



Dissemination Workshop

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BOOK OF ABSTRACTS



RETURN Dissemination Workshop

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Digital Twin, Virtual Reality and Metaverse: what technologies to support the asset management workforce?

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The challenging paradigm of the Digital Twin of construction combined with the new possibilities offered by information and visualization technologies provide innovative ways to approach, study, and investigate the risk and vulnerability of an area. The Digital Twin is proposed as a digital copy of an artefact, city or territory overcoming the use of Geographic information system (GIS) and Building Information Models (BIM) as capable of establishing a bi-directional data transfer between the physical object and the model (Khallaf et al., 2022). On the other hand, three-dimensional dealing with infrastructure has opened up new horizons related to communication and the fruition of the assets, expanding the pool of users that can be reached. If the *digital model* is the computer representation of the work containing all the information for its life cycle, the *virtual model* is an interactive simulation of it.

The Spoke TS2 of the RETURN project also reflects how these methodological and technological advances can be leveraged to enhance the asset management workforce and forecasting capacity. In particular, situational awareness applications are considered for the staff's re-skilling and up-skilling. In this context, WebGIS platforms, Virtual Reality experiences, and the new frontier of the Metaverse can play a role.

Geospatial technologies promote spatial thinking skills and enhance content knowledge necessary to examine linear infrastructure, which requires a multi-scalar approach concerning their specific connotation. Possible integration with BIM, which examines the scale of the point artefact, enhances the system capability by allowing it to move from particular to broader context. As understanding the context is necessary for comprehending the problems, the WebGIS framework enables integration, simulation, analysis, and visualization of the GIS technology result in an online environment. The distribution of spatial geographic information is, at this point, interfaced with big data from the sensor network, empowering stakeholders' decisions based on real-time changing situations. Through Decision Support Systems, they can have valuable information for planning and management without so much effort and time. According to the literature, incorporating traditional knowledge into modern technology is suitable for disaster risk reduction education. In recent years, web hazard maps have received attention not only from experts but also from students (Song et al., 2022), and flood resilience information systems for raising awareness among citizens (Albano et al., 2015).

On the other hand, the navigability of the model achievable through Virtual Reality (Ghobadi et al., 2020) technologies overturn the condition of the observer on both an experiential and conceptual level. Starting from digital models, it is possible to promote engaging and stimulating cognitive experiences to illustrate even to a non-technical or non-expert audience how complex constructions work so that political and economic choices can be made with greater awareness. The immediacy and hypermedia nature of the graphical representation makes the virtual model a powerful tool that enables more effective dialogue in, for example, local authorities planning conferences and service meetings. At the same time, it makes it possible to create innovative training solutions for the training of actors who operate in different roles on infrastructures: improving knowledge of sites, even those that are difficult to reach; transferring skills for maintenance; simulating or reproducing critical situations (Tender et al., 2023), such as emergencies or failures, which when they occur require a rapid response. Let us imagine the potential and stakeholder interest in simulating an accident interconnected perhaps to a natural event on a railroad tunnel section. Examining the situation in a

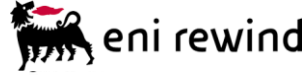
realistic and safe environment without needing to be in the field allows for the best assessment of safety procedures and operation management efficiency while also reducing costs.

As the final frontier, the Metaverse (Ritterbusch et al., 2023) emerges as the further evolution of these immersive and multimedia environments by enabling their interconnection and decentralization based on open platform. Unlike the traditional virtual world, the concept of community emerges strongly, emphasizing much more realistic interaction between people and with their surroundings.

As we glimpse the possibilities are remarkable. Are we ready for change?

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