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Cardinal Gets His Geek On

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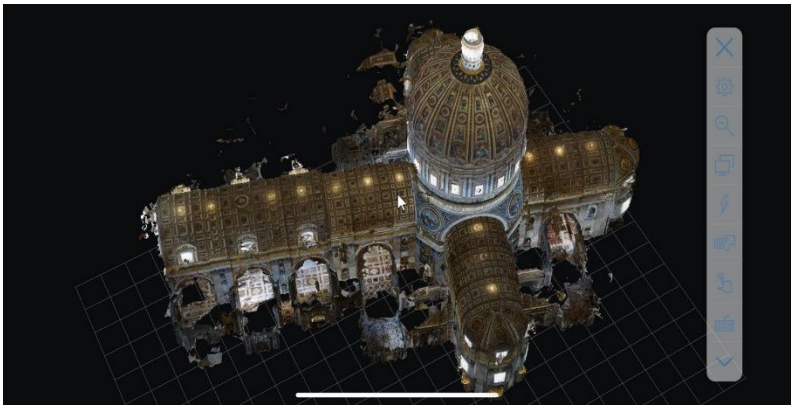


To help preserve one of the world's most important architectural icons and religious history, Italferr S.P.A. created a digital twin for structural monitoring of St. Peter's Basilica in Vatican City.

The project required an extensive survey campaign, resulting in a large amount of data needing to be managed and processed into a reality mesh, and shared among multiple disciplines and stakeholders for continued monitoring. To address these challenges on a six-month timeline, Italferr needed integrated and open 3D modeling and digital twin technology.

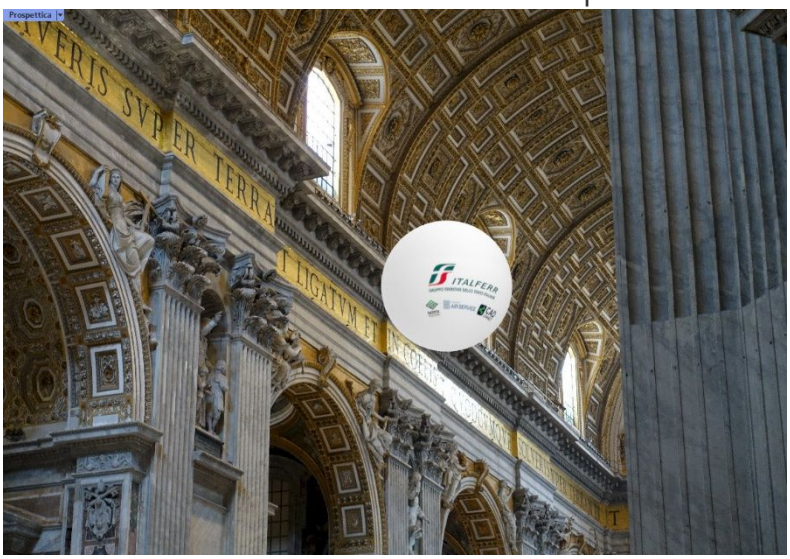
Letizia Attili, building engineer, Italferr, says, "The creation of a digital twin was essential for achieving the goals of the of the project, including increase the knowledge of the state of art of the building for create a baseline for subsequent structural analysis, centralize all the collected data in a clear manner, and monitor the safety levels of the control parameters designed in the monitoring phases, and represent all these analysis results in an efficient way."

Italferr relied on Bentley Systems ProjectWise, iTwin Capture, and MicroStation to manage three terabytes of multisourced data and generate a digital twin model

shared among 30 people. Attili says they began with extensive surveys of its geometry and materials and after postprocessing the survey data, they proceeded to BIM (building information modeling) modeling, which then facilitated the finite element analysis. Finally, they developed a custom platform to centralize all the information and represent the realtime monitoring results.

Working in a collaborative digital environment saved 50 hours in modeling time, delivering the model 20 days ahead of schedule. Using iTwin, a structural monitoring system will be developed, facilitating data collection, and connected to the digital twin to monitor the basilica's health.

Davide Porzio, common data environment manager, BIM coordinator, and digital twin expert, Italferr, says, "Today, we have complete knowledge of the state of health of the Basilica for the structural part. And in the next months, we will design



the monitoring system layout because we have to choose where to install the sensors, which kind of sensors we need and for what purposes. And when we have completed these activities, the next step will be an integrated use of the digital twin and IoT (Internet of Things) system to represent even the IoT data in the digital twin. In this way, all the stakeholders involved can enter the platform and with a simple highlight of a critical situation for each component, assigning it a different color, they can understand how to resolve the critical situations."

This is perhaps one of the coolest parts of BIM and digital twins—multiple stakeholders can have access to the data. Porzio says this digital twin is a platform where more than 50 users have access including designers, artisans, students, architects, operation maintenance, and even the cardinal.

Attili candidly told me the cardinal is a mechanical engineer, so he is very interested in all of this behind the scenes and enjoys seeing the progress. Porzio adds, what makes this even more exciting and fun, the cardinal is a mechanical engineer, and he is very impressed with this type of technology.

At the end of the day, the digital twin gives people access to information when and where they need it, ultimately saving time, money, and helping to restore an architectural icon.

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