

# Waterfront Infrastructure Management

## A Tool For Our Times

A look at the options available for supporting efficient stewardship of our nation's port infrastructure.

# Outline

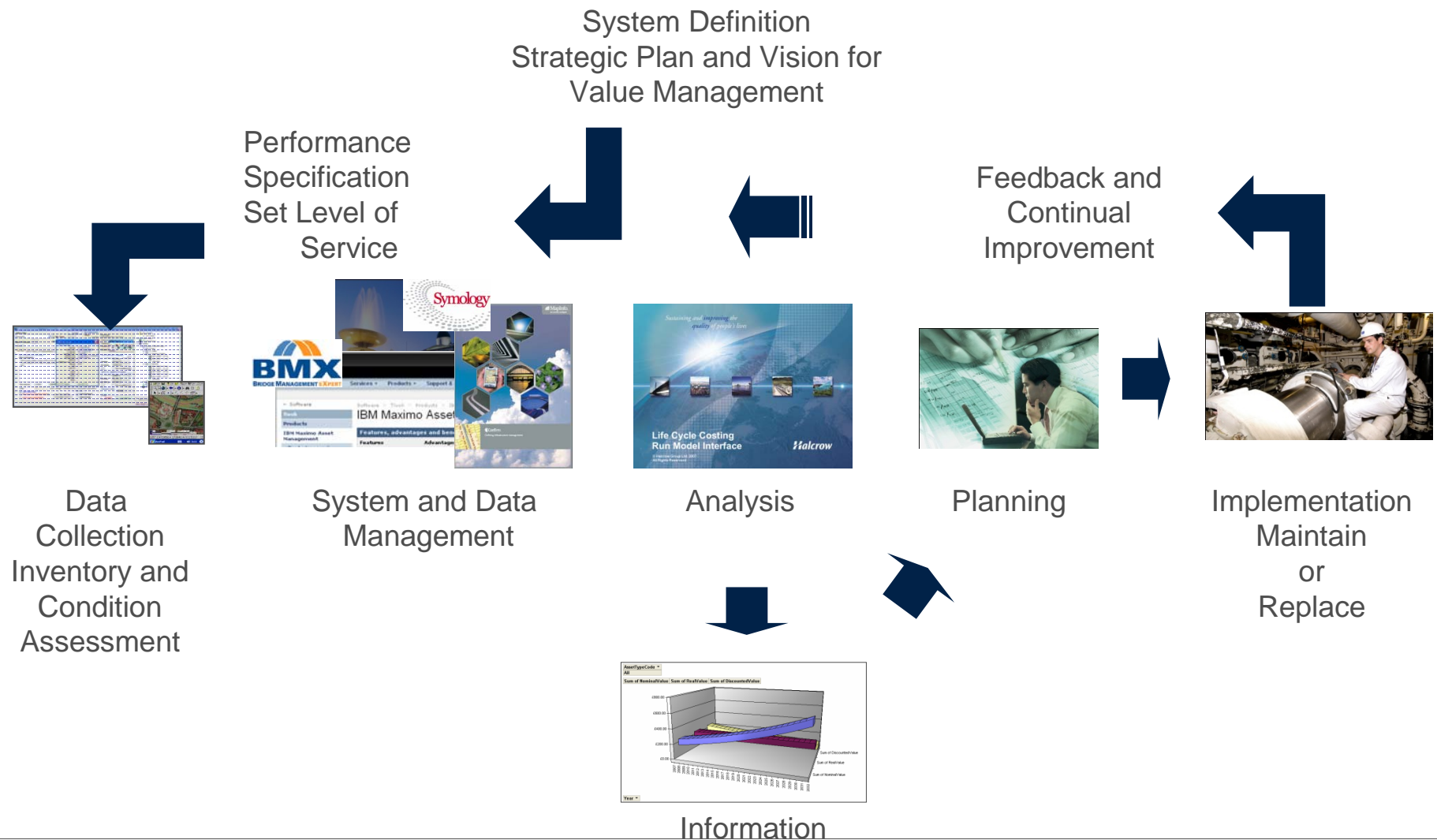
- Introduction and context
- System overview
- System components
- Lessons learned and best practices
- Case study

# Introduction and Context

- 'The systematic and coordinated activities and practices through which an organization *optimally* manages its physical assets, and their associated performance, risks and expenditures over their lifecycle for the purpose of achieving its organizational strategic plan'.
- Decision-making at each stage of the life cycle
- Converting data into information
- Minimize cost
- Maximize productivity
- Objective, defensible framework



# System Overview

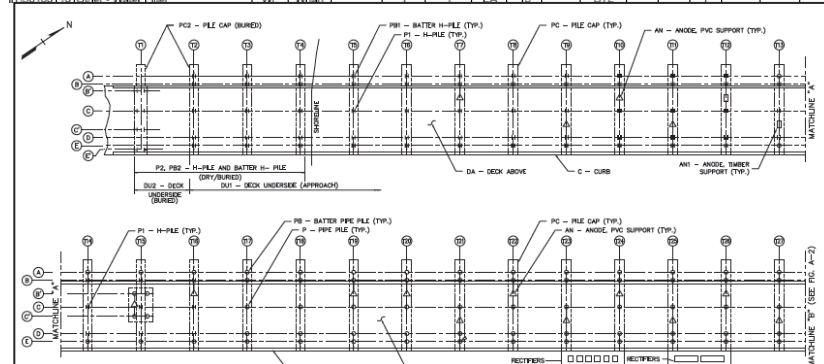


# System Components

# System Components - Inventory

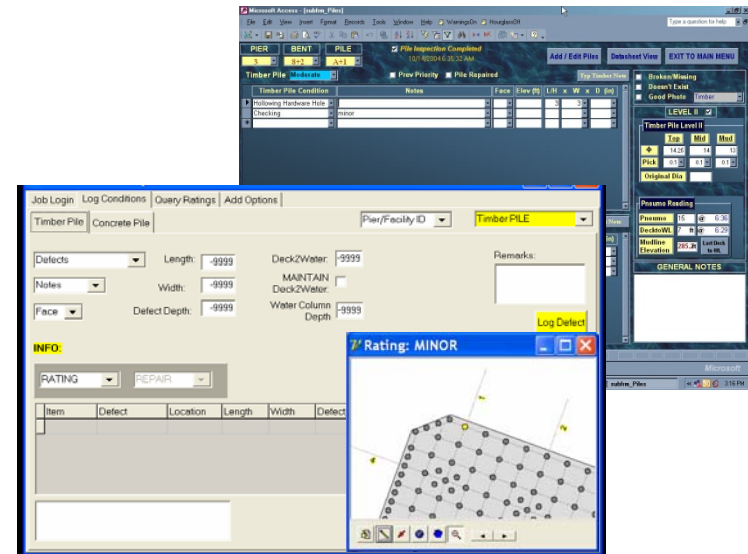
- ASTM Unifomat II
  - Currently in draft format
  - Waterfront element-specific classification
- Simultaneous cataloging and hierarchy development
- Enables querying and consistent economic evaluation
- “DNA” of the system
- Can be spreadsheet-based
- Desktop study, field verification, or combination

UniFormat II		Asset Type <sup>SP</sup>	Facility Section	Criticality Factor	No. of Assets (Count)	Quantity of Units	Unit	Size (in.)	Shape	Material	Age	Diameter		Dimensions		
Code	Name											ID (in.)	OD (in.)	Depth (ft.)	Width (ft.)	Length (ft.)
H10100102	Sheet Piles	SP <sup>1</sup>	Wharf	1	256	LF	PZ-27	STL								
H10100201	File Caps	PC	Wharf	1	4352	CF	REC	CNC					8.5	2	268.0	
H10300101	Deck	DA	Wharf	1	6,003	SF	REC	CNC						29	200	
H10300101	Deck	DA1	Wharf	1	378	CF	REC	CNC						1	21	13
H10300401	Curbs and Bulrails	C	Wharf	1	91	CF	REC	CNC						0.583	1	155.8
H10300401	Curbs and Bulrails	C1	Wharf	2	9	CF	REC	CNC						0.333	0.5	51
H10300401	Curbs and Bulrails	C2	Wharf	1	4	LF	REC	STL								4
H10300401	Curbs and Bulrails	SHW	Wharf	1	1	LF	REC	RBR								
H10300501	Moorings Foundations	MFD	Wharf	1	4	SF	REC	CNC							2	2
H10300501	Moorings Foundations	MFD1	Wharf	8	16	SF	REC	CNC							4	4
H10300601	Guard Posts and Railings	GP	Wharf	1	13	LF	CYL	CMP						3		
H10300601	Guard Posts and Railings	GP1	Wharf	12	1	EA	CYL	CMP					6.63	4.417		
H10300601	Guard Posts and Railings	GP2	Wharf	2	1	EA	CYL	CMP					3.5	3.967		
H1400103	Extruded Fender	FE	Wharf	23	15	LF	CYL	RBR				4	8			
H1400103	Extruded Fender	FE1	Wharf	1	30	LF	CYL	RBR					4	8		
H10400110	Fender Connection Points	FC	Wharf	65	1	EA										
H1400501	Bollards	MF	Wharf	1	1	EA	34	BOL	STL							
H1400503	Cleats	MF1	Wharf	8	1	EA	30	CLT	STL							
H10000001	Safety Ladders	L	Wharf	1	1	EA									2.26	
H30200101	Miscellaneous - Rip-Rap	RR	Wharf	1	20	LF		BLD	RCK							
H50100101	Pipes & Fittings	W	Wharf	1	2	LF	CYL	STL			5/8					
H50100101	Pipes & Fittings	W1	Wharf	1	3	LF	CYL	STL			2					
H50100101	Pipes & Fittings	W2	Wharf	1	13.25	LF	CYL	STL			1.5					
H50100102	Hangers & Trays	WS	Wharf	1	3,125	CF	REC	CNC						0.6	2.5	2.5
H50100102	Hangers & Trays	WS1	Wharf	1	1	EA	FLY	ALM								
H50100102	Hangers & Trays	WS2	Wharf	1	1	EA	ANG	ALM								
H50100102	Hangers & Trays	WS3	Wharf	1	1	EA	1.5	STL								
H50100102	Hangers & Trays	WS4	Wharf	1	5,02953	CF	CNC	CNC						0.333	3.333	5.333
H50100103	Valves	VV	Wharf	1	1	EA	5/8	BRS								
H50100103	Valves	VW1	Wharf	1	1	EA	2	BRS								
H50100103	Valves	VW2	Wharf	1	1	EA	2	BRS								
H50100105	Hose Connections	WC	Wharf	2	1	EA	5/8	BRS								
H50100105	Hose Connections	WC1	Wharf	2	1	EA	2	BRS								
H50100107	Meters	WM	Wharf	1	1	EA	5/8	BRS								
H50100110	Other - Water Pump	WP	Wharf	1	1	EA	1.5	STL								
H50100110	Other - Water Filter	WF	Wharf	1	1	EA	13	BRS								



# System Components – Condition Assessment

- Output provides data on the health of the inventory
- Key to updating management plans



# System Components – Management Plan

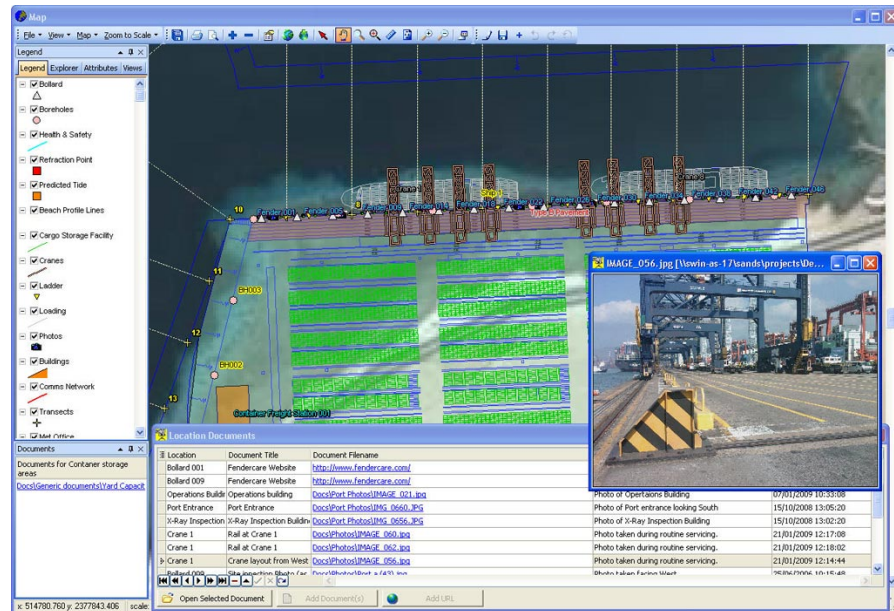
- Key long-term strategy document containing:
  - Asset make-up (built from inventory elements), location, construction costs, and life span
  - Capital maintenance:
    - Tasks, intervals, pricing
  - Operating & maintenance:
    - Tasks, intervals, pricing
  - Risk profile
  - Criticality
- Feeds life-cycle cost model
- Can be spreadsheet-based

Dataset version no: 2.5 Prepared by: <input type="text"/> Name: <input type="text"/>																																			
<b>Asset Description and Initial Capital Cost</b>																																			
Record comments on the asset here - any descriptive detail will be useful																																			
Asset name Basic description Completion of construction (year) Duration of construction (months) Takeover date (year) Useful life of asset	<table border="1"> <tr><td>xxxx</td><td>Free text</td></tr> <tr><td>xxxx</td><td>Free text (date)</td></tr> <tr><td></td><td>Free text (date)</td></tr> <tr><td></td><td>Free text (date)</td></tr> <tr><td></td><td>Free text (date)</td></tr> <tr><td></td><td>Free text (date)</td></tr> </table> <p><small>To include no. of units if appropriate</small></p> <p><small>Only if known - represents the date of handover of asset to management co.</small></p> <p><small>The number of years until the whole asset will need to be rebuilt based on maintenance levels to current best practice</small></p>	xxxx	Free text	xxxx	Free text (date)		Free text (date)		Free text (date)		Free text (date)		Free text (date)																						
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Unique Asset ID	<input type="text"/> <small>Leave Blank</small>																																		
Asset location	<input type="text"/> <small>Choose from dropdown list (submarine is for tunnels between differing locations)</small>																																		
Structure type	<input type="text"/> <small>Choose from dropdown list</small>																																		
Construction cost	<table border="1"> <tr> <th>AED'000</th> <th>Source</th> </tr> <tr> <td><input type="text"/></td> <td>Free text</td> </tr> <tr> <td><input type="text"/></td> <td>Free text</td> </tr> <tr> <td><input type="text"/></td> <td>Free text</td> </tr> <tr> <td><input type="text"/></td> <td>Free text</td> </tr> </table> <p><small>May include design costs if a Design &amp; Build contract</small></p> <p><small>Record costs in AED thousands</small></p> <p><small>Zero if Design &amp; Build contract</small></p>	AED'000	Source	<input type="text"/>	Free text	<input type="text"/>	Free text	<input type="text"/>	Free text	<input type="text"/>	Free text																								
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Total construction cost	0.00%																																		
Assessment based on: <input type="text"/>																																			
Describe the allocation of build cost over the components i.e. by contract, previous experience, knowledge of project etc.																																			
<b>Replacement in year</b>																																			
Efficiency savings in construction Useful life of replacement asset (years) Construction period (months)	<table border="1"> <tr><td>0.00%</td></tr> <tr><td></td></tr> <tr><td></td></tr> </table> <p><small>Review whether at rebuild stage the asset will cost the same, more or less than originally. i.e. there may be no need to replace original groundworks, or asset innovation may mean that future replacements could be smaller. If costs are to be less at replacement stage insert the percentage saving - if more, enter the additional cost as a negative % (i.e. negative saving).</small></p> <p><small>Review the useful life of the replacement asset and how long it will take to build.</small></p>	0.00%																																	
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<b>Replacement in year 0</b>																																			
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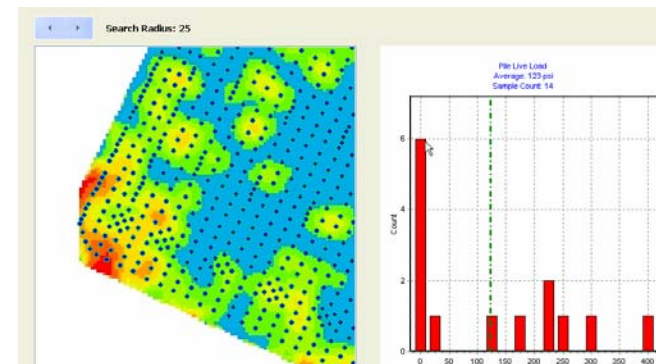
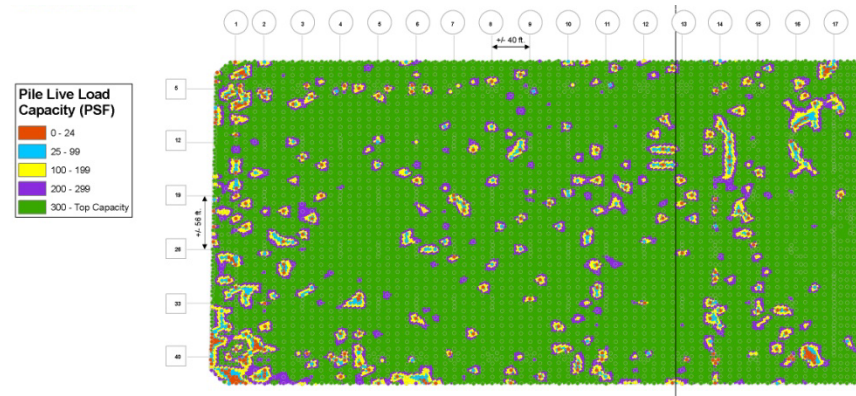
# System Components – Data Management

- User interface / electronic filing cabinet
- Dashboard and map to data
- Can be GIS-enabled
- Point-and-click access to:
  - Drawings and specifications
  - O&M manuals
  - Photographs
  - Bid packages
  - Tidal data
- Useful tool for visualization
- Commercially-available GIS and database tools



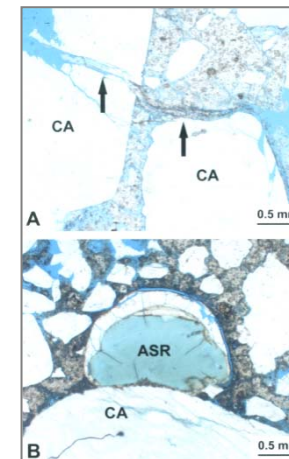
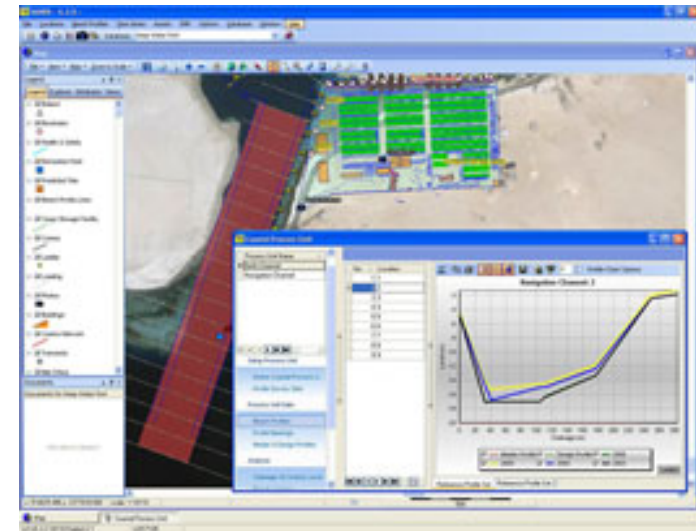
# System Components – Data Management

- Operations
  - Capacity analysis
  - Lease management
  - Health and safety recordkeeping
  - Dredge management
  - Maintenance and inspection scheduling
  - Automated report generation
  - 3D planning



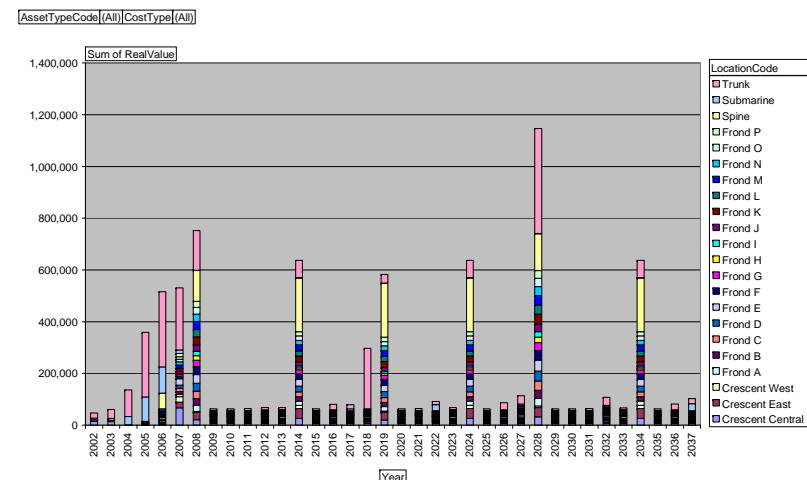
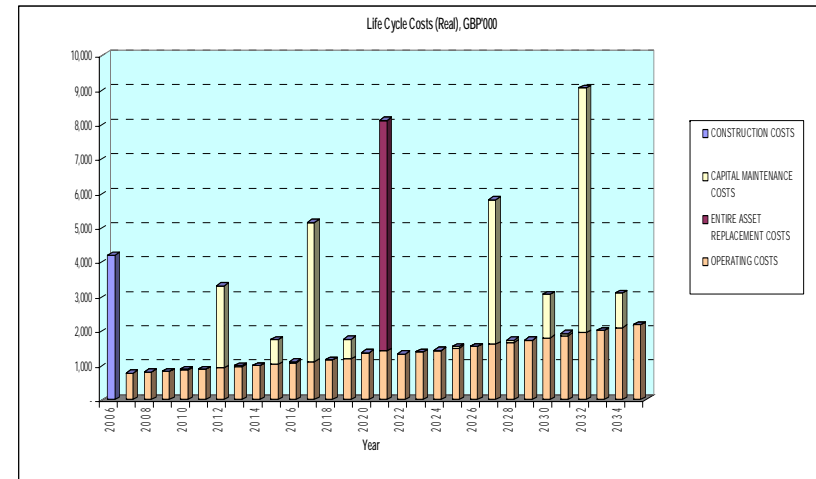
# System Components – Analytics

- Converting data into information
- Repair program definition
  - Rapid generation of extent of repair based on varying structural requirements OR varying resource availability
- Querying for inventory-wide trends and spends
- Time-history analysis of channel accretion/erosion
- Materials technology
  - Service life prediction
  - Cathodic protection

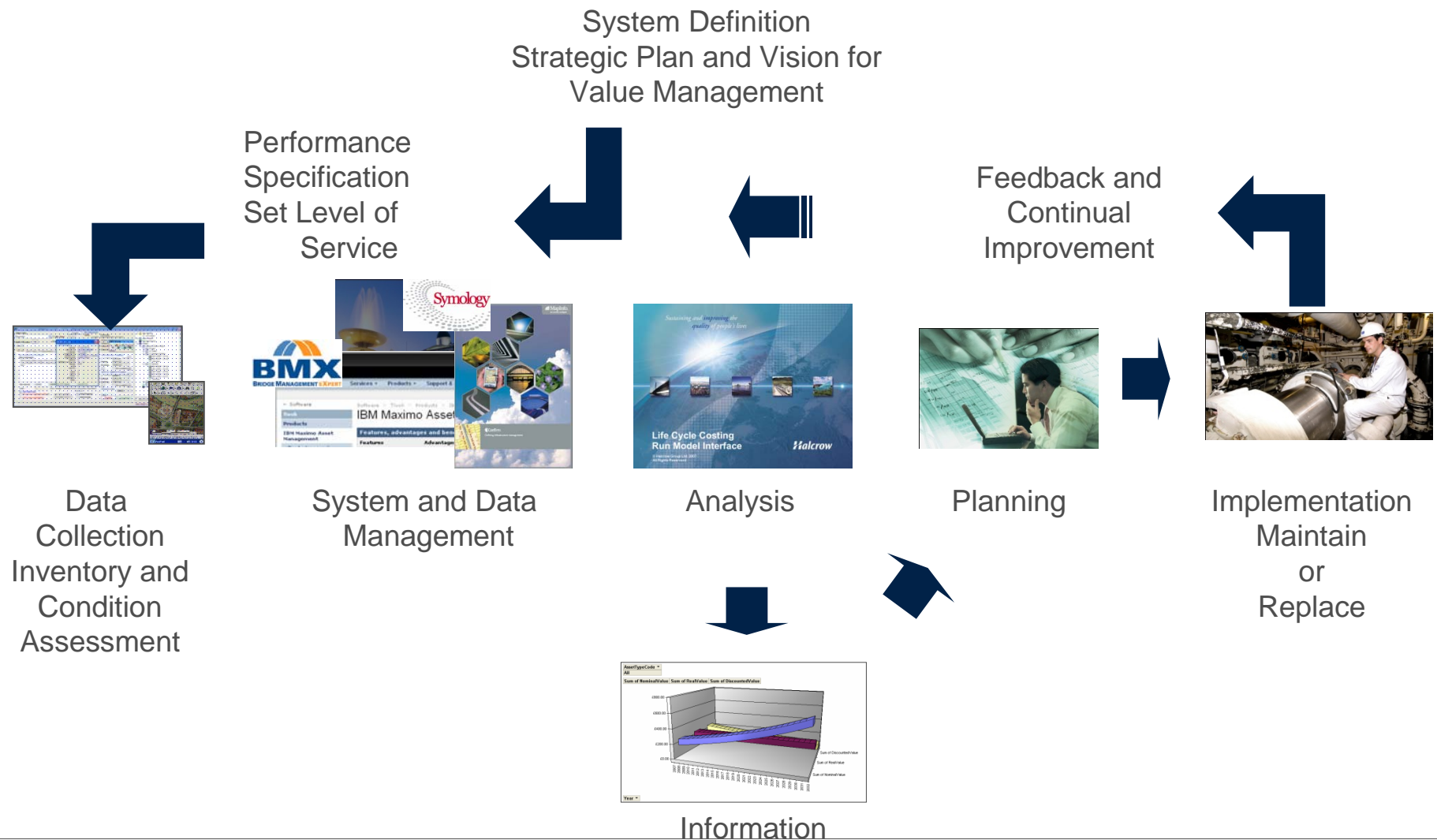


# System Components – Analytics

- Bringing it all together
- Life-cycle cost model
  - Allows for 'what-if' scenario analysis
  - Price risk of deferred maintenance
  - Develop long-term expenditure plan
  - Enables prioritization of capital projects



# System Overview



# Best Practices and Lessons Learned



## Best Practices and Lessons Learned

- The Right Tool for the job
- Organizational support
- Clearly defined organizational goals
  - Port strategy should be driver for decision-making
- Clearly defined levels of service
  - What is acceptable? What is the goal?
  - Serves as benchmark for performance, thus funding
- Clearly defined criticality
  - Factor in prioritization
  - Not an issue with unlimited funding...
  - Resources are finite- where are they deployed most effectively?
- Goal is continuous improvement
  - Inspection and Evaluation is Key to Refinement
  - Demand what you need from Inspection Program

## Best Practices and Lessons Learned

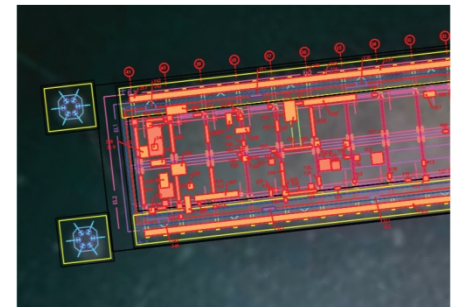
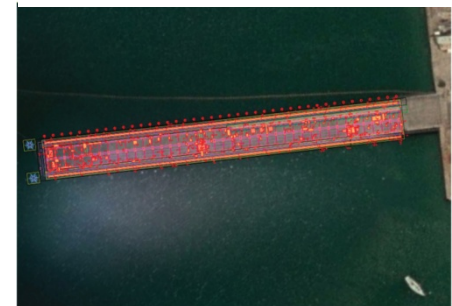
- Automating judgment may not be worthwhile
- Materials technology is key
  - Understanding hidden deterioration
  - Modeling of deterioration, applying calculated timescales and applying a valuation
- Flexibility
  - Guaranteed evolution in IT industry
  - Important not to lock owners into highly customized, proprietary software
- Scalability
  - Systems should be interoperable with existing systems and capable of supporting other infrastructure types



# Case Study

# Case Study – US Navy

- Follows system overview approach
- 1,400 + Facilities
- Development of comprehensive asset inventory tool
  - ASTM Uniformat II Coding
- Paperless process
- Inspection data warehousing
- Open standards



# Thank you!

Kirk Riden, Halcrow

Michael Russalesi, Synergy Software Design