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Vehicle Telematics in Data Analysis and Importance of Vehicle Tracking For Businesses

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Abstract: ***[3] Vehicle/driver monitoring and sensing is one family of applications which falls in the M2M (Machine-to-Machine) area. Drivers, fleet owners, transport operations, insurance companies are stakeholders which need to have analytical reporting on the mobility patterns of their vehicles, as well as real-time views in order to support quick and efficient decisions towards eco-friendly moves, cost-effective maintenance of vehicles, improved navigation, safety and adaptive risk management. [1] Vehicle telematics is an interdisciplinary field that combines telecommunications, informatics, computer science, electrical engineering, and vehicular technologies to create a vehicle telematics system that functions to collect and derive insight from vehicle telematics data and ultimately improve the efficiency and safety of the overall driver experience. The use of Vehicle Telematics has now-a-days been an active contributor for the global market.***
Keywords: monitoring, sensing, analytical reporting, adaptive, interdisciplinary, efficiency.

I. INTRODUCTION

Before, when Vehicle Telematics was not used, there were many problems that caused a physical, financial harm to the concerned person. Accidents frequently took place when compared to today's scenario. This downgrade in the number of accidents was possible due to the invention of Vehicle Telematics.

Telematics is the branch of science concerned with the use of technological devices to transmit information over long distances. [4] Telematics systems continuously capture data via mobile vehicle units ("on-board unit") and transfer it to a server which feeds it into the system platform.

Here the data is processed and displayed in a clear structure. Simultaneously the data is analysed and archived which makes it easier to make informed decisions. The data is available in real-time for fleet managers and drivers. Thus, vehicle data can be digitally transferred and effectively utilized in a system platform for dispatchers.

II. RESEARCH SCOPE

The use of technology in the industry has been beneficial, vehicle telematics has proved to be very efficient in real-time for drivers, car owners and fleet managers.

The use of telematics has proved its worth and has become an important part for each and every field. In this research I will discuss about Vehicle telematics and the importance of vehicle tracking for businesses.

III. RESEARCH

A. Vehicle Telematics

1) What is Vehicle Telematics?

a) [2] Vehicle telematics is the use of computing, sensing and telecommunication technologies to provide services in an automotive environment. Vehicle telematics service categories include navigation, remote diagnostics, fleet management, safety, information access, context awareness and mobile commerce. Supporting these services requires unique hardware and software architectures. Additionally, issues such as privacy, data security and human factors design must be considered in the implementation of vehicle telematics services.

b) [1] Vehicle telematics combines GPS systems, onboard vehicle diagnostics, wireless telematics devices, and black box technologies to record and transmit vehicle data, such as speed, location, maintenance requirements and servicing, and cross-reference this data with the vehicle's internal behavior. This information can be used in real-time analysis to improve overall driver safety, and reduce costs and improve performance for commercial vehicles.

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2) *How does Telematics work?*

a) [5] At its core, a telematics system includes a vehicle tracking device installed in a vehicle that allows the sending, receiving and storing of telemetry data. It connects via the vehicle's own onboard diagnostics (ODBII) or CAN-BUS port with a SIM card, and an onboard modem enables communication through a wireless network.

b) The device collects GPS data as well as an array of other vehicle-specific data and transmits it via GPRS (General Packet Radio Service), 4G mobile data and cellular network or satellite communication to a centralized server. The server interprets the data and enables it to be displayed for end users via secure websites and apps optimized for smartphones and tablets.

c) The telematics data captured can include location, speed, idling time, harsh acceleration or braking, fuel consumption, vehicle faults, and more. When analyzed for particular events and patterns, this information can provide in-depth insights across an entire fleet.

d) [1] Modern commercial vehicle manufacturers typically embed automotive telematics technology directly into fleet vehicles. Aftermarket GPS devices are also available for installation.

3) *How are Telematics Devices Installed?*

a) [5] Many modern commercial vehicle manufacturers install embedded GPS tracking and telematics technologies directly in their fleet vehicles. If a vehicle does not come with this technology pre-installed, aftermarket GPS devices are available for installation. These can be battery powered or powered via the vehicle's own internal electrical system.

b) Some OEMs, including Volvo, Mack, Hino, Ford, and GM, also partner with telematics providers to provide a seamless end user experience. In the coming years, it's likely that the automotive industry will continue to develop smart cars that use telematics to deliver better results for their customers. These systems will also capitalize on the emerging Internet of Things (IoT) landscape that can help connect vehicles to cities and smart traffic technologies.

4) *What are Vehicle Telematics Used For?*

[1] Vehicle telematics applications include:

a) *Telematics Vehicle Tracking:* In telematics vehicle tracking systems, GPS and an onboard GPRS modem communicate with the user and web-based software, transmitting and then transforming vehicle data into information with management reporting tools and mapping software.

b) *Trailer/Container Tracking:* GPS devices communicate their location via mobile phone or satellite communication.

c) *Fleet Vehicle Telematics Management:* Commercial vehicle telematics involves the management of a company's fleet of vehicles, which includes vehicle scheduling, financing, maintenance, and onboard diagnostics; driver, fuel, health, and improved safety management; reducing costs, improving productivity, minimizing vehicle investment risks, and maintaining compliance with Duty of Care obligations.

d) *Telematics Standards:* Vehicle telematics providers must adhere to standards developed by the Association of Equipment Management Professionals, which enables the delivery of telematics data in a standard xml format.

e) *Wireless Vehicle Safety Communications:* Sensors in electronic sub-systems installed in vehicles and in fixed locations, such as call boxes and near traffic signals, transmit important safety information via wider networks to driver displays. This is useful for optimizing routes and fuel usage in company vehicle telematics.

f) *Emergency Warning Systems:* Vehicle telematics architectures are open, self-orienting structures developed with the intent to blend warning information with vehicles in the vicinity. Telematics emergency warning systems can produce instantaneous autonomous warning notifications in real-time using computerized systems that update information at the same pace at which they receive data, which is particularly useful for intelligent vehicle technologies.

g) *Carsharing:* Vehicle telematics services facilitate the tracking of members' usage for pay-as-you-drive billing, tracking of available vehicles, and using GPS tracking to outline pre-defined geofence areas for available vehicles.

h) *Insurance:* Insurance companies use driver behavior data to make risk assessments and charge customers premiums accordingly. Higher risk behavior, such as speeding and not obeying road signals, will result in higher premiums.

i) *Maintenance Improvements:* Vehicle maintenance and asset lifecycle management can be improved by using fleet telematics to track hours-of-use records and schedule preventative maintenance, as well as help keep tabs on warranty recovery, engine hour tracking and service records tracking. Fleet managers can decrease expenses and keep vehicles in safe operating condition by staying on top of engine diagnostics, including battery voltage, coolant temperature, powertrain malfunctions, intake valve issues, oxygen sensor problems, and more.

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B. Vehicle Tracking

[6] Vehicle tracking involves placing a GPS device in a vehicle. This device gathers information about the location of a vehicle and sends it to a central location. A person at the center location can monitor the information to know the exact location of a vehicle at a given time. The route followed by the vehicle can also be known. GPS tracking is utilized today not only in business but in many other applications.

1) *Active Vehicle Tracking Systems:* [7] Active Vehicle Tracking Systems use devices that send data in real time to the fleet management software. They typically use cellular data networks to transmit this data, although alternatively satellite networks can be used and are preferred by fleets that travel outside of areas covered by cellular networks.

a) Advantages of Active Systems

- Real-time information allows fleet managers to correct vehicles that are off route, saving time and fuel
- The software on these systems can be configured to automatically reassign tasks to vehicles based on cost efficiencies, taking into account driver working hours, fuel efficiency and current location.
- Active systems can automatically notify customers of expected delivery time, reducing the number of failed deliveries
- Working time directive and driving hours compliance can be monitored in real time to prevent fines or penalties for non-compliance
- Active Vehicle Tracking Systems are more easily integrated with other live systems such as delivery tracking and point of sale information from drivers cell phones or other devices.
- No need to collect data from devices at the end of each day

b) Disadvantages of Active Systems

- As the equipment required uses additional pieces of hardware it can be more expensive to purchase
- On going costs are likely higher due to fees associated with cellular or satellite network usage
- Staff are more likely to object to real time tracking systems than passive systems

2) *Passive Vehicle Tracking Systems:* [7] Passive systems might seem a little dated in comparison with the latest active systems, yet they are still available and are better for cost-conscious businesses with little need for the advantages offered by active systems, as well as fleets that regularly drive outside of areas covered by cellular networks.

a) Advantages of Passive Vehicle Tracking Systems

- Lower cost equipment
- Lower ongoing costs for the business as no cellular data costs
- Data analysis often yields better insights when not done in real time
- Latest passive models don't require manual upload and instead use wireless connections at vehicle bases
- Drivers more likely to accept this form of tracking
- Many of functions of active systems such as working time compliance and route efficiency can still be used even if same-day adjustments are not possible

b) Disadvantages of Passive Vehicle Tracking Systems

- Unable to adjust off-route vehicles in real time
- Unable to notify customers of precise delivery time
- Many systems require manually removing each device from each vehicle and connecting to a central computer for each data upload
- Less future proof than active tracking systems

3) *Importance of Vehicle Tracking For Businesses:* [6] The implication of vehicle tracking in businesses today is really impressive. Vehicle tracking allows you to see where your vehicles are at all times. It also allows you to know the routes taken by the drivers. An employee using a business vehicle that has a GPS tracking device can never lie to you about his location or the route he has taken at any given time since you can see everything on a map.

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a) *Helps You To Keep An Eye On All Your Vehicles And Employees:* When you have all your vehicles tracked, you will have their location and that of employees using them on a map at all times. In addition, you can also know how long a vehicle stays in a given location. Therefore, when an employee takes a vehicle to a location that it is not supposed to be or stays in one location for longer than expected, you will know right away. Also, if a driver follows another route other than the one he should, you will know. This prevents any driver from engaging in personal errands that waste your business' resources. This also helps to significantly increase productivity by reducing idle time.

b) *Helps You To Find Stolen Vehicle:* Losing a vehicle to thieves is very expensive to your business. This is because when you lose a vehicle, you also lose the inventory it was transporting. You can also lose the trust of your customers when the goods that were being transported to them get lost on the way. However, if the vehicle can be tracked, you can act quickly and communicate with the relevant authorities to recover the stolen vehicle.

c) *Helps You To Know Your Inventory's Exact Location:* An efficient business should track inventory from one location to another. This can help you tell the customers waiting for given products exactly when they should expect their arrival. Knowing the location of the goods can also help you to communicate with the receiving or shipping crew, or the receiving customer more effectively.

d) *You Will Pay Less Insurance Premiums:* Insurance is a big cost for any business that owns vehicles (especially if it is a large fleet). Many insurers provide discount to vehicle owners who install vehicle tracking systems. The discount on premiums may actually pay for the cost you incurred when installing the GPS vehicle tracking system. Hence, if you want to reduce the cost of running your business, start by installing a GPS vehicle tracking system to all your vehicles.

e) *Helps to Improve Employee Safety:* If you are running a responsible business, you have to value the safety of your employees. Through tracking, you significantly improve the safety of your employees. This is because a tracking system allows you to locate them in the field when you lose communication. In case of an emergency, your employees will be able to get the help they need in good time.

f) *Helps To Reduce Fuel Consumption:* If the vehicles used in your business consume a lot of fuel on a daily basis, then it is very wise to have a vehicle tracking system installed. It will significantly help to reduce the amount of fuel consumed by each vehicle. This is because a tracking system will force the driver to operate the vehicles more responsibly. They will not go to places they should not go and will drive the vehicle at reasonable speeds. Some tracking systems send an email or text message notification to you every time a driver breaks the rules and regulations of the business.

g) *Allows You To Monitor The Speed Of Your Vehicles:* Some driver can really misbehave on the road when they are not being monitored. They can drive recklessly and cause accident that hurt them or hurt other road users. The inventory being transported can also be lost or damaged when a vehicle is involved in an accident. A vehicle tracking system will help you ensure that all vehicles are driven within the recommended speed limits.

h) *Vehicle Tracking Will Help You Compete More Effectively:* You customers will view you as a reliable business if you can tell them the exact time they should expect the products they have bought from you will reach them. Being unsure about time is unacceptable in today's market. Customers will always choose to buy from business that gives them accurate information concerning the location and delivery of goods. When everything else is the same, the fact that you are using a tracking system will give you a competitive advantage.

i) *Improved Vehicle Maintenance:* Tracking devices can be plugged into vehicle analytics to keep accurate records of vehicle usage. This can make it easy to follow maintenance schedules. Vehicle tracking also gives you the power to look at the locations of a vehicle and verify whether it was taken to a service station or not. Improved maintenance helps to prolong the life of the vehicles. It also helps to prevent delays that may be caused when the vehicles break down. Today, vehicle tracking is not as expensive as it used to be in the past. It is now an inexpensive endeavour for any business that wants to operate more efficiently. The set up cost and service fee are worth it if you want to maximize profits. This is why vehicle tracking is considered as one of the best practices by the largest and most profitable companies on the world.

IV. FUTURE SCOPE

[5] Telematics is poised for exponential growth as new applications are developed to take advantage of modern GPS units and the widespread use of mobile devices. More fleets are recognizing the need to monitor fleet activity to control costs, boost productivity, improve accountability, and maintain full compliance with government regulations.

As owners look beyond the basic needs in order to achieve "increasing integrations into the broader scope of the enterprise, including with mobile workforce management, ERP software, and business management software," telematics will become an integral component of all modern fleet operations.\

V. CONCLUSION

We have studied about the Vehicle Telematics, how does it work, what it is used for, and how is it installed in the vehicle. We further studied about one of the application of Vehicle Telematics i.e. Vehicle Tracking. We learned about, What is Vehicle Tracking, Active Vehicle Tracking, Passive Vehicle Tracking and their advantages and disadvantages. We now know the necessity for having the telematics installed on the vehicle to be prevented from accidents, preventing them from getting stole, etc. Also we need to have Vehicle Tracking to be up to date about your personal vehicle, find stolen vehicle, etc.

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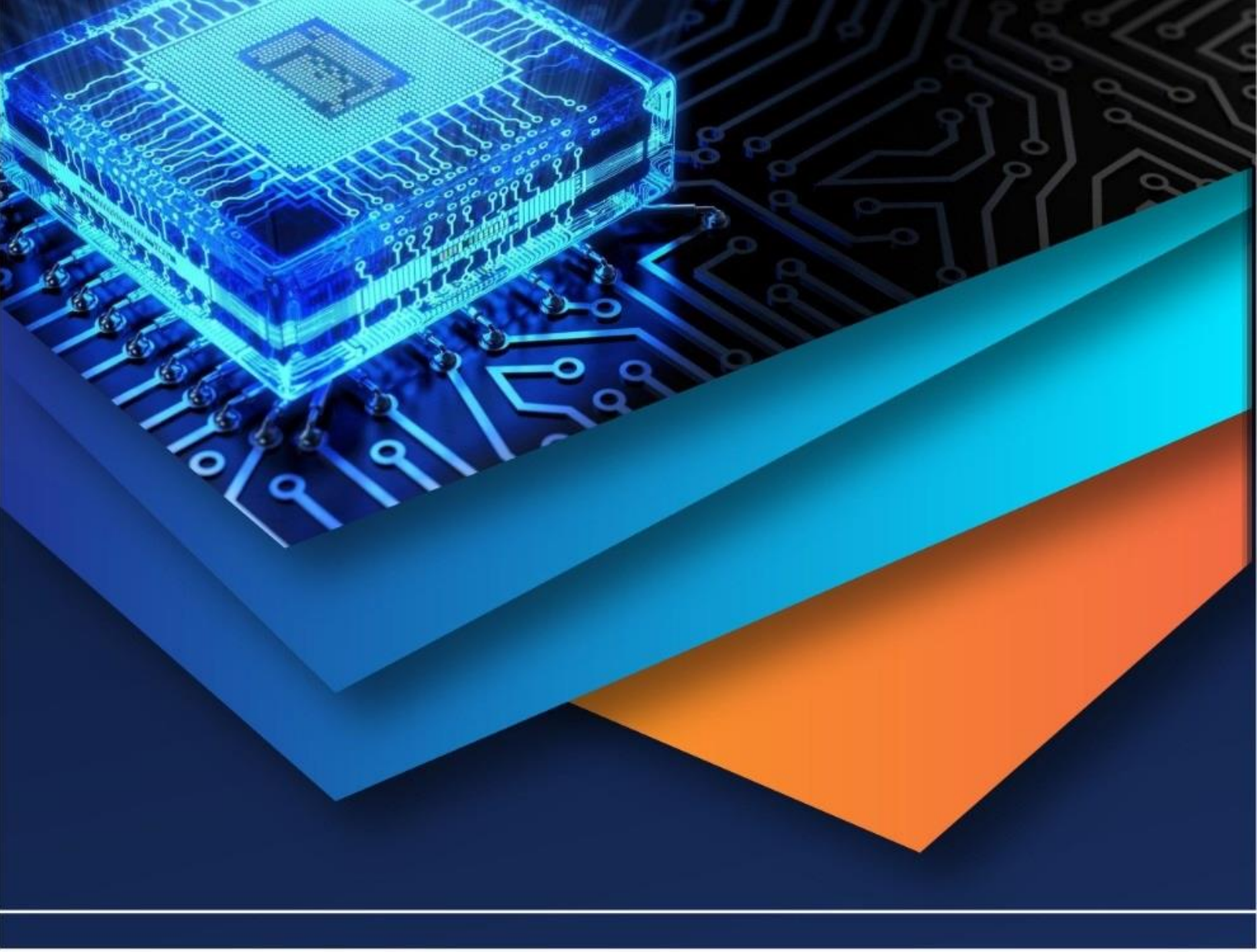

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