openBIM® Processes Helped Minnucci Associati s.r.l. Deliver Whole-life Value for Naples Station

About Naples Centrale Station
The Naples Central Station is the sixth largest train station in Italy for passenger flow. The station manages an average of 150,000 people a day with around 400 trains in operation. The owner, Rete Ferroviaria Italiana (RFI) is responsible for the management and safety of railway traffic on the entire national network, including tracks, stations and installations.

With the need to continuously develop its own assets and at the same time maintain existing ones, RFI initiated a pilot project to capture their existing assets through surveying to modeling. This digital twin would then be converted to an open and collaborative format, allowing integration into their facilities management system in order to help improve the whole-life value of their assets. The project was developed through standardised methodology requiring project teams to work within buildingSMART standards and toolkits to better manage the flow of information guaranteeing maximum interoperability.

Going Digital
The project began with a complete survey of the entire station. Afterwards, a team of BIM specialists developed a digital twin of the station, including the equipment needed for maintenance. Minnucci Associati s.r.l., as project manager, created a 3D model covering the 5 main buildings of the station and the neighbouring areas that were useful to contextualize the station which spanned a total of over 400,000 square meters. More than 12,500 items, which characterize the maintenance objects, were placed inside and associated with their relative information fields of maintenance processes.

To keep pace with growing demands, the owner needed to eradicate existing paper-based decision-making for new building installations and ongoing maintenance decision-making. RFI also wanted to enforce open and interoperable standards to improve the flow of the newly created data.

As a result, Minnucci organized a data archive to replace traditional paper documents with other more streamlined digital processes. These new processes automatically exchange data between different software applications based on buildingSMART open standards.

Creating a Common Data Environment
To achieve the archiving, organization and sharing of produced data, it was necessary to set up a common data environment (CDE). Geoweb CDE Suite Smart Building was the chosen solution. It was customized as required for the client and divided into four sections called 'Work in Progress', 'Share', 'Publish' and 'Archive'. The processes of interaction with the client, which were formalized and shared in the BEP (BIM Execution Plan), was then implemented in the CDE allowing RFI to approve and, in some cases, to request information relating to the models and the documents. Archicad from GRAPHISOFT was the BIM authoring software. The interoperability with the CDE and other software was enabled through an open workflow based on the IFC format.

The IFC files, generated by the authoring system according to the criteria defined in the project, were approved and consolidated in the CDE in the PIM (Project Information Model) section and then transferred to the CDE in the Asset Information Model (AIM) section (Asset Information Model). Through an IFC viewer integrated into the CDE, all the elements of the model, including modeled assets (fire extinguishers, elevators, technical sites, etc.) and other elements (such as walls and beams.) were made searchable. They also carried all the IFC properties associated in the native file.

The CDE needed to house 12,500 components that were divided into 65 groups. The CDE also acted as an interface for the models for the facility management processes (ordinary maintenance, on-demand maintenance, below the threshold, on-demand and above-scheduled maintenance) by implementing a new system of management, referred to as 'BIM6D'.

Project Overview
Minnucci Associati s.r.l.

Location:
Naples, Italy

Objectives:
To develop an openBIM methodology to integrate with existing facilities management processes

Software used:
Leica TruView, CloudCompare, Smart City 3D, ARCHICAD, BIMcloud, BIMx Pro, SOLIBRI Model Checker (SMC), Tekla BIMsight, GeoWeb Fm, GeoWeb Smart Build CCDE, Lumion 7

buildingSMART tools:
IFC 2x3
BCF
bSDD

Naples Centrale Station is the main railway station in the city of Naples and in southern Italy and the sixth largest station in Italy in terms of passenger flow. The station has 150,000 daily passengers, 400 operational trains and an annual ridership of 50 million passengers.

Highlights:

- 44 different designs that totaled 12,500 components

- 400 operating trains

- Point clouds were 380 gigabytes in size

- 7 different stakeholder organizations involved in the project

Managing Big Data

Given the extension to the Naples Central Statio, Minnucci had to implement very accurate data management and mapping systems in order to manage its complexity over a long-term period. Laser scanners were used to capture the whole station with a point cloud of the area totalling 380 gigabytes. To make the process of virtualization of the station more manageable within the authoring tool, the cloud was partitioned into smaller federated models coded along a suitably prepared management grid. Each model was then assigned to a single modeller.

ARCHICAD as the BIM authoring software provided this capability. The interoperability with the CDE and other software was obtained through an open workflow based on the IFC format.

buildingSMART Tools Deployed

This project benefited from a variety of buildingSMART tools and solutions to enable better collaboration, cooperation and value from BIM deliverables. IFC2x3 was deployed for Coordination View, Reference View, Design Transfer View and FM Handover View. By committing to this way of working, and adopting buildingSMART standards, this project was able to take advantage of an openBIM workflow to meet the overall project demands.

Coordination View

Using the IFC coordination view enabled Minnucci to merge different models to better check geometric interferences and IFC sheet information inconsistencies. IFC files were exchanged with other BIM checking tools (Solibri Model Checker) to validate the model. This was used for clash detection, deficiency detection, and enabling the matching of elements. The IFC files were exchanged with BIM checking tools (Solibri Model Checker) to validate the model and to achieve an overall view of the whole modeled asset. In this way, it was possible to merge the different models to check the geometric interferences and inconsistencies of the information entered.

IFC Reference View

The IFC standard was used to periodically extract the models that allowed RFI to control the virtual model's progress against what was predicted during the drawing of the BEP.

Design Transfer View

As part of the contractual obligations, the IFC models were delivered to the client either at the revision stage or against final completion of the pilot project. The validation, contract compliance and final model acceptance were based on IFC files that were uploaded into the appropriate section of the CDE.

FM Handover View

For asset management, the client used SAP. Thanks to the import into BIM6D, the workflow was configured for SAP and used by the client for property management. Through the BIM6D, a link between modeled assets and assets managed in SAP was created. In this way, it was possible to browse to any model (including federated models) and view, for each component or zone selected, either the information included in the model or the information managed by SAP. The process could also be reversed, starting from an asset managed in SAP, the user could view it from within the model. These links were made possible by using IFC standards and properties that were mapped to their IfcProperty and gathered into IfcPropertySet.

Minnucci used a variety of tools to connect to an existing facilities management system

BIM Collaboration Format

The XML open format file, BCFXML and the BCF open file were used to check the compound's buildings geometric interferences that were modeled separately. All models were merged into a unique reference view into Solibri Model Checker software and the BIM coordinator generated the revision report.

buildingSMART Data Dictionary

The buildingSMART Data Dictionary (bSDD) was used as a reference guide to define all undergone maintenance objects within Central Naples and classify them either as an IFC level or below as IFC subtype.

The value of openBIM

As a consequence of adhering to open standards, Minnucci Associati was able to demonstrate true value in developing, managing and exchanging BIM deliverables as well as seamless integration with existing facilities management tools. This not only helped the detection and modeling of existing assets but enabled improved decision making for the ongoing operations and maintenance of the Naples Central Station.

"The most complex and important aspect that BIM offered us was the ability to support the need for building stock management throughout the project.

We are able to design and create a virtual building model using the latest openBIM technologies, delivering exceptional management and maintenance capabilities during the entire process.

This was only possible thanks to the buildingSMART's open digital data workflows."

*Ernesto Minnucci
Technical Director, Minnucci Associati s.r.l.*

For more information about buildingSMART International, please visit:

www.buildingSMART.org

Or contact us:
Email: contact@buildingsmart.org
Tel: +44 923 277953