Rail4Future

Projekttitel:	**Resilient Digital Railway Systems to enhance performance**
Projektnummer:	**882504**
Deliverable:	**D1.1.1 Report of requirements**

This report presents the requirements of the R4F platform, based on which we designed a conceptual model-based digital twin for the holistic large-scale railway infrastructure. With the R4F Platform, different railway infrastructure assets can be automatically and efficiently integrated, and a continuous flow of reliable and meaningful information throughout the entire life span of different railway infrastructure subsystems can be ensured. To distinguish the importance of different requirements, each of them is marked with either a letter (M), which means "mandatory", or a letter (E), which means "expected". **Compatibility (M):** The compatibility refers to the platform's ability to access, integrate and analyze the data and models from various subsystems. Standardized file formats and vocabulary should be defined so that any subsystem can be mapped, dynamically interacted with, and well connected in the platform. Compatibility is an essential characteristic of the proposed R4F Platform, as it can directly influence the platform's efficiency and consistency. **Synchronization (M):** The platform will require the physical entities of different integrated subsystems to be characterized and managed along the same time-axis with a unified data format. These data should be synchronized and include the geometry, state, attribute, and internal mechanism of the subsystems, which form a digital virtual mapping of the real-time state of the physical entities. **Reliability (M):** The platform requires a reliability assessment system, in which the system can supervise the states of the components of the platform and make corresponding adjustments. With the help of the reliability assessment system, the platform can run smoothly despite disruptions. **Fidelity (M):** The fidelity of the platform describes the proximity of the integrated model and the physical entity. It is required that the integrated model maintains a high degree of proximity of the geometry, state, phase, tense, etc. High fidelity is the prerequisite for the development of its future functions. **Expandability (E):** The proposed platform should have sufficient expandability to add and integrate new sub-models. It should also allow modifying or replacing existing sub-models and functionalities. Lacking expandability can cause problems for the maintenance and reusability of the platform**. Interactivity (M):** The interactivity refers to not only the interaction between the users and the platform, but also the interaction between the designers and the platform, as well as between the physical models and the platform. A closed loop should be built based on the above-mentioned interactions, which may help the platform be updated and improved. **Real Time (E):** The platform should make a prompt response to real-time input data to analyze the emergent problems and give corresponding solutions. The platform tracks the changes as versions and ensures consistent behaviour of simulations in their lifecycle.