BIM AND GIS INTEROPERABILITY

EDGAR BARREIRA | INÉS VILAS BOAS
YOUNG SURVEYORS PORTUGAL
WHAT IS BIM?
WHAT IS BIM?

How Young Surveyors looked for this one year ago (YSEM17 - Helsinki)?
WHAT IS BIM?

An incremental plus equation...

2D 3D 4D 5D 6D

We did! We do! We want! We need! We must be part of it!
### WHY GET BIM FOR US?

Take a look for the Vision and Opportunities

- **Move from Analogue into Digital**
  - Surveyors made this long time ago! We are so good for this!

- **Move from Drawings/PDFs into Data**
  - GIS is within our skills. Let’s to it!

- **Enabled Data-Driven Decision-Making**
  - You just need to be a better Data Scientist, but using what you know about geography!

- **Information Management in embedded**
  - It’s not a Surveyor problem. But Surveyor knows the importance of integration!

- **Reduce wastage in construction**
  - Our tradition is to be budget-keepers. Go with the flow!

- **Make efficiencies in operation / maintenance**
  - Geography is absolutely part of the response. And Geography is our realm, right!?
WHY BIM-GIS INTEGRATION?
Real or 3D GIS models?
WHY BIM-GIS INTEGRATION?
Check the major differences on software to manage BIM

- File based
- File based exchange
- Inferior data exchange between COTS products
- Small number of users

- Server based w/ relational databases
- File and webservices for Exchange
- Full integration between COTS and OS products
- Large number of users

Evolution of the scientific articles about BIM-GIS in last years
HOW TO ADD VALUE WITH BIM-GIS INTEGRATION?
To Plan, To Design, To Build

- Site Selection/Location planning
- Site circulation/parking/vehicle routing
- Visualization
  - Building Skins
  - Textures
- ViewShed analysis
- Drainage analysis
- Erosion control analysis
- Height analysis
- Airspace encroachments
- Shadow analysis (solar potential)

- Security/Evacuation planning
- Temporal Analysis
  - Historical
  - Existing
  - Future
- Economic Analysis
- Demographics
- Soil Conditions
- Transportation
- Emergency Management/Security
- Total Cost of Ownership/Lifecycle Analysis
HOW TO ADD VALUE WITH BIM-GIS INTEGRATION?
Use GIS as a Live layer of an operation

• GIS-based Facilities management (maintain 3-D models)
• Network routing/analysis
• Asset management
• Public Safety (Security, Fire Protection…)
• Way-Finding (Routing)
• Interior Space analyses (Areas, Elevation, Volumes)
• Energy Management (sensors)
HOW TO ADD VALUE WITH BIM-GIS INTEGRATION?

Analyse BIM as a typical GIS layer

- Existing As-built architectural/structural models
- Existing As-built networks
- Security planning
- Evacuation routing
HOW TO ADD VALUE WITH BIM-GIS INTEGRATION?

Analyse BIM as a typical GIS layer (examples)
HOW TO ADD VALUE WITH BIM-GIS INTEGRATION?

Integrate point clouds with BIM models as a plus (examples)

The basic attributes for procedurally creating a 3D building.

Building footprint polygons on a digital surface model raster (left) and a rooftop classified by slope and aspect.

All the images from The ArcGIS Imagery Book
HOW TO ADD VALUE WITH BIM-GIS INTEGRATION?

Some of the most popular 3D data formats

- 3DS
- ACAD
- ADAC
- AIS
- AIXM
- ARCGEN
- ARCGISMAP
- ARCGIS_LAYERS
- ARCINFO
- ARCPADAXF
- BMP
- CAT
- CDED
- CGDEFO
- CITYGML
- COLLADA
- CSV
- DATAFILE
- DB2
- DB2SPATIAL
- DBF
- DGNV8
- DVL
- DMDF
- DNF
- DSFL
- DTED
- DWF
- E00
- EPA_GDXML
- EPS
- ESF
- ESRIIMS
- FACET
- FFS
- FILECOPY
- FILEDB
- FM0
- FM0_SQL
- GDMS
- GENAMAP
- GENERIC
- GEODATABASE_FILE
- GEODATABASE_MDB
- GEODATABASE_SDE
- GEODATABASE_XML
- GEOHASH
- GEOJSON
- GEORSS
- GEOTIFF
- GG
- GIF
- GML
- GML212
- GMSF
- GOOGLE_SPREADSHEET
- GOOGLEFUSIONTABLE
- GOOGLEFUSIONTABLE_S
- GOOGLEFUSIONTABLE_S_DB
- GPX
- GRD
- IDRSI
- IEP5
- IFC
- IFF
- IGDS
- INF
- INF5
- INFO5SPATIAL
- ISO8211
- IUF
- JOBXML
- JSON
- KF85
- LANDINGLINE
- LANDXML
- LAS
- MASK
- MCF
- MDF_ADO
- MGE
- MIF
- MITAB
- MOEP
- MSSQL_ADO
- MSSQL_SPATIAL
- NEN3610
- NTF
- NULL
- OBJ
- ODBC2
- OGCKML
- OGEOSMS
- ORACLE
- ORACLE8I
- ORACLE8I_DB
- ORACLEPOINTCLOUD
- PCARCCINO
- PDF
- PDF2D
- PHOCUS
- POINTCLOUDXY
- POSTGIS
- POSTGRES
- QLF
- RDB
- RDB_PROJECT
- REGIS
- S57
- SAIF
- SALESFORCE
- SCHEMA
- SCHEMA_FROM_TABLE
- SDE30
- SDL
- SDTS
- SEG-P1
- SHAPE
- SKETCHUP
- SLF
- SPATIALITE
- SQLITE3
- SQLDR
- STRUMAP
- SVG
- TEXTLINE
- TIGER
- TIGERGML
- TOP10
- TOP50NL
- UFO
- VML
- VPF_DB
- VRML
- VRT
- WFS
- WHITESTAR
- XYZ
- Z-
- MAP_ASCII
- ZFS
- ZGF
- ZMAP
CASE STUDY
Hospital Divino Espírito Santo (Azores – Portugal)
Both parties developed this case study in different phases to get solid outputs for each workflow step.

**Step 1**
Sharing Knowledge

**Step 2**
Interoperability Tests

**Step 3**
IFC/REVIT Interoperability

**Step 4**
Geo-Services and Virtual Reality
Both parties shared BIM technical knowledge and how to leverage BIM through interoperability. This phase was useful to understand the requirements and the priorities to integrate a REVIT project into GIS. The parties identified:

- Contents and good practices to manage the information
- Requirements to transfer graphic components and the best practice to manage the collaboration
- Market strategy
The teams started to research and test different interoperability formats. After these tests both parties listed advantages and disadvantages. Interoperability is regularly on the mindset of GIS professionals and the sequence of procedures were:

- The architecture model was modeled and managed in **Autodesk Revit** format (RVT)
- The model was exported to an interoperable format: **IFC** by buildingSMART Data model
- The model was imported for the **ArcGIS** ecosystem
CASE STUDY
Workflow | Step 3 | IFC / REVIT Interoperability
Step 4 Geo-Services and Virtual Reality

IFC turns into a fundamental interoperable format for BIM, improving the interaction between different software (CAD-GIS or GIS-GIS). In this case the end platform was ArcGIS Online, as the reference technology platform to allow as-a-Service BIM platform. This platform allows:

- Access for all kind of professionals, with different levels of permissions
- Reduce project errors and an easy way to show the project for the infrastructure owners
- Keep the copyright of the project and its object classes and families
Virtual Reality as trigger to improve the project meetings between Architects and the owners
Georeference is important to use in the site of the works (for the owner or another companies)

This solution must be improved in the next interactions, to adapt and add more tools for each persona and business
CT197 NATIONAL BIM AWARD
2017

Team:
Sara Pelicano (Administrator at ARIPA)
Nuno Pinto (BIM Manager at ARIPA)
Rui Sabino (CEO at Esri Portugal)
Edgar Barreira (Consultant at Esri Portugal)
Inês Vilas Boas (GIS Consultant at Esri Portugal)
WHEN THE TECH LEADERS JOIN EFFORTS...
NEW TRENDS
GIS into Unreal Engine
Surveyors must keep updated the technical approaches to be part of the evolutions, not the breaks for the innovation.

SKIPE is not a tool for Surveyors, if Surveyors don’t consider it as a tool for the another ones to update its own projects...In this case, with a perfect integration with GIS, Surveyors will work in collaboration with another ones and be leaders in a process (not followers – followers ensure Surveyors must be Leaders!"
ABOUT REVENUE...
Statistics about the size Market of BIM

Allied Market Research (2016)

World Building Information Modeling (BIM) market is expected to reach $11.7 billion by 2022.

World Building Information Modeling (BIM) Market, by Deployment
- Cloud based
- On-premise

World Building Information Modeling (BIM) Market, by Solution
- Software
- Services

World Building Information Modeling (BIM) Market, by Vertical
- Commercial
- Residential
- Institutional
- Industrial
- Infrastructure

World Building Information Modeling (BIM) Market, by Geography
- North America
- Europe
- Asia-Pacific
- Latin America

World Building Information Modeling (BIM) Market, by End User
- Architect
- Contractor
- Others

Geospatial World Media (2018)

Global BIM Market share & size to grow US $10.36 billion by 2022

Image Courtesy: Ashishk
CHALLENGES...
What kind of challenges for BIM-GIS and for the Surveyors?

Please! Try don’t be this folk!

He is actively trying to destroy the operation but is often trying to hide his deeds by the use of a “nice” social mask.

Try to be one of these ones!
BIM and GIS Interoperability

Edgar Barreira | Inês Vilas Boas
Young Surveyors Portugal

Thank you!
ysnpugal@gmail.com