Implementation of BIM methodology to the Karavanke tunnel

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Practicing tunneling engineer, researcher and geotechnical engineering professional with more than 15 years of experience on large infrastructure projects at home and abroad. Actively involved in developing innovative use of 3D geological, geotechnical and BIM modelling tools. I am acting as a partner at Elea iC, part of iC group of companies, a multiengineering global firm supporting public & private clients as well as contractors on projects on all continents.

Civil engineering professional with 10 years of experience in implementation of BIM methodology. Currently he is responsible for systematic implementation of BIM methodology in iC group of companies and in major infrastructure and building engineering projects. In particular for development of internal BIM standards, BIM execution planning, 3D modelling, BIM coordination (collision detection), 4D and 5D modelling for cost estimates and controlling and PIM – Project information management.
"BIM Wash or BIM Washing is a term describing the inflated, and/or deceptive, claim of using or delivering Building Information Modeling services or products."

Wikipedia

CONFUSION or Unintentional BIMwash
INEXPERIENCE or Low-Level BIMwash
EXAGGERATION or Mid-Level BIMwash
ILLUSION or Severe BIMwash
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**Lower costs**
- 33% reduction in the initial cost of construction and the whole life cost of built assets

**Faster delivery**
- 50% reduction in overall time, from inception to completion, for newbuild and refurbished assets

**Lower emissions**
- 50% reduction in greenhouse gas emissions in the built environment

**Improvements in exports**
- 50% reduction in the trade gap between total exports and total imports for construction products and materials
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Venn diagram of purpose-built BIM models, Randy Deutch^9

3D → 4D/5D → 6D → ???
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The New Networks

Distributed ledgers can be public or private and vary in their structure and size.

Public blockchains

Require computer processing power to confirm transactions ("mining")

Distributed Ledgers
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Use of Technology

Automation of big data

Analysis

Real Benefits

Adds Value to our industry

 Raises Attractiveness of our industry.
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Facts about **Karavanke tunnel**

- **8.000 m** long conventional tunnel
- > **1.000 m** overburden
- **Complex geology**

- 2 countries, 2 clients
- 5 coordinate systems
- Apart from the tunnel **many other structures** are part of in the design scoped
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Why deploying BIM?

past Experiences

lots of Confidence

standard for the Future
Tunnel as fall over & twisted skyscraper?

Martin Lah courtesy
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1. GEOLOGY AND GEOTECHNICS
   - Driven by mining exploration
   - Logging, managing and interpreting data

2. TEMPORARY WORKS
   - Driven by mine construction
   - Resource and time management

3. SPATIAL DATA ANALYTICS
   - Govern by stakeholders
   - Modified GIS approaches

4. PERMANENT STRUCTURES
   - Driven by maintenance
   - Modified surface construction BIM approaches

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**Stage**

- Parametric
  - Basic design
  - Topography
  - Population
  - Alignment
  - Geology

- Segregated
  - Detailed design
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Create parametric families

Assembly: distribute parametric families over profiles
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Distribute niches and other interventions according to the requirements.
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- Analysis of alignment
- Cost estimates
- Risk estimates
- Defining best excavation method
- Multicriterial analysis
- Analytical stability calculation

Parametric model
Local
Global
3D Geo model
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- Analysis of alignment
- Cost estimates
- Risk estimates
- Defining best excavation method
- Multicriterial analysis
- Analytical stability calculation
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- UTILITIES
- ROAD DESIGN
- INNERLINING - STRUCTURES
- EQUIPMENT
- REINFORCEMENT
- DDS-CAD
- AUTODESK AUTOCAD CIVIL 3D
- SOFiSTiK
- iC
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Communication, Collaboration and Coordination
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5D Modelling
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Our plan

Reality
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BIM ≠ BiM

C25/30 ≠ C25\30
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- 4D
- 3D
- 5D
- 6D
- BEP
- BIM
- EIR
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EIR: 6 Months of workshops

BEP: Workshops, trainings
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- **PEOPLE**
- **PROCESSES**
- **TECHNOLOGY**

6 Months of workshops
Workshops, trainings
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- EIR 6 Months of workshops
- BEP
- Workshops, trainings
- 3D BIM
Over 200 partial models
Implementation of BIM to Karavanke Tunnel

- EIR
  - 6 Months of workshops

- BEP
  - Workshops, trainings

- 3D BIM
  - QC No7 90%
  - QC No2 50%
  - QC No1 40%
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EIR 6 Months of workshops

Workshops, trainings

BEP

3D BIM

QC No7 90%

QC No2 50%

QC No1 40%
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EIR 6 Months of workshops

BEP Workshops, trainings

3D BIM

QC No1 40%
QC No2 50%
QC No7 90%

5D BIM

Stairway to another dimension

3D BIM 90%

6 Months of workshops
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BEP 6 Months of workshops

Workshops, trainings

3D BIM

QC No7 90%
QC No2 50%
QC No1 40%

3D BIM

5D BIM

Stairway to another dimension

C25/30
C35/45

Tunnelling Class

Tunnelling Class

EIR
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Solution – Standardization, Integration

BIM Requirements (EIR, BEP)

Standard database:
- Element (Classification)
- Properties (Standard names and values)
- Who?, What?, When? (IDM)
Thank you.