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VIRTUAL ITS AND BIG DATA: NEW POSSIBILITIES FOR ROAD OPERATIONS AND TRAFFIC MANAGEMENT

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Introduction

- The original idea for this concept was generated by the lack of possibility to generalize the use of ITS in a middle-income countries even after reforming the authority's requirements on toll roads.
- We mixed in-field experience with theory and technological tools such as Artificial Intelligence to an application that has not been traditionally experimented before.
- Also, by using existing data, we are "recycling" already justified information, making the application cost-effective from the beginning.
- In addition, it presents an opportunity to access the use of information to countries that struggle with budget allocation, reporting routines, and lack of general and specific data.

THE RELEVANCE OF ITS

- For the purpose of this presentation, ITS is defined as a tool to measure, monitor and manage data related with mobility, warnings, alarms, and Key Performance Indicators (KPIs).
- KPIs become the basis for monitoring and compare performance among cities and projects in time or simultaneously. This use responds to the fact that cities may have similar problems but the same program may generate different outcomes, depending on the context.

Objectives

- **Accessibility**: to enable the main activity of the area, whereas it is industrial, social, commercial, leisure, etc.
- **Mobility:** to interact with public and private agencies to move towards a focus where roads moving more people are stimulated to perform better by maximizing the vehicle's occupation efficiency.
- **Quality of life:** to improve quality of the infrastructure by assuring cost-effectiveness, protecting the environment, energy efficiency and enhance overall quality of life.
- **Operational efficiency:** to reduce delays and inconveniences of the traffic.
- **System condition and performance**: to preserve the infrastructure's value by managing its use and maintenance.

THE CHALLENGE FOR MIDDLE INCOME AND DEVELOPING COUNTRIES

- According to the Human Development Index (HDI), only 51 (27%) out of 188 countries have a “very high human development” score (2). That means that 72% of the countries face a different set of challenges. Priorities are not necessarily generating unbiased and available data, let alone regarding mobility.
- According to the The IRF Vienna Manifesto on ITS the limitations most countries have been insufficient funding, physical barriers, lack of support from different actors, and integrating more abstract objectives such as safety and liveable communities.

The case of Mexico

- Toll road concessions have requested ITS infrastructure since 2008 to approximately half of them.
- Toll roads represent only around 5.4% of the 180, 606 kilometres of paved roads in the country.
- The requirement opened the conversation and made some practical applications for new discussions to come, however, even though indicators that are relevant for the network management were specified, volume has not been enough even to create a traffic management central on the government side.

Technology evolution

- In this new era, we want to achieve the use of an ITS system with much less ground (hardware based) systems, with much less data-gathering-ability from people, and with much less reporting culture in society. This way we'll start a new scheme without having expensive ground infrastructure and focus on training road operators.

The “Leapfrog”

- The good news for the new scheme is that we are in less need to go through organizing ourselves to acquire data and manage the sources in the traditional way.
- Our proposal is to take advantage of these ideas by taking the existing data and taking a shortcut to the desired applications of ITS.

Description of the System

- Virtual ITS is the conjunction of existing mobility related data and organized ad-hoc to define the Prevailing Road Status (Estado Vigente de la Autopista, EVA in Spanish) to manage traffic and road infrastructure.
- The EVA gives us a view of how the population moves within the area of influence and what is happening at any given time, from a multidisciplinary point of view.

Alarms and Alerts

- Constant EVA reports analysis allow the system to determine normality in no time. Normality refers to the typical behaviour depending on itself but related to temporality, environment and many other variables every time. It is not the same to read a Friday, payday, afternoon peak-hour (dark), beginning of a long weekend, raining in the winter time, compared to a sunny Friday, payday, afternoon peak-hour, during summer break.
- AI allows us to translate such conditions into Alarms and Alerts.

The importance of the Specialist

- The EVA is not arbitrary but it is designed to respond to the Operator, the authorities and other traffic and mobility managers.
- Experience in traffic management, in addition with specialized knowledge related to the reading and use of the tool, are fundamental.
- Without the presence of an adequate specialist it is not possible to guarantee the efficiency of the customization and application of the product for a specific area.

Universality

- Since there is little or none hardware to install, it is substantially cheaper, therefore cost-effective.
- Since data is taken from multiple sources, it is possible to add new variables constantly.
- The scope of the system automatically expands to anywhere data is already being generated, connecting to the database roads that were not originally considered as part of the ITS network. This may refer to a sophisticated toll road or a rural dirt road without distinction.
- The vision of the Virtual ITS (VITS) shifts from moving vehicles to moving people, which expand the possibilities to uses that are not even listed on this paper, such as intermodal private, public and/or mixed transportation, among others.

The Challenges

- Introducing a new method and/or technology to substitute an already established method is always a challenge.
- Without a Champion within a government, a company or any organization, specialists might not find the space to modify the status to a new era.
- Denying such an opportunity, not only has an impact on the industry itself because it is being left behind in comparison to other industries. It also destroys the possibility for most of the countries to “leapfrog” into the future where just getting to the current ITS management expectations seemed impossible not long ago.

Thank you!

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