How to boost the efficiency of your railway — without expanding your network

The answers to 3 major challenges in passenger rail operations

QUINTIQ

Passenger rail may have taken a back seat due to the emergence of personal transportation and the democratization of air travel in the last few decades, but it is now back with a vengeance.

Public transportation ridership in the United States has increased by 34% between 1995 and 2012, bringing passenger numbers to levels not seen since 1957.[1] Over 1.65 billion passengers travelled by rail in Great Britain between 2014 and 2015, an increase of 4.2% from the year before.[2] The demand is expected to double over the next 30 years.[3] Japan's newest bullet train line has ferried 9 million passengers between Tokyo and the Hokuriku region in its first 12 months of operations — exceeding initial expectations by 3 million passengers.[4]

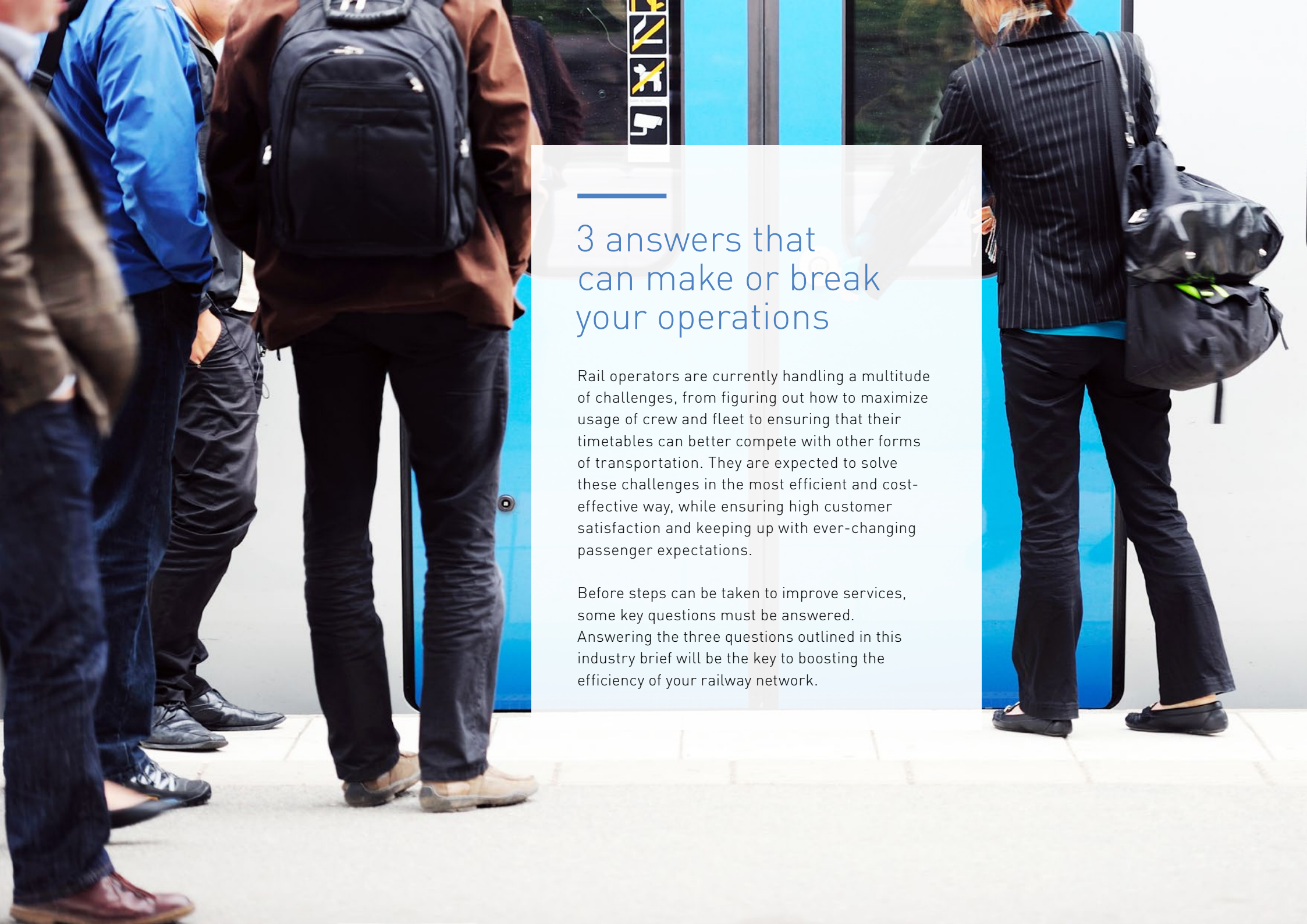
Unfortunately, existing railway systems — built decades ago — are struggling to handle the demand of railway passengers. These are some of the challenges that threaten to grind the railway industry to a screeching halt:

Limited options to expand railway infrastructure
New projects or expansions to existing projects can end up taking far too long to get approved. Even if approval is obtained, there's still the matter of battling through opposition from political interests and the surrounding community.

Aging equipment and rolling stock
As an asset, your network is a relatively fixed structure. With the problem of aging equipment and rolling stock, fleet and mechanical issues are bound to become more frequent. There will be less flexibility in building timetables and fleet plans, and the passenger experience will suffer as a result.

Ever more complex labor rules and regulations
Making a crew plan is a complex endeavor. Planners are faced with the daunting task of creating an optimal plan that must take into account mandatory rest periods, hours of service limits, individual shift preferences and union agreements.

[1] Issues & Facts (National Association of Railroad Passengers, 2016)
[2] Rail passenger journeys reached a record high of 1.65 billion between 2014-2015 (Office of Rail and Road, 2015)
[3] Britain relies on rail (Network Rail, 2014-2016)
[4] Japan's newest bullet train line has busy first year (Nikkei Asian Review, 2016)



3 answers that can make or break your operations

Rail operators are currently handling a multitude of challenges, from figuring out how to maximize usage of crew and fleet to ensuring that their timetables can better compete with other forms of transportation. They are expected to solve these challenges in the most efficient and cost-effective way, while ensuring high customer satisfaction and keeping up with ever-changing passenger expectations.

Before steps can be taken to improve services, some key questions must be answered. Answering the three questions outlined in this industry brief will be the key to boosting the efficiency of your railway network.

Question 1: How can I better utilize crew and rolling stock?

Crew and rolling stock planners usually rely on these established planning processes when creating the long-term plan:

- Reuse last year's plan with minor adjustments if the year-on-year timetable changes are negligible
- Rely on the experience of planners with years of field knowledge to oversee the planning
- Manually check the plan to confirm its validity

It's easy to see why it's unlikely to get an optimal solution by sticking to these processes. As widespread as they may be, these methods don't allow planners to quickly adapt to changes in train services and rules, nor do they consider any improvements that could be made as a result of these changes.

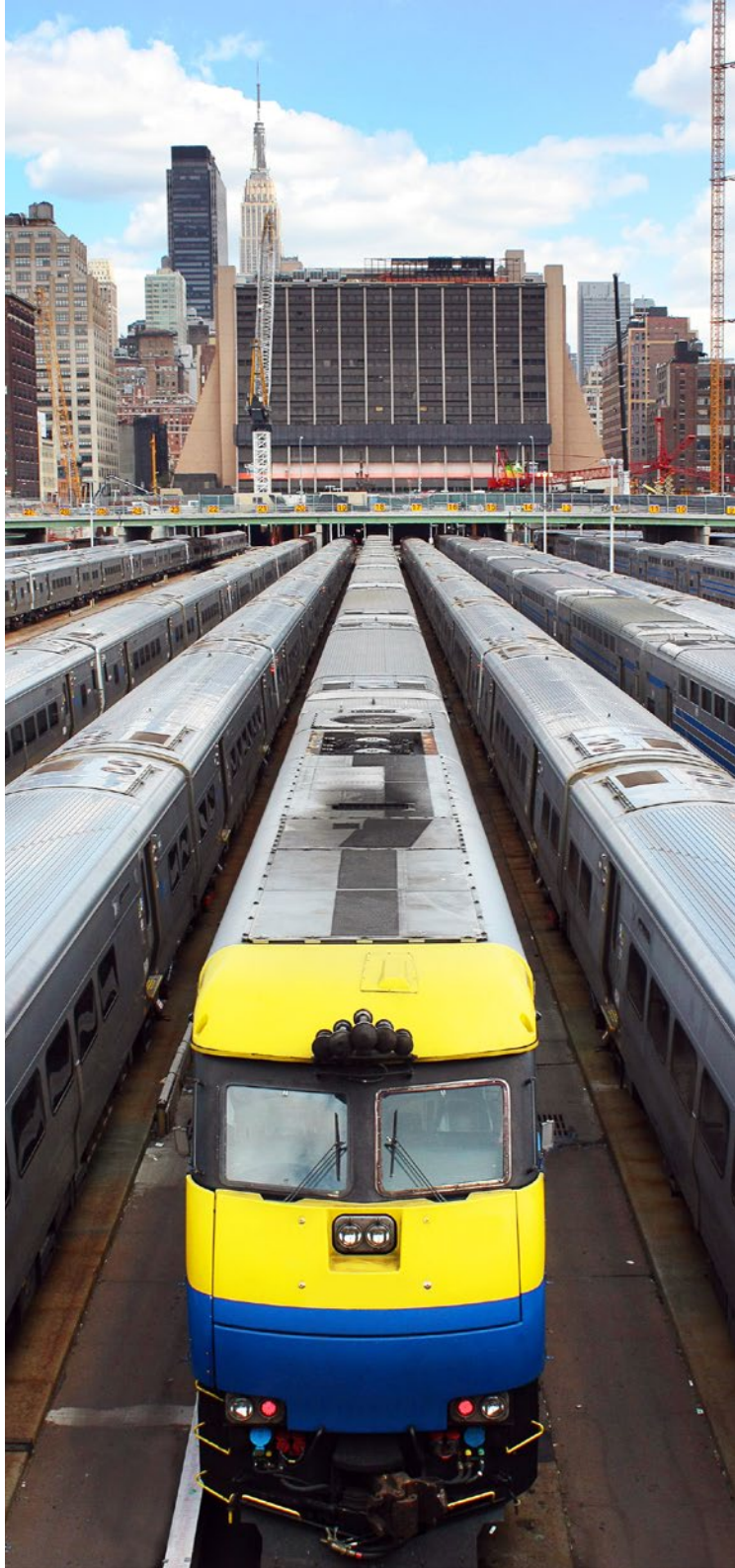
You need a planning and scheduling solution that can deal with the mind-boggling number of possible options when assigning train services to fleet and crew. At the same time, you have to find the right balance of KPIs for your operations while satisfying complex maintenance rules and labor laws. Simply put, you need a proven optimization technology that is supported by world-class algorithms running in real time.

By taking into account all relevant rules and constraints, an optimized planning solution reflects your operational reality and requirements. Real-time optimization allows your planners to sort through all possible outcomes and choose the decision that maximizes fleet utilization and crew productivity, keeps costs down and ensures high service levels.

Saving even a single locomotive can save your business millions in investment. Imagine what can happen when you bring optimization into a planning puzzle that involves hundreds of services, train sets and crew.

Answer:

- **Model all of your unique constraints for crew and rolling stock**
- **Use optimization to sort through all possible outcomes and choose the best one for your service levels**



Question 2: How can I better respond to disruptions on the day of operations?

Disruptions are messy. Responding to them often becomes a race against time. Your fleet and crew are always on the move, which means that you need to be agile enough to begin the problem-solving from where they are. If your method of handling disruptions involves changing many diagrams quickly, it's bound to be a recipe for chaos.

In the absence of proper decision support, planning is usually done in silos. Collaboration between the teams is limited. The service controllers will work on the timetable adjustments, then pass it over to the fleet controllers for the necessary assets to be ready and available. The crew dispatchers will then try to place the right people at the right place at the right time.

But when time is of the essence and disruptions occur, this approach can affect your daily operations. Decisions that seemed optimal for the fleet may end up being the exact opposite for the crew, but the crew dispatchers have neither the time nor the authority to influence the fleet plans. As a consequence, operational efficiency will go down and cost and overtime hours will go up. Worse, your passengers will experience poorer service levels.

An integrated approach brings an optimized solution to handling disruptions. It looks at disruptions in its entirety. All changes to operational plans are coordinated with the fleet and crew teams and communicated immediately to personnel who will be affected by the disruptions. It takes into account the availability of crew at different locations, leading to a solution with higher service levels and lower overtime. Planners can receive up-to-the-minute feedback and make changes in unison. The walls go down and communication is clear across all teams.

Smart filtering of planning options gives planners the agility to make the best changes quickly and with minimum effort. Passenger disruptions are minimized, and costs and overtime hours go down. Focused optimization — brought together by an integrated approach and smart filtering — brings clarity to chaos.

Answer:

- **Look at disruptions in their entirety to make changes that satisfy all conditions**
- **Use optimization to make the best changes quickly and minimize passenger disruptions, costs and overtime**

Question 3: How can I align my operations to growing passenger demand?

Preparing for the future and dealing with increasing passenger demand requires fact-based decision-making. Rail operators need to manage resources effectively, and this calls for the ability to evaluate multiple situations quickly before arriving at the final decision with confidence.

Apart from having a full view across all planning horizons, rail operators must also be able to make the right strategic and tactical choices that lay the foundation for a smooth operation. These are just some of the decisions that rail operators must deal with over the long term. The wrong solution for any one of these scenarios could put a serious dent on their bottom line.

Predicting the impact

Typical scenarios	The questions
Changing the timetable	
• Add a new service • Increase the frequency of a service	• Can we maintain the same service levels with our current fleet? • How many additional crew do we need? • How much additional cost is associated with the additional capacity?
Changing the fleet	
• Buy new units • Change the specifications of the carriage cars	• How will this impact the utilization of our fleet? • Can we maintain the same service levels? • Can we meet maintenance requirements?
Changing the crew	
• Reduce the maximum diagram duration • Change the break requirements • Hire additional drivers for a depot	• Would it affect the number of diagrams needed? • How will this impact the utilization of our crew? • How will this affect the robustness of the plan?

A truly successful railway network will be able to deliver an optimal balance between cost efficiency, passenger satisfaction and high service levels. A proven, world-class optimization technology is the key to gaining that balance. Your planners will gain a detailed view of all possible scenarios, allowing them to make the best and most feasible decisions for your service. Optimization gives you the confidence to make changes that bring the best business impact for your railway network.

Answer:

- **Combine world-class optimization together with detailed scenario analysis to make the best decisions with confidence**

Plan smarter for a more efficient railway network

The essentials for a successful optimization of your operations are within reach. Optimized strategic planning of your fleet and crew, combined with the ability to be agile in responding to operational disruptions and evaluate options across your entire puzzle, will ensure that you achieve your core operational objectives. To find out how you can boost the efficiency of your railway network, **contact us** or visit **our website**.

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