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Transport systems telematics, Cuba case study

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ABSTRACT

The result expansive development in urban and suburban areas have put in a difficult situation in terms of sustainable development, where pollution, traffic congestion and accidents, the strong negative external impact on the economy and health of citizens. All these problems are encouraged to develop new global strategies for sustainable urban transport. The strategies relate only a wide range of mitigation measures, but also use innovative technologies and infrastructures. The concept of an efficient, effective and safe transport prevails today in the new transport policy. Among the innovative technologies and infrastructures, it should be noted that the use of telematics systems for transport provides for several measures to enable the route and means of transportation that help reduce the time and route of travel, while searching for the increase traffic volume, a better level of service roads, and the rationalization of consumption and emissions, as well as inspection services and information in real time. The introduction of these systems should lead to the development of research population movement and settlement, with improved popular routes, in order to optimize the introduction of TST (Transport System Telematics).

KEYWORDS: Telematics, Transportation system, Intelligent managemnet

1. Introduction

In recent years the world has experienced a technological revolution that is changing our lives in all its dimensions. The new technology is advancing unstoppably and technologies that 20 years ago seemed illusory and impossible are now a reality just as technologies that now seem ridiculous and unworkable in 20 years will be an important tool to ensure a decent and comfortable life. The development of technology is not focused on a specific field, but advances are occurring in different fields like computer science, electronics, communications, energy and medicine.

Along these lines, many of these technologies are being applied in the area of transport to combat problems such as traffic congestion, improve road safety, providing passenger information and protect the environment. The application of these technologies to improve transportation called Transport System Telematics.

Transport engineering: It is the branch of engineering dedicated to planning, designing and operating means to enable movement of people and goods. Transportation engineering can also be seen as the integration of a set of knowledge, by which technological problems related to infrastructure management and vehicle systems using various tools and knowledge provide solutions.

Telematics System: Telematics is the blending of computers and wireless telecommunications technologies, ostensibly with the goal of efficiently conveying information over vast networks to improve a host of business functions or government-related public services. The most notable example of telematics may be the Internet itself, since it depends on a number of computer networks connected globally through telecommunication backbones [1].

Transport System Telematics: It refers to all the networks and transport infrastructure, the electronic equipment on board or own transport services. The use of telecommunication systems and data processing is applied to the transportation system, in order to provide improvements to its quality and performance.

These systems have the potential to deliver significant benefits with respect to operational efficiency, service reliability, infrastructure management, as well as enhanced safety, reduced environmental impact, and valuable information services for transport users.

2. Telematics services applied to transportation

They are inclined to meet the needs of the transport authorities or traffic management add value to the services provided on a commercial basis. The following types of services is possible to specify:

1. Management and control traffic: facilitate traffic management network operators, improving emergency notification and response times.
2. Traffic information services and travel; that facilitate the operation of networks and planning trips with choice of trails.
3. Safety and quality improvement of the public transport services.
4. Advanced security services for vehicles that offer various forms of collision avoidance and safety precautions being the objective the implementation of automatic vehicles.
5. Payment and electronic booking services.

Every system has his complexities and TST is not the exception. For its properly function needs a strategic framework as a basis for choices concerning their design and deployment, as well as for investment decisions. This framework is usually called a Transport System Architecture.

A Transport System Telematics Architecture will need to cover technical aspects, plus the related organizational, legal and business issues. It could be planned to function at different levels of complexity; can be created at a national, regional or city levels; also could be organized to work at specific sector of services. The Figure 1 present a full scheme of the architecture, which is divided in 4 main groups, and each one received and deliver information to and from the other groups.

These organizations ensure that the resulting TST deployment:

1. Can be planned in a logical manner;
2. Integrates successfully with other systems;
3. Meets the desired performance levels;
4. Has the desired behavior;
5. Satisfies the expectations of the users.

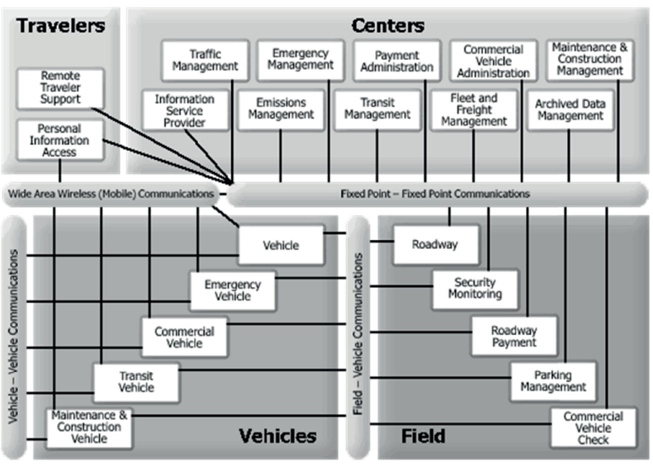

Fig. 1. TST Full Architecture Scheme: 4 main groups ar divided into several subgroups that interact among them [3]

and applications:

1. Implementation of the system control and traffic management;
2. Implementation of information services and travel management;
3. Creation of intelligent work stations for air traffic control, flow management and accident avoidance systems;
4. For the combined transport works as a viable and efficient option of transport services of merchandise and passengers, are needed information and management tools that aloud an optimal performance;
5. Create a national information network for the tracking cargo units, which should cover all modes of transport.

3. Main phases of implementation

TST can be applied at three different phases of approach to the lifestyle of people:

1. In the first phase, one may distinguish the provision and use of information by means of telecommunication to trip-makers in order to increase the efficiency and reliability of transport operations. The electronic data interchange in the loads transport sector is a good example. The same holds for automatic debiting systems for parking or road pricing. In this case, telematics does not necessarily affect transport behavior (in terms of route choice, trip scheduling, departure time), but it serves to increase the performance of transportation. This is more or less a non special use of telematics in the transport sector.
2. The second phase is the application of various telematics technologies which may have an immediate day-by-day consequence for transportation behavior. Examples are route guidance, variable message signs or radio data information. Such uses of telematics influence spatial behavior of trip-makers, not only for car users and truck drivers but also for users of public transport.
3. The last phase is dedicated to the telematics applications which have a structuring impact on mobility behavior. This may be found in tele-working, tele-commuting, teleconferencing, tele-shopping etc., where trip-making (e.g. home-to-work) is influenced in terms of changes in commuting or shopping patterns.

We can specify the following technologies applied in real-time traffic information:

1. Variable message signs: Interest information transmitted from a single panel, which is remotely updated from central operations. Since these core data that are captured by sensors installed on the tracks, with the primary goal of providing relevant information on the way users are collected; so they can choose the best route option [4].
2. Road sensors: Detect accidents and reduce the rate of false alarms. Those systems connected to the emergency call service, can locate the crash site.
3. Automatic vehicle location (using GPS): This system is mainly directed to cargo transport fleets; and allowing the fleet operated to control the timing and frequency change when an unexpected occurs. The implemented system allows the passenger to provide

information on the travel and arrival times every whereabouts. this information may be released and applied to the public transport system, through interactive information kiosks where you can check routes and purchase tickets.

The Figure 2 shows how these technologies could be applied in a Real-Time Traffic Information Systems:

1. A fixed sensor is a technology that is stationary at the roadside or embedded in the road to monitor traffic flow.
2. Vehicle probes use roaming vehicles and portable devices to collect data on travel times. Vehicle probes include cell phones and Global Positioning System (GPS) devices.
3. Highway advisory radio uses radio stations to broadcast traffic- and travel-related information to travellers using AM radio.
4. Dynamic message signs are permanent or portable electronic traffic signs that give travellers information on traffic conditions and travel times, among other things.

Transport telematics is increasingly seen as a new possibility for improving the performance of transport systems while respecting at the same time conditions imposed by environmental and safety goals. The main purposes of the current projects of application of telematics in road transport are to improve road safety, eliminating congestion and increasing system efficiency and decreasing environmental pollution.

To eliminate congestion, it comes to improving methods of regulation and control of the movement making them dynamic so that they respond to changes that occur in traffic immediately. This requires that those responsible for inspection have permanently updated information road conditions. This information is necessary to obtain it directly to the road network and transmit it to the control center. This must have the means to process it, make forecasts about the likely evolution of the situation, and selecting measures to optimize the operation of traffic. These measures should be made known to drivers and monitor compliance.

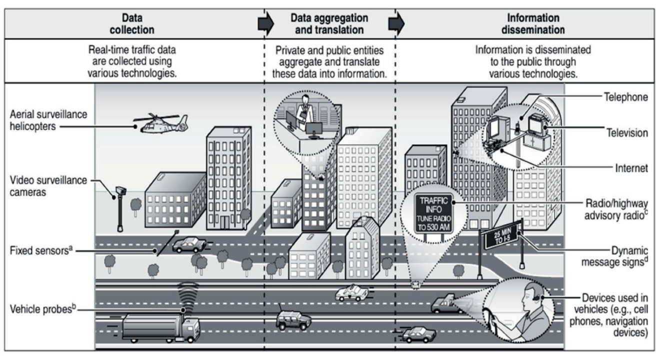

Fig. 2. The data is collected, processed and delivered through different media in a cyclic way, in order to maintain updated the users all the time [5]

4. Transport in Cuba

The infrastructure of the Cuban Transport System has always been an essential component of the Cuban economic process of update. Currently the transport system has a good infrastructure of transport, such as air and rail motor that enables the connection between all parts of the country in terms of hours. As the most used means of transport in Cuba, public transportation has always been the one who suffers the most damage during periods of crisis. In the 90's the bus system suffered big damages because of low resources that had the country and overpopulation of cities.

In the year 2012 Cuban Government bought a new group of buses from China, which improved public transport although still at a disadvantage with the current demand of the country. Large cities such as Havana and Santiago de Cuba, have a system of road from the colonial period are not entitled to receive the volume of transport operation that goes through the streets every day, so recent transport engineering studies have shown that alternate routes that go through the outskirts of cities that allow release congested traffic routes that are constantly affecting the built heritage of the city are needed.

Currently in Cuba, they are conducting studies directed to modelling of road transport for cars and trains, given the increasing levels of transportation due to the new economic policies of the country. One example is the studies for the implementation of the new railway network linking the entire island with the new container base Mariel. Other studies and being carried out to measure the flow of passengers that use public transport, places greater flow of entrance and exit, as well as studies of alternative routes in the areas of major congestion at peak times. For the latter projection diagnostics are performed with all requirements.

Studies are being made for the mobility of the population and reconstruction of workshops, for the latter projection diagnostics are performed all requirements. The government will also buy higher capacity buses for urban routes and fabricate smaller buses of national production.

Before TST could be applied in our country, there are some problems in the transport infrastructure that should be fixed:

1. There are few public transport vehicles in line with the demand of people who use it.
2. Poor condition of the roads. with bottlenecks at peak times, poor drainage and constrictions on main roads, causing commercial speed of around 14 kilometers per hour.
3. Designed for road routes that not satisfy the minimum design requirements corresponding to the flow of current transport.
4. Poor condition of the rail trucks that cause trains operating below 80 km/h, in most cases the cars are over 50 years of use.
5. Bus stops without waiting conditions, with poor signage and lack of information required for passengers.
6. There is no urban station for intermodal transport change.
7. Poor lighting in public areas stops and main roads.
8. Transport system telematics in Cuba

The use of outdated technologies in transport with the poor condition of the means of transport, make that under the current conditions of the economy in Cuba is almost impossible to apply telematics systems. So far only they have been widely implemented the installation of GPS systems on public buses, which collect route information and then stops to be downloaded and processed on a data base. Also has been implemented in companies that transport cargo across the country.

The best way of apply Transport Telematics System in Cuba would be through the introduction of management systems and traffic control allowing the authorities to make quick decisions or unforeseen accidents; the creation of a national system of networks that allows users to choose the best routes and modes of transport and the implementation of electronic payments and reservations, facilitating access to vehicles at any time and in haste.

For the correct application of telematics systems in load transportation throughout the national territory, must develop the corresponding typological studies of the main national and inter-urban traffic arteries that favor heavy equipment without seeking any danger to the rest of the population.

The first step would be the selection of relevant inter-urban corridors (i.e. the identification of those inter-urban road connections whose characteristics make them appropriate for a possible implementation of telematics technologies). This issue depends inter alia on two aspects of the problem, viz. the expected telematics impacts (on systems efficiency, on network reliability, on environmental quality, etc.), and the modus operandi of different actors in the transport system concerned (users, operators, public decision-makers and private decision-makers in the economic and social system). From the variety of different inter-urban road corridors in Cuba, a selection based on plausible criteria must be made on the basis of the following criteria:

1. The geographical site and spatial coverage of a road; this criterion refers to origin-point destinations and to classes of regions being connected (e.g. central and peripheral areas, the strategic importance of the corridor, connectivity with metropolitan areas etc.).
2. The site-specific mobility patterns on these corridors; such aspects relate to congestion degrees in certain segments of the corridor (e.g. in the vicinity of large urban centers), environmental pollution in given areas, network reliability and safety on certain segments, etc. Such aspects should be considered in the studies; in relation to region-specific social-economic conditions (e.g. in terms of welfare, sectorial specialization etc.).

5. Conclusion

The brief study indicates clearly that transport telematics systems can help save lives and reduce the number of injuries on the roads to reduce congestion and pollution from traffic, improve transport efficiency and make transport systems more accessible and more enjoyable for the user. In any case, these can become one of the most effective responses in order to combat the growth of automobile traffic congestion and pollution and have become a serious threat to the quality of life in large cities. But despite the success they have assumed or may assume initiatives as indicated, it should be noted that the implementation of these systems must have a technology infrastructure that can sustain the constant data transfer through wired and wireless connection in the country.

As indicated, in the region of Latin America great developments in the issues we have discussed in these lines are not observed, there are only a handful of ideas and specific projects lacking coordination to provide synergies and extend gains. It is essential, therefore, generate initiatives to analyze and implement technology systems that conform to the possibilities of each country and to your requirements. This requires coordination of efforts around national standards so that a process of integration of regional transport is generated.

Finally, the main goal of this study was fulfilled because we were able to propose a sequence of procedure to applied Telematics Technologies to our Transportation System. This process must be done gradually starting with the improvement of roads and transport routes, and gradually change also transport vehicles, such as both the individuals. Since most of them do not satisfy the minimum conditions necessary connections.

Acknowledgment

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