

The Next Frontier of Rail

Productivity Lies in the Interfaces

Why the next productivity breakthrough in rail will come from the interfaces along the value chain



Background

With transport demand growing, many networks already congested and Europe needing rail to carry a larger share of passenger and freight traffic, getting more from the existing system has become increasingly important.

The technology being presented in Berlin will show how much more is becoming possible. Digital signalling can allow more trains to run on the same infrastructure, while predictive maintenance can increase asset availability. Better data can improve traffic management and disruption recovery, and AI is increasingly being applied to optimise decisions across networks, fleets and the customer journey.

Together, these technologies can unlock capacity and improve railway performance. But this is where the discussion needs to go one step further.

Capacity is only valuable if we use it well

More trains running does not automatically mean better outcomes for passengers or freight customers. Higher asset availability creates the potential for better utilisation, but whether that potential translates into better services, stronger demand or improved economics depends on the decisions that follow.

The question that deserves equal attention at InnoTrans is therefore: how do we turn the capacity and performance unlocked by infrastructure, technology and AI into greater value?

We see this as a connected value chain: Investment → Capacity → Performance → Value

Each part is reasonably well understood. The harder challenge, and perhaps the larger opportunity, is making the whole chain work together.

Investment creates capacity

The European Court of Auditors' latest assessment of eight major European transport infrastructure projects provides a sobering starting point. Their estimated costs have increased from €36.5 billion to €66.5 billion at constant prices, while five of the eight have experienced average delays of 17 years against their original timelines.

Improving infrastructure delivery therefore remains fundamental. Better governance, earlier risk management and stronger cost and schedule discipline all matter. But delivering the infrastructure is only the first step.

The business case for a railway is rarely the railway itself. Investment is made because of what the infrastructure is expected to enable: more capacity, better connectivity, shorter journey times, greater reliability, economic development or modal shift. Successful delivery creates the conditions for these benefits, but it does not deliver them on its own.

Europe therefore faces two related productivity challenges: delivering infrastructure more efficiently, and ensuring that the capacity it creates is translated into performance and ultimately value. Solving the first without addressing the second leaves part of the investment potential unrealised.

Realising that potential depends on what happens as infrastructure moves from construction into operation.

Capacity needs to become performance

Once capacity exists, the challenge shifts from creating it to using it effectively.

This is where many of the technologies being showcased at InnoTrans have enormous potential. Predictive maintenance can improve rolling-stock and infrastructure availability. AI-supported traffic management can help networks recover more quickly from disruption. Better timetable optimisation can increase the effective capacity of existing infrastructure, while integrated data can improve decisions across trains, infrastructure and control centres.

These are not simply technology improvements. Their value comes from changing how the railway performs.

A few percentage points of additional asset availability can reduce fleet requirements or enable additional services. Better traffic management can improve punctuality and make existing capacity more resilient. More intelligent timetable planning can allow capacity to be deployed where it creates the greatest benefit. But operational optimisation is only part of the equation.

Performance needs to create value

A railway can operate efficiently and still fail to capture the full value of the capacity available to it.

This is where the connection between operations and demand becomes important. Capacity needs to be available not only technically, but in the right place, at the right time and in a form that customers value.

Aviation has spent decades developing sophisticated approaches to this challenge. Airlines continuously connect demand forecasting, capacity allocation, pricing, distribution and customer segmentation. Rail is different, not least because of its public-service obligations and network characteristics, but some of the underlying management principles are increasingly relevant.

Commercial maturity remains uneven across European rail, while liberalisation and open access are increasing competitive pressure. And while many AI applications focus on improving how the railway operates, data and AI have an equally important role on the demand side: helping operators understand where, when and how capacity should be offered to the market.

Better demand forecasting can inform timetable and capacity decisions. Revenue management can improve the relationship between occupancy, price and demand. Integrated operational and customer data can help operators adapt services more closely to how customers actually travel.

This is where operational and commercial optimisation begin to meet. Better demand insight should influence how capacity is deployed, just as changes in available capacity should influence commercial decisions.

Value is, of course, broader than revenue. For public transport and infrastructure authorities it can mean accessibility, connectivity, decarbonisation, modal shift and wider economic development. The principle remains the same: performance needs to be connected to the outcomes the investment was intended to create.

The opportunity is in the interfaces

This brings us to what is the broader management challenge.

Rail is necessarily a specialised industry. Infrastructure managers manage networks. Operators run services. OEMs provide rolling stock and technology. Authorities define policy and procure services. Consultants and engineering companies design and deliver infrastructure and transformation programmes.

Specialisation creates expertise, but it also creates interfaces.

Transport is organised around projects, assets, disciplines and institutions, while value is created by the performance of the system as a whole.

That means an infrastructure project can be delivered successfully without its original benefits being fully realised. A technology can improve availability without the operator changing how that capacity is deployed. An operator can optimise its own performance while infrastructure, timetable or regulatory constraints limit the value it can create.

The opportunity is therefore not to remove these organisational boundaries, but to manage across them more effectively.

For operators, that means connecting operational and commercial decision-making more closely.

For OEMs and technology companies, it means increasingly linking products and technology to outcomes such as availability, capacity, lifecycle performance and customer economics.

For authorities and infrastructure managers, it means keeping the intended benefits of investment visible as projects move from construction into operation, and aligning stakeholders around shared outcomes and KPIs.

For infrastructure and engineering consultants, deep knowledge of the asset provides a natural platform to move both upstream into strategy and value definition and downstream into operational performance and benefits realisation.

And for all of us, data and AI create an increasingly powerful way of connecting decisions that have historically been made separately.

Technology can connect the system, but management must connect the value.

InnoTrans will showcase extraordinary advances in rolling stock, signalling, software, automation, data and AI. Each can make rail more productive.

But the next frontier of rail productivity lie less within individual assets, technologies or organisations, and more in the interfaces between them.

Data and AI can increasingly connect the railway technically and optimise decisions at a scale that was previously difficult to achieve. They cannot, however, determine which outcomes matter, align incentives between organisations or decide who should be accountable for turning performance into value; those remain management choices.

No single actor can optimise the system alone. The opportunity is to connect decisions more effectively across the value chain, so that improvements in one part of the railway translate into value across the whole.

This is how we can get more from every euro invested in rail: not only by building more or introducing better technology, but by connecting investment, capacity, performance and value more effectively.

“Rail has optimised the parts. The next breakthrough lies between them.”



Fredrik Enander

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