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Potential analysis and recommendations for self-organising rail traffic management

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Railways are in need of technological and operational enhancements to achieve the EU strategic vision of a sustainable, integrated transport system. Beside the deployment of digital signalling and automatic train operations, advanced rail traffic management is critical to increase rail transport capacity and provide a seamless intermodal integration. To this aim, the concept of self-organisation has been recently proposed, which involves intelligent trains to autonomously decide and locally negotiate optimised traffic strategies. Although science considers self-organisation key to an efficient flexible rail service, the view of the industry is still unclear. Characterising the industrial perspective is instead essential to evaluate investment and migration plans of future rail developments. This paper addresses such a need by a multi-target Delphi analysis outlining an expert perspective on current traffic management gaps, potentials of self-organisation as well as critical steps and recommendations enabling a paradigm migration. Analysis results indicate that the state-of-practice is limited by technological and legal barriers to transport data sharing, slow rail digitalisation and organisational separation between infrastructure and operations. Traffic self-organisation could overcome current limitations only if it fosters digitalisation, a cooperative business model and policies for intermodal planning and data sharing. The rail market could be expanded by easier investor accessibility and a more attractive demand-effective intermodal rail service. Stakeholders' reluctance in approving novel business models, policies and rules is however a threat to this paradigm. Feasibility studies, round-tables and joined sector actions are recommended for defining policies, proof-of-concepts and plans for migrating to a self-organising rail traffic.