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DIGITAL INTEGRATION: THE NEXT STEP FOR EUROPE'S TRANSPORT NETWORK

Digital technology is changing the way we design, build and use our roads and railways. Europe needs to embrace these advances if its infrastructure is to keep up with the rest of the world, says AECOM's **Costanzo Graffi**.

The transport network of Continental Europe is as diverse as the people who live within it. From the French high-speed rail network, the undulating mountain roads of Switzerland and narrow waterways of the Netherlands, all are ingrained in the fabric of the country in which they were built.

The Trans-European Transport Network (TEN-T) is a long-standing European Union policy that seeks to unite these diverse systems by developing a core network across the continent by 2030, and a comprehensive network by 2050.

Through the construction of new physical infrastructure, TEN-T aims “to close gaps, remove bottlenecks and technical barriers, as well as to strengthen social, economic and territorial cohesion in the EU”¹.

The potential of TEN-T is enormous, both for the continent as a whole, and the parts it connects.

Important as it is, delivering the physical infrastructure is just the first step. Now, we are recognising a need to think beyond this phase — full interoperability and integration should be the next goal. Maintenance protocols and operations need to be fully standardised to ensure maximum

safety and efficiency for Europe's road and rail users. Furthermore, with connected and autonomous vehicle (CAV) trials taking place, the network needs to be ready².

Digital transformation is a powerful enabler for this progressive integration. ➔

The dream: an interoperable and integrated network

So, what would an integrated and interoperable network look like — and how could it be achieved? Currently, there are varying degrees of uniformity across the continent. Broadly speaking, design and health and safety are largely standardised while road condition and monitoring standards, along with tolling systems, are still governed by individual countries.

In an ideal situation, an integrated and interoperable network would be designed, constructed and operated under integrated guidelines and requirements to guarantee a uniform performance and level of services.



MAINTENANCE PROTOCOLS AND OPERATIONS NEED TO BE FULLY STANDARDISED TO ENSURE MAXIMUM SAFETY AND EFFICIENCY FOR EUROPE'S ROAD AND RAIL USERS.

All these phases would be combined in an integrated digital platform — a continent-wide monitoring system, which would be unified by a unique performance measuring system based on local technologies for the most effective compliance and quality control to keep the network as safe as possible. Awareness around the value of such a system has begun to grow among industry and policymakers alike.

The process of developing this continent-wide monitoring system would be similar to the one required to operate connected and autonomous mobility services (CAVs), as well as pods on demand (PODs) in the future. These innovations from the automotive industry are driving the policy changes needed for integration into the public transport network. As infrastructure engineers, we must be ready to provide effective models to deliver and operate the network.

Digital technologies are already performing

While a continental-wide monitoring system may be still be a long way off, we have seen first-hand how digital technologies are already proving their worth in the design and construction of major cross border projects.



DIGITAL DESIGN IS THE STARTING POINT, WHICH DEVELOPS INTO A POWERFUL COLLABORATIVE APPROACH FOR BOTH CONSTRUCTION AND OPERATION PHASES.

The successful development of key international transportation links such as Rail Baltica and the Lyon/Turin high-speed railway line will benefit from integrated delivery platforms able to guarantee the compliance of unique optimised technical solutions with different operational standards. The latter, for example, is due for completion in 2030 and includes the Mont d'Ambin Base Tunnel, a 57.5 km-long tunnel bored under the Alps between Italy and France. It is a key link for the completion of the 6,000km Mediterranean rail corridor between Bulgaria and Spain. Once completed, besides being the longest rail tunnel in the world, it will enable fast and safe regular passenger and freight traffic across the border, with consequent environmental, economic and social value for a better integrated Europe. Travelling time will be sensibly shortened compared to the present line and a large amount of road freight traffic will be transported by rail, something that the present infrastructure doesn't allow for.

As technical consultants, we are working on the Mont d'Ambin Base Tunnel project — as well as with other authorities in charge of complex infrastructure schemes — to define the optimal delivery platform that will enable them to deliver their schemes — efficiently. Digital design is the starting point, which develops into a powerful collaborative approach for both the construction and the operations phase. Not only should this approach lead to the timely and economical delivery of landmark schemes but it also enables

us and our clients to successfully manage the multiple contracts programme in challenging logistical and environmental conditions.

Let's also not forget how tools and methods such as Automatic Design, Artificial Intelligence (AI), and Design for Manufacture and Assembly (DfMA) are being commonly used to design and construct projects across the continent in the most efficient and safe ways possible. Digital technologies are increasingly being integrated in the construction phase, using data to speed up the construction process together with improving safety, cost management and finally quality.

Furthermore, the construction industry is being empowered through the integration of other industries to reach its full potential and achieve maximum efficiency. The telecommunication industry, for example, is proving to be a strong ally — the Internet of Things is in changing the way infrastructure is conceived, designed, built and operated by changing the focus from the asset to the end user.

Engineers need to meet the challenge

The adoption of a common design language, functionality ethos as well as sustainability targets are the first key steps in developing a unified and integrated transportation network in the EU. The intelligent use of enabling technologies and tools will help cover the remaining distance towards a fully interoperable network.

As well as building the physical infrastructure, TEN-T also supports the adoption of new technologies and digital solutions. However, policy alone is not enough. As competent integrators of powerful tools and data that is now available and ready to use, engineers and developers need to use their expertise and collaborate across the industry to make the most of the unique opportunity to create a fully connected Europe — economically, culturally and socially.

It might be the stepping stone Europe needs to take an even bigger role in the global arena. **WL**



Early trials of the connected and autonomous vehicles (CAVs) at London's Olympic Park

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