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Advancing GIS for Infrastructure

Talal Shawwa
Regional Director
Bentley Systems-MENA

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Advancing GIS for Infrastructure

- What's driving change and why?
- How does Technology respond to those drivers?
- How are organizations solving the problems today?

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Drivers of Change

1. Diversity
2. Modeling Reality – 3D
3. Engineering users
4. Openness
5. Multi-disciplinary projects
6. Workflow

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1. Diversity

- Infrastructure information is diverse and heterogeneous in nature
- Spans AEC, Geospatial (GIS), database, Microsoft, and other forms
- The need to urgently locate both current and historical information is prevalent
- Transforming the information into one form is difficult at best

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NIST U.S. Department of Commerce
Technology Administration
National Institute of Standards and Technology

Advanced Technology Program
Information Technology and Electronics Office
Gaithersburg, Maryland 20899

Cost Analysis of Inadequate Interoperability in the U.S. Capital Facilities Industry

40% of engineering time is spent locating & validating information

Poor communications between systems wastes 30% of project costs

Total bill: $15.8B

If information can be entered once and used by all, reductions in delivery time up to 50% are possible

a 14% savings of O&M funding is also possible

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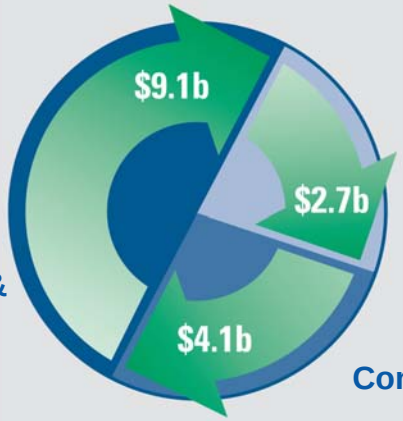
Who Pays the $15.8B?



Planning, Design & Engineering

Operations & Maintenance

Construction

Source: NIST

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U S Army Corps of Engineers Interagency Performance Evaluation Taskforce

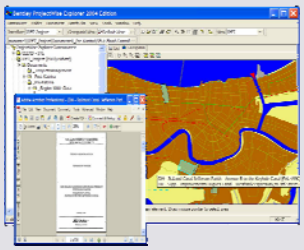
Objective:

- Assemble a comprehensive set of data and information about the conditions before and after Hurricane Katrina, as well as a complete history of the construction and maintenance of the projects

Fast facts:

- The data repository has **three main components**:
  - unstructured data in SQL Server
  - GIS data in an Oracle SDO database registered through ArcSDE
  - large data sets such as Lidar and elevation models stored on a terabyte server with metadata and geospatial extents stored in Oracle SDO
- The ProjectWise software provides the overall data management functionality by **integrating the data stored in the three components such that users may access all datasets from one central application** without having to know which data is stored in which component.

US Army Corps of Engineers



We were able to **effectively and efficiently store and manage thousands of documents/datasets in multiple formats and the metadata associated with that data**. The managed environment provided by Bentley's ProjectWise was instrumental in meeting the time constraints and volume of engineering and scientific data required by the IPET.

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2. Modeling Reality - 3D

- 'because the world is not flat'
- A lifelike, intuitive environment for users
- Move from *Symbolic* representation to *Geometric* reality
- 3D infrastructure models become the new base map
- Infrastructure assets of all types populate and extend this geometry
- Models the impact of change in the real world
- Improves accuracy and quality of decisions

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3D Modeling – Helsinki

Project:
3D Helsinki
City of Helsinki, City Survey Division

Objectives:

- To create a citywide 3D model supplementing older 2D basemaps **for urban planning,civil engineering projects, soil surveys, building permit processes, and more**

Fast facts:

- Laser scanning and aerial digital photogrammetry are used to gather 3D information on as-built and terrain objects
- Orthophoto mosaics produced from photogrammetry, along with laser point clouds, are used in mapping features and in vectorizing buildings and streets in 3D

The Survey Division is using **3D models** for city and street planning, civil engineering projects, soil surveys, building permit processes, noise modeling, traffic simulation, and military defense applications.

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3. Engineering users

- Infrastructure has a lot do to with engineering
- Design Centric / Database Centric divide
  - Interoperability is key BUT…
- Planning, Design, Modeling, Analysis, and GIS/Facilities Management should be accessible to users in a single environment

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Communication Network Engineering, Analysis, and Management

Project:

KeySpan Communications Fiber Network
KeySpan Corporation

Objectives:

- Build **intelligent network design, documentation, and management system** for KeySpan's fiber network
- Integrated inside and outside plant network model
- **Use the system for troubleshooting and outage analysis to optimize customer service**

Fast facts

- KeySpan is a subsidiary of the fifth-largest gas distributor in the United States
- **The intelligent network model is used in network management and operations, and is shared with other departments such as customer billing**

KEYSPAN Communications

"**Zero hours downtime** related to hardware, software, or data loss was recorded in the last three years. The data was kept at **98 percent** real-time accuracy..."

James Commisso
Lead Network Design Engineer
KeySpan Corporation

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4. Openness

- Single vendor, proprietary solutions are out
- Open standards and interoperability are in
  - OGC, GML, XML, etc...
  - De-facto standards
    - »Oracle
    - »PDF
    - »Google Earth

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Water and Land Related Utility System and Power Utility Maintenance Applications

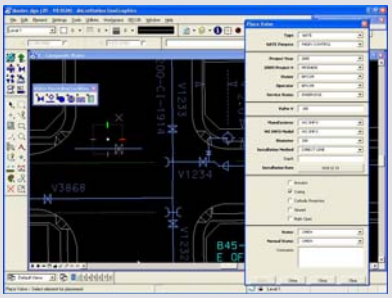
Objectives

- Implement a second generation GIS which was data-centric and **application neutral based on Oracle Spatial** technology.

Fast facts:

- EPCOR custom implementation built on MicroStation GeoGraphics
- Posting process ensures integrity per business rules and checks network connectivity
- Water facilities were **migrated from legacy FRAMME System**, electric from a previous MicroStation implementation in **only 16 days**
- **Work Management and Asset Management systems interface to the new database**
- Cadastral maps from the City of Edmonton were integrated and **a process to automatically update them was implemented**

EPCOR



Increased productivity, increased usability of GIS data through Oracle Spatial, and increased flexibility to meet evolving business needs of two unique business units. GIS data is more up to date and accessible, increasing its value to the company.

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5. Multi-disciplinary projects

- Infrastructure projects require flexible, multi-disciplinary, teams
- Each discipline has specific tools that make it productive
  - It is unproductive to ask ALL team members to conform to one technology
- The technology infrastructure needs to allow for collaboration and synthesis

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Infrastructure Disciplines form a Continuum

Project:
Alexandra Park Restoration
Oldham Metropolitan Borough Council

Objectives:

- Identify and investigate areas potentially contaminated by centuries of industrial development

Fast facts:

- A composite of historic information, maps, and data was brought into Oldham's corporate geospatial system to analyze alongside current information.
- Without the need for repetitive and costly site visits, investigators could compare, appraise, and track changes in how land was used over the past 300 years

OLDHAM Metropolitan Borough

All departments and **disciplines** can search and display land-use information, maps, and images from a **common data store**.

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6. Workflow

- Workflow Centric vs. Task Centric
- Task Centric
  - Focused on **individual productivity**
    - » Increasingly difficult to get orders of magnitude productivity gains
  - Results in stranded data silos and proprietary data
  - Results in currency and synchronization issues
- Workflow Centric
  - Focused on **Organizational productivity**
    - » Can provide order of magnitude productivity gains
  - Information management
    - » Federated data
    - » Engineering, Analysis, AEC, GIS disciplines united through an environment that allows collaboration and syntheses
  - Comprehensive change management (ensures currency etc.) throughout the enterprise

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Capitalizing on Workflow

Project:
S.I.T. Project (Systema Informativo Territoriale)
AEM Torino

Objectives:

- Use a central data store to help meet customer needs more effectively
- **Improve production processes to offer new and improved services to customers**
- Allow company **personnel to retrieve customer information linked to the graphical representation** of the network
- **Publish data across the Internet and intranets, reducing paper documentation**

Fast facts:

- One of Italy's largest multi-utilities, serving the 900K residents of Turin
- **Market forces required them to reduce costs, achieve operational excellence, and provide superior service at fair prices**

Created **single-model solution** for each of their networks: electricity, district heating, gas services and optical fiber resulting in:

- **20-30%** savings in network design time
- an efficiency increase of **200%** for external data delivery
- virtually **eliminating** printing and distribution of paper maps

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Advancing GIS for Infrastructure

Diversity

Federated Information Management

Modeling Reality - 3D

Model the real world

Engineering users

One environment for Planning, analysis, design, and facilities management

Openness

Environment based on Oracle 10g Spatial, OGC

Multi-disciplinary projects

Use of best of breed tools with collaboration

Workflow

Focus on the whole Enterprise

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..a *managed* environment..

In which …

- People become *Teams*
- Tasks become *Processes*
- Products become *Solutions*
- Data become *Information*

…. across *all* disciplines and processes in your Organization

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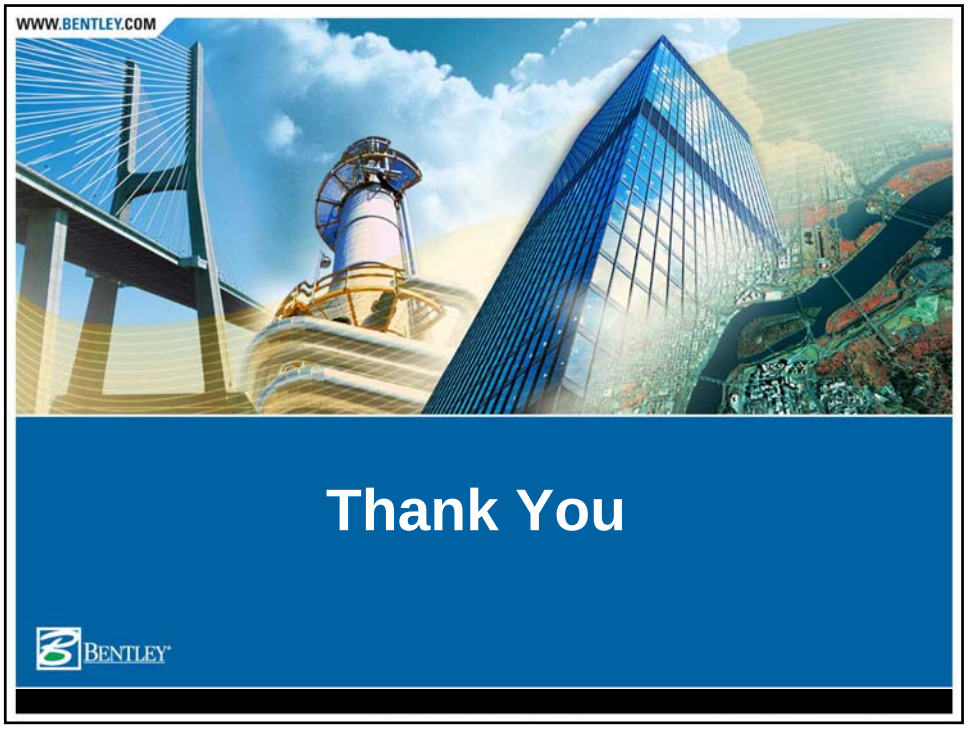
For a civil engineer, there's no such thing as a "little mistake."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Thank You
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