

Telematic management technologies for urban public transport

ARELLANO-ROCHA, Francisco Javier*† and DÍAZ-NIETO, Elia Socorro

Universidad Autónoma de Querétaro. Cerro de las Campanas s/n, Las Campanas, 76010 Santiago de Querétaro, Qro.

Received July 14, 2017; Accepted December 5, 2017

Abstract

This article is shown that relates a public urban transportation problem in a city in Queretaro, Mexico, that made review literature with topics about the subsidy as help to invest to develop this service in Mexican medium-sized cities. As well, it is reviewed the topic of pollution, from the view of another country, and it is taken to a conclusion, the creation of routes, the general systems, the road system, the stronger internet system and the proposal, where the great benefits of the usage of telematic technologies to develop this project. It is concluded with a proposal to apply with the central topics in an applet to query, but under a scheme of data base and monitoring control of all needs required to start this process. All said previously could be taken as a model to be applied in other Mexican cities. The management of the informatic technologies in the transportation to benefit users is the central topic. The article gives a revision and analysis of the telematics technologies management literature.

Transportation, digital devices, informatic, users

Citation: ARELLANO-ROCHA, Francisco Javier and DÍAZ-NIETO, Elia Socorro. Telematic management technologies for urban public transport. Journal- Economic development, technological chance and growth 2017. 1-1; 44-59

* Correspondence to Author (arellanodrfjavier@gmail.com)

† Researcher contributing first author.

Introduction**Justification**

The Urban public Transport Systems in the country present several problems which can be addressed in research work like this, similarly, the same types of problems are presented in other countries, which have been treated in published articles. For example, the issue of subsidies, an urban collective transport service must be subsidized by local governments or federal governments. Not only it is up to governments to regulate and control the urban collective transport service, where their tasks range from the approval of routes, establishment of official stops for descent and boarding, establishment and publication of regulations, among others, where the subsidy must exist for the series of expenses that requires forming a urban collective transport route and groups or individuals do not have enough capital to spend on that establishment of routes and stations. Even more difficult where the collective transport must be through trains on a rail route, the investment is greater and individuals can not with the enormous investment load for its creation. Then it is up to the local, state or municipal governments, sometimes even in tripartite form, to allocate part of the capital they have to invest in support and support of urban collective transport networks. (Kiggundu, 2009)

The cases of Kuala Lumpur, Manila, Tokyo, or Mexico City, show that they are examples worldwide for urban public transport services and their investment at the state, federal or local level, and where they work for citizen users in those cities.

However, the cases of this type of investment are for larger cities in population size, not for small cities such as those in the city of San Juan del Río, surely the management to achieve investment in a large project of rail lines, dual or monorail, trains, stations and the whole range of services that are involved with the presence of this type of services, will not be possible because the same industrial, commercial, city, do not allow so much investment, even tax collection of contributions to the treasury, do not support large investments, therefore, it should be left aside and wait until a larger population is reached to address the solutions to this issue of subsidizing the implementation of an urban collective transport service. This is not a problem to address in San Juan del Río because it will not be possible to invest on the part of the federation, the state or the same municipality.

Problem

The issue of emissions from the urban public transport or by all motor vehicles in a city, is everyone's problem, whether federal, state and local government, citizens using private vehicles and also users urban public transport, all affected, and all cause impact to emissions, but also forget those users who do not use any of these vehicles, but being pedestrians, passers-by and do not use them but inhabit the same place where if used and they share emissions in a general way, so the problem is everyone's. In Singapore, it has been possible to create a strategic control with the creation of government policies that are applied in the reduction of emissions, with the creation also of alternative transport that uses non-polluting renewable energy among other advantages to reduce the environmental pollution caused by motor vehicles. . (Hoi, 2003)

The experience in Mexico City, first led to build an incredible network of a collective system called metropolitan, but over time simply derived by metro, an urban transport service, very low cost for the user, clear with high federal subsidy, and that led to transport a large number of passenger users throughout Mexico City, seeking to reduce emissions and creating a type of transport for the masses. There is also the trolleybus system, which works with electricity, not causing emissions from fuel used in transport and other interesting phenomena such as the management of joining transport companies in a single line among other great achievements, which, although applied to Throughout history, it has not worked. We see the example in the non-circulating program, which appeared to be the best for the control of millions of vehicles, but it did not work, since the middle class managed to save money for the purchase of two or more vehicles to be able to circulate in the days a car did not do it. So the staff of vehicles in Mexico City doubled in the first decade of operation of the program and now it has quadrupled, causing chaos with traffic and emissions.

This problem is not unique to Latin American countries, the OECD has investigated these phenomena and there are other studies worldwide that have addressed it, even the problem has been evaluated to develop appropriate proposals.

For example, in a group of Asian countries, specifically in Bhutan, Cambodia, Lebanon and Sir Lanka, (Dhar and Marpaung, 2015) in Table 1 of their article, on page 453, refer to the prioritization actions that they had to present in their respective countries and include the data in the replica of the table below.

Use of non-motorized transport

Establish policies to modify and eliminate non-motorized transport, with alternative technologies.

Transit in urban mass

Control the movement of people en masse, through the cities.

Planning and administration

Maintain control in the planning and administration of companies and the government that regulates them.

Interurban rails

Investment, development of inter urban technologies that can allow the transportation of the masses in an organized manner.

Efficient vehicle technologies

Efficiency is sought for vehicles with modern technologies that avoid the problems they have suffered in the history of transport for cities with large populations. (Dhar and Marpaung, 2015)

Mitigation strategies	Prioritized technologies			
	Bután	Camboya	Líbano	Sir Lanka
Use of non-motorized transport	1	0	0	1
Transit in urban mass	1	1	0	1
Planning and administration	1	0	0	1
Interurban rails	0	1	3	0
Efficient vehicle technologies	3	2	3	3
Total	6	4	6	6

Table 1

Source: (Dhar y Marpaung, 2015)

However, none of these prioritization technologies and strategies can be applied in the city of San Juan del Río, because they do not correspond to the situations of these countries, since these are not applications for small cities, but are applications of strategies that are implemented in the whole country, in the cities of large populations, therefore, it is not corresponding to the case that is proposed to analyze and evaluate, for a proposal in the city of Queretaro.

The most important thing would be the proposal to reduce pollutants in transport using alternative renewable energy technologies that do not pollute and do not cause damage to the environment. (Dhar and Marpaung, 2015)

Hypothesis

The urban collective transport service in the city of San Juan del Rio, presents problems that can be solved with the management of the use of telematic technologies for its improvement.

Objectives

General Objective

Identify the problems that exist in the urban collective public transport service in the City of San Juan del Rio, Querétaro, derived from the fact that the routes offered are not known, the schedules, fares and a large number are not known of additional problems.

Specific Objective

Find the possibilities of proposing technologies to create an application that can solve the information needs, the control of a database and the fleet, as well as to solve the problems of telecommunications in a city in the process of being intelligent.

Theoretical Framework

In an approach to the routes that are established in San Juan del Rio, do not amount to more than 27, which are authorized to operate in the city, in the urban part, since the municipality has urban routes, suburban routes, routes foreign and mixed routes. The only routes that are part of the topic of this research is that of urban routes, the others will be excluded because they are not part of the study.

At first, several years ago, the citizens of San Juan del Rio, began to need collective transport and gradually, taxis were authorized. This allowed any person, citizen who obtained his license plate to operate, could provide the taxi service. Of course, he had to have his mobile transport unit, knowledge of the city and experience as a driver of vehicles. However, the service was lousy, uncontrolled, expensive and many abuses were committed, causing no quality recognition. The ladies did not receive good treatment and everyone complained about the terrible service.

With the passage of time, the Diligencias emerged, which were organized minibuses in a concessionary transport line that began to provide good service and linked the two parts of the city, the center with the east. After that and with the surprising growth of the city, two more concessionary lines were authorized, which are those of the FTEQ and the CTM, which operate not only in San Juan del Río, but in Tequisquiapan and Ezequiel Montes. (Treviño, 2016)

There is no catalog of routes that can be consulted by users, so it is necessary to create one. Check the routes and if possible the schedules. The only way to know about the routes operating in the city is by asking the same users.

And if someone does not know or has bad will, they simply report erroneously, which causes more problems. It is also not known what time the first route is in the morning and what is the schedule for the night routes. This misinformation causes great confusion and problems.

Similarly, we must modernize the fleets, their services, the staff and give some advantages of modernity and updating as the information of all the above, but in digital form. This information will be broadly addressed in the proposal of this investigation. However, one of the urban collective transport lines of San Juan del Río, is already being revised to integrate GPS locators and video cameras so that the signal can be seen from a control and monitoring center, this was announced in a press conference in the month of November 2016. (Treviño, 2016)

Of great importance the contribution of Camacho (2016), where the philosophy of thinking about transport is that it is focused on the passenger, on the user who travels and consumes this type of service: the philosophy is the innovation of focusing on the passenger. (Camacho, 2016).

In its three derivations, commercial aviation, the connected vehicle and the reconceptualization of public transport. The latter is where the idea of shared public transport is focused for its consultation, knowledge and use, with an application equally focused on the passenger so that it allows a better use of the routes, schedules and all the additional information that allows . (Camacho, 2016)

Research Methodology

The human body is full of systems, digestive, circulatory, auditory, visual, many more, and that human condition is identified from the entrails of the human to its outside, for example, a lot of factors in previous centuries in the cities helped creating systems, for example, in houses, walls, supports, columns, providing shelter and protection to people, in addition to others, such as water supply, waste in channels, served as systems external to human beings , with great help to their own development, life and growth. As the cities grew, these systems also needed development and expansion, causing a great manifestation and creation of more developed and sophisticated systems. Everything that surrounds the human being is composed of systems, from the most basic principles such as sleeping, eating, drinking, is supplied through systems, and everything outside is also provided by systems. (Mitchell, 2007)

The fact that a large number of people live in a city, this allows them to be connected to different networks and systems, which, without their participation, life would not be the same; even, every year, every period, networks and systems face improvement processes, which makes them more practical and convenient for use with the inhabitants.

The use of a currency in a country is a whole system. The language spoken and written by a certain population is a communication system with many variants, but it is a system. The transmission of television programs is a system, which implies from its production of the recordings, its editing, its transmission, then its reception, decoding and projection in another device, until it is seen in our homes, it is a predetermined system that day by day, it has been perfected to what we have today, but also has the possibility of improving every day equally.

The urban collective transport is a system that also uses other systems, which must all have correspondence and follow-up to work, the determination of the routes, the control of the personnel operating the units, the determination of the rate, the form of payment and collection, the system of stops to board and descend, the schedules, the control of the cleaning of the units, in short, it is a whole system that works on the basis of other subsystems. This is a problem that we want to study, analyze and look for solution opportunities, supporting with development and technology activities (Seguí, 2004), to achieve greater satisfaction for the inhabitants and visitors of the city of San Juan del Río, second municipality in importance and population in the State of Querétaro, let's see this segment of a magazine article.

"Urban traffic is now complicated in most metropolitan areas of developed countries where congestion has become a daily problem of difficult solution. A problem that produces undesirable effects on the mobility of drivers and pedestrians. Failure to comply with schedules in public transport, increased travel time in public and private transport, air pollution and intolerable sound levels that seriously affect health are some of these effects.

All this results in an evident decline in the well-being of the population, but, in addition, has its correlate in significant economic losses. "(Seguí, 2004: 1)

The issue of the systems will be addressed for its solution in the aspect of an urban collective transport system for the city of San Juan del Río, where technology can be applied, apply the management and propose an innovation project in these two senses previous And the subsystems that this need requires will be addressed.

Type of investigation

It is a quantitative and qualitative research. Quantitative because the aspects and factors of flotillas, user population, distribution centers and Internet signal emission, repeaters, routes will be considered, therefore, their objects of study are quantitative.

The research is qualitative, because the problems that arise to improve will be analyzed and in the proposal the factors that will change the quality of the services will be considered, making the users more satisfied with it.

Theoretical methods

It is very important to consider this aspect in city life, the road system, which includes transportation routes, the direction of roads, the width and thickness of the streets to transit, the areas allowed and restricted, the hours of circulation or restrictions such as the No program circulates in several important cities of the world such as Mexico City, as well as the traffic signaling, signaling, personnel control system on foot, control with patrol personnel or control with motorcycle personnel.

The subsystem of stops and / or boarding and descending stations, all are aspects that must be planned according to the growth of each city and each local need. In the city of Tokyo, it is estimated that due to traffic problems, 50 million euros are lost each day, since congestion causes many problems of various kinds, for that reason it is necessary to plan the road system, the place where the means of transport and specifically the means of urban collective transportation in the city of San Juan del Río, which will lead to several problems to be solved beginning with the origin of the city that has had different stages due to different needs. (Seguí, 2004)

In its origins, the city is developed in the pre-Columbian period by the proximity to the river and to be between some rocks where there would be place for rituals and to observe enemy attacks. Then comes the colonial era and there is San Juan del Río at the beginning of the route to the north, as it was called the Camino de Tierra Adentro now declared a World Heritage Site by UNESCO mentioned in the Informador (2010), since it was the passage for the north from the city of Mexico to strategic points for trade and for the exploitation of mining, say gold and silver.

San Juan del Río was developed because in the rainy season, the river had a growing and needed a place to spend the night, including the service for people and animals of draft or load, that's why the former hacienda of La Venta is to take care of a side of the river that need and on the other side of the river, several places were developed to stay. (Informer, 2010)

With the passing of time in the 70's of the last century the Mexico-Querétaro highway was built and brought with it the eviction from the center of many commerce and food places, industrial development reaching the city due to the use of groundwater. Trade and other services also arrive.

However, they did not realize that the city had been designed originally for the passage of carts and cars with draft horses, so it has a medieval type cut, although it has no hills and mountains such as Zacatecas, Guanajuato, San Miguel de Allende or some other mining type, such as El Oro, Tlalpujahuá, Taxco, simply in a semi flat place, at 1890 meters above sea level, the city develops.

Even in times of the previous century and of this the expansion of the same city towards the east is built without adequate planning, which makes it very difficult to develop excellent roads such as in the city of Obregon in the State of Sonora, which has a planning urban excellence Without observing, for example, the electricity supply network, the potable water supply and sewerage network, the drainage network, which causes problems in the roads so that transports transit. Therefore, they must be addressed at some point for their solution. Neither have they considered that in the future they can have transport as a collective train type Metro, or a monorail, they have left the roads without development opportunities.

Today the city of San Juan del Río, requires a proposal to improve the roads for the passage of transport, both private and private, as well as specifically the urban collective transport. It could address issues such as the proposed "Civitas Initiative that takes place in 19 European pilot cities: Aalborg (DK), Barcelona (E), Berlin (D), Bremen (D), Bristol (UK), Bucharest (RO) , Cork (IRL), Gdynia (PL), Göteborg (S), Kaunas (LT), Lila (F), Nantes (F), Pécs (HU), Prague (CZ), Rome (I), Rotterdam (NL) , Stockholm (S), Winchester (UK). Civitas is part of the EU's 5th R & D framework program and aims to support the development and implementation of innovative and effective measures to improve the problem of urban transport.

"Electronic controls have been introduced to limit traffic in cities. urban centers, has also opted for a logistics improvement, information is given to the traveler and public transport itself. Intelligent transport systems have been proposed to manage urban transport with new strategies. (Seguí, 2004)

On the other hand, Pozueta (2000), considered in his time after a long analysis with graphs and theory, that it is necessary to promote in the cities the use of urban collective transport against the reduction of the individual vehicular transport. With a large number of options such as cycling or walking, including the promotion of special lanes for collective transport beyond the lanes for individual transport.

Also with policies such as higher fuel prices among other policies, but the main trend is that both local, state or federal government, and organized citizens, should promote the use of urban collective transport in preference and almost absolute priority, and reduce individual transports. (Pozueta, 2000)

Proposal

In order to achieve a project for the development of urban collective transport that can be applied through the management of technology with digital devices, quality and innovation strategies, it is essential to strengthen the internet system. The current networks are not providing a strengthened system, on the contrary, it is weak, with too many failures, falls and this does not allow projects of better quality to be developed.

Let's see what Castells and Quintana (1995) think, "In order not to get too far back, we started in the decade of the 80s, an especially significant decade because a set of relevant innovations converge in it: microcomputers, data transmission networks Low cost or data storage systems.

These innovations prepared the revolution that would take place in the middle of the 90s and that involved the convergence of technological innovation and digitized information through the network of networks, the Internet.

Information and Communication Technologies have since inaugurated and defined the new information society "cited by (Seguí, 2004), the Internet service stands out among other factors in order to revolutionize telecommunication and digitized information.

On the other hand, the same Seguí et al, (2004), mention that "Already in the 2000s, the technologies communication and data transmission made it possible to query data on mobile devices, such as cell phones or Personal Agendas. Digital Assistance (PAD). Thus, through the mobile phone or the PADs that have access to the Internet, the user can access the data transmission networks from anywhere.

For example, through an Internet interface, drivers have the possibility of accessing the digital plans of most European or North American cities through personal agendas or on-board computers, "so the use of digital devices such as the cell phone, now called smart and the personal assistance digital diaries, the pad, to connect to the Internet and interact with applications and digital information. The necessary thing is to maintain that connection to the networks of data transmission from any place. (Seguí, 2004)

The city of San Juan del Río, requires that leap towards technologies by implementing, for example, the GSM technology, which means Global System Mobile, that is, Global Mobile System, even now surpassed by another technology such as UTMS, Universal Mobile Telecommunication Service, that is, for its acronym in English, Universal Mobile Telecommunication Service, which consists of a third generation technology that works with a protocol called WAP, that is, Wireless Application Protocol, or in other words, the Protocol of Wireless Application, which allows the devices to connect with each other, through the Internet.

This technology is 200 times faster than the GMS. Currently in Europe, the leadership in the information systems depends on the UMTS. All movements can be made based on the transmission of voice and data in digital format, all images, transactions can be made, also make payments in virtual currency, videos and the use of high quality multimedia. (Seguí, 2004)

To support in control, monitoring and security, another communication technology is used to support the SIT (Intelligent Transportation Systems) and it is the GPS, Global Position Systems, Global Position Systems, for its acronym in English, the which allow the location of vehicles and the movement of them in real time. (Seguí, 2004)

A well-established extraordinary network must be created so that, in the city of San Juan del Río, users can implement this type of systems and subsystems for better communication, and the best provision of the urban collective transport service. The city would become a totally intelligent and virtual city. The OECD (2016) lists the laws that currently allow the regulation of the topics of Internet use in Mexico, with the following publications:

Federal Law on Protection of Personal Data in Possession of Individuals, published in DOF on July 5, 2010 ; Regulation of the Federal Law for the Protection of Personal Data Held by Private Parties, published in the DOF on December 19, 2011 and finally the Self-Regulation Parameters in the field of personal data protection published on May 29, 2014. (OECD , 2016). There will have to be more collaboration and contribution from the Congress of the Mexican Union to implement more laws as it is discovered and other aspects of Information Technology are needed in the Economy, in the Systems and in the daily life of the citizen users.

The OECD (2016) also considers that the Internet system should be strengthened not only in Mexico, but also in other Latin American countries so that through its services the economic development, security and sustainability of the regions can be improved. All the above with a better broadband in the national system so that all citizens can benefit. (OECD, 2016)

Result

The proposal is as follows, and the information in the table that includes the integral strategies of an Intelligent Transportation System (SIT) is taken as a model, with the following applications and with the responsibilities according to a proposal presented by Miles John and Perret, Ken (1997) cited by Pérez, Gabriel (2001):

ITS application	Main decision maker or responsible for its implementation
Management and control of interurban traffic	Government, highway authorities and tenured highway concessionaires
Electronic tolls	Government, authorities and concessionaires of tendered highways, bridges or tunnels
Management and control of urban traffic	Local authorities with support from the central government
Electronic identification of vehicles	Authorities, concessionaires and private that require it
Speed and traffic monitoring	Authorities and police
Passenger information systems	Bus operators and collective transport authorities
Payment cards	Bus operators and collective transport authorities
Driver information systems, including VMS, GPS	Operators of buses and fleets, private vehicles, authorities of collective transport and government
Efficient fleet and cargo handling applications	Operators of fleets of trucks or cargo transport, multimodal operators
Applications for road safety	Government, highway authorities and tenured highway concessionaires

Table 2 Main applications and its responsible for implementation

Source: Miles, John y Perrett, Ken (1997) Citados por Pérez (2001)

As for the management and control of interurban traffic, it does not apply in this proposal because the scope is only for urban collective transport. This possibility is ruled out in this proposal.

The electronic tolls do not apply either because it implies the payment of a fee for the use of the motorways, so, since it is a project for a city, for a purely urban center, then it will not be used in this proposal.

The management and control of urban traffic if included in this proposal and will have to be established in the research project to consider all the possibilities that are required as a control center with telecommunications, with equipment for the emission and reception of signal, of voice and data, and that there is a monitoring of the buses, the stops for users, the points of repetition and connection to Internet, even to the personnel that operates the units. Throughout the research process other alternative needs will arise to resolve with this proposal, such as control of bus flow, entrances, exits, route, and traffic conditions in the city. The boarding and descending of the users of the routes. (Pérez, 2001).

For this strategy, those responsible for the control and management of urban traffic are the local authorities with support from the central government, that is, the local government and perhaps an inter-disciplinary committee with representation in these sectors of government, chambers of professional associations, industrial, commercial, education sector, health sector and society in general, so that the decisions that are made, are totally permeated by majority and without particular or specific interests. The search is for traffic control and management that is efficient and of high quality. The management work will be left by the stakeholders of the local government and the representatives of the companies that provide the transport service. (Pérez, 2001).

To improve the control of the vehicles, of the urban collective transport units, the following strategy is required, the electronic identification of vehicles, which allows us to first know the total of the units with which it is counted, of course with a dynamic database that allows the immediate identification by the search of any of the items of the base, also by way of inventory, a coding number not only by the engine number, but by the unit numbers assigned by grouping, Measures, FTEQ and CTM. In such a way that they are under control, with highs, lows and movements by update. (Pérez, 2001)

Also that you can know where they are, in which of the roads they are, where they cross and more information about the route taken, together with information on the applied maintenance, daily cleaning, complaints received by the unit and its operators, in case of accident, the registration of all information. All the above, controlled from an intelligence center that leads to perform these tasks of the strategy. (Pérez, 2001)

Those responsible for achieving this strategy, to maintain it and to take it to its permanent continuous improvement, are the local authorities, the concessionaires and individuals that require it and that have been assigned. It is important to add that this strategy will increase security by the control of the vehicles, it will be possible to help with GPS technologies, UMTS and other standard telecommunications services that are already known in the market, supporting of course with a closed circuit system with cameras in the units, in strategic points to be able to review the information that happens every day in them. (Pérez, 2001)

A very specific strategy for the control of the units in question of traffic in the roads is the monitoring of speed and traffic, which corresponds to the local authorities and the road police, however, it is also required and useful for the representatives of the 3 urban collective transport lines. Sensors are placed to record the speed of the units, both externally and internally, which help to fully report the speed of the units with high technology, if there was a stoppage by any unit, an alert would be recorded for know that something is happening, in the same way if the maximum speed is exceeded both for the normal route and in roads of greater caution, you must report a different alert so that the situation of the speed increase can be verified later. It is a very logical and very important strategy that will help to increase the quality of the service and guarantee the safety of users, operators and the same urban collective transport units. (Pérez, 2001)

One of the strategies of great importance for the continuous improvement, for the development of the society, is to have an urban collective transport with information systems to the passenger, to the users, where the routes can be consulted, the costs of the routes, if there are discounts, if there are cancellations, including recommendations for visits to cultural places, events and other additional services, all through web pages or blogs that can be consulted through an application to traditional systems such as Microsoft™, Android™, IOS™, among others, then from a digital device, mobile or fixed, a computer, a laptop, or any other similar nature, the person who wants to consult all kinds of information can do so as long as they have access to the Internet. (Pérez, 2001)

For example, when boarding a bus, with specific codes of Augmented Reality, you can know the operator's data, your name, age, employee number, among other data, or consult the bus data, your traffic registration, your numerology, you can even know the location of a unit, recognizing that it has been launched on a route, or if you are in a unit, then to be able to inform someone you trust that you are in such a unit to be located and follow up through maps.

This strategy will require management sessions to negotiate with companies that already provide these location services or maybe create some new ones, using the same aforementioned network of sensors, combined with GPS, UMTS, and telecommunications to be able to provide the information in a complete way. to users or prospective users, it is not necessary to be a user, but the general public that wishes to consult information on urban collective transport. (Pérez, 2001)

The previous conceptualization is supported by Foth (2013), where it is indicated that the user of urban collective transport must be supported with entertainment when sitting in any unit and that from there, it can be connected not only for fun and distraction, but for interact with information applications, links with other routes, specific routes, rates, schedules and a whole range of additional information services in one or several applications that provide this sense for the simple fact of being connected to the Internet. (Foth, 2013)

Those responsible for the implementation of these passenger information systems will include the bus operators, the authorities that control and represent the collective transport, and perhaps the monitoring centers of the same service.

It is very likely that, in order to implement these systems, tripartite investment will be required, part of the entrepreneurs that represent the urban collective transport lines, another part the local government supported by the state and federal governments, and finally some of the associations that can participate with a little investment. (Pérez, 2001)

This is a very attractive proposal for the users and very convenient for the administrators of the urban collective transport lines, since it consists in that the user will no longer charge any kind of cash to address the transport services, all will consist of cards of payment in several modalities, for example, a card with microchip, which is recharged in specific kiosks distributed in the city for its operation of sale and collection, but also rechargeable through electronic transfer and payment with credit and debit cards. Another option is the cards with electronic band, which bring a charge of specific prepaid rate, which are bought in the kiosks, are not rechargeable, but they are bought even in other self-service stores.

A third option is to pay with a type of tag that is loaded and recharged in the different modalities already mentioned, but that allow the approach to the units without problems, and more quickly, with the option to register a user or more one's. Finally, the units for the collection of the transport can accept the payment with credit and debit cards, which will allow a wide range of forms of payment, which will no longer allow the user to suffer from the load of cash or collection. With change and cash handling problems for operators, everything now would be digitally, prepaid and securely. For this, the investment in equipment that makes all this service more complete, because it will have its value at the beginning, but will bring the great benefits as in the great cosmopolitan cities. (Pérez, 2001)

Those responsible for this strategy, which are implemented, are met and achieve their objectives, will be the bus operators, and the collective transport authorities, who must do all the management work for the implementation of the technology, the kiosks, of the system of collection and collection, of the negotiation with the banks and the subsidiaries so that the cards are accepted, but once implemented, the services will be safer and more efficient, proof of theft and looting, or of losses in the use of capital for the trips made. (Pérez, 2001)

As it is proposed that there are information systems for users, it is also proposed that there are driver information systems, including VMS, GPS among others, this will allow operators, when a problem arises, setbacks or doubts, including, the frequency of traffic and stoppages for special reasons, make decisions and adjust according to what is indicated, traffic and road issues that can help you give a better service. The technologies are variable, but repeated, also include UMTS and of course the Internet connection that is very important in the telecommunication networks with the controllers or the monitoring centers. (Pérez, 2001)

Those responsible for this strategy, goes directly to bus operators and collective transport authorities, for security reasons, also falls to local governments. All together, will make the decisions that arise for the needs identified, but the driver is a matter of great importance to have him in constant communication to inform him of the routes, roads and traffic issues in general. (Pérez, 2001). The strategy of creating efficient management applications for fleets and cargoes will not be necessary for this project, although it will be considered in the previous strategy, an application to consult operators on the issues already raised.

Similarly, the creation of applications for road safety, will not be necessary because it has been implemented little by little, generally the telemonitoring system with security cameras in strategic points of the city and will gradually increase to have a total follow-up of what happens in San Juan del Río, therefore, this strategy does not apply directly.

Conclusions

The set of strategies of this project is specifically for users of urban collective transport, but within this user population, there is a group of users who are classified as tourists, which, little by little, will cause a greater flow of visitors to the city of San Juan del Río, derived from the word-of-mouth dissemination that occurs, since it is not only intended for the general population, but also for a population of visiting tourists who come to the city to enjoy what it offers in culture, commerce and sports or other activities.

Technological innovation in tourism is also important and can be studied by developing several factors of benefit, which although much has been done using computer technologies, more can be done, combining one of the tourist services used by the local visitor, which is the Urban Collective Transport, where it is confirmed that this service benefits and affects the development of society, with the application of computer technologies. (Álvarez, 2008)

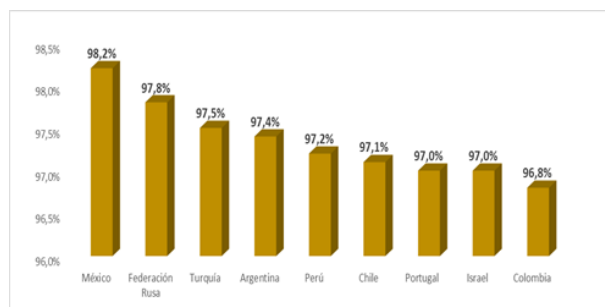
Miret-Pastor (2011) in collaboration with other authors of the Polytechnic University of Valencia, indicate that tourism products must be renewed, updated, reformed, applying new technologies, not only perform this process of integration to digital devices and computer technologies, but are fully eco-innovative processes that benefit.

For example, the emissions of buses in the urban area so that there is no pollution, which Tourism and the areas where it develops, can be better exploited with this technological application that is proposed.

Not only is the consultation and knowledge of the routes, but the application of new technologies in the control of emissions, among other applications. (Miret-Pastor et al., 2011). Telecommunications then become the central point of the theme because they are the promoter of development, causing the increase in the flow of information (voice and data) that the benefit in the countries is considered as development. With this increase in the flow of information, companies and users, face great benefits resulting in higher revenues, transformed the economic and political life of their environments. (De León, 2009)

Users will benefit from the use of networks and the Internet, regardless of the difference between common users of the same city or if they are a tourist type user, a visitor in the city concerned, their use and application of the social networks and the international network, will allow users to be connected to the most important media currently, with unparalleled growth, with additional services and everything in a digital type device, which is really a great benefit. (Miranda, 2016).

The use of the Internet is one of the tools with the most used electronic devices by the world population, and more in Mexico, let's see the following graph published by Miranda (2016).



Graph 1 Use of social networks in the world (in percentages of scope)

Source: Miranda (2014)

Social networks are applied in all areas, in all sectors, so it would be of great help, apply it in matters of urban public transport in any city, and Mexicans would have no problem as it has been shown that they are Internet users more than other populations in the world. (Miranda, 2016)

The connection to networks allows them to obtain the information that is offered and the users are determinant for the consultation depending on the information needs that they have, for the specific case of the urban collective transport services in any part of the world, it is of great importance. utility to be able to have the opportunity to know the routes of the collective transport, the tariffs of the same ones, the schedules and all a series of information that helps to take the decisions that the users have.

The virtual reality is very important in supporting the use of computer technologies where it allows that reality that is needed can be reproduced in digital devices, in such a way that they benefit society, the community in general. Strengthen access, consultation, interconnectivity, which, as a whole, allows for development. (Coca, 2009)

There are proposals from research centers such as the UPQ, where it is proposed to create 3D models of Augmented Reality so that it is supported by videos, books and applications where tourists to the city of Querétaro can through a consultation on digital devices, Find information about the attractions that are offered and found in the area. Similarly, these models can be applied for urban collective transport in other cities, considering the need for information and consultation on attractions in Augmented Reality. (Peredo, 2014)

Once the literature supporting this project is reviewed, issues such as public transport, its subsidy, the creation of policies for its development and improvement, as well as some case analyzes are addressed. In this article the problem of urban collective transport in the city of San Juan del Río has been presented, and to solve or reduce these problems a proposal is made integrated by the strategies that were also explained.

It will be necessary to work in the management between work groups composed of the representatives of the bus lines of Diligencias, of the FTEQ and of the CTM, together with local, state and federal government authorities, as well as with associations and society in general. , so that the treated points can be fulfilled. The proposal includes the strengthening of an internet service in the city that will help improve telecommunication in all aspects. The implementation of databases and applications for users and operators with technologies such as GPS, UMTS, software such as Microsoft TM, Android TM and IOS TM, as well as the connection and consultation with any type of device, fixed and mobile, in order to track routes, rates, units, traffic, problems and many other issues.

There should be capital investment and management should be worked on so that all participate and can jointly implement these strategies. The proposal should be more robust as the project progresses and as more specific needs arise for the area, the city and the real circumstances.

What is sought then is the management of telematics and quality technologies for continuous improvement in the urban collective transportation system of San Juan del Río through digital devices and will be achieved through a project that addresses the details for its implementation.

Once the literature supporting this project has been reviewed, issues such as public transport, its subsidy, the creation of policies for its development and improvement, as well as some case and situation analyzes in other countries are addressed, citing Camacho (2016), also to Dhar (2015), going through Kiggundu (2009) and Hoy (2006), who make approaches and proposals to find a transport service in cities with better expectations and in a better sense of provision.

All the literature reviewed by these authors was very supportive, although in cases where situations from Asia or from other cities in Europe were addressed, it is not applied in a specific way, but it would be applied in case of carrying out the project, in an adaptation to the case of San Juan del Río.

Of great support was what De León (2009) contributes, where the importance of tourism, economy, and innovation is mentioned, which with a project to improve urban collective transport through management, through technologies, coincides in a big way for the purpose of this project.

The strength of the assembly of literatures that have to do with proposals for Information Technology is abundant, and we have Castells (1995), Coca (2009), Mitchell (2007), OECD (2016), Peredo (2014).) to Pérez (2001) who write about the application of technologies in transport processes, although the emphasis is in general for the use of technologies, telematics, telecommunications among other very similar items, all the literature consulted and cited from very specific support for this topic.

And consistent with the use of computer technologies and urban public transport, they were presented to Foth (2013), Pozueta (2000), Seguí (2004) and Treviño (2016), who reinforced in a way the approach to the use of these technologies in applications with urban collective transport, emphasizing the creation of virtual and intelligent cities both for consulting services and for the use of applications in very specific cases.

Finally, the literature consulted by Álvarez (2008), Miranda (2016) and Miret-Pastor (2011), reinforce the importance of Tourism and the use of technologies, applied to the administrative processes of the two disciplines, emphasizing in Tourism.

All the literature consulted makes a minimal contribution, although some provide additional and exhaustive way, saying directly the possibility of dealing with the topic of this project. It has been a very productive consultation.

References

Alvarez Sousa, Anton; Rego Veiga, Gustavo; Leira López, José; Gomis Rodríguez, Alfonso; Caramés Valo, Rosa y Andrade Suárez, María José (2008). *Innovación turística: perspectivas teóricas y objetos de estudio*. Coruña: Revista de Ocio y Turismo. No. 1. 19-50.

ARELLANO-ROCHA, Francisco Javier and DÍAZ-NIETO, Elia Socorro. Telematic management technologies for urban public transport. Journal- Economic development, technological chance and growth 2017

- Camacho, Tiago; Foth, Marcus; Rakotonirainy, Andry; Rittenbruch, Markus; Bunker, Jonathan (2016). *The role of passenger-centric innovation in the future of public transport*. Berlín: Springer. 8:453–475
- Castells, Manuel y Quintana Muñoz, Raúl (1995). *La ciudad informacional: tecnologías de la información, reestructuración económica y el proceso urbano-regional*. Madrid: Editorial Alianza. 504.
- Coca Bergolla, Yunuesky (2009). *Agentes Inteligentes: Aplicación a la realidad virtual*. Cuba: Revista Cubana de Ciencias Informáticas. Vol 3. Número 1-2. 49-54.
- De León Lázaro, Guillermo (2009). *Las empresas multinacionales y la economía mundial*. Anuario Jurídico y Económico Escurialense: Real Centro Universitario. XLII. 339-352.
- Dhar, Subash y Marpaung, Charles O. P (2015). *Technology priorities for transport in Asia: assessment of economy-wide CO2 emissions reduction for Lebanon*. © Springer Science+Business Media Dordrecht. (131): 451-464
- Foth, Marcus (2013). Opportunities of Public Transport Experience Enhancements with Mobile Services and Urban Screens. Brisbane: Queensland University of Technology. (5) 1: 1-18.
- Kiggundu, Amin T (2009). *Financing public transport systems in Kuala Lumpur, Malaysia: challenges and prospects*. © Springer Science+Business Media, LLC. (36): 275-294
- Hoi Lam, Soi y Dinh Toan, Trinh (2006). *Land transport policy and public transport in Singapore*. Singapore: School of Civil and Environmental Engineering, Nanyang Technological University. 171-188
- Informador.mx (2010) Camino Real de Tierra Adentro, Patrimonio de la Humanidad. El Informador: Cultura. <http://www.informador.com.mx/cultura/2010/222659/6/camino-real-de-tierra-adentro-patrimonio-de-la-humanidad.htm>
- Miranda Zavala, Ana María y Cruz Estrada, Isaac (2016). *Redes sociales: herramienta de marketing internacional en el sector hotelero. El Periplo Sustentable*. 31. El artículo no tiene incluida paginación, [en línea].
- Míret-Pastor, Luis; Segarra-Oña, María-del-Val y Peiró-Signes, Ángel (2011). *¿Cómo medimos la ecoinnovación? Análisis de Indicadores en el Sector Turístico*. Valencia: Tec Empresarial. Vol. 5, Número 2. 15-25.
- Mitchell, William J. (2007). *Ciudades inteligentes*. Universitat Oberta de Catalunya. <http://uocpapers.uoc.edu>
- OCDE (2016). *Políticas de banda ancha para América Latina y el Caribe Un manual para la economía digital*. BID: OCDE. 484.
- Peredo Valderrama Iván, Peredo Valderrama, Rubén y Anaya Rivera, Ely Karina (2014). *Interacción de modelos 3D con realidad aumentada*. Vol. 11. Número 2. (7) 60-66.
- Pérez, Gabriel (2001). *Telemática, un nuevo escenario para el transporte automotor*. Chile: CEPAL, ONU. (63) 3-63.
- Seguí, Joana Maria y Martínez, Maria Rosa (2004). *Los sistemas inteligentes de transporte y sus efectos en la movilidad urbana e interurbana*. Barcelona: Departament Ciències de la Terra, Universitat de les Illes Balears. Vol. VI, núm. 170 (60).
- Treviño, María (2016). *Instala FTEQ video cámaras en transporte de San Juan del Río*. Diario Rotativo, 03 de noviembre de 2016. [En línea]