



Telematics in Transport Processes with Unpredictable Threats

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ABSTRACT

Transport is one of the basic elements in economic and social development of mankind. The today public transport system in Nepal is characterized with many challenges: lacks of safety, availability and reliability, as well as unscheduled travel time, emissions. Another key barrier of the transport system development in the city is lack of proper transport policy, bus fleet exploitation management problem, strategy to adapt new technological solutions. Intensively. The aim of this paper is the concept study how to improve the public transportation system in Nepal with use of the new management solutions and technology based on telematics solutions.

KEYWORDS: public transport, transport fleet availability, transport telematics, intelligent transport

1. Introduction

Transport is one of the basic elements in economic and social development of mankind. Transport system is one of the complex sub-systems as result of involving various technologies, working mechanisms and systems in order to transport passengers and goods from one point to another. The today public transport system in Nepal is characterized with many challenges: lacks of safety, availability and reliability, as well as unscheduled travel time, emissions Ethiopian transportation system is dominated by informal and back warded system since its advancement with reference to passenger's interest and accessibility is very low. People most of time prefers used to walk long distance as result of shortage and inadequacy of transport infrastructure with different corridors of the city.

This minimizes the productivity of work as well as has an impact on keeping proper working time. There is government direction in order to solve the problem through expanding the existing road infrastructure to connect with different corridors. An expansion of road network capacity has been taken as major solution as a result of resolving traffic congestion and provides smooth traffic flow. Apart this, transport system should

adapt and entertain n modern technology in order to make the transport system more efficient, attractive and effective. According to various studies, transport telematics is a part of modern transport technology which could support and facilitate the decision making process in real time phenomena through providing data analysis and information.

Transportation can be seen as an activity of movement from one point to another. This is accomplished through the use of devices called transportation devices. A transportation system can be modelled as in a closed loop control system with input and outputs. The typical design objectives are time-based such as accuracy, reliability, safety and availability.

As seen in Fig. 1, transportation is modelled as an activities which takes a number of inputs, such as energy (fuel), intelligence of the operator and finances. It then produces a series of measurable outputs such as time of travel, availability, reliability and safety. The user will have a set goal, or target of these outputs, which we will call standards. The output is then compared with these standard parameters and a feedback of the difference (error) is supplied back to the main activity. The user then tries to achieve these parameters by varying the input parameters. In real-life scenarios, however, the activity might not run as expected due to varying reasons. These

can be predictable or unpredictable. These unpleasant situations are referred to threats. Internal threats include threats within the transportation device while external threats deal with the ones outside the device such as the environment or the operator. Luckily, there are tools to check these variations/threats. Digital technology has allowed us to use sensors and communication systems in transportation devices that transmit important information to other devices or to a centralized system. The most important of these systems is telematics.

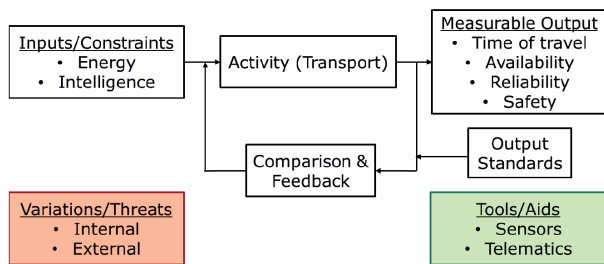


Fig 1. Transportation system block-diagram [own study]

2. Methodology

This study is based on literature reviews and three discussions held at AGH University of Science and Technology – two with masters degree students and one with international students from various backgrounds.

3. Telematics as a tool in transportation

Telematics can be defined as the blend of communication technologies and computers along with transport devices to transfer information across devices. They consist of sensors and communication systems. The sensors read information physical parameters from the system that are transmitted through the communication system. They can be as simple as a navigation system and as complex as a automated servicing system. Today, telematics rely heavily on the internet, being a part of the Internet of Things (IoT). It transmits data usually using a broadband connection or through the help of cellular networks. For the sake of simplicity, we will assume that this prerequisite is met in every scenario discussed here onwards.

Telematics are seen in many services today ranging from fleet tracking to routing and scheduling, ride-sharing to satellite-based navigation, accident prevention to smart insurances.

4. Unpredictable threats

As discussed in the previous section, threats are undesirable situations of operation and can be both internal and external. Most threats in real-life are unpredictable, i.e. they occur without

prior notice. It is of highest concern that these threats do not affect the activity of transportation. The transported goods, people should be unaffected by these threats. Similarly, there should be no compromise in the availability, safety and reliability of transportation.

5. Scenarios

Three scenarios of unpredictable threats are presented as follows.

5.1 Traffic congestions

A traffic congestion is a situation of immobility on road. It can be characterized by complete stoppage of vehicles or limited speeds of vehicles. While fundamental causes of traffic congestions are known, the underlying issue cannot always be known beforehand. Hence, they are unpredictable threats.

Telematics can be to help in scheduling and routing the vehicles. The data obtained from them can be used in decision making in order to meet standards of safety, reliability and availability. Solutions involving telematics are far and many. Sensors installed in cars can calculate the average speed and distance between two consecutive vehicles, thus notifying when a congestion is most expected. The data thus obtained can also be used to control traffic lights and signals. Some traffic congestions are caused due to irregular parking space, sensors in parking spaces would inform when a space is empty. Similarly, data can be used to introduce more favorable public transport alternatives. Ride sharing apps can also help to reduce traffic congestions. The introduction of an additional segment of road whose usability changes depending on the time of traffic will also help alleviate the problem. Using drones for accident spotting can also be a viable solution.

5.2 Natural calamities

Natural calamities are another kind of unpredictable threat. Most are caused due to environmental factors over which we have no control. Specifically, in a mountainous country like Nepal, cases of landslides are quite frequent in the rainy season. Additionally, roads in mountainous terrain are narrow and winding, around mountains specifically. Thus, in case of an internal or external threat, the entire road network will be affected. The rivers originating from the Himalayas flow into the southern plains of the country; often flooding them in rainy seasons. Finally, in 2015, Nepal was victim to a series of earthquakes peaking at 7.8 Richter's scale in magnitude. This caused substantial problems to the road network. These natural disasters are indeed a big problem.

Telematics can be used to solve these problems. Data of stuck vehicles can be obtained through GPS and a rescue team can be deployed accordingly. An app can be devised to call people to remove debris due to landslides, etc. A smart solution involving sensors in the cliff that check for motion and moisture content in the soil can be used to prewarn authorities on landslides. A sensor checking water levels of rivers can be used to communicate risks of floods.

5.3 Industrial problems

Material moves in and out of industries. The equipment that handle this equipment are called material handling equipment. For example forklifts, conveyors, pipelines, inventory robots, fleet, cranes, etc. These machines need to working at the entire working hours. Any stoppage of these machines due to any reason would result in losses for the industry. In addition to these, tight working schedules make it harder to allocate time for maintenance.

Telematics can be used effectively to address these issues. Devices with sensors in warehouses can automatically place orders when inventory is low. Data from these sensors can also be used to predict times of procurement of inventory. In addition, smart forklifts can be used that communicate the order of transportation of goods. We can have materials waiting near the production line instead of the warehouse by using a kind of a JIT system. Telematics devices installed in warehouses and trucks can be used to effectively communicate for scheduling shipments. We can use data of downtimes of equipment to develop a regression curve between mean time between failure and time of maintenance. Finally, specifically in the case of cranes, the load on the wires can be measured to determine the amount of cycles the crane can operate without repair and maintenance.

6. Conclusion

This paper has strongly examined that benefits of using transport technology is indisputable and believed that it can brings a potential impact into day to day activities of peoples and goods. Telematics can provide solutions to problems arising due to unpredictable threats in transportation.

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