DDIO: Revolutionising railway disruption management with data-driven algorithms

CGI

Dutch railway infrastructure company ProRail facilitates safe travel and sustainable transport, and every day enables a million passengers and more than 100,000 tons of goods to reach their destination by train, using over 7,000 km of track.

If a disruption occurs somewhere on the Dutch railway, it is important to resolve it as quickly as possible to minimise delays to the service. But the speed of action must not come at the expense of safety.

That's why ProRail creates a risk assessment with safety instructions for each disruption. The DDIO (Data Driven Infrastructure Withdrawals) work planning application developed by CGI ensures that for each 'withdrawal' (part of the track that is temporarily out of service) a tailor-made proposal is made for both the contractor and the train service management with the necessary measures.

The situation

The total cost of delays and disruptions on the track amounts to around €400 to €500 million per year. Any track closure, broken overhead line or other disruption must be resolved as quickly as possible, not only to ensure safety but to reduce unnecessary delay penalties.

To do this, maintenance engineers must often work on or close to the track. To ensure they can do this safely, part of the track is taken out of service (infrastructure withdrawal). This means that the withdrawn track section is temporarily removed from railway network service, so no trains can run while the disruption services work on the repairs.

Our solution

DDIO is an application developed by CGI in collaboration with ProRail that generates a tailored proposal for each disruption using an algorithm.

Instead of securing the workplace optimally, which takes a lot of time, DDIO works much faster and delivers tailored work that serves as a proposal. It is a complex and extensive assignment that until now has been based on processes and logic all in the head of an experienced engineer.

An important part of our work is an agile approach to development, consisting of working with a scrum team to get the desired requirements from various stakeholders. The next challenge is to translate these requirements as generically as possible into code. A nice puzzle, where perspective is continuously shifting.

The challenge

Determining the right set of instructions for a specific situation is an extensive process. The workplace safety officer must inventory all necessary measures and then design the withdrawal. They also determine which safety measures need to be taken by train control. There are measures for both the contractors and the train control, which, for example, ensure that the driver of an approaching train knows the correct procedure and how to execute it within regulation e.g. temporary speed restrictions.

Currently, the standard set of safety instructions attempt to cover every eventuality for the railway and are time consuming and often not appropriate for the engineering requirements. This makes the whole process labour-intensive, especially when everything the first workplace safety officer decides is checked by a second workplace safety officer. Our client needs to be able to give tailored proposals for each withdrawal that ensure the correct safety measures are in place.

Our solution

This way of working has been replaced by a method where Data Driven Infrastructure Withdrawals (DDIO) has a central role. DDIO is an application developed by CGI in collaboration with ProRail that generates a tailored proposal for each disruption using an algorithm. Instead of securing the workplace optimally, which takes time, DDIO works much faster and delivers tailored work that serves as a proposal. It's a complex and extensive assignment that until now have been based on processes and logic in the head of an experienced engineer.

Infrastructure withdrawal is a whole process in itself as it has multiple stages due to the number of individuals and 3rd parties involved. An important part of our work is an agile approach to development, consisting of working with a scrum team to get the desired requirements from various stakeholders. The next challenge is to translate these requirements as generically as possible into code. A nice puzzle, where perspective is continuously shifting.

Future development

DDIO provides a service that focuses on both planned maintenance and disruption recovery. At a later stage, it will be possible to use 'Data Driven' for maintenance on the track for workplace safety. Other data is then needed for disruption recovery, where the proposals are based on processes that are ongoing. This will lead to withdrawal forecasting which requires data about the future location of the track, as well as forecast data and an extension of the algorithm.

We are currently working on automatically generating data-rich information models (IMSpoor), an information model that contains geographic data so ProRail will be able to schematically represent this data.

About CGI

Founded in 1976, CGI is among the largest IT and business consulting services firms in the world. We are insights-driven and outcomes-based to help accelerate returns on your investments. Across hundreds of locations worldwide, we provide comprehensive, scalable and sustainable IT and business consulting services that are informed globally and delivered locally.

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