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Authorization of Heavy Load Trucks in Tollgate

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Abstract
Nowadays many road accidents were done, there are many people losing their lives and their families. Many Trucks drivers take over loaded due to high money and less fuel and less time. So they take lots of profits. So accidents occurs due to over weight of trucks. This project is done based on to reduce the road accidents. So, many heavy vehicle drivers were under gone overloading, if once the heavy vehicle there is out of control in lorry so accidents may occur. So we want to reduce the accident and also control the overloaded things. For that we want to install load limits city entrance . So we can install weigh bridge in city entrance, once the truck with over load is reached the city, weigh bridge indicates the over loaded and its give intimation to Higher Authority of cities, so they don't allow the truck into the city. For this we use IOT in this project and we use the node MCU ESP 32 board for coding purpose this will get an load details from the loadcell and that low signal convert into high signal by HX711 amplifier then it will pass the information to the to the node MCU then it will work according the coding like finding the overloaded and give alarm sound with mail indication

Keywords: Tollgate , IOT Load Limit, Heavy Load Vehicles, Authorization of trucks, Mail Indication.

Chapter 1
INTRODUCTION

1. INTRODUCTION TO OVER LOADED VEHICLE

Overloaded trucks phenomena generally common in developing countries where the traffic control is poor. In Indonesia, the percentage of overloaded trucks can reach more than 60% in the total number of trucks and may be one of the substantial factors that reduce the service life of the road pavements.

Truck weight-limit regulations have significant influence on truck operating weights. These regulations directly influence loads applied to highway facilities, such as bridges and pavements. "Truck weight" herein collectively refers to a vehicle's gross weight, axle weights, and axle configuration. Truck load spectra as a result of truck weight limits are important to bridge engineering in many respects, such as that of determining requirements for evaluation and design of bridges for both strength and fatigue. Further, the analysis of the results in the lorry type section shows that the least likely occurrence of overloading is among pickup truck drivers such that this likelihood within this group was one-third among Nissan and small truck drivers. Also, the results of modeling the type of route showed that the highest likelihood of overloading is for internal loads (origin and destination inside Tehran), and the least probability of overloading is for suburban trips (origin and destination outside of Tehran). Considering the type of load

packing as a variable, the results of binary regression model analysis showed that the most probability of overloading occurs for packed (boxed) loads. Finally, it was concluded that drivers are 18 times more likely to commit overloading on weekends than on weekdays.In some other studies, the effect of committing driving offenses on the occurrence of commercial vehicle crashes has been considered. One of the most important offenses identified in past studies as a major contributing factor to the occurrence of accidents is speeding. So we want to stop this over loading of heavy vehicles for avoiding accident

Chapter 2

2. Literature Survey

2.1 ACCIDENT DUE TO OVER LOAD HEAVY VEHICLE

Overloading. Overloaded vehicles accounted for **10% of total accidents, 12% of fatalities and 27% of injuries**, as per the 2018 Ministry of Road, Transport and Highways report. However, the number of accidents and deaths caused by overloading registered a decline in 2018 compared to 2017. Overloaded trucks cause accidents for multiple reasons: tyre burst, worn brakes, road collapse, loss of balance, and speed while negotiating inclines, as per the report. “Overloading impacts the weightage of the vehicle and also impacts the centre of gravity, which in turn, impacts the physical movement of the vehicle. Similarly, partially loaded tanker trucks carrying liquids that slosh back and forth upset the natural centre of gravity of the truck. “Overloading impedes the ability of the truck’s ability to brake,” said Ubhaykar. “Overloading is one issue where everyone makes money – the road transport office, the consignment office and the truck owners. “So to curb overloading, you need to hold all three parties accountable along with the driver. Moreover, the penalty that is imposed has to be more than the profit made by overloading. Otherwise, this will not stop.” First, an overloaded truck is **less able to respond to emergency conditions**. This factor alone can cause an accident. Second, too much weight drastically reduces braking ability and means a truck takes longer to stop. In many cases, drivers misjudge their stopping distance and end up being in or causing accidents

Figure 2 – Accident due to over loaded vehicle

2.2 THE PRICE THEY PAY

The tendency to speed and overwork is linked to incentives, truckers told *IndiaSpend*. “We have to drive continuously because we get an incentive to reach on time,” said Ejaz Ahmed, a driver from Patna. “For example a courier delivery will want us to deliver in 65 hours. If the truck reaches on time you get a bonus of Rs 1,000-Rs 2,000. But if you are more than two hours late, they cut Rs 200 per hour of delay.”

In April 2018, Castrol India conducted a month-long survey involving 1,000 truck drivers from Delhi, Chennai, Mumbai and Kolkata. About half – 48% – of those interviewed reported doing an average of over 12 trips a month, and more than half of these lasted over 12 hours. About 63% of drivers said they drive for more than eight hours a day, according to the survey. While 56% of drivers took one or two short breaks, 78% one or two long breaks. About 5% of truck drivers carried on without any break and 6% without long breaks, the survey found.

Figure 2.2 The price they pay

Drivers keep driving for long stretches of time which causes fatigue that impacts their capability to control the steering," said Verma of IISc. "This also happens due to lack of amenities for truck drivers. We don't have the concept of a terminal where there are facilities for them to rest. This aggravates their fatigue."
"We have designated places, mostly dhabas, where we take a break," said Ahmed. "You cannot just stop the truck at the side of the road." About a quarter of the drivers – 23% – reported sleep deprivation. Most drivers – 49% – coped with long hours by listening to music , while 14% opted for a regular walks or jogs

2.3 CHASSIS CRACK DUE TO OVER LOAD

Every vehicle has a specific limit to which it can carry passengers or cargo. In most cases, people overlook this and end up overloading their car with passengers and cargo. This may seem an easy answer to your momentary problem of carrying the load, but in long term scenario, it can dent your pocket as your vehicle will wear and tear overtime. Your wheels may bulge out and heat up increasing the risk of a blowout when you overload your car.

Figure 2.3 – CHASSIS CRACK DUE TO OVER LOAD

The safety mechanism that your vehicle has may not function properly under the stress of weight. This means you are putting yourself as well as others on the road under the risk of an accident. Under the overloading condition, the suspension system comes under heavy stress and is rendered less effective over a period of time. It will also be unable to properly handle high speed. Overloading diminishes the effectiveness of your brakes. The most affected part of overloading is felt when it seriously compromises your ability to steer the car in straight line as well as on curves.Any sudden steering could result in you losing the control of your vehicle.Overloading seriously jeopardises your vehicle's fuel economy, besides hampering the life of your engine. We are sure with petrol prices surging you would not like to drive a car with a bad mileage.Given the conditions of Indian roads and the badly designed speed breakers, the under body will get hit easily while the vehicle is overloaded with cargo or passengers. For cars that already have "low ground clearance" overloading can be a nightmare. Overloading increases the chances of wear and tear of the tyre which results in early degradation of them. That eventually results in economic loss for you In certain cases, you might be denied "insurance claims" if you are driving a vehicle with too much weight on it and meets an accident that is a result of overloading.

2.4 SAFETY MANAGEMENT OF OVER LOAD

However, overloaded vehicles have been causing frequent traffic accidents. Thus, to alleviate or resolve the corresponding problems associated with highway engineering safety and the market economy, an improved technique for overload management is urgently required. Thus, transport operators hope to expand their profits by overloading their vehicles; however, overloading leads to frequent traffic accidents. According to the Highway Bureau of the Chinese Ministry of Transport, more than 80% of truck road traffic accidents are caused by overloaded transport. Overloading continuously causes road damage [1] and traffic accidents [2], disrupts the normal economic order of the logistics market, and affects the healthy development of the highway transportation economy [3]. Thus, to alleviate or resolve the problems associated with highway engineering safety and market economy, an improved technique for overload management is urgently required. This study makes a significant contribution in assisting highway management departments to reasonably allocate resources, optimize information utilization, improve the transportation management methods and management efficiency, and alleviate highway engineering safety problems. Furthermore, this study aids in economic and environmental development and provides a practical

reference for future work on overload management. Rapid advancements in the field of science and technology have enabled the constant updation of software and hardware for overload control; consequently, toll collection centers at all levels in China are able to store increasing amounts of detailed historical data. These massive amounts of data contain abundant valuable information. Conventional research methods for analyzing the characteristics of overloading in China mainly include literature review, statistical prediction model, and game analysis model. For example, Li and Wang analyzed the characteristics of freeway overload vehicles via cluster analysis. Past research has revealed that the overload characteristics [4, 9] should first be clarified to further study the problem of overload management. Machine learning, a typical data mining technique, uses the "black box" principle to build a machine learning model to address complex and diverse data [10]. In the field of traffic management, machine learning is currently applied to feature mining, prediction, response, and timely disposal of traffic events. Therefore, machine learning can be used for data mining, studying the characteristics of overloading, and forecasting overloading patterns to thoroughly exploit the massive amounts of historical data in the existing domestic highway toll collection centers at all levels; this complies with the current demand for off-site law enforcement and technology. This could significantly improve highway transportation management and alleviate highway engineering safety problems. Most of the current research is based on data modeling for data mining;

2.5 IOT IMPlEMENTATION

The Internet of things (IoT) is the inter-networking of physical devices, vehicles (also referred to as "connected devices" and "smart devices"), buildings, and other items embedded with electronics, software, sensors, actuators, and network connectivity which enable these objects to collect and exchange data.

The **Internet of things** (**IoT**) describes physical objects (or groups of such objects) with sensors, processing ability, software and other technologies that connect and exchange data with other devices and systems over the Internet or other communications networks.[1][2][3][4][5] Internet of things has been considered a misnomer because devices do not need to be connected to the public internet, they only need to be connected to a network[6] and be individually addressable.[7][8]

The field has evolved due to the convergence of multiple technologies, including ubiquitous computing, commodity sensors, increasingly powerful embedded systems, as well as machine learning.[9] Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation), independently and collectively enable the Internet of things.[10] In the consumer market, IoT technology is most synonymous with products pertaining to the concept of the "smart home", including devices and appliances (such as lighting fixtures, thermostats, home security systems, cameras, and other home appliances) that support one or more common ecosystems, and can be controlled via devices associated with that ecosystem, such as smartphones and smart speakers. IoT is also used in healthcare systems.[11]

There are a number of concerns about the risks in the growth of IoT technologies and products, especially in the areas of privacy and security, and consequently, industry and governmental moves to address these concerns have begun, including the development of international and local standards, guidelines, and regulatory frameworks..

The main concept of a network of smart devices was discussed as early as 1982, with a modified Coca-Cola vending machine at Carnegie Mellon University becoming the first ARPANET-connected appliance,[13] able to report its inventory and whether newly loaded drinks were cold or not.[14] Mark Weiser's 1991 paper on ubiquitous computing, "The Computer of the 21st Century", as well as academic venues

such as UbiComp and PerCom produced the contemporary vision of the IOT.[15][16] In 1994, Reza Raji described the concept in *IEEE Spectrum* as "[moving] small packets of data to a large set of nodes, so as to integrate and automate everything from home appliances to entire factories".[17] Between 1993 and 1997, several companies proposed solutions like Microsoft's at Work or Novell's NEST. The field gained momentum when Bill Joy envisioned device-to-device communication as a part of his "Six Webs" framework, presented at the World Economic Forum at Davos in 1999.[18]

figure 2.3 – IOT Implementation

The concept of the "Internet of things" and the term itself, first appeared in a speech by Peter T. Lewis, to the Congressional Black Caucus Foundation 15th Annual Legislative Weekend in Washington, D.C, published in September 1985.[19] According to Lewis, "The Internet of Things, or IoT, is the integration of people, processes and technology with connectable devices and sensors to enable remote monitoring, status, manipulation and evaluation of trends of such devices."

The term "Internet of things" was coined independently by Kevin Ashton of Procter & Gamble, later of MIT's Auto-ID Center, in 1999,[20] though he prefers the phrase "Internet *for* things".[21] At that point, he viewed radio-frequency identification (RFID) as essential to the Internet of things,[22] which would allow computers to manage all individual things.[23][24][25] The main theme of the Internet of things is to embed short-range mobile transceivers in various gadgets and daily necessities to enable new forms of communication between people and things, and between things themselves.[26]

In 2004 Cornelius "Pete" Peterson, CEO of NetSilicon, predicted that, "The next era of information technology will be dominated by [IoT] devices, and networked devices will ultimately gain in popularity and significance to the extent that they will far exceed the number of networked computers and workstations." Peterson believed that medical devices and industrial controls would become dominant applications of the technology.[27]Information on permitted gross weights of vehicles operating in the UK is contained in The Road Vehicles (Authorised Weight) Regulations 1998, Road Vehicles (Authorised Weight) (amendment) Regulations 2000 and Construction and Use Regulations 1986. These include the weights for different vehicle types, combinations and individual axles. Copies of regulations can be obtained from Her Majesty's Stationary Offices (HMSO) by calling 0870 600 5522.

• Distribute your load appropriately to avoid overloading axles. After any drop-offs, re-check the distribution of the remaining load, as load shifting could cause an axle overload or cause the load to become insecure, which also constitutes an offence (please refer to the Fleet Safety Forum's guidance sheet on load safety);

• Check the Gross Vehicle Weight be fore setting out,either using your own weighbridge, or one nearby. Your drivers are allowed to drive to the nearest available weighbridge to check their load and then go to a place where they can take off some of the load if the vehicle is overloaded. See the 'Information on weighbridges' section above for further information, and
guidance on finding your nearest public weighbridge;
Do not automatically trust declared weights,invoicesor delivery notes given to you by customers. Remember that you and your driver hold the responsibility for not overloading, not the customer.

Figure 2.4 overloading

2.6 SENSOR TO SENSE THE WEIGHT

The vehicle will be less stable, difficult to steer and take longer to stop. Vehicles react differently when the maximum weights which they are designed to carry are exceeded. Overloaded vehicles can cause the tyres to overheat and wear rapidly which increases the chance of premature, dangerous and expensive failure or blow-outs.

The driver's control and operating space in the overloaded vehicle are diminished, escalating the chances of an accident. The overloaded vehicle cannot accelerate as normal – making it difficult to overtake. At night, the headlights of an overloaded vehicle will tilt up, blinding oncoming drivers to possible debris or obstructions on the roadway. Brakes have to work harder due to 'the riding of brakes' and because the vehicle is heavier due to overloading. Brakes overheat and lose their effectiveness to stop the car.

With overloading, seat belts are often not used as the aim is to pack in as many persons as possible into the vehicle. The whole suspension system comes under stress and, over time, the weakest point can give way. By overloading your vehicle you will incur higher maintenance costs to the vehicle – tyres, brakes, shock absorbers and higher fuel consumption. Insurance cover on overloaded vehicles may be void as overloading is illegal.
he number of overloaded vehicles being stopped and checked is on the increase. If a fixed penalty notice is issued, the examiner will also prohibit the driving of the vehicle on a road. Not only does this take your vehicles off the road, but those found to be overloaded must reduce their load before being allowed to continue – a move which would require another vehicle to be dispatched to share the load

During August 2013, The Department for Transport announced that fixed penalty notices for offences against roadworthiness, loading and drivers' hours rules will result in higher penalties at the roadside. For overloading in particular, the fines are as follows:

he risks of overloading on gross vehicle weight are well-known, while the importance of axle weights is often overlooked. In some instances the gross vehicle weight is not exceeded, but the load may still exceed the maximum permissible axle weight. Uneven loading of a vehicle makes it far harder to handle, putting undue pressure on tyres, steering and braking.

Figure 2.5 – Overloading weight scale

2.7 NODE MCU Working – ESP 32

Node MCU is an opensource firmware for which open source prototyping board designs are available. The name "Node MCU" combines "node" and "MCU" (micro-controller unit).[8] Strictly speaking, the term "Node MCU" refers to the firmware rather than the associated development kits.[*citation needed*]
Both the firmware and prototyping board designs are open source.[8]
The firmware uses the Lua scripting language. The firmware is based on the eLua project, and built on the Espress if Non-OS SDK for ESP8266. It uses many open source projects, such as lua - cjson[9] and SPIFFS.[10] Due to resource constraints, users need to select the modules relevant for their project and build a firmware tailored to their needs. Support for the 32-bit ESP32 has also been implemented.
The prototyping hardware typically used is a circuit board functioning as a dual in-line package (DIP) which integrates a USB controller with a smaller surface-mounted board containing the MCU and antenna. The choice of the DIP format allows for easy prototyping on breadboards. The design was initially based on the ESP-12 module of the ESP8266, which is a Wi-Fi SoC integrated with a Ten silica Extensa LX106 core, widely used in IoT applications (see related projects).A strategy map that will assist planners in deciding on appropriate locations for additional weighbridges. A database containing information on weighbridge operations and monitoring, as well as monthly reports that will be accessible via a web-site.This database will also contain information on habitual offenders. Practical guidelines on how to deal with these offenders are being developed. Portable scales are being evaluated, determining their accuracy and acceptability for prosecution purposes. Legislation to extend the responsibility of overloading to the consigner and the consignee is being drafted. New vehicle testing stations are equipped with state-of-the-art testing equipment such as break rollers to test the quality of a vehicle's breaks, a scuff gauge to measure the wheel alignment and many others. This will ensure that when a vehicle is certified as being roadworthy it will definitely meet the prescribed standards.The National Roads Agency has invested in several

weighbridges located on the N3 between Johannesburg and Durban, on the N4 between Witbank and Komatipoort, and on the N1 at Mantsole, located between Pretoria and Warmbaths.

On the N3 and N4 the National Roads Agency has entered into performance-based agreements with the private sector for the operation and administration of the weighbridges, and service agreements with the Provincial Traffic Authorities in order to ensure a dedicated attack on overloading. Over a period of five years, this investment will exceed R500 million. This strategy includes the monitoring and weighing of vehicles attempting to bypass the weighbridges by using alternative routes.

2.8 Recommendations & Advice

Know the weight of your vehicles – both the permitted axle weight and the gross vehicle weight. The gross vehicle weight is the maximum permitted weight of the vehicle (plus any load it is carrying). The permitted weights can be found on 'plates' which are fitted to all buses and coaches. These are normally fixed to the chassis, often in the engine bay. It may alternatively be fixed to the bodywork on the inside of the vehicle, usually by the entrance or emergency door. On minibuses, the weight can be found in the manufacturer's handbook. The driver must take into account the weight of the passengers as well as possible packages, suitcases etc. Distribute your load appropriately to avoid overloading axles. Companies need to have a "safety culture" in place which ensures that drivers understand weight legislation and immediately report any concerns that a vehicle is illegally overloaded. Vehicle weights (before and after loading) should be checked using a weighbridge. Companies that do not have their own in-house weighbridge can use one belonging to a client or a company nearby, or a public weighbridge. Use a weighbridge as close to your depot as possible to check every load your vehicles carry. It is recommended that companies with a fleet of articulated trucks or a very high volume of traffic should install a fixed axle weighbridge. These give rapid axle and total weight checks on all types of commercial vehicle. Companies that run fleets of two-axle rigid chassis vehicles could consider purchasing one of the several types of portable axle weighing systems.

Heavy goods vehicles (trucks) and buses have an important role to play in the economic wellbeing of any country.The greater mass of heavy vehicles means that consequences of any crashes they are involved in tend to be severe. As they interact with other road users (especially vulnerable ones such as pedestrians, cyclists and motorcyclists) there can be serious safety consequences, especially without adequate facilities and controls.

Truck occupants are also at risk themselves, particularly in higher speed environments. Trucks may run off the road or collide with other vehicles, with serious consequences to occupants.Data also exists in some countries on single heavy vehicle crashes that result in multiple fatalities of up to and over 30 deaths. This is from crashes involving public transport heavy vehicles.There are also many road related factors that influence the risk of crashes. It is often easier and cheaper to improve safety through a change to the road environment than it is to change driver behaviour, so improvements in the road system are an important means of improving road safety.Road related contributing factors to crashes includeHigh speedsUncontrolled movements and turns, especially at intersections and access pointsLack of separation of vehicles or road users of different size (e.g. lack of facilities for pedestrians and cyclists)Lack of separation for vehicles travelling in different directions (e.g. lack of median barriers)Tight radius turnsLack of advanced warning of hazardsInadequate information to enable road users to negotiate the roadway safelyPresence of hazards, particularly at the roadside (e.g. utility poles and trees)Poor road surface

2.9 Heavy vehicle safety

Around 18% of all road crash deaths – about 210 in 20191 – involve a heavy vehicle. While heavy vehicle crashes are lower relative to other road users, these crashes are more likely to result in a death or serious injury and contribute to disproportionate harm to other road users.While fatal crashes involving articulated trucks are slowly declining, fatalities in crashes involving heavy rigid trucks and buses have not reduced in the past decade.Approximately 500 heavy truck occupants are hospitalised from road crashes each year. Of these, approximately 30 per cent are categorised with High-threat-to-life injuries. 2The mass of a heavy vehicle contributes a considerable amount of kinetic energy to a crash, with the other vehicle or vulnerable road user in the collision enduring the worst of the impact.Annual counts of fatalities in crashes involving heavy vehicles, 2010-2019. he greater mass of heavy vehicles means that consequences of any crashes they are involved in tend to be severe. As they interact with other road users (especially vulnerable ones such as pedestrians, cyclists and motorcyclists) there can be serious safety consequences, especially without adequate facilities and controls.Truck occupants are also at risk themselves, particularly in higher speed environments. Trucks may run off the road or collide with other vehicles, with serious consequences to occupants.Data also exists in some countries on single heavy vehicle crashes that result in multiple fatalities of up to and over 30 deaths.

This is from crashes involving public transport heavy vehicles.Driver errors resulting from speed, drink driving and fatigue all contribute to truck crashes. Vehicle defects may also play a significant role in truck crashes. Recently manufacturers have made advances in the design of heavy vehicles and in some countries regulation of their use is well established.In the UK, only heavy goods vehicles that with safety equipment fitted are allowed on London's roads and are also given a safety rating between zero and five stars, measured by how much a driver can see directly through their cab windows.There are also many road related factors that influence the risk of crashes. It is often easier and cheaper to improve safety through a change to the road environment than it is to change driver behaviour, so improvements in the road system are an important means of improving road safety.

2.10 Crash avoidance and harm minimising technologies

- Side (to protect pedestrians and cyclists from going under heavy vehicles) and rear (to reduce the intrusion into a car's passenger compartment) underrun protection systems
- Autonomous Emergency Braking
- Fatigue Monitoring systems
- Lane Departure Warning systems
- Enhanced vehicle visibility markings
- Enhanced driver's field of view through the introduction of blind spot information system
- Anti-lock braking/Electronic braking systems
- Electronic Stability and anti-rollover
- Cabin rollover protection

Regulatory improvements have been made to heavy vehicle braking and stability, although adoption into the heavy vehicle fleet can take a long time largely due to the significant cost of heavy vehicle assets.
The Performance-Based Standards (PBS) Scheme provides the heavy vehicle industry with the potential to achieve higher productivity and safety through innovative and optimised vehicle design. PBS vehicles

are designed to perform their tasks as productively, safely and sustainably as possible, and to operate on networks that are appropriate for their level of performance.

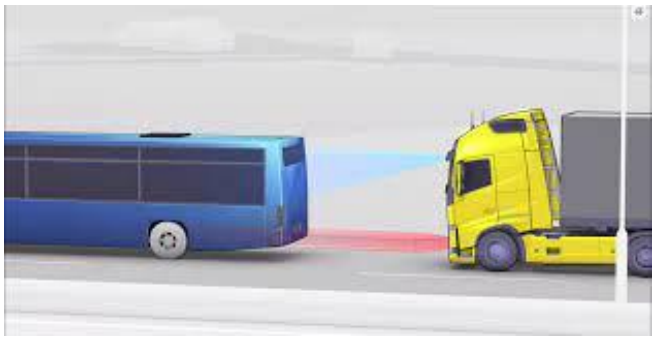

Figure 2.6 – Crash Avoidance

2.11 Heavy vehicle regulation

The creation of the Heavy Vehicle National Law (HVNL) and the establishment of the National Heavy Vehicle Regulator in 2013 saw an increased focus on safety education on sharing the road with heavy vehicles, enforcement of heavy vehicle standards and safety-related campaigns, including chain of responsibility obligations to improve safety in transporting goods along the supply chain.
The National Heavy Vehicle Accreditation Scheme provides a formal process for recognising operators who have robust safety and other management systems in place.

The Industry Master Code represents an industry-led risk-based safety and compliance framework and provides a set of national standards and procedures developed to assist parties in the chain of responsibility to identify and mitigate risks to meet their obligations under the HVNL. In Western Australia Heavy Vehicle Accreditation is mandatory for anyone requiring a permit or order to perform any transport task within Western Australia, including interstate operators.
Heavy vehicle safety is a key consideration of the HVNL Review currently being conducted by the National Transport Commission, with policy options from the review expected to be considered by Australian transport ministers in 2021.

While Heavy Goods Vehicles (HGV) and buses account for just a small proportion of the vehicle fleet or the total vehicle kms travelled in the EU, they are over-involved in severe road accidents, creating a significant need to better understand the characteristics specific to this vehicle group.In 2013, more than 4,500 persons were killed in road traffic accidents involving HGVs or bus/coach in EU, constituting almost 18% of all road accident fatalities for that year. The objective of this research is the analysis of basic road safety parameters related to HGV and buses/coaches in European countries, by the use of the EU CARE database with disaggregate data on road accidents, as well as of other international data sources. Time-series data on road accidents involving HGVs and buses/coaches for 27 EU countries over a period of 10 years are correlated with basic safety parameters, such as area type, season of the year, casualty age and gender, as well as the day of the week.

Additional insight into accident causation is offered through analysis of a set of in-depth accident data from the EC SafetyNet project Accident Causation System. The results of the analysis allow for an overall

assessment of the HGV and buses/coaches safety level in Europe in comparison to other modes of transport, thus providing useful support to decision makers working for the improvement of safety in the European road network.

2.12 Heavy trucks—2019

- A total of 188 people were killed in crashes involving heavy trucks. This is an increase of 19.7 per cent compared with the total in 2018. Over ten years, the trend was an average reduction of 2.7 per cent per year.

Figure 2.7 Heavy Trucks

- Light vehicle occupants account for approximately 47 per cent of the total fatalities involving heavy trucks. Heavy truck occupants account for about 29 per cent.
- The latest hospitalisation data (2018) shows that approximately 510 heavy truck occupants are hospitalised from road crashes each year. High threat to life injuries comprises around 34 per cent of the total.

2.13 Development of Heavy Road Vehicles

As mentioned earlier, the monocoque construction of the modern car is intrinsically safer than a vehicle with a rigid chassis. This is due, at least in part, to the incorporation of a which collapses in a collision and absorbs some of the energy of impact without transferring it directly to the vehicle occupants.

Seat belts, to restrain vehicle occupants from violent movement during a crash, were first introduced by the Nash Motors Company in the USA in 1950 and soon taken up by other car manufacturers. Initially, these safety belts were confined to the front seats and were simply lap belts, as are used in aircraft and some buses, but their limitations were soon realized and full shoulder harnesses, with three-point fixing, were adopted. Today, most cars have shoulder-type seat belts for all occupants. Modern belts are retractable and cleverly designed so that they may be reeled out if pulled gently, thus allowing some freedom of movement to the seat occupant, but they are instantly locked in position if jerked suddenly, as in a collision. Seat belts, together with laminated-glass windscreens, are known to have saved thousands of lives and in many countries the wearing of belts is now compulsory. The world's first legislation was put in place in 1970 in the state of Victoria, Australia, whereby the wearing of a seat belt became mandatory for drivers and front-seat passengers.

Other safety features to be introduced in the past few decades include recessed steering wheels, reinforced roofs, and roll bars for convertibles that have no rigid roof. Head restraints fitted to all seats are designed to limit whiplash injuries to the neck in rear-end collisions. An important safety feature on some cars is the provision of rear doors that can be arranged to open freely from the outside while remaining locked on the inside. This prevents child passengers from opening the doors when the car is moving. Nowadays, virtually all side doors are hinged at the front, so that they tend to stay closed when the car is in forward motion.

The inflatable airbag was first employed in the 1980s to protect the driver from being impaled on the steering column in a front-end collision. The bag is neatly stowed in the centre of the steering wheel. In the event of a sudden deceleration, as in a crash, the airbag inflates violently, in a fraction of a second, in front of the driver's chest and face, and thereby should reduce the risk of serious injury. Later, a second unit was installed in the fascia to prevent the front-seat passenger hitting his/her head against the wind-screen. Subsequently, further airbags have been provided in the sides of the front seats to provide protection during a side-impact collision. In some cars, a similar facility has now been included for the benefit of rear-seat passengers. The latest innovations are curtain airbags for side-impacts, deployed from the roof, and even airbags incorporated in the seatbelts. Airbags are only intended to inflate in moderate-

to-severe crashes and thus they supplement seatbelts, which provide basic protection in lesser collisions.

The mode of operation of airbags is of interest. A small accelerometer records the initiation of the collision. The instrument contains a mechanical component that moves to change the capacitive element of an electronic circuit and this perturbation is detected by the electronics on an integrated chip. An electrical current is immediately sent to a pyrotechnic device that, in turn, actuates the airbag. The device rapidly heats a chemical compound that decomposes explosively with liberation of nitrogen gas to inflate the bag. The overall time for this operation is 60–80 ms from the first moment of vehicle contact.

Recently, the emphasis in vehicle safety has moved from mitigating the consequences of an accident to preventing the accident from happening at all. Developments in electronic braking control, tyres and in improved lighting (*v.s.*) all contribute to this goal.

2.14 Preventing overloading

Overloading a vehicle, whether a goods vehicle, Passenger Service Vehicle (PSV) or car, is illegal. Preventing your vehicle(s) being overloaded isn't difficult and procedures should be put in place as a policy of best practice.

Companies need to have a "safety culture" in place which ensures that drivers understand weight legislation and immediately report any concerns that a vehicle is illegally overloaded to their manager. Their manager should investigate all concerns immediately to prevent overloading.

Putting a policy of best practice in place may seem an obvious solution, but it isn't always undertaken. It is all very well considering that your drivers and warehouse staff should know what is safe to load, but for the majority of general hauliers, their drivers will be loading from manufacturers or warehouse distributors etc.

Problems can occur when loading at customers premises where (through human error) the weight of the consignment note is incorrect. Equally so, it may be the case that a client (or agent) merely wants the whole consignment to be loaded and doesn't consider the weight implications that may follow.
Whatever the case, a policy of vigilance must be foremost at all times.
It is important to remember that the GVW is the weight of the vehicle plus overall load; taking into account weight of goods, driver, passengers and fuel, for example. Treat weight declarations on invoices and delivery notes with some caution, they may be "guesstimates" only. The only way to ensure that the vehicle's maximum permissible weights are not exceeded is to weigh it – either using a weighbridge or an axle weigher.
Portable, static axle weighers provide a solution for spot checking, while dynamic fixed or portable solutions can weigh in motion, speeding up the process and providing a solution for those with larger and mixed fleets.

2.15 Vehicles and Weight Checks

DVSA employees, trading standards officers, and police officers carry out random checks at the roadside to enforce overloading regulations. It should be noted that these are carried out regularly, especially by the DVSA, who do so at all checkpoints.
It should also be noted that there are WIMs (weigh in motion systems) strategically in place throughout the UK road network.
The fines for overloading are high In most cases of serious overloading offences, these would be dealt with in a magistrate's court for both driver and operator and in the case of the operator, the operator would likely be summoned to a public inquiry (PI).

Overloading vehicles significantly increases fuel consumption. Tyres are more prone to wear, steering becomes more difficult to control and vehicles take longer to react to braking. This can dramatically affect vehicle handling, increase daily wear and tear and increase the likelihood of a costly – and potentially fatal - accident.
"Now, we're on a par with the international freight carrying norms for transport vehicles. It will also bring down overloading," a senior government official said. "The new norms will be applicable to the vehicles that would be manufactured after the statutory order comes into effect. Heavy vehicle manufacturers will be given time to meet the standards of the new norms."

The gross vehicle weight of a **two-axle truck** (two wheels in the front axle and four wheels in the rear) has been increased to 18.5 tonne from the existing 16.2 tonnes, increasing the load carrying capacity by just over 20%. Similarly, the gross vehicle weight for a three-axle truck has been increased to 28.5 tonne from 25 tonne: For a five-axle truck, the vehicle weight has been increased from 37 tonne to 43.5 tonne, increasing the load carrying capacity by more than 25%. The load carrying capacity for other categories of multi-axle trucks has also been increased. For tractor trailers, the limit has been raised 36%.

Figure 2.8 Trucks Weights Checks

Chapter 3

3.METHODOLOGY

We used IOT for our project, load cell is calculated the weight and report to amplifier that will convert low signal to high signal then its passes to the Node MCU, we input the coding to Node MCU so its work According to coding it is based on the load limit weight once it reached the load limit its create beep sound and passes mail to higher authority The weight limits displayed on either the manufacturers' plate or ministry plate are determined by the technical specification of the vehicle and the need to protect GB roads and bridges from excessive wear. The weight limits displayed on either the manufacturers' plate or ministry plate are determined by the technical specification of the vehicle and the need to protect GB roads and bridges from excessive wear. The weight limits displayed on either the manufacturers' plate or ministry plate are determined by the technical specification of the vehicle and the need to protect GB roads and bridges from excessive wear. Vehicles are permitted to operate at weights above 44 tonnes in exceptional circumstances (such as when moving abnormal indivisible loads) but special provisions are in place to deal with such occasions, which can be found in the Road Vehicles (Authorisation of Special Types) (General) Order 2003. A vehicle is overloaded if it exceeds the weight limits displayed on either the manufacturers' or ministry plates. A vehicle could be overloaded on its axle(s), gross and train weight, with each of these being separate offences; for example, a 3 axle articulated vehicle exceeding the plated weights on the 1st axle, and 2nd axle and gross

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Figure 3.1 - Methodology

3.1 ADVANTAGES

Introduction. Increasing the legal maximum weight of trucks enables companies to consolidate loads and thus **reduce the amount of vehicle movement required to distribute a given quantity of freight**
So accidents are reduced due to overload and we can control the lorries overloaded and road side people and Villages suffers a lot due to this over loaded trucks and then villages roads are damaged by over loaded lorries
It is important that vehicles are not overloaded, given that the effects are likely to be: Road Safety - vehicles that are loaded beyond their design weight are likely to be less stable and will take longer to stop, particularly in an emergency Road Wear - the structural road wear attributable to vehicles is normally assumed to be proportional to the fourth power of the axle weight; this means, for example, that a 10% increase in the weight imposed on a road by an axle is assumed to increase structural road wear by 46%, and a vehicle with 2 times the axle weight of another vehicle will cause 16 times the wear . A vehicle's gross or axle weight limits are found to have been exceeded when weighed by either DVSA, the police or trading standards officers, the company and/or driver risk prosecution. In addition to this, an overloading conviction is one of the factors that could lead to a Traffic Commissioner taking disciplinary action against the operator's licence.

4. CHAPTER
Components

4.1 Node MCU

It is an open source platform based on ESP8266 which can **connect objects and let data transfer using the Wi-Fi protocol**. In addition, by providing some of the most important features of microcontrollers such as GPIO, PWM, ADC, and etc, it can solve many of the project's needs alone.The name "NodeMCU" combines "node" and "MCU" (**micro-controller unit**). Strictly speaking, the term "NodeMCU" refers to the firmware rather than the associated development kits. Both the firmware and prototyping board designs are open source.**NodeMCU is a microcontroller development board with wifi capability. It uses an ESP8266 microcontroller chip. Whereas Arduino UNO uses an ATMega328P microcontroller**. Besides the chip, it contains other elements such as crystal oscillator, voltage regulator, etc.**The 32 bit ARM Cortex M0+ of Raspberry Pi Pico makes an increment in the speed of the processor that will make the product processing faster in comparison to the NODEMCU**. NODEMCU runs on the 32 bit LX106 that is good for the projects also but in comparison with the Raspberry Pi Pico it feels slower.The name "NodeMCU" combines "node" and "MCU" (**micro-controller unit**). Strictly speaking, the term "NodeMCU" refers to the firmware rather than the associated development kits. Both the firmware and prototyping board designs are open source. The firmware uses the Lua scripting language.

4.2 16 x 2 LCD

A 16x2 LCD means **it can display 16 characters per line and there are 2 such lines**. In this LCD each character is displayed in 5x7 pixel matrix. The 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols. This LCD has two registers, namely, Command and Data. As the name suggests, it includes 16 Columns & 2 Rows so it can display 32 characters (16×2=32) in total & every character will be made with 5×8 (40) Pixel Dots.So the total pixels within this LCD can be calculated as 32 x 40 otherwise **1280 pixels**. 16 X2 displays mostly depend on multi-segment LEDs. Factor each of the denominators into its primes. List all of the primes, noting down all of the matching primes. Multiply the factors, and the product will be the lowest common multiple of the denominators. The lowest common multiple of the denominators is the LCD of the two fractions.

A change in voltage applied to liquid crystals changes the transmittance of the panel including the two polarizing plates, and thus changes the quantity of light that passes from the backlight to the front surface of the display. This principle allows the TFT LCD to produce full-color images.

Figure 4.2 LCD 16 x 2

4.3 HX711

It is an electronic scale module, whose working principle is **to convert the measured changes in resistance value changes, through the conversion circuit into electrical output**. The module communicates with the host computer through TTL RS232.

The HX711 **uses a two-wire interface (Clock and Data)** for communication. Any microcontroller's GPIO pins should work, and numerous libraries have been written, making it easy to read data from the HX711.

The HX711 amplifier is a breakout board that allows you to easily read load cells to measure weight. You wire the load cell wires on one side, and the microcontroller on the other side. The HX711 communicates with the microcontroller using two-wire interface (Clock and Data).

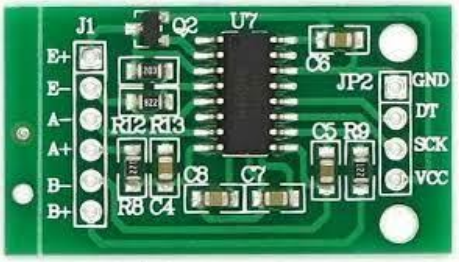

Figure 4.3 HX711

4.4 LOAD CELL

A load cell measures mechanical force, mainly the weight of objects. Today, almost all electronic weighing scales use load cells for the measurement of weight. They are widely used because of the accuracy with which they can measure the weight. Load cells are a type of sensor which are used to measure force and load. They convert the force into an electrical signal. Many load cells use internal strain gauges in order to do this. The strain gauges react to the compression and the change in resistance results in a change in output.

A load cell is a type of force sensor that, when connected to appropriate electronics, return a signal proportional to the mechanical force applied to the system. They can be hydraulic, pneumatic, or, most commonly, based on strain gauges. A load cell amplifier with a built-in regulated excitation source is thus necessary to ensure that the output voltage of the strain gauge is proportional to the excitation voltage. This will ensure that the final output voltage produced by the load cells is accurate and free from noise and fluctuations. The rated capacity is the maximum recommended load for a particular load cell.

All load cells have a range of loads where the output signal is proportional to the load; that is the deformation of the strain gauge caused by the load produces an output signal having an approximately linear relationship to the strain. There are three main types of cellular work: Chemical, Mechanical, and Transport. In chemical work the phosphorylation of reactants provides energy to drive the endergonic synthesis of products. A strain gauge is constructed of very fine wire, or foil, set up in a grid pattern and attached to a flexible backing. When the shape of the strain gauge is altered, a change in its electrical resistance occurs.

The wire or foil in the strain gauge is arranged in a way that, when force is applied in one direction, a linear change in resistance results. Tension force stretches a strain gauge, causing it to get thinner and longer, resulting in an increase in resistance. Compression force does the opposite. The strain gauge compresses, becomes thicker and shorter, and resistance decreases. The strain gauge is attached to a flexible backing enabling it to be easily applied to a load cell, mirroring the minute changes to be measured.

Figure 4.4 Load Cell

Since the change in resistance measured by a single strain gauge is extremely small, it is difficult to accurately measure changes. Increasing the number of strain gauges applied collectively magnifies these small changes into something more measurable. A set of 4 strain gauges set in a specific circuit is an application of a Wheatstone bridge. The hydraulic load cell uses a conventional piston and cylinder arrangement with the piston placed in a thin elastic diaphragm.

The piston doesn't actually come in contact with the load cell. Mechanical stops are placed to prevent over strain of the diaphragm when the loads exceed certain limit. The load cell is completely filled with oil. When the load is applied on the piston, the movement of the piston and the diaphragm results in an increase of oil pressure. This pressure is then transmitted to a hydraulic pressure gauge via a high pressure hose.[3] The gauge's Bourdon tube senses the pressure and registers it on the dial. Because this sensor has

no electrical components, it is ideal for use in hazardous areas.[4] Typical hydraulic load cell applications include tank, bin, and hopper weighing.[5] By example, a hydraulic load cell is immune to transient voltages (lightning) so these type of load cells might be a more effective device in outdoor environments. This technology is more expensive than other types of load cells. It is a more costly technology and thus cannot effectively compete on a cost of purchase basis.[6] The pneumatic load cell is designed to automatically regulate the balancing pressure. Air pressure is applied to one end of the diaphragm and it escapes through the nozzle placed at the bottom of the load cell. A pressure gauge is attached to the load cell to measure the pressure inside the cell. The deflection of the diaphragm affects the airflow through the nozzle as well as the pressure inside the chamber. Load cells are commonly used to measure weight in an industrial environment. They can be installed on hoppers, reactors, etc., to control their weight capacity, which is often of critical importance for an industrial process. Some performance characteristics of the load cells must be defined and specified to make sure they will cope with the expected service. Among those design characteristics are:

- Combined error
- Minimum verification interval
- Resolution

4.5 Connecting Wires & IOT Implementation

It is based on IEEE 802.3 standard. Within an IOT system, Ethernet can be used to connect stationary or fixed IOT devices. For example, the Ethernet cables are used for connecting the computers with the routers to provide the Internet connectivity. Ethernet is the most commonly used Local Area Network (LAN) technology which provides a wired connectivity scheme to connect many IoT devices together using an Ethernet switch. Connecting the Ethernet switch to an Internet Protocol (IP) router can give IP connectivity to all those IoT devices. IoT allows devices on closed private internet connections to communicate with others and "the Internet of Things brings those networks together.

It gives the opportunity for devices to communicate not only within close silos but across different networking types and creates a much more connected world." Cellular and WiFi are the two most popular connectivity methods for IoT technology. Though many early IoT projects relied on WiFi, cellular technology has grown in popularity as it became better equipped to handle more use cases. A wired network uses copper cable or fibre optic cable to form the connections between the networked devices (nodes). Fibre optic cables have a greater bandwidth so transfer speeds are faster. Examples include telephone networks, cable television or internet access, and fiber-optic communication. Most wired networks use Ethernet cables to transfer data between connected PCs.

Figure 4.5 Connecting wires

Wired networks are generally much faster than wireless networks. In buildings where there are concrete walls or other obstructions to wireless signals, physical connections will be much faster and more reliable. A WiFi connection transmits data via wireless signals, while an Ethernet connection transmits data over

cable. No cables are needed to access a WiFi connection, providing greater mobility for users who can connect to a network or the Internet while moving freely around a space.

4.6 IOT (Internet Of Things)

The term IoT, or Internet of Things, refers to the collective network of connected devices and the technology that facilitates communication between devices and the cloud, as well as between the devices themselves. The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. The internet of things is a technology that allows us to add a device to an inert object (for example: vehicles, plant electronic systems, roofs, lighting, etc.) that can measure environmental parameters, generate associated data and transmit them through a communications network. IoT Intelligent Applications are prebuilt software-as-a-service (SaaS) applications that can analyze and present captured IoT sensor data to business users via dashboards. We have a full set of IoT Intelligent Applications.

IoT applications use machine learning algorithms to analyze massive amounts of connected sensor data in the cloud. Using real-time IoT dashboards and alerts, you gain visibility into key performance indicators, statistics for mean time between failures, and other information. Machine learning–based algorithms can identify equipment anomalies and send alerts to users and even trigger automated fixes or proactive counter measures.With cloud-based IoT applications, business users can quickly enhance existing processes for supply chains, customer service, human resources, and financial services. There's no need to recreate entire business processes.

CHAPTER 5
WORK PLAN

We make an literature survey regarding our project and the we make an ppt that what we are going to implement, so our next step is to make an miniature demo model of our project using IOT. So we first want to know what are the components and how its work is very important to our project so we take an literature survey, the we came to know the purpose of the of the components that we use in our projects. Then we ready to make ours models of our project, next we assemble the components

The official said that road transport and highways minister held a meeting with top officials and highway developers on whether the Indian highways were fit for additional loading. "As per our survey, there's overloading of at least 50% by the trucks currently plying on highways. The trucks that will have more load carrying capacity will bring down overloading.

CHAPTER 6
WORKING & CONSTRUCTION

6.1 WORKING

A load cell is an electronic sensor for measuring weight and force. When a force is applied to it, a weak electrical signal at the millivoltage level appears on its output wires. In fact, the load cell is a transducer which converts force into measurable electrical output.

A load cell consists of a metal core and a set of electrical resistances that transform when a force is applied to it. But after the force is removed, it returns to its original state. The reversibility of this material

determines the quality and accuracy of the load cell. The equivalent electrical circuit of a load cell is as follows:

6.2 CONSTRUCTION

The output signal produced by the load cell is in range of millivolts, so we need an amplifier to convert the signal into a level that we can later transform it into a digital signal and process it. For this purpose, we useHX711 amplifier sensor. The HX711 amplifier sensor includes a HX711 chip with analog-to-digital conversion capability in 24-bit accuracy. The HX711 module amplifies the low-voltage output of the load cell and sends it to the Arduino so that the Arduino eventually calculate weight from this data. **Load limit of Trucks**

The Centre has increased the official maximum load carrying capacity of **heavy vehicles**, including **trucks**, by 20-25% besides scrapping the mandatory annual renewal of fitness certificates for freight carriers. Stocks of truck makers have corrected in recent days on concerns that higher **load capacity** would hurt demand for new vehicles, something the government argues would not happen as the **norms** apply to new vehicles and not the existing fleet. Fitness certificates for trucks would now be renewed every two years. The statutory order was issued by the road transport and highways ministry late on Monday. The norms were last updated in 1988. The official said that the move would not hit demand of commercial vehicles as the norms would be applicable only to vehicles made after the statutory order is implemented. "The vehicles that have been registered as per the earlier norms would continue to carry load in accordance with the earlier limit," he said.

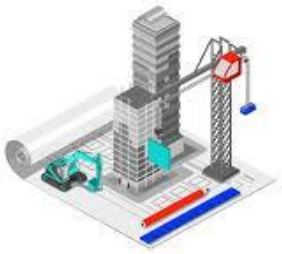

Figure 6.1 – Construction

CHAPTER 8

8.1 SCOPE OF FUTURE

- There is reduce of
  accident due to over load limited system
- This project will help people to avoid overloading
- This will helpful for future generation and they modified it and discover more thing from this
- More life is save by this system
- This plays major role in automobile field

8.2 CONCLUSION

The load limit has been successfully designed Load limit is successfully established with limits.

- Use of Arduino U
- NO, we limit the load weight
- Due to the limit of weigh load, ignition wouldn't start Hence the output has successfully attained.
- Finally the load limit has been fitted to heavy truck
- So in future the accident can be reduced by this load limit ingnition

CHAPTER 9

Cost

S.NO	COMPONENTS	COST
1	Node MCU (ESP 32)	
2	Load Cell	
3	Hx711	
4	Servo Motor	
5	Buzzer	
6	LCD 16 x 2	
7	Connecting wires	

Chapter 10

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