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The Role of Smart Transport in Reducing the Economic Cost of Traffic Accidents in Countries: Presentation of International Models

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ABSTRACT

The study aimed to clarify the topic of intelligent transport and traffic accidents, in order to minimize costs and achieve economic development and well-being of society and its members. There are many traffic accidents today, many deaths have been recorded, so it is imperative that countries look for ways to cope with it, and one of the ways is smart transport. In order to reach the results, the descriptive-analytical approach was adopted, by relying on a desk survey and searching books and references. The application aspect was based on the presentation of models from countries that relied on smart transport and digital applications in order to combat traffic accidents.

We came to the conclusion that smart transport worries about many costs through digital applications that help regulate traffic and facilitate land, sea and air transport, and we also came to the conclusion that in the United Arab Emirates, the strategy of smart transport was adopted through automatic control of light signals starting in 2000 and the traffic data management system through easy access to information as a whole. The state of Qatar has also adopted the smart transport strategy and adopted a new project that represents the first stage of the development of smart transport systems in the country and the installation of 29 traffic monitoring cameras at 29 intersections. the project includes the implementation of a traffic control room.

Keywords: Transportation, Smart Transportation, Economic Cost, Traffic Accidents.

INTRODUCTION:

The topic of protecting a citizen from risks is one of the topics pursued by states as a whole, and this is in order to provide safety and well-being to members of their society. Today, many countries are interested in traffic accidents in order to achieve economic and social development and safety, and even achieve the principles of sustainable development.

As a result of technological development, the trend today is to abandon traditional methods and rely on Digital Trends and applications that facilitate work, life and transportation easier.

Despite the development that has affected all countries, we note that some countries are still suffering from traffic accidents, high costs and the negative consequences that they entail, so in this intervention we are trying to

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present many examples from countries that have relied on strategies and projects related to roads, route facilitation and security and from the countries signed by the study, the United Arab Emirates and Qatar.

The problem of studying:

From what has been presented, the main question can be formulated:

What is the role of smart transport in reducing economic costs and reducing traffic accidents in the countries of the world and in the United Arab Emirates and Qatar?

Therefore, the main question gives rise to the following sub-questions:

- What is the concept of intelligent transport and traffic accidents?
- How can the necessary applications be adopted in order to combat traffic accidents?
- How did Qatar and the UAE adopt policies and strategies to combat traffic accidents and reduce costs?

Scholastic hypotheses:

To answer the main question, we have formulated the following main hypothesis:

There is a role for smart transport in reducing economic costs and reducing traffic accidents in the countries of the world as a whole, the United Arab Emirates and Qatar.

To answer the sub-questions, the following sub-hypotheses can be formulated:

- The concept of both intelligent transport and traffic accidents is one of the modern concepts nowadays;
- The state of Qatar and the UAE rely on multiple strategies to combat traffic accidents, including the use of traffic lights that facilitate traffic and transport.

The importance of the study:

the importance of the study stems from the topic itself, as the topics of technological development and piety are among the topics addressed by many experts in order to rid individuals of traffic accidents and movements, and the importance of the topic is highlighted through references and literature on the topic itself.

Study objectives:

The study aims to highlight the following:

- Highlighting the most important concepts related to smart transportation and traffic events;
- Exposure to various elements of intelligent transport;
- Identify smart transportation strategies and take advantage of digitization in this area;
- Presentation of the most important international models that faced traffic accidents, the most important of which are the United Arab Emirates and the state of Qatar.

1. THE THEORETICAL ASPECT

The topic of transport is one of the topics that help in economic, social and environmental development, so that access to a means of transport is not easy, so the dependence of transport on technology is one of the things that improve and facilitate mobility, this is what will be discussed in the theoretical aspect.

1.1.The concept of intelligent transport systems:

Intelligent transport includes many types of communication from navigation systems in vehicles and between them or with fixed locations for any service place, and it can build an air road network, smart traffic, protected bicycle and pedestrian paths, and integrated public transport, all characterized as fast, safe and reliable transportation systems as well as inexpensive. This type of transport maximizes the range of uses of vehicles and optimizes their operation. The intelligent transportation system allows travelers to easily choose the shortest or fastest travel distances at a low cost. Examples of intelligent transportation technology in vehicles are the use of sensors to avoid accidents, as well as anti-skid devices and the use of radio waves to identify the vehicle RFID in case of toll collection on some major highways that require it. The development of the use of autonomous vehicles and the process of delivery by robots is also becoming more and more popular (El-Hachimi, 2025, P. 246).

Therefore, many researchers have provided many definitions on the topic of intelligent transport and traffic accidents, the most important of which are:

Smart transport systems are defined as: "the use of modern technologies of communication and media technology, to face many challenges in various fields of transport" and smart transport systems are defined as: "the use of modern technologies of communication and media technology to face many challenges in various fields of transport" .Intelligent transportation systems are also known as: "The use of Computer, Electronics, Communications and control technologies to face many of the challenges facing road transport, such as improving safety, productivity and public movement, despite the worsening congestion and the continuation of errors affecting the safety of commuters and increasing scarcity in the budgets of the responsible authorities for Transport".(Chanabi, 2026, page 38)

Therefore, smart transport today is one of the things that have become necessary in order to contribute to achieving economic, social and environmental development and create an atmosphere of reassurance for citizens in order to facilitate and organize traffic and enable citizens to get a means of transport comfortably and easily. The main goal of using smart transport systems is to develop the transport sector and facilitate its operation, eliminate or minimize its problems and preserve the environment. this goal is achieved through basic goals that fall under sub-goals, which are summarized as follows:(Chanabi, 2026, pp. 41-42)

- Increase the operational efficiency of the transport system and increase its capacity: by reducing delays at transfer points between modes of transport and facilitating the collection of public transport fare;

- Improve the levels of movement and comfort for travelers by reducing the costs of cargo movement and for shippers, reducing driver fatigue and maintaining the security of the goods;

- Improving the level of traffic safety by reducing the number of accidents, their severity and cost, reducing vehicle theft, while reducing the number of deaths;

- Reduce energy consumption and reduce environmental impacts: by reducing exhaust emissions and fuel consumption due to congestion and reducing environmental pollution;

- Improve the current and future economic productivity of individuals, organizations and the general economy: by reducing the costs of information collection, increasing the circulation of information on emergency events and congestion with full coordination in network operations, management and investments.

1.2. The Main Challenges of the Transport Sector:

Meeting the basic access needs of individuals and communities, safely and in a manner consistent with human health and the ecosystem, equality within and between social groups and generations at affordable prices, are the most important public challenges to the functioning of the world's transport system, it poses the problem of efficiency and provides transport choices and mechanisms to support the economy and trade as well as environmental constraints such as emission, waste, consumption of non-renewable resources, land use and noise production and summing up all these factors, the OECD has selected a set of studied challenges, which are as follows:(Assia, 2022, pp. 425-426)

* **Gas emissions and air pollution**: transport activities generate a wide range of emissions that affect air quality at the local level and have various harmful effects on human health and the environment. this includes nitrogen oxide and volatile organic compounds.

* **Climate change:** the prevailing transport system causes a set of global greenhouse gas emissions, where most of its share originates from the burning of fossil fuels and the largest contributor to this so far is the road transport of goods and passengers. in general, transport is responsible for 13% of global greenhouse gas emissions and 23% of energy-related carbon dioxide emissions, as industrialized countries are currently the main contributor to total greenhouse gas emissions, but 80% of the expected increase until 2030 is related to road transport in developing countries, especially in emerging economies such as China.

* **Congestion:** unsustainable transport systems lead to significant negative impacts on international and national societies and economies, as congestion causes the loss of a large amount of time that could have been used for other purposes and increases operating costs, especially for vehicle owners and freight operators.

* **Energy intensity and consumption of Natural Resources:** The current forecasts for the global growth of freight and Passenger Transportation show that the increase in transportation activities will cause greater energy consumption such as Aviation, Private mechanical transport and road freight. this contradicts the principles of sustainable production and consumption, which, among other things, calls for a significant increase in energy

efficiency to reduce the need for natural resources. the current transportation relies heavily on fossil fuels and this causes fluctuation in world market prices and significantly higher crude oil costs on fossil fuels and this causes fluctuation in world market prices and higher crude oil costs in general with a limited number of supplier countries, this poses a great threat to energy security Especially in the developing world.

* **The right of access for all:** urban and rural populations depend on affordable means of transport to get to work, markets, schools and health care, the transport system increasingly focused on mechanized individual transport reduces the accessibility of low-income groups and this seriously reduces equality and weakens poverty reduction efforts in developing countries.

* **Fragmentation of urban spaces and land consumption**: transport infrastructure is a major reason for the division of ecosystems, lands for agriculture and sites of flora and fauna, into smaller and more isolated units and this constitutes the disturbance of animals and their lack and this is a common concern. in the long run, the basic ecosystem processes can be affected, when groups of individual species separate. in addition, land consumption of transport infrastructure is a growing problem especially in urban areas and the huge area ignited by roads and railways is already reducing other valuable urban space available for living, leisure and business.

* **Noise**: the noise associated with traffic has a severe impact on public health and quality of life not only in cities but anywhere near major transport infrastructure.

* **Road safety**: road traffic accidents are likely to become the third important cause of deaths and injuries by 2030 so that the victims include a large number of pedestrians and cyclists, especially in developing cities. on the other hand, many developed countries have succeeded in significantly reducing the number of injured and killed in road traffic, in addition, accidents cause a large percentage of the total costs of Transportation on society such as costs related to medical care for victims.

1.3.Concepts about traffic accidents:

The topic of traffic accidents is one of the important topics that many researchers and experts are looking for solutions related to avoiding and minimizing them, as their absence creates reassurance among members of society. And that's what you're going to address in this part.

1.3.1-definition of traffic accidents: the transport system is newly defined as an organized set of institutions and services that provide and distribute access areas to specific and confused areas in the urban area. This is because the attitudes of individuals and businesses in choosing the locations of events related to them are greatly influenced by the implementation of relocation proposals. These situations will also affect the choice of location for these events and, consequently, the efficiency of the functioning of the transport system in the long term (Hamid, 2015, Page 236).

The transfer is based on the law derived from the Greek word meaning straight stick and is defined by a term as a set of general and abstract rules aimed at regulating the behavior of individuals within the group. Physical traffic accidents are accidents in which at least one victim, either dead or injured, falls on a road open to public traffic and is caused by at least one vehicle (Giroud,Ben Brahim, 2021, page 441).

The UN Economic Commission for Europe defines a traffic accident as one in which the following elements are present:

- To happen on the roads of the year;

- To be engaged by one of the moving vehicles on the road.

The World Health Organization defined it as an unapproved incident, resulting in an apparent injury, and there are those who defined it as an interception that occurs without prior planning by one or more vehicles with other cars or vehicles, facility, animals or objects on a public or private road.usually, a traffic accident results in damage ranging from minor to serious property and vehicles leading to death or permanent disability (Djagdeli, 2021, page 784).

We define traffic accidents as everything that happens due to the use of a vehicle and results in loss of life, bodily injury or loss of equipment and property and that individuals are involved in them without expectation or prior knowledge (Biaa, 2017, Page 231).

A traffic accident is defined as an interception event that occurs without prior planning by one car or with other cars, pedestrians, animals or objects on a public or private road.the accident usually results in material or physical

damage and is unacceptable. it is every act of self-destruction or damage to human limbs or money that arose from a person walking or standing with his vehicle on the road. So, traffic accidents are physical and moral injuries that affect the vehicle due to a collision or technical deviations in the vehicle or the bad actions of its driver, which causes material and moral losses, which are called traffic accidents (Hafida, 2016, Page 32).

Traffic accidents are one of the topics that countries are interested in order to reduce their occurrence and damage and search for solutions in order to avoid them, and currently there are many solutions that reduce accidents related to traffic and road transport related to digital technologies.

1.3.2-causes of traffic accidents: The problem of traffic accidents has become one of the biggest problems suffered by all countries of the world because of the damage and social and economic losses caused by these accidents, and traffic safety in its broad concept aims to adopt all plans, programs, traffic regulations and preventive measures to reduce or prevent the occurrence of traffic accidents to ensure the safety of people and their property and to preserve the security of the country and its human and economic components.

it is information that the traffic phenomenon and the resulting accidents are formed of three overlapping elements: the vehicle, the road, the human element. Where a traffic accident generally occurs as a result of a malfunction that occurs in one or more of the following elements: the human component of the vehicle, the road is natural factors, and a large percentage falls on the human element, that is, as a result of the error that occurs from drivers or pedestrians or from both Manifested in: (Djagdeli, 2021, pages 785-786)

- **Traffic awareness:** one of the elements that affect the problem of traffic accidents in it is the degree of traffic awareness, which in turn is reflected in the form of negative behavior that affects the size of the problem and their aggravation of the risks arising from it in terms of losses incurred by society, whether material or social;

- **Factors affecting the degree of traffic awareness:** there are factors that have a varying impact on the degree of traffic awareness in developing and developed countries, and the following factors can be countered:

A-level of education: due to the high rate of illiteracy in developing countries, this has led to the inclusion of traffic awareness at a late stage in those countries, and in developed countries have significant elements that affect reducing the rate of illiteracy and benefit from traffic awareness measures, where it is better for developing countries to pay attention to literacy first and then increase traffic awareness.

B-the lack of performance of the media: the media play an effective role, because of their impact on the interests of the individual and society, especially audio-visual means, and how quickly they are efficient in achieving the desired goals from what they provide in preventing traffic accidents and reducing the best for developing countries to pay attention to literacy first and then increase traffic awareness.

C-insufficient performance of the media: The media play an effective role, because of their impact on the interests of the individual and society, especially audiovisual means and how quickly they are efficient in achieving the desired goals from what they offer in preventing traffic accidents and reducing their dangers and negative effects in the national economy of countries, where the results of the survey conducted by the Research Center for the study and monitoring of living conditions on the role of the media showed that television is undoubtedly the media most aware of these questions about road hazards and Prevention, which broadcasts special information express views Considering the Variety that is broadcast during prime time and on a regular basis has a greater impact than advertising and commercial programs.

D-traffic schools: through research and field studies, especially in economically developing countries, we find that adherence to traffic rules and etiquette is an individual behavior of citizens and that these countries must prepare a generation to be trained to adhere to traffic rules at the beginning of their lives. this is done by establishing traffic schools that instill traffic concepts and rules and melt them since the childhood of children.

E-sense of belonging: economically developing countries still have not developed a sense of belonging to the public system, and this, in turn, was reflected in the problem of traffic accidents, in that compliance with traffic instructions and rules is subject to the presence of traffic policemen.

1.3.3.Types of traffic accidents: Considering that the roads are traversed by multiple and different means of transport, from private, utilitarian, tourist cars and public means of transport, from buses and small-sized and huge trucks, and giant tanks for transporting water and energy materials from gasoline, gasoline, oil, oil and gas, they constitute the environment of accidents and permanent danger, with their multiple accidents, the effects of which are reflected on: (El- Hossin, 2020, pages 182-183)

- Fatal accidents / which occur to hundreds of individuals every year and cause the loss of their lives;

- Serious injury accidents: which hinder the individual for a period of time, or may result in permanent disabilities that may hinder the individual completely;

- Minor injury accidents: these affect a lot every year, but their effect disappears after a short period;

- Accidents that do not result in any injuries: their impact is often obvious in vehicles and is material, and traffic statistics refer to them as damage accidents;

- Serious accidents: these accidents are represented by the various consequences that result in the loss of life and the depletion of the wealth of society, which may result in many temporary and permanent disabilities and various deformities that divert from the functional performance of these individuals in addition to the psychological suffering suffered by the relatives of accident victims, and The Associated negatives reflected on the individual, family and society as a whole.

- Medium accidents with economic impact: these are accidents that do not result in injuries, but cause the loss and waste of private or public funds, and this is represented by the damage that occurs to cars and facilities, and these losses constitute material effects as well as imaginary figures in our country and other countries of the world.

1.4.Elements of intelligent transport systems:

It consists of detection technologies that monitor the operations of the Smart Mobility System, data processing that includes computer programs that process system performance information, as well as modern electronic technologies that provide information to people, communication networks that operate on data flows, as well as control tools, and these components can be illustrated as follows: (Garoui and Aissani, October 30, 2024, pages 6-7)

The transport system consists of:

1.4.1. Traffic Management Centertcm: is a traffic information system that provides live information from road traffic the system is used by car navigation systems and traffic receivers to provide drivers with information about traffic congestion, accidents, road works and other obstacles. The TMC system consists of three main components:

- Traffic sensors: road traffic sensors are installed to collect data about traffic, these data include speed, traffic volume, traffic accidents and road works,

- Control Center: the data collected from traffic sensors is sent to the Control Center, the control center processes this data and converts it into a format that can be read by navigation systems and traffic receivers,

- Navigation systems and traffic receivers: navigation systems and traffic receivers receive information from the Control Center and display it to drivers.

TMC information provides multiple benefits to drivers such as avoiding traffic congestion, saving them time and reducing fuel consumption, reaching their destinations faster by providing information about the fastest routes, increasing road safety by providing information about accidents and road works.

1.4.2. data acquisition: intelligent transport systems rely on a variety of data to operate effectively this data comes from various sources including:

- Road sensors: sensors are installed on the roads to collect data about traffic, such as speed, your lane, traffic accidents and road works;

- Surveillance cameras: surveillance cameras are used to monitor traffic, identify accidents and road works;

- Automated vehicle identifiers: are systems used to identify vehicles in any form, these systems are used in a variety of applications including:

- Toll collection system: AVI systems are used in electronic toll collection systems to allow vehicles to pass through toll collection points without stopping;

- Parking: AVI systems are used in parking lots to allow vehicles to enter and exit parking lots without having to pay parking fees manually;

- Access control system: AVI systems are used in access control systems to control access to restricted areas;

- Vehicle tracking system: AVI systems are used to track vehicles and their route.

AVI systems generally consist of two main components:

- AVI sticker the AVI sticker is installed on the windshield of the vehicle the sticker contains an RFID chip containing identifying information about the vehicle;
- AVI reader: Avi reader is installed at toll collection points, parking lots and access control areas AVI reader reads information from a sticker on the vehicle ;
- Passive AVI system the passive AVI system is not powered by a battery when the sticker approaches the AVI reader the sticker responds to a signal from the reader;
- GPS Global Positioning System: GPS is used to determine the location of the car by reading a wireless chip installed in it;
- RFID system for vehicle identification by reading a wireless chip installed in it;
- License plate recognition: uses PR to identify and identify the vehicle's license plate;
- Car tire fingerprint recognition: car tire fingerprint recognition is used to identify the car by the tire pattern.

1.5.Intelligent Transportation Systems:

It is one of the most important means of road and Transport Management, where screens are distributed at the entrances and exits of cities, as well as main roads. these systems are equipped with radar devices to determine the traffic density inside and outside the city, monitor the main road, and control information screens remotely from the central control room to direct vehicles. Screens are widely used in the fields of smart mobility, as they can be used to expand applications to include international borders (local market) between countries or between large cities within countries, which facilitates traffic and makes it more organized. Intelligent transport systems are based on many technological areas: (Top Screens, 2026, page 2)

- Wireless communication;
- Computer technologies and software;
- Databases;
- Remote sensing technologies and sensors;
- Vehicle detection by video visualization;
- Analytical examination of the system;
- Automated periodic reports.

There are also mobile applications that help facilitate and organize traffic within cities and increase traffic awareness, as they direct cars on smooth tracks, which reduces congestion and reduces the percentage of traffic accidents, and the tops screens are distinguished by their leadership in this field and the implementation of all system requirements with high technology.

There are many examples of the application of intelligent transport systems from various regions around the world, including: (ESCWA, 2021, pages 42-45)

1.5.1-Dubai Smart Traffic System project: in 2018, the Dubai roads and Transport Authority launched a USD 160 million project to expand the smart traffic system in Madinah. the project aims to increase the system coverage from 11 percent to 60 percent of roads in Dubai and aims to reduce traffic jams, improve the detection and response to traffic accidents, improve safety and enhance personal mobility.

1.5.2. Seattle one Arbor and London traffic light control system with scoot technology: the segmented cycle rationalization technology, abbreviated in English as Scoot, improves the performance of traffic lights that rely on a number of technologies including the Internet of things and artificial intelligence. this technology analyzes the traffic situation based on data collected from sensors installed at intersections and instant rationalization of traffic lights and their timing in the nodes of the road network, reducing congestion. this system is not new, but has benefited from the development of technology over time.

1.5.3-Pittsburgh adaptive traffic control system: researchers from Carnegie Mellon University in Pittsburgh have been working since 2012 with Urban Affairs managers to develop an adaptive traffic control system, this system was named soutrak and granted a license. Rapid Flow technology is using this technology is an adaptive AI-based system that allows traffic signals to communicate with each other and make their timing decisions independently.

1.5.4-Seoul real-time traffic management system: the city of Seoul, the capital of South Korea, has established a transport operations and information service that allows real-time management of communications and traffic by collecting and linking information from major traffic information centers. In addition to playing a central role in the intelligent management of bus service in Seoul. This service controls the city's transport system by collecting and processing real-time traffic information. The receivers of the bus management system are also used to collect information.

1.5.5-other systems: other systems that do not require a more detailed discussion include the following: operation and maintenance of smart parking lots these systems can display vacant places in the parking lot and direct drivers to them in addition to allowing online payment when parking on the side of the streets.

1.6.Areas of Use and services of intelligent transport systems:

The areas of Use and services related to intelligent transport systems are divided into two sections: (Chanabi, 2016-2017, pages 157-158)

1.6.1. journals of the use of intelligent transport systems:

Intelligent transport systems are widely used, among the most important of which we mention:

- Department of highways;
- Traffic signal;
- Department of public transport;
- Traffic accident management;
- Collect transit fees electronically;
- Railway crossings;
- Information intended for travelers in regional multimodal transport.

In each of the areas there are many uses for intelligent transport systems adopted by the following elements:

- Navigation and guidance systems inside special vehicles: Where these systems can be used in private vehicles, so that the driver is provided through a television screen installed inside the vehicle showing a digital map of the road network through which the location of the intended final point can be identified, and the most appropriate route can be exploited to reach the goal, and the expected time to reach this point can be known according to the traffic situation, and in case of an emergency on the proposed route, another route to reach the final point is shown on the screen in the shortest possible time, in order to reduce the journey time, and some car rental companies in some countries provide their vehicles with such systems to help ions.

- Traffic control system at the entrances of highways: this system is considered one of the applications of intelligent transportation systems, and this is done through a light signal that works automatically at the entrance from the service road to the main road on the highways so as to allow vehicles to enter the main road (highway) as well as with Loop circuits on the entrance itself to operate all in an integrated system.

- Variable message boards systems: the purpose of these systems is to provide motorists and vehicles with information related to the traffic situation on the road, so that the driver of the vehicle can make the right decision to change the route of his trip, to avoid traffic congestion, to alert to accidents and reduce the journey time, there are two types of variable message boards, one fixed and the other mobile.

-Traffic control systems for signaTraffic control systems for signals: Through these systems, the operating times of traffic signals are controlled, so that time is saved and there is no delay from that signals, and this is done by having electronic sensors installed at intersections that measure traffic volumes to pick it up, and then determine the signal opening times according to those volumes, or through the control room, Traffic signals can also be controlled to serve emergency vehicles and ambulances in order to reduce the time of transporting the injured from the accident site to the hospital, and these signals can work on arterial roads as integrated organizations with Highway Traffic, and there is a need to divert traffic on arterial roads of the highway.

- Accident management and emergency response systems: these systems are how to report the accident, determine its location, how to reach and treat it, and address the traffic affected by the accident, and some international companies have developed an automated system to report the traffic accident in a timely manner through devices installed inside the vehicle.

1.6.2.Intelligent transport systems services: The classification of intelligent transport systems services in general varies from country to country, and the national engineering of intelligent transport systems in the United States of America has determined the following classification of these services:

A-disposal of traffic and passengers: these services fall under:

- Information about transfers before departure;
- Inform the driver on the roads;
- Traffic management;
- Information about services for travelers;
- Traffic adjustment;
- Disposition to accidents;
- Handling of mobility requests.

B-disposal of public transport: other services fall under this service:

- Disposal of mass transport;
- Information on the roads;
- Safety in mass transport.

C-the work of commercial vehicles: fall under it:

- Electronic verification of commercial vehicles ;
- Automated Traffic Safety Inspection;
- Safety monitoring on board the wagons;
- Administrative procedures related to commercial vehicles;
- Intervention in case of accidents associated with hazardous substances.

D-acting in urgent cases: include:

- Notification of urgent cases and personal safety;
- Disposal of emergency vehicles;
- Prevention of longitudinal and lateral collisions.

E-payment: all services in this field are included under this service.

F-information management i.e. processing of stored information.

G-the safety system in the vehicles: includes:

- Prevention of collisions at intersections;
- Extreme vision to avoid collisions;
- Automated driving of vehicles.

2. International models on the use of intelligent transport to reduce traffic accidents:

Through the theoretical aspect, we project the concepts related to smart transportation on two countries: the United Arab Emirates and Qatar.

2.1.View the UAE experience:

In Abu Dhabi, for example, the latter relied on modern technologies in order to achieve more efficient traffic management and for smart transport in Abu Dhabi City, there are several applications, including:

A-automated traffic light control: Abu Dhabi Municipality introduced the first Pillars of intelligent transport systems in 2000 with the construction of automated traffic light control, which manages 115 intersections controlled by a local control system linked to a central control system via a wired and wireless communication network.

B-traffic data management system: traffic accident information management through real-time access to the required information during traffic accidents and documentation of these accidents on site through equipment inside the company's cars and directly connected to the Control Center and the database of vehicles and drivers.

In Dubai, the roads and Transport Authority (RTA) has implemented a field trial to operate the smart pedestrian light signal in one of the authority's initiatives in response to the Smart City trends in order to provide pedestrian transit on the road in order to achieve the RTA's vision of ensuring safe and easy movement for all.

The installation and operation of a smart light signal for pedestrian traffic on Al-Saada Street has been completed, as its system eliminates the time of pedestrians in case of not reading any presence of them on the sidewalks, which provides greater traffic flow by providing sufficient time for the passage of as many vehicles as possible.

The authority explained that the traffic signal operates using an intelligent system based on holograms through a ground light system that works in perfect harmony with the signal lighting that reads the movement of pedestrians, whether on the sidewalks before crossing the street, or on the pedestrian walkway during crossing the street, and adjusting the timing of the traffic light automatically based on it so as to allow a safe crossing for as many pedestrians as possible and thus provide a smart service to road users.

On the one hand, and on the other hand, a number of programs, initiatives and projects have been launched in Dubai that prioritize traffic safety, such as the inauguration of the brick Plus system in the organization's taxis, which in turn automatically activates the taillights of the taxi vehicle when the driver presses the brakes in cases of speed reduction and sudden stop to avoid possible accidents as a result of rear collision, as well as the application of the maximum speed limit system of 120 km.SA is on the highways of all taxis of the enterprise. The most frequent places of accidents have also been recorded and monitored on geographical maps to study the causes leading to accidents and develop preventive measures to reduce them, and the foundation intends to launch a surveillance system by cameras inside taxi vehicles to monitor the movement of the driver in case of omissions or sudden growth to avoid any accidents.

Within the framework of the strategy adopted for the development of the transport sector, several smart transport systems have been implemented, the most important of which are summarized as follows:

A-The adoption of the automated bus traffic management system, which contributed to an increase in the percentage of buses meeting the scheduled times to reach the stations from 19% to 75% between 2012 and 2014, respectively;

B-the adoption of the health and safety management system at the transport and Roads Authority calculates the accident equivalent based on the calculation of minor, moderate and severe accident injuries to assess safety performance, and this indicator decreased by 12% at the beginning of 2016 compared to 2015;

C-the establishment of the first fully automated metro network, which contributed to reducing congestion and traffic congestion by 25% as a result of the transition to the use of the Metro, whose average number of passengers at the beginning of 2016 was about 500,000 passengers per day, which in turn contributed to avoiding 327,000 tons of carbon emissions annually;

D-the adoption of the smart payment card system represented by the Nol card, which enables the mobile to pay the mobility tariff through various means of transport;

E-providing smart applications such as: my destination program, which provides various information about the available means of transport, its cost, the time taken, the route followed, enabling the mobile to choose the appropriate means of transport;

F-adopting environmental management systems as the transport and Roads Authority is the first government entity in the Middle East and North Africa to obtain accreditation for the ISO 2011:50001 energy management system as a result of its implementation of several initiatives to rationalize energy consumption, the most important of which are:

- With regard to light signals, it has been started to replace the lighting of these halogen-type signals with light-emitting diode-type lamps, which is scheduled to be completed in 2018, and it is expected that it will contribute to reducing carbon emissions by 430 tons per year and reducing electricity consumption by an estimated one million kilowatts per year;

- With regard to road lighting, the beginning of 2016 witnessed the replacement of lamps powered by Mercury technology with lamps made of Halide metal, resulting in additional savings in energy consumption, in addition to turning off the lighting of internal roads of residential neighborhoods after ten in the evening, turning off excess lighting in parking lots, and reducing the working hours of road lighting by 20 minutes a day before and after sunset;

- Replacing the fleet of old public buses with modern buses according to European standard specifications, which use gasoline with a lower grand content and equipped with Selective Catalytic Reduction technology,

in addition to exhaust gas recycling;

- The hybrid taxi project was launched in 2013 on a three-year training basis to reach 147 hybrid vehicles in 2015, which contributed to improving fuel efficiency by 34%, saving about 1,440,242 liters of fuel and reducing carbon emissions by 3,442 tons at the beginning of 2016.

2.2. View the experience of the state of Qatar:

In 2012, the Public Works Authority in Qatar adopted a new project that represents the first stage of the development of intelligent transport systems in the country by installing 29 traffic monitoring cameras at 29 intersections.the project includes the implementation of a traffic control room to control traffic signals inside the city of Doha, if the project includes connecting cameras to the traffic control room by communication lines, installing video systems, connecting them with programs to communicate with cameras and connecting intersections with SCATS system, the central control system for traffic coordination between light intersections.

Over the past few years, the state of Qatar has witnessed rapid population growth accompanied by strong economic expansion, which has required the introduction of further developments and updates to the road transport infrastructure to support the various economic, industrial and service sectors.

In light of the increasing importance of the road transport sector in enhancing the growth and competitiveness of the economy of the state of Qatar, the sector continues its efforts to develop advanced infrastructure in line with the objectives of the Qatar National Vision 2030. The state has allocated 95% of its huge investments in infrastructure projects to organize road transport with the aim of increasing the length of highways to 8,500 kilometers, in addition to building 200 bridges and 30 new tunnels by 2020.

The road transport sector is developing a global infrastructure for road and road transport systems and building a smart, safe and reliable transport network to support the national economy and vital sectors within the state of Qatar. The sector attaches particular importance to traffic safety, stimulating investment and work in the fields of road transport, and enhancing international trade movement to connect the state of Qatar with the regional and global economy. Based on the Qatar National Vision 2030, the sector continues its efforts within the framework of its work and competencies to develop effective and sustainable plans that take into account the best practices and international technical standards to build an advanced land system that extends throughout the country (Ministry of Transport, 2026).

Figure 01: Smart Transport Experience in Qatar

Institutional Excellence

Strengthening partnerships

Supporting the economy

Ministry of transport values

Adopting Smart technologies

Team spirit

Sustainability

Innovation

Source: (Ministry of transportation, 2026)

3.Results and discussion:

We conclude from the concepts of smart transport that it is one of the modern topics that help solve problems and achieve economic development, and therefore a number of the following results have been achieved:

3.1.-Theoretical Results:

- We have found that intelligent transport includes many types of communications from navigation systems in vehicles and between them or with fixed locations for any service place, and it can build an air road network, intelligent traffic, protected bicycle and pedestrian paths, and integrated public transport, all of which are characterized as fast, safe and reliable transportation systems as well as inexpensive.

- We have come to the conclusion that smart transport systems are the use of modern technologies of communication and media technology, to face many challenges in various fields of transport" smart transport

systems are also defined as: "the use of modern technologies of communication and media technology to face many challenges in various fields of transport.

- We have come to the conclusion that meeting the basic access needs of individuals and communities, safely and in a manner consistent with human health and the ecosystem, equality within social groups, generations and between them at affordable prices, are the most important public challenges to the functioning of the world's transport system, it poses the problem of efficiency and provides transportation options and mechanisms to support the economy and trade. among the most important challenges are gas emissions and air pollution, climate change, congestion, as well as energy intensity and consumption of Natural Resources, and the right of access for all.

- We have found that a traffic accident is an interception event that occurs without prior planning by one car or with other cars, pedestrians, animals or objects on the public or private road. the accident usually results in material or physical damage and is unacceptable. it is every act of self-destruction or damage to human limbs or money that arose from a person walking or standing with his vehicle on the road. So, traffic accidents are physical and moral injuries that affect the vehicle due to a collision or technical deviations in the vehicle or the bad actions of its driver, which causes material and moral losses, which are called traffic accidents.

- We have also found that road accidents are diverse and multiple according to different means of transport and their consequences and effects and can be classified as follows: fatal accidents/ which occur to hundreds of individuals every year and cause the loss of their lives; serious injury accidents: which hinder the individual for a period of time, or may result in permanent disabilities that may hinder the individual completely; minor injury accidents: these affect many every year but their impact disappears after a short period; accidents that do not result in any injuries: their impact is mostly visible in vehicles and is material, and traffic statistics indicate that damage accidents.

- We have found that one of the most important means of road and Transport Management is where screens are distributed to the entrances and exits of cities as well as main roads. these systems are equipped with radar devices to determine the traffic density inside and outside the city and monitor the main road. the screens are controlled remotely from the central control room to direct vehicles. Screens are widely used in the fields of smart mobility, as they can be used to expand applications to include international borders (local market) between countries or between large cities within countries, which facilitates traffic and makes it more organized. Intelligent transport systems are based on many technological areas: radio communications; computer and Software Technologies; databases; remote sensing and sensor technologies; video visualization vehicle detection; analytical system inspection; automated periodic reports.

3.2.Applied Results:

- We have found that in Abu Dhabi, for example, the latter has relied on modern technologies in order to achieve more efficient traffic management and for smart transport in the city of Abu Dhabi, several applications, including: automatic control of traffic lights, traffic data management system.

- We have found that in Dubai, the roads and Transport Authority (RTA) has implemented a field experiment to operate the smart pedestrian light signal in one of the authority's initiatives in response to the Smart City trends in order to provide pedestrian transit on the road in order to achieve the RTA's vision of ensuring safe and easy mobility for all.

-We have found that in 2012, the Public Works Authority in Qatar adopted a new project that represents the first stage of the development of intelligent transport systems in the country by installing 29 traffic monitoring cameras at 29 intersections. the project includes the implementation of a traffic control room to control light signals inside the city of Doha, if the project includes connecting the cameras to the traffic control room via communication lines, installing video systems, connecting them with programs to communicate with cameras and connecting intersections with SCATS central control system.

CONCLUSION:

The topic of traffic accidents and transport is one of the modern topics that many authors have been interested in, and nowadays modern ways have been sought in order to modernize transport, so it has become called smart transport, which relies on many applications that facilitate the movement of transport and facilitate life.

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