Virtual Construction-Site Management with Advanced Workflow in BIM 360

Stefano Libianchi
Rosaria Ferro
Agenda

About us
FSTechnology
The Competence Center BIM GIS
Italferr
Construction Management Activity

The Project
Quality Check
Description
Figures
Feedback from construction Site

Technical detail
Description
Figures
Feedback

Next Step
FS Technology is the hi-tech company of the FS Italiane Group. The mission of FS Technology is to strengthen and support digital innovation in group companies, and ensure top levels of quality, efficiency and time to market in customer services. Special attention is paid to the optimisation of predictive diagnostics in industrial processes that involve the adoption of new technologies such as blockchains, Artificial Intelligence, robotics and the IoT and to the centralised management and standardisation of processes and tools.
The Competence Center BIM GIS

The Competence Center BIM GIS is a team inside FSTechnology. The main objective of our team is the research of new technologies to improve the processes and the workflows for the entire lifecycle management of an infrastructure. Considering the core processes of the group, we mainly support linear infrastructure project.
The Competence Center BIM GIS

The Competence Center BIM GIS is a team inside FSTechnology. The main objective of our team is the research of new technologies to improve the processes and the workflows for the entire lifecycle management of an infrastructure. Considering the core processes of the group, we mainly support linear infrastructure project.
The Competence Center BIM GIS is a team inside FSTechnology. The main objective of our team is the research of new technologies to improve the processes and the workflows for the entire lifecycle management of an infrastructure. Considering the core processes of the group, we mainly support linear infrastructure projects.

- **Field survey:**
  - Mobile app
  - Augmented reality

- **Applications:**
  - AUTODESK CIVIL 3D
  - AUTODESK BIM 360
  - ArcGIS Pro
  - ArcGIS onLine
  - SAP System
Constractions Management Heald
«The strategic goal is to achieve investments according to high quality standards, complying times and costs, ensuring and guaranteeing the supervision of all technical and managerial activities for planning, designing, executing, testing and commissioning the works»
About us
Italferr – The engineering company of FS Italiane Group

Years of advanced engineering

36
Experience

360°

Technical and economical feasibility study
Design & Build
System Engineering
Project Validation
Tender Documents and Procedures
Project Management
Construction Management
Safety Management
Field Engineering
Test on Civil Structures
Commissioning Assistance
Sustainability Protocols and Methods
Innovation, Research and Development
Value Engineering
Cost Estimate, planning and control
Integrated Management Systems (IMS)

From the Design to Commissioning

Rosaria Ferro
29/10/2020
2020 – Italferr’s construction management in Italy

CONTRACTS IN PROGRESS

SPECIALISTS INVOLVED ON CONSTRUCTION AND CONTRACT MANAGEMENT

29/10/2020
Rosaria Ferro
What «digitalization» means in Italferr

DIGITALIZATION OF CONSTRUCTION PROCESSES

CONSTRUCTION DATA MANAGEMENT
COMPANY BIG DATA
SHARING AND INCLUSION

STANDARD
KNOWLEDGE
OPTIMIZATION
Construction Process Digitalization
Construction Data Management

Piattaforma Costruzioni

- Affidamento Subappalti
- Gestoine Appalti
- Gestoine Riserve
- Gestoine Documentazione DL/SL
- DB Sicurezza
- Gestoine Imprese
- Procedure Autorizzatorie (PAC)
- Gestoine della Conoscenza
- Presidio Normativo Costruzioni
- Sicurezza Cantieri
- Costruzioni Online
- Controlli di Accettazione

- Reportistica DL
- Tutorial
- Procedure Societarie
- Deleghe
- Lista distribuzione
- Alert
- News
- Registro strumenti

Lucia Stellin
29/10/2020
Tracciato di progetto: 19

ID Progetto
Nome
Progetto
Descrizione
Progetto

L’itinerario Napoli-Bari rappresenta una sezione del TEN-T Core Corridor n. 5 "Scandinavian-Mediterranean (Helsinki-La Valletta)" e fa parte delle opere strategiche previste dal Decreto Legge Sblocca Italia.
Trans-European Transport Network (TEN-T)

**Corridors**

**Scandinavian - Mediterranean**
- Milan-Bologna-Florence-Rome-Naples-Salerno lines
- Naples-Bari line and Palermo-Catania-Messina line

**Rhine – Alpine**
- Milan-Genoa line (Terzo Valico dei Giovi)

**Mediterranean**
- Turin-Milan-Verona-Venice line

**Baltic – Adriatic**
- Ports of Trieste, Venice and Ravenna
How we are Organized

Operational management Business Unit

Constructions Management

Operational Area

Lawsuit, Expropriation and Subcontract Management

Field Operations, Safety and Commissioning

Operational Area

Project Manager

Project Manager

Project Manager

Project Manager

Field Operations, Safety and Commissioning

Operational Area

Project Manager

Project Manager

Project Manager

Project Manager

Project Manager

Planning Business Unit

Innovation and Strategies Business Unit

Design Management Business Unit

Construction Manager (Safety Manager)

Project Manager Assistant

Project Controller

Quality Engineer

Construction Manager (Safety Manager)

Construction Manager (Safety Manager)

Construction Manager (Safety Manager)

Construction Manager (Safety Manager)

Construction Management

CMA

CMA

CMA

CMA

CMA

CMA

CMA

CMA

CMA

29/10/2020
Lucia Stellin
Digital Contraction: Last Released
Digital ConstrACTION:
Last Released

Materials’ documents and certifications

Data Management
Quality Steel Reinforcement Check
Taking Concrete Samples
Register of Taking Concrete Samples
Sending Letter Request for Tests
Test Certificates
Acceptance Check
Documents for Construction Close Out Report
Digital ConstrACTION: Last Released

Quality Checks and Inspection Surveys
Quality checks and inspection detail

Using BIM 360 platform we improve the efficiency of the actual workflow in favour of a new and faster one.
QUALITY CHECKS AND INSPECTION SURVEYS

PPA.0001656 defines the way to monitor the correct execution of civil works.

- **Stakeholders and Interests**
  - Autonomy and independency from Contractors
  - Flexibility to assure ways and frequency of the checks depending on the Contractors
PPA.0001656 defines the way to monitor the correct execution of civil works.

**STANDARD CONTROLS**

- Autonomy and independency from Contractors
- Flexibility to assure ways and frequency of the checks depending on the Contractors

---

**QUALITY CHECKS AND INSPECTION SURVEYS**
PPA.0001656 defines the way to monitor the correct execution of civil works.

- **STANDARD CONTROLS**
  - Autonomy and independency from Contractors
  - Flexibility to assure ways and frequency of the checks depending on the Contractors

**QUALITY CHECKS AND INSPECTION SURVEYS**

- 39 ATTACHMENTS
- 46 TYPES OF CIVIL WORKS
- 10 TENDER DOSSIER SECTIONS
- 36 NEW CHECKLIST
- FASTER AND MORE FOCUSED CHECKS
- DIFFERENT WORK PHASES
- CLOSE ANSWER
QUALITY CHECKS AND INSPECTION SURVEYS

OLD WORKFLOW

- Print documents and drawings
- Print the specific attachment for the specific civil work
- Go on the field and make the control
- Go back to the office, scan and upload on PDM the completed checklist
- Share the checklist with the interested stakeholders
QUALITY CHECKS AND INSPECTION SURVEYS

OLD WORKFLOW

• Print documents and drawings
• Print the specific attachment for the specific civil work
• Go on the field and make the control
• Go back to the office, scan and upload on PDM the completed checklist
• Share the checklist with the interested stakeholders

NEW WORKFLOW

• Upload on the app documents and drawings
• Go on the field and make the control
• Time saving
• Documents availability
• Data elaboration
Quality check workflow
Quality checks Figures

- Document management: -50%
- Data acquisition: -50%
- Data elaboration: 25%
Feedback from the Construction Site: Bicocca-Catenanuova Railway Line

Whit check list all previous surveys and check lists are online. This allow the construction site manager to compare the previous results with the current situation
Feedback from the Construction Site: Cancello – Frasso Railway Line

With this new workflow we have the possibility to compare always the design with the works because we have drawings or files in the cloud
Feedback from the Construction Site: Brescia Est-Verona Railway Line

These are the feedback from this field: reduce the time of filling out the check list
Inside bim360 we have the possibility to upload attachments like pictures or document
Technical details
Technical Modifications

Sometime a technical detail is not feasible and therefore the Contractor proposes an alternative for building.
According to:
- D. lgs n. 50/2016
- Il D.M. 49/2018
- Request for proposal
- Draft Agreement
- Technical requirements

Civil works that fall under the modification can vary their cost up to 5% per contractual Type of work (SOA Categories).

In the end the total differential must be 0.
According to formal deeds, accounting documents and related management methods, for use by The Supervisor Works in tender contracts at cap. II.2.3.27.
### Register as is

According to formal deeds, accounting documents and related management methods, for use by The Supervisor Works in tender contracts at cap. II.2.3.27 (attached A27)

<table>
<thead>
<tr>
<th>Matrice</th>
<th>Evaluation</th>
<th>Documents</th>
<th>Description</th>
<th>Date</th>
<th>E.D.</th>
<th>Ref.</th>
<th>Emessa Differenziale</th>
<th>Emessa Differenziale Documento</th>
<th>Emessa Differenziale Documento Documento</th>
</tr>
</thead>
</table>
Register to be

According to formal deeds, accounting documents and related management methods, for use by The Supervisor Works in tender contracts at cap. II.2.3.27.
Register to be

According to formal deeds, accounting documents and related management methods, for use by The Supervisor Works in tender contracts at cap. II.2.3.27.

<table>
<thead>
<tr>
<th>ID_CONT</th>
<th>ABS</th>
<th>Descrizione</th>
<th>CORRISPONDENZA</th>
<th>QUADRO ECONOMICO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>V02</td>
<td>Modifica spala</td>
<td>RSAA-T-0000000009</td>
<td>2204498.49 €</td>
</tr>
<tr>
<td>2</td>
<td>V03</td>
<td>Modifica fondazione</td>
<td>RSAA-T-0000000011</td>
<td>2278035.49 €</td>
</tr>
<tr>
<td>3</td>
<td>V09</td>
<td>Modifica parete</td>
<td>RSAA-T-0000000012</td>
<td>187504.70  €</td>
</tr>
<tr>
<td>4</td>
<td>IN1</td>
<td>Modifica parte</td>
<td>RSAA-T-0000000014</td>
<td>301959.03 €</td>
</tr>
<tr>
<td>5</td>
<td>IN2</td>
<td>Modifica fondazione</td>
<td>RSAA-T-0000000016</td>
<td>121715.47 €</td>
</tr>
</tbody>
</table>
Tools

Smarter...

Overlapping and Underlining differences between previous reviews

![Image of a tool interface]
### Technical detail workflow

---

#### Table

<table>
<thead>
<tr>
<th>ID</th>
<th>CODE</th>
<th>WBS</th>
<th>Descripción</th>
<th>MATERIAL APPROVED</th>
<th>APPROVAL APPROVED</th>
<th>APPRAISER APPROVED</th>
<th>APPRAISER APPROVED</th>
<th>FEEDBACK</th>
<th>MODIFICATION TECHNIQUE</th>
<th>VALORE PASSO</th>
<th>CAT SOA</th>
<th>IMPORTO ASSEGNAZIONE</th>
<th>NOTE</th>
<th>NOTE ITF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>V002</td>
<td></td>
<td>W02 Modifica alla</td>
<td>N03A-T-0000000030</td>
<td>N03A-T-0000000030</td>
<td>Ordine di rilascio della DL</td>
<td>2234468,49 €</td>
<td>€ 2374468,49</td>
<td>603</td>
<td>2234468,49 €</td>
<td>0,02%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>V003</td>
<td></td>
<td>W03 Modifica lontana</td>
<td>N03A-T-0000000030</td>
<td>N03A-T-0000000030</td>
<td>Ordine di rilascio della DL</td>
<td>2234468,49 €</td>
<td>€ 2374468,49</td>
<td>603</td>
<td>2234468,49 €</td>
<td>0,02%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>V009</td>
<td></td>
<td>W09 Modifica pila</td>
<td>N03A-T-0000000030</td>
<td>N03A-T-0000000030</td>
<td>Ordine di rilascio della DL</td>
<td>2234468,49 €</td>
<td>€ 2374468,49</td>
<td>603</td>
<td>2234468,49 €</td>
<td>0,02%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>IN01</td>
<td></td>
<td>N01 Modifica piana</td>
<td>N03A-T-0000000030</td>
<td>N03A-T-0000000030</td>
<td>Ordine di rilascio della DL</td>
<td>2234468,49 €</td>
<td>€ 2374468,49</td>
<td>603</td>
<td>2234468,49 €</td>
<td>0,02%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>IN02</td>
<td></td>
<td>N02 Modifica lontana</td>
<td>N03A-T-0000000030</td>
<td>N03A-T-0000000030</td>
<td>Ordine di rilascio della DL</td>
<td>2234468,49 €</td>
<td>€ 2374468,49</td>
<td>603</td>
<td>2234468,49 €</td>
<td>0,02%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Technical detail Figures

- Document management: -50%
- Data acquisition: -75%
- Data elaboration: 50%
Digital constrACTION: coming soon

CONSTRUCTION MANAGEMENT TEAM NEEDS

POSSIBLE TECHNOLOGIES / WORK TOOLS IN ORDER TO EFFICIENT PERFORMANCE OF CONSTRUCTION MANAGER ACTIVITIES

SURVEY AND WORK IN PROGRESS ESTIMATION

3D SURVEY

EXPERIMENTATION

29/10/2020
Davide De Santis
Topographic survey – Digital and aerial photogrammetry

Objective definition
Choice of tools based on accuracy required

Evolution of aerial classic survey and integration between aerial and ground survey, by using HD Laser Scanner
**Objective:** Get a 3D survey for what built

Flight above the High Speed construction site Naples-Bari, 100 - 560 M of measurement points, centimetric accuracy

Some of the results and analysis of test

Work progress – Comparison of built at T1 - T2

Support to economic working progress by using field data with survey one

Use of survey data for economic reasons

---

29/10/2020
Davide De Santis
Data from survey carried out

**PLANIOMETRIC AND LINEAR MEASURES**

- Planimetric and linear measures for the accounting works
- Measures about right spacing of obstacles
- Measures about right spacing between elements of built

**VOLUMETRIC MEASURES**

- Volumes to be demolished or building close to
- working area
- Volume of excavation and installed material
- m³ of concrete

**Applications and future goals**

- Do detailed topographic survey, «certificated» of built
- Check during railway infrastructure realization
- Detection of work equipment and people by GPS systems
POTENTIAL FUTURE
USE THERMAL INFRARED CAMERA

NON-COMPLIANCE
Display of concrete cracks – Possibility to apply a thermal camera on drone in order to value any non-compliance

HOLOLENS – Augmented Reality

- check 3D survey and view in 3D the structure elements on site
- view 3D survey remotely
- collaborative visualization - cooperation between people from different locations
- remote assistance&training – Construction Manager could see remotely what construction manager
Our Skills, Our People

ITALFERR
GRUPPO FERROVIE DELLO STATO ITALIANE
Thank You