



Transport Telematics for Sustainable Environmental Development

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ABSTRACT

The paper is presenting the survey results was carried out to evaluate the general opinion of student on how transport telematics could be enhanced for sustainable environmental development. This survey, which was mainly brainstorming on real transport challenges and its negative environmental impact, gave a deep insight into what the future of transportation system would be with a robust data for efficient and effective telematics system to enhance environmental sustainability in the transport sector.

KEYWORDS: transport telematics, sustainable environment, transport development

1. Introduction

The EU Transport Council has defined a sustainable transport system as a system that: allows the basic access and development needs of society to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations; is affordable, operates fairly and efficiently, offers choice of transport mode, and supports a competitive economy, as well as balanced regional development; and limits emissions and waste within the planet's ability to absorb them, uses renewable resources at or below their rates of generation and uses non-renewable resources at or below the rates of development of renewable substitutes while minimising the impact on the use of land and the generation of noise.

With this definition, an effective transport sector is crucial for the well-being of people and economic development. However, the different negative environmental impacts from transport activities such as high air pollution due to emission and noise from the various modes of transportation in most developed cities across the world, the increasing demand on the natural resources such as crude oil among others are serious concerns to everyone in our society both young and old, great and small. The physical exposure to chemicals and

compounds in the environment either consciously or unconsciously have resulted to diverse health issues in human beings and animals as well as distorted the natural environment. Pollutions from transport system is the major source of the increased concentrations of NO_x , SO_x , CO_x , hydrocarbons, etc Environmental pollution from transportation system is a threat to healthy living and sustainable environment across the globe, resulting to intensive quest for lasting solution through new innovations.

2. Research problem and method

The need for more sustainable and integrative transport system in our society cannot be overemphasized as population of cities continue to increase along with the increasing environmental challenges. To allow environmental pollution from the transport sector to continue to add to the already existing environmental challenges in our cities is a dilemma that could be averted through innovations. While there are new modes of transportation inventions in the pipelines awaiting to be completed and launched, enhancing the telematics of the existing transportation system

could enhanced the current transportation system of any city for environmental sustainability since cities are responsible for 75% of global CO₂ emission. Pollution from transport sector is a threat that requires great attention if clean air and sustainable environment needed for healthy human existence across the globe is our common goal. This could be achieved through new innovations and adjustment in our way of life as well as modification on the current transportation system with telematics.

3. Review of current existing transportation systems

Cities are locations having a high level of accumulation and concentration of economic activities. They are complex spatial structures supported by complex infrastructure, including transport systems. The larger a city, the greater its complexity and the potential for disruptions, particularly when this complexity is not effectively managed. Urban productivity is highly dependent on the efficiency of its transport system to move labour, consumers, and freight between multiple origins and destinations. Additionally, transport terminals such as ports, airports, and railyards are located within urban areas, contributing to a specific array of challenges such as traffic congestion and parking difficulty, longer commuting, public transport inadequacy, difficulties for non-motorised transport, loss of public space, high infrastructure maintenance cost, environmental impact and energy consumption, accident and, land footprint etc.

Nevertheless, some solution that could ameliorate transportation challenges include: ramp metering, traffic signal synchronization, car ownership restrictions, sharing vehicles, high occupancy vehicle (HOV) e.g. buses, parking management efficient utilization of public transit.

A look into the transport systems of a few major cities of the world gives insight on the characteristics of the complexity of some transport modes and the importance of this sector to humanity:

1. Seoul, South Korea – The KoRail, or subway is always the way to go in a crazy traffic situation in South Korea. The train is clean and also run on schedules.
2. Santiago, Chile – has one of the most advanced and convenient transportation systems in Latin America. With over 100 stations in operation. Currently, the Santiago line of commuter rails is the best way to beat the heat and the traffic.
3. Tokyo, Japan – Spanning a mind blowing 193 miles, the public rail system in Tokyo is arguably top 5 in the world despite the densely populated Japanese cities, the trains are clean, quiet and on time.
4. Madrid, Spain – Madrid has the best public transportation not only in Europe, but in the world. Their system includes a metro, light metro rails, commuter rails and buses. In addition to being safe and clean, public transportation is quite affordable in Madrid.
5. Shanghai, China – moving around in a big and happening city like Shanghai, China is incredible. Every corner is connected by metro trains and buses. Everything is accessible and affordable.
6. Paris, France – with over 300 stations, it seems a bit overwhelming to imagine mastering the system, but Paris has one of the best

designed metro lines ever. It is so easy to navigate and literally get anywhere and everywhere.

7. Taipei, Taiwan – an island off mainland China has a complex transportation system that is used by more than 35% of locals. The complex system is labelled according to colour and number in order to make it user friendly to locals and travellers alike. The advanced technology in transportation system used in Taiwan makes one feel already in the future. The „MRT“ is the local subway system in Taipei that connects the entire city. It's clean, modern, extremely efficient, and easy to understand and navigate.
8. Dubai, United Arab Emirate – one of the things that make Dubai so unique for public transportation is the fact that it has so many options to connect people with places. For example, the water taxi, the monorail, the tram or simply the many buses connecting the city.

Complexity of modern transportation system and its accompanying infrastructure should have been sufficient to curb the environmental challenges associated with transportation system in our society. Yet, the increasing exodus of people to the cities will not stop and will tend to negate the efforts made by inventors and engineers in proffering solution to this challenge. It is therefore necessary to apply a more subtle way in controlling the situation. This could be the enhancement of telematics application on transportation aimed at environmental sustainability.

4. Case study

A quick survey was carried out to evaluate the general opinion of people on how transport telematics could be enhanced for sustainable environmental development on students of AGH University of Science and Technology, Krakow. This survey, which was mainly brainstorming on real transport challenges and its negative environmental impact gave a deep insight into what the future of transportation system would be with a robust Internet of Things (IoT) data for efficient and effective telematics system to enhance environmental sustainability in the transport sector.

The outcome/result of the brainstorm proffer the following:

In order to shape the transport system for a sustainable development:

1. The implementation of cashless city (instead of paying cash for tickets and transport fares) should be enforced in major cities where the technology could be beneficial.
2. Sustainable consumption of natural resources and raw materials (petroleum, lead, iron, cotton, polythene, etc.) should be the goal of every manufacturer and users of transport equipment.
3. Countries that wish to implement car-free city policy should derive this concept from standardized town-planning concept, in which all social amenities are sited within a walking distance to discourage driving personal cars when trying to get things in another neighbourhood. The strategies for the implementation of this should include:
 - effective and efficient communication;

- provision of more public means of transportation to reduce over-crowding in vehicles;
 - efficient and accurate time table/ schedule of timing for public means of transportation;
 - provision of adequate roads/ infrastructures for pedestrians/ scutters/ bicycles/ parking;
 - relevant and strong safety and security policies should be put in place to encourage walking without fear of attack;
 - public transport system should be made very attractive (either by making some section of the vehicle to have private compartment for privacy) to encourage the elite to also use the conventional public transport instead of driving their cars;
 - massive awareness campaign to change the orientation/mindset of the populace especially in countries where ownership of cars is seen as a sign of being wealthy. this will reduce the number of personal cars on the road especially during peak hours/ period.
4. To ensure safety, reliability, efficiency and time management in transport system based on existing infrastructure local culture, habits and customs will require:
- a tracking device for monitoring drivers behavior while on the steering should be used to achieve safety, reliability, efficiency and time management in transport process. The aim is to record down the frequency of matching break, the frequency of locking and unlocking the seat belt etc. while driving within a specific period;
 - installation of alcohol sensor to detect the slightest smell of alcohol consumption on a driver before mounting the driving seat or while on the driving seat;
 - to ensure safety, sales of alcoholic drinks to self-driven customers at bars should be discouraged so as to avoid driving back when drunk;
 - the installation of a speed-governor, speed limiter or controller with sound sensor to guard against reckless driving so as to maintain stipulated speed limits in cities;
 - the installation of road /traffic camera e.g. photo radar at strategic points on the road to capture road traffic rules defaulters for appropriate sanctioning.
5. Energy - saving technologies, emission control as well as environment-friendly practices will include:
- use of bicycles and electric cars instead of conventional vehicles;
 - installation of device that detects excess CO₂ emission in cars and the information sent to a server;
 - proposed launching of hyperloops (a positive innovation aimed at covering long distance within a short time across busy cities or even between continents);
 - proposed design of two wheels gyroscopic vehicles (one in the front and the other behind), will save cities of traffic congestions and reduce gaseous emission. Its assumed design advantage of elevated – height - drive which is above the normal height of other road vehicles such as buses and its ability to meander within a very short distance, will make it the preferred choice of means of public transportation in the future;
 - investment on public transport to reduce the number of private vehicles on the road;
- the utilization of extant self - driving/ autonomous cars, a positive environment - friendly innovation because of its ability to overcomes traffic congestions through rerouting the vehicle hence averting the emission of CO_x during traffic congestion;
 - manufacturing vehicles that could automatically switch to electric power mode after being on motion to conserve fuel;
 - adequate and strategically designated recharging points for refueling of electric cars so as to reduce carbon emission commonly associated with conventional fuel vehicles;
 - production of hydrogen - fuel cars to help produce clean air. The hydrogen gas which may be produced from petroleum will go a long way to modify the present form of fuel being consume in vehicles.
6. The use of telematics for the evaluation and enhancement of the life cycles of a vehicles' components (e.g. battery, seat, etc.) to reduce the pressure on the demand for raw materials used in manufacturing them could be achieved through:
- the utilization of Electronic Control Unit (ECU) in vehicles to monitor and detect the deterioration levels of the components of each vehicle through the sensor base on the information on the life cycle of each of the components. The information communicated to the server, could be used to evaluate the life span of each of the components for decision making;
 - the components/ products of the vehicles must be of high quality so as to last longer with regular maintenance schedules;
 - modern and new production vehicles should have an inbuilt updating function for regular instant online update (instead of driving the car for repairs);
 - updating the life-span of any component/ product used in the vehicles to enrich the data base for efficient telematics application in the available mode of transportation.

5. Conclusion

So far, the invention of mobile transport system in the form of cars and other vehicles have led to the evolution of the transport sector while shaping the way movement of goods and people from one place to another. The existing infrastructures varies according to the location. For example, the developed countries have most of the up-to-date equipment (even though some new innovations like the hyperloops, gyroscopic vehicles are in the pipe line) for efficient transport system, but in the developing countries the case is not the same.

While we await the latest technological invention in transportation to save energy, time and sustain the environment, innovation in telematics of our existing modes of transport and a little adjustment in our way of life could contribute positively to curb the negative impacts of transportation system and also enhance environmental sustainability. This could include among others:

1. Installation of tracking device for monitoring drivers behavior while on the steering to achieve safety, reliability, efficiency and time management in transport system with the device connected to server. The aim is to record down the frequency of matching break, the frequency of locking and unlocking the seat belt etc. while driving within a specific period.

2. The utilization of Electronic Control Unit (ECU) in vehicles to monitor and detect the deterioration levels of the components of each car through the sensor base on the information on the life cycle of each of the components. The information communicated to the server, should be used to evaluate the life span of each of the components for decision making.
3. Manufacturing of vehicles that could automatically switch to electric power mode after being on motion to conserve fuel.
4. Adequate and strategically designated recharging points for refueling of Electric cars so as to reduce carbon emission from conventional fuel cars.

These among others, will go a long way to enhance the environmental quality of cities, enhance healthy living and longevity. It will also shape the future telematics in transportation system and encourage sustainability of our environment.

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