accident victims should be set up as soon as possible.
13. Controlling speed and Controlling irrational behaviour of drivers are the most effective ways of reducing accidents in Kerala.

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PART B

ONLINE COURSE REPORT

1. NAME OF THE COURSE:

FUNDAMENTALS OF PROJECT PLANNING AND MANAGEMENT.

2. COURSE OFFERED BY:

University of Virginia.

3. DURATION OF THE COURSE:

15 HOURS

4. COURSE DESCRIPTION:

“Projects are all around us. Virtually every organization runs projects either formally or informally. We are engaged in some or the other projects at home and at work. Across settings, planning principles and execution methodologies can offer ways in which projects can be run more effectively and efficiently. Project management provides organizations as well as individuals with language and the frameworks for scoping projects, sequencing activities, utilizing resources, and minimizing risks.”

“This is an introductory course on key concepts of planning and executing projects and identify factors that lead to project success, and learn how to plan, analyze, and manage projects and will be able to consider the challenges of various types of projects.”

5. OBJECTIVES OF THE COURSE:

- Initiate, define and organize a project.
- Develop a project plan, including scoping, sequencing tasks, and determining a critical path.
- Assess, prioritize and manage project risk.
- How to execute projects and use the earned value approach for monitoring and controlling progress.

6. COURSE CONTENTS:

I. WELCOME TO THE WORLD OF PROJECTS

- What is a project?
- How do we define a project?
- Considering the organization and stakeholders.
- Project success and failure.
- Project life cycle.

II. THE INS AND OUTS OF PROJECT PLANNING

- Why plan?
- Detailed scoping.
- Identifying dependencies.
- Determine the completion date and critical path.
- How do we schedule?
- What if I don't like planning? Making changes.
- Reflecting on common mistakes.

III. IT'S A RISKY WORLD AND THEN THE UNEXPECTED HAPPENS

- What is risky about projects?
- Identifying and Assessing project risks.
- A more realistic timeline Part I
- A more realistic timeline Part II
- Cost risk analysis.
- Planning for Ambiguity.
- Lime juice (Supplemental case study).

IV. READY, SET, GO: PROJECT EXECUTION

- From plan to action.
- Earned value.
- Those who execute.
- Agile, Scrum, and Kanban.
- Tracking progress and updating project plan in Microsoft Project.

7. LEARNING METHODOLOGY USED IN THE COURSE:

- Lectures.

- Video.
- Cases.
- Reading material.
- Simulation on MS Project and MS Excel.

8. KEY LEARNINGS FROM THE COURSE:

- Three Objectives of a Project: Scope, Time and Budget.
- Setting up Objectives Priorities against Constrained, Optimize and Compromise and Scope, Time, Budget.
- Stakeholder's cycle (Cleland and King, 1988).
- Stakeholder's Power/ Interest Grid (Freeman, 1983).
- Why projects fail so often?
- Four bases for successful projects (Shenrhar and Dvir, 2007).
- Four stages of Project Life Cycle: INITIATE, PLAN, EXECUTE AND CLOSE.
- The Stage Gate Process (Cooper and EDGETT, 2011).
- Detailed scoping is very important which is often neglected. It is visualizing the project, visually breaking down the project, and looking what activities are. TOOL USED: WORK BREAKDOWN STRUCTURE (WBS).
- Identifying Dependencies: There are three types of tools used.
- Design matrix, Table format, Network Diagram.
- Determining the durations for each activities and problems of activity durations: Parkinson's Law, Student Syndrome and Overconfidence.
- Early Start (ES) = Late Start (LS) is CRITICAL PATH.
- Tool used for Dependencies and Milestones: Gantt Chart, Ms Project, other software tools.
- Project Crashing: Project durations can be reduced by shortening critical activities.
- Sources of Uncertainty (Foreseeable Uncertainties, Complexity and unforeseeable Uncertainties).
- Risk Management Plans: 4 steps – Identification, Assessment, Planning and Response, Monitoring and Controlling.
- TORNADO CHARTS: Visual representation of the variability in the overall project duration. It is a triangular distribution.
- Earned Value: Earned Value Analysis: Two Performance Indices - Schedule Performance Index (SPI) = $\text{Earned value/Planned}$ and Cost Performance Perspective (CPI) = $\text{Earned Value/Actual}$.
- Agile (software development firms) and Agile variations like Scrum Sprints and Kanban.

