TRANSFORMING TRANSPORT

HOW BIG DATA CAN TRANSFORM EVERYDAY MOBILITY AND LOGISTICS

Transforming Transport (TT) is one of the first two lighthouse projects of the **EU Big Data Value Public Private Partnership**. The project, coordinated by Indra, has involved 48 partners. During its 30-months of execution, TT has been able to demonstrate the transformation that Big Data could bring to the mobility and logistics industries, which represents 15% of the global GDP and employs over 11 million people in the EU-28 zone. As the project end approaches, we revise the higher impact success stories that Big Data has brought over its implementation. ▶

SAFER AND BETTER MOBILITY IN EUROPEAN ROADS AND CITIES

Everyday citizens are facing growing traffic challenges in their mobility. The complex interactions of traffic flows, together with road conditions, are in many cases the main causes of road accidents, which yearly provoke 26,000 casualties in the EU. Most of the time, these traffic situations are generating large amounts of data that are usually under-exploited. With predictive real-time analytics and algorithms for traffic flows, operators can now better diagnose traffic status and more accurately foresee its evolution, mitigating the impact of roadworks and optimizing infrastructure usage and accident prevention.

With solutions developed in TT, we have had the opportunity to showcase how **Big Data can increase traffic observations by 70% in the city of Tampere (Finland) and provide accurate traffic and accidents predictions up to 2h in advance in the AUSOL highway in Spain**, improving from the previous 20min prediction. ▶

" These extra 100 minutes make a great difference in our daily operations. Unexpected peaks of traffic approaching toll stations may cause drivers' comfort to downgrade, so any extra minute counts when it comes to accomplish changes in the system configuration (reversing lanes, shifting payment mode), with a very positive impact on customer experience. "
Cornelio Aguilar – AUSOL Highway Manager

Another example of how TT has unlocked the potential of data to optimize road operations is the case of the existing **optic fiber buried along the shoulders of Norte Litoral highway in Portugal**, normally used for communication purposes. Thanks to Artificial Intelligence, a device based on Distributed Acoustic Sensing has been used in TT to reuse this communication infrastructure to detect events that could affect traffic (accidentes, congestion). It has improved real-time detection of incidents, which reduces response times to accidents and guarantees safer roads. ▶

" AI has showed how just one device switched to the already existing fiber optic backbone can monitor from 30km to 50km of linear infrastructure every 10 meters, with no signal degradation. If final tests go as expected, this technology might help Cintra to provide the Traffic Control Centre with early warnings that might shorten reaction time to traffic events to nearly zero. "
Miguel Carpio – Cintra Project Manager

Truck fleets also play a significant role on inter-urban traffic, and specific-related activities such as deliveries (loading/unloading) have a great impact on urban mobility. Big Data has also the power to reduce this impact and at the same time improve the efficiency of the operation of these fleets by developing technology to identify better routes and shorter travel times for trucks. **AI solutions developed in TT have shown their potential for reducing truck driving and handling process by 17% at a critical central EU Corridor (Amsterdam - Frankfurt) and reduce delivery vehicle usage at Valladolid (Spain) by 30%.** This enables truck drivers to reduce buffer and delay times and provides more realistic travel times, reducing the traffic congestion in the cities.

BOOST THE RELIABILITY AND PRODUCTIVITY OF TRANSPORT SERVICES AND OPERATIONS

Infrastructure maintenance activities are critical to guarantee the high levels of safety and reliability required for their operation. With Transforming Transport, rail operators from the **UK and Spain** have been able to experience the benefits that Big Data can bring to the Rail sector. Solutions developed in TT can monitor the quality of individual assets, providing predictive analytics of their degradation thanks to maintenance models as a way to prevent service disruption.

" Thanks to Big Data, we have paved the path to switching from preventive maintenance to predictive maintenance, performing forecast of assets behavior and planning interventions in advance. We have tested this new approach in our High-Speed Line between Malaga and Cordoba. "
Jose Conrado - Head of R&D Projects Development Area at ADIF

The benefits of these solutions go beyond the improvements on services reliability (like minimizing downtime and service interruptions); they improve safety of passengers and rail workers and can **reduce maintenance costs by up to 34% by minimizing the time spent track-side (reducing maintenance interventions by 10%).** ▶

Port operations are also being transformed thanks to AI. Using TT solutions it is possible to predict the need for maintenance and replacement of equipment based on facts and real usage rather than on estimates. The **Port of Valencia (Spain)** and the **Port of Duisburg (Germany)** have developed optimization algorithms for crane operation and a terminal productivity cockpit that have allowed them to prevent the occurrence of equipment and system failures. The minimization of maintenance work has a great impact in the mitigation of delays and increases the effectiveness of terminal operations, **bringing savings in operational costs of around 10% and improvements in terminal efficiency of 5%.**

ENHANCEMENT OF TRAVELER AND CUSTOMER EXPERIENCE IN THE TRANSPORT AND LOGISTICS DOMAIN

At the **Athens International Airport**, they were struggling to allocate resources more efficiently since the airport was reaching its full capacity due to the important growth of the airport in the last years. TT shows how **Big Data helps optimizing airport resources** by applying behavioural analysis and predictions to passenger arrival times and flows within the airport with the passenger descriptive models developed. TT solutions allow airport managers to optimize operations with predictions of flight delays due to late passengers, as well as to optimize the resources in security areas and to create new data-driven business models in retail and the airport stores, thereby enhancing the travel experiences. ▶

Big Data solutions have also been tested at the **Malpensa Airport in Milan**, showing how Big Data can reduce overall turnaround times and **increase gates capacity by up to 10%**. These improvements also have a direct impact on the **passenger's travel experience** by reducing delays and the number of passenger missing connections and lost baggage.

> *The TT solutions developed allow airport managers to optimize the predictability of aircraft delays and the whole aircraft turnaround process, to apply recovery plans well in advance before the problem happens (based on data driven decision making tools), thereby creating better traveler experiences.*
> **Marcella Scuccimarra - Manager at SEA Malpensa Airport**

The boom of **e-commerce** has increased the heterogeneous customers' demands and locations for supply networks that aims to stay competitive with challenging shipping times and methods. These high customer expectations are related to reliable and accurate transport execution and arrival times on the road in the day-to-day business. TT has been able to show that **Big Data can provide new planning tools for analysing and optimizing delivery fleets**, identify patterns of problematic deliveries and forecast problematic situations or dynamically identify alternative delivery options. These solutions have demonstrated that **Big Data can decrease the number of distribution vehicles used per day by 38% in the Athens area**.

Overall, TT has performed **13 large-scale pilots covering 7 different domains**, measuring the **value created by Big Data** in terms of improved operational efficiency, better customer experience and new data-driven business models **with more than 130 KPIs**. These pilots have generated important **data awareness** inside the involved organizations, especially end-users. Stakeholders have also realized how data can provide added-value and understanding of their operations and how important the **data sharing** approach is for bringing new knowledge in order to understand their business operations better. This new mentality could open a door for promoting **open data policies** inside the companies that could drive into new business models and opportunities.

BIG DATA IS IMPROVING YOUR JOURNEY EVERYWHERE YOU GO

Kate has a plane to catch today to attend an event in Riga. To go to the airport from Madrid, she will take the 10.30 train at the nearest train station after a 15 minutes ride from her home.

Little does Kate know that all her previous trips through that road along with other data from many different drivers are helping her today to defeat the traffic jam. By developing prediction for traffic flows, the toll station in the highway will have optimal resources to reduce her waiting time for paying the toll.

In addition, her car is equipped with sensors that collects data from her driving behaviour. By using tools that exploit this data, Kate will be notified about eco-driving actions that can help her reduce emissions and fuel consumption, allowing her to become a better driver and save money.

Kate is now at the train station, ready to catch her train. Without even noticing, Big Data is also involved in the punctuality and safety of the service. Rail operators and managers have introduced predictive analytics tools to optimise maintenance interventions and minimize downtime. Thanks to that, Kate could catch her train on time and safely arrive at the airport at the expected time to go through security.

When Kate arrives at the airport the security lanes do not have long queues because Big Data is used by airport operators to optimize security queues and to reduce the waiting time. These Big-Data based tools have also allowed airport managers to allocate the boarding gates efficiently and ensure that Kate's plane can depart on time. Moreover, thanks to Big Data, the airport can obtain insights on how passengers behave along their way through the airport so Kate can buy her favorite newspaper before her flight and enjoy her trip.

> *Through these pilots, TT has demonstrated the technical and economic viability of Big Data to optimize transport network operations. With today's promising results, we expect Big Data and AI- based advanced analytics solutions will act as enablers to automated decision-making support for operational systems. These will establish the next level of efficiency and operational improvements in the mobility and transport sectors in Europe.*
> **Rodrigo Castiñeira (Project Coordinator) -R&D Manager at Indra**