Infrastructure Manager's common view on the concept of Collaborative Decision Making in the railway sector

Discussion paper

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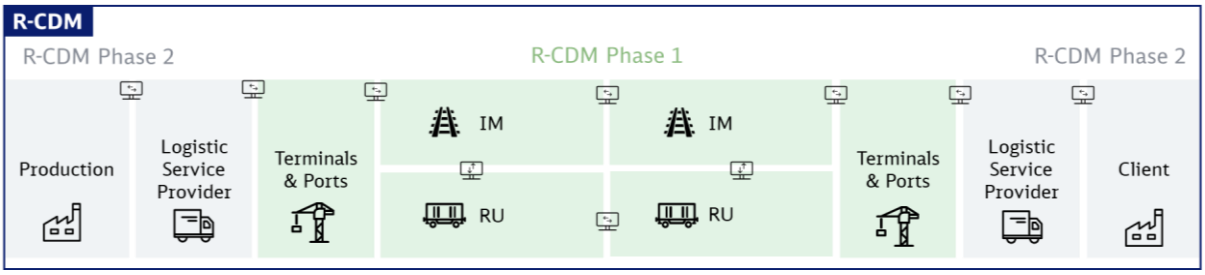
1. Introduction

Currently, cooperation and data sharing are not that common amongst the units in the railway sector. Especially common data sharing between infrastructure managers, railway undertakings, terminals, and ports only works on a bilateral level, or in many cases not happen at all. However, sharing data in all stages of the transport chain would be beneficial for the whole sector in order to increase efficiency and to be able to react quickly to disturbances. That is why the Railway Collaborative Decision Making (R-CDM)-concept, which was derived from the Airport Collaborative Decision Making (A-CDM)-concept, was developed. The A-CDM has shown significant benefits in the aviation sector improving the efficiency of flight and ground processes as well. First, in 2020 a feasibility study was carried out by Rail Freight Corridor Rhine – Alpine together with Hacon, To70, and RNE. The study confirmed the transferability of A-CDM to the railway sector proposing to the railway sector relevant adaptions. Furthermore, it showed that R-CDM and digital data sharing provide significant positive benefits by enabling the involved stakeholders of the railway sector to plan, coordinate and synchronize activities more efficiently giving rise to enhanced and more efficient overall performance.

2. R-CDM-concept

R-CDM aims to improve the efficiency and resilience of railway operations by allowing individual stakeholders to optimize the use of their resources by improving predictability. It achieves this by encouraging the involved stakeholders (RUs, terminals, ports, shunting yards, etc.) and the Infrastructure Managers to exchange relevant, accurate, and timely information with their subsequent stakeholders. The following picture shows the involved stakeholders in the transport chain and suggested phases of R-CDM-implementation:



Different actors of the transport chain and phases of R-CDM-implementation

The implementation of the concept can be divided into two phases. The first phase covers only the railway section of the supply chain, this set includes infrastructure managers, railway undertakings, ports, and terminals. This circle is completed by the second phase with the logistic service providers, as well as the production and client sides.

The basis of R-CDM is providing the right information at the right time to the right people to optimize their decisions. Eventually, that information can be used to optimize the whole transport chain. This means that all relevant actors can be aware of the current status of the transport chain at any given time. To ensure the transfer of information, a milestone approach was proposed in the study. Following the A-CDM approach, various milestones are defined throughout the transport chain, at which times are passed on to the relevant actors. The timestamps can include planned-, estimated-, targeted-, and actual values. For each milestone, predetermined stakeholders provide the information. All information should be available to the relevant stakeholders as soon as possible, as the time stamps in the downstream stages of the transport chain are calculated on the basis of these values.

3. Expected benefits

In general, R-CDM focuses to improve the operational efficiency of the (railway) transport chain as a whole. The main benefits are improvements related to information sharing, which allows each stakeholder to optimize their decisions in collaboration with the other stakeholders, knowing their preferences and constraints, as well as the current and projected situation. This is expected to lead to reduced delays, an increase in the predictability of events, optimization of the utilization of resources, and a decrease in energy usage. In particular, this will contribute to better joint management of disruptions. As a result of the optimized processes, enhanced capacity utilization is possible, which can increase the number of trains running on the network. The listed advantages and developments naturally result in the improvement of economic indicators. To sum up, R-CDM is about efficiently using existing capacity and resources, offering resilience and potentially better recovery from disrupted situations.

a. Benefits for Infrastructure Managers

R-CDM changes the situation by creating awareness for all parts of the infrastructure to all stakeholders. The gain of transparency providing a better quality of service, decreasing overall delay minutes for the network, predictable operations and more effective management are the main benefits for IMs. These points can contribute to improved capacity management and in turn to an increase of the capacity available on the existing infrastructure.

Better transparency could provide a better quality of service and by reducing buffers additional capacity on European railway networks. The information chain starts and ends in the transshipment tracks of the terminals and enables the IM to have exactly the same transparent information about the progress of loading a train as the TO itself. Of course, the same applies to all other involved stakeholders.

b. Benefits for Railway and Shunting Operators

Sharing of information could enable the acceleration of railway processes and lead to better reliability, higher safety, and more cost-efficient operations. Cost savings for resources can achieve an even bigger effect. For a specific rail freight service, costs for resources (locomotives, wagons, and drivers) amount to around 50% of the total transportation costs. Better resource utilization and a shorter allocation for locomotives, wagons, and personnel to transport will enable more cost-efficient operations.

For RUs and SOs, the implementation of Rail CDM enables real-time monitoring and proactive re-planning of freight train journeys and shunting activities internally or together with other stakeholders. At the same time, it can be easier to predict implications on staff deployment and to optimize the utilization of driver working hours including necessary pauses.

Since a majority of rail freight transports involve several RUs, the exchange of operational data between two RUs is facilitated. In case of delays, the corresponding new predicted arrival time helps for coordinating handover procedures at borders and other points of transfer.

c. Benefits for Terminal Operators

The implementation of R-CDM allows TOs to optimize their decisions in collaboration with other stakeholders, knowing their preferences and constraints and the actual and predicted situation. Trucking companies are informed via IOs enabling improved management for arriving trucks as well as traffic management on the terminal itself.

Rail CDM enables better predictability of train arrivals and consequently on the occupancy of the transshipment tracks. Changing wagon sets will also work more smoothly due to the early information to the SOs. Consequently, TOs are able to optimize slot booking by reducing the buffer times for unexpected events. Based on an average slot duration of 6 hours, which provides four possible slots per 24 hours, a reduction of 20% already provides five possible slots per 24 hours, increasing the capacity and the utilization of the gantry cranes per track by 25%.

d. Benefits for Intermodal Operators

Introducing predictions eliminates planning uncertainties because a clear picture is transmitted about the actual operating scenario and its predicted development. The concept enables proactive collaborative decision making between all stakeholders and finally timely and complete information to the client. In the future, IOs could be able to better meet the expectation of their customers by concerning higher requirements for the reliability of rail freight transports and concerning transport information, which is essential for just-in-time transport chains.

4. Proposal for further proceeding

The culture of a future R-CDM or “information sharing” shall ideally involve all stakeholders from origin to destination. For that reason, actors develop the concept further and decide on the way of implementation together. But it means also that successful implementation can be realized only when core actors participate equally. Additional actors are always welcome to join the implementation process.

This document is developed from an IMs perspective and further discussions should be done with other stakeholders to get a common view on the concept. After the common opinion is set up, the development of the process can begin with the milestone approach. In practice, this means that the milestones must be defined together so that the so-called Metro Map, which presents the general picture of the processes could be defined.

In the following phases, the technical background of the concept must be developed. These are, for example, the standards for data sharing and the digital services for situational awareness. But the fulfillment of these tasks is the question of mutual agreements.

Immediate implementation for the whole sector at once does not seem feasible, so pilot projects should be discussed and agreed upon by stakeholders, e.g. IMs, RUs, terminals, and marshaling yards. In the end, funding could be applied to finance the pilots. The feasibility study involves the transferability of A-CDM to the railway sector in detail, and the advantages of lessons learned and challenges in A-CDM implementations also could take into account. If an implementation is successful, it is highly probable that more and more actors in the sector will follow the example and join the R-CDM.