Spatial Accounting
Turning Strategic Asset Management Programs into Practical Decision Support Systems

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President & CEO, NSGIS
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AAPA Facilities Engineering Seminar
Jacksonville, FL, April 24, 2019
The Geospatial Experts in Ports

NorthSouth GIS LLC

- Consultants and Geospatial System Integrators in Ports
- Founded in 2005
- Headquarters in Los Angeles
- An integral member of the Ports industry
- Esri Gold Partner and leading partner in ports
- Makers of the Enesgy® line of software

Daniel Elroi

- Founder, CEO (helped start 4 GIS consulting firms in 3 countries)
- 32+ years in the geospatial field
- One of a handful of SMEs in GIS & ports worldwide
Best Known for Our Geospatial Work in Seaports

- Port of Los Angeles
- Port of Oakland
- Port of Stockton
- Port of Tacoma
- Port of Tampa Bay
- Port of Vancouver
- Port of Alaska
- Port of Long Beach
- Port of San Diego
- Port of Hueneme
- Port Houston
- Port of Charleston
- Port Everglades
- Port of Longview
- Port of Columbia County
Contributing to the “Science of Where” in Ports

Spatial Accounting:
Managing Your Physical and Financial Assets
Using a Map-Based Dashboard

Daniel Elroi
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AAPA Marine Terminal Management Training
Long Beach, CA, October 4, 2018
Dispelling that GIS is Just a System of Record

- GIS as a System of Record
- GIS as a System of Insight
- GIS as a System of Engagement
Main Areas of Applicability for the Enterprise

- Information Management
- Document Management
- Security Management
- Property Management
- Facilities Management
- Asset Management
Strategic Asset Management (SAM)

Standards

- **Are**: Specifications
- **Are not**: Prescriptions
- **Do**: Provide guidelines
- **Do not**: Provide implementation
- **Can**: Help design a SAM program
- **Can not**: Get a program off the ground
Key Information Management Components

• Port of Rotterdam seen as the gold standard
• Foundation Systems
  • ERP – Enterprise Resource Planning, or
  • EAM – Enterprise Asset Management
  • GIS – Geographic Information System
  • EDMS – Electronic Document Management System
• Expert Systems
  • Engineering
    • Condition Assessment
    • Materials Testing and Lifecycle Modeling
  • Real Estate
    • Mass Assessment
    • Comparables Analysis
  • Fleet
    • Automotive diagnostics
**Decision Support System Components**

- What is your current “decision support system”?
  - Your brain, memory, knowing where to find information
  - Your institutional knowledge, your “old timers”
  - Your gut feel, your intuition

- What does it lack?
  - Accountability
  - Transparency
  - Repeatability
  - Scalability
  - Resiliency

- What is the new Decision Support System?
  - Let’s take a look
Decision Support System
Decision Support System
Decision Support System
Decision Support System
Decision Support System
Decision Support System

• “It’s broken, it needs to be fixed, now!”
• “We’ll have to stop operations if we don’t fix”
• “We’ll have to stop operations in order to fix”
• “Somebody is going to get hurt”
• “We’re not meeting the lease terms”
• “It’s not in the budget”
• “We should have inspected sooner”

• But…
• “It’s broken, it needs to be fixed, now!”
Let’s Start with Condition Assessments
Put All Assessments in a Database
Visualize the Condition of One Aspect
Look at the Overall Rating to Identify Trouble
## Access Current and Past Assessments

### View Inspection

- **Quick Tools**

### View Documents

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### Source
NSGIS
Retrieve Inspection Records

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### Photos

- Typical appearance of diagonal crack on prestressed tendon, located in red for visibility. Note that the crack shown does not appear to originate at the supporting element.

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### Maritime Asset

**Property:** Cargo Terminal  
**Asset ID:** Wharf 101  
**Source:** NSGIS; Wiss, Janney, Elstner

**Inspection Date:** July 9 & 10, 2018

**Inspection Type:** Baseline  
**Inspection Scope:** Above Water

**Inspection Report:**
- **Inspection: E3**
- **Inspection: E3**

**Reported By:** Patrick Mann, WJE  
**Report Date:** July 25, 2018

**Follow-up Actions**

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<th>Item No.</th>
<th>Priority</th>
<th>Component</th>
<th>Element Type</th>
<th>Condition Identified</th>
<th>Reason for Action</th>
<th>Recommended Action</th>
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<td>Superstructure</td>
<td>RC Deck Beams</td>
<td>Diagonal crack present at ends of tendon beams, possibly indicating flexural distress.</td>
<td>Condition may reflect post-loading or underlying deficiency in structure.</td>
<td>Follow-up investigation (In-Depth Inspection) to include structural calculations.</td>
</tr>
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</table>

Source: NSGIS; Wiss, Janney & Elstner
Let's Not Stop There!

Source: NSGIS; Wiss, Janney, Elstner Associates, Inc. (WJE)

Figure 1. Typical appearance of diagonal crack on front beam, located in red for visibility. Note that the crack shown does not appear to terminate at the supporting element.
Use Spatial Accounting!

- A visual dashboard into your data, maps, and documents
- Manage both physical and financial assets together
- Including real estate
Connect To Your Lease Management

Surprise earner

Losers

Most efficient earner

Source: NSGIS
Connect To Your Work Order System

Expensive

Expensive

Source: NSGIS
Add The Asset Register

This one is valuable

This one is not as valuable

This one is valuable

Source: NSGIS
Quantify All Liabilities

But so does this one

High liabilities

Source: NSGIS
Visual Balance Sheet: Net Asset Values

- Get rid of this
- Most neglected earner: Reinvest
- Good asset, focus on cash flow

Source: NSGIS
“But Wait, There is More…”

- Get rid of this
- Most neglected earner: Reinvest
- Good asset, focus on cash flow

Source: NSGIS
Use a Map-Based Dashboard

- Repair Second
- Repair First
- Move Tenant

Source: NSGIS
Operational Decision Support & Planning Tool
Let’s Recap

• Spatial Accounting is the concept of:
  • Connecting different Systems of Record using geospatial systems, especially GIS
  • Implementing the principles of Strategic Asset Management as a Decision Support System
  • Delivering it as a map-enabled System of Engagement

• This requires:
  • Existing systems to be connected
  • New systems to be added
  • Collaboration across the enterprise
How Does One Get There, Incrementally?

- “We have nothing” or “We have pieces”
- “We don’t have the experts to do this”
- “I’ve heard this is very expensive”
- “We’ve tried this before, it failed”
- “I already have a day job!”
- “We’re just a small port”
- “Channel deepening”
- “Cyber-security”
- “Something urgent came up”
- “My commissioners don’t get it”
GIS Strategic Plans

**What:** Interviews across port, budget, staffing, 100s actions

**ROI:**
- Coordinated vision
- Sync with port master plan & strategic asset management plans
- Road map
- Basis for budget requests
- Bridge gap with IT
- Better communication with leadership
Assessment of Paper Records

• **What**: Catalog paper, scanned and digital documents

• **ROI**:
  - Catalog of available data
  - Prioritization for conversion to GIS so only most reliable data is used
  - Gain value from GIS even before starting on data conversion and even from documents that are never converted
  - Map- and metadata-based search and retrieval of documents
Spatial Index of Digital Documents

- **What:** Spatially search and retrieve record drawings
- **ROI:**
  - Reduced risk of using wrong or incomplete document sets
  - Easier for new staff to find documents
  - Some ports have reported 90%+ reduction in search for as-builts
Rectification of Scanned CAD Drawings

- **What**: Overlay images spatially without conversion to GIS
- **ROI**:
  - Much easier to use than disjointed standalone scanned drawings
  - Can stitch drawing sets together
  - Retain details that will never be converted to GIS
  - Save one-of-a-kind drawings before they are destroyed
  - Tangible value from document scanning
Data Conversion and Publication

• **What:** Conversion of 100s map layers from paper, CAD, GIS

• **ROI:**
  - Vetted, authoritative data sources
  - Available any time and on any device
  - Stored on-premise or in the cloud
  - Tools for sketches, measurements
  - Integrates external data sources from city, county, state, NOAA, USACE, etc.
  - Integrates dynamic data with static data sources
Esri Geospatial Cloud

• **What:** ArcGIS Online* deployment

• **ROI:**
  • Complete Systems of Record, Insight and Engagement
  • Economical cloud data streams, storage, analysis
  • Available on any device, anytime and anywhere (including offline)
  • Backed by Esri’s desktop software
  • Supports third-party software like Enesgy
  • * also Portal for ArcGIS
Field Data Capture and Verification

• **What:** Verification and documentation of assets in the field

• **ROI:**
  - Increase confidence in data
  - Field apps eliminate paper
  - Can inspect conditions while verifying locations
  - Capture photos
  - Instant feedback to office
Condition Assessment Management

• **What:** Combine data, reports, maps, photos in one system

• **ROI:**
  - Faster, more precise access to condition data, not just recommendations
  - Comparison of conditions across space and time
  - Integration with load-bearing data to plan for project cargo missions
  - Integration of data from different consultants and from internal assessments
  - Overlay with other map layers
Facilities and Work Order System

• **What:** GIS-based work order system, linked to finance & docs

• **ROI:**
  - Electronic work orders based on mapped assets
  - Work, labor and cost history retained in a database
  - Correlated to other systems through location information
  - Built-in scheduling and load balancing
  - Inventory control
  - Preventive maintenance planning
  - No paper records
  - Risk-based prioritization
Long-Term Lease Management

• **What:** Management of commercial property portfolio

• **ROI:**
  - Single map-based view of all properties
  - Differentiate between leased, available, expiring leases
  - Searchable, integrated data, maps and documents
  - Lease abstract and other reports
  - Query and analysis capabilities
  - Alerts and email notifications
  - Linkable to document management system
  - Executive dashboard
Short-Term Space Assignments/Leases

• **What:** Short-term space assignments/leases

• **ROI:**
  • GIS-power system used to drive the entire process
  • Propose, measure, calculate rates
  • Link and search documents
  • Create instructions for accounting department
  • Review history
  • Send alerts
Permit & Project Cargo Management

• **What:** Single source of information for permitting and project cargo mission planning

• **ROI:**
  - Single source of information on dock capacity, condition assessments, utilities, clearance, other cargo missions
  - Sketch, measure, calculate
  - Propose, notify, track
  - Report
  - Search by description, location and history
Capital Projects Management

• **What:** Tracking capital projects, exposing through dashboard

• **ROI:**
  - Internal tracking, public sharing
  - Can be used from beginning to drive the process
  - Linkable to document management system
Where is Your Port on This Path?

• Do you lack systems or connectivity?
Where is Your Port on This Path?

- Or only have enterprise systems for finance?
Where is Your Port on This Path?

• Or have some GIS but it stands on its own?
Where is Your Port on This Path?

• Or you have some GIS but it isn’t an enterprise system?
Where is Your Port on This Path?

• Or your GIS is connected to some enterprise systems but is not itself an enterprise system?
Where is Your Port on This Path?

- Perhaps you are still managing everything with Word and Excel?
Where is Your Port on This Path?

• You can start with specific systems, perhaps to just manage your record drawings
• Or just your critical map layers in GIS
Where is Your Port on This Path?

- Or have a couple of systems, one for engineering and one for real estate
Where is Your Port on This Path?

- As long as you have a plan for how you will eventually bring these systems together using the principles of Spatial Accounting
- Your port too can build a Decision Support System that will reflect your Strategic Asset Management Plan
- Not surprisingly, best outcomes if you
  - Have a plan
  - Get buy-in and budget
  - Standardize on a common platform
  - Learn from your peers, contract with experts, grow and hire people to sustain and grow
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