# Speaker Bio: Robert Secrest, Asset Manager, City of Carlsbad

20 years experience in asset management and civil engineering and construction management

- Master of Business Administration, MBA
- Registered Professional Civil Engineer, P.E.
- Project Management Professional, PMP
- Leadership in Energy and Environmental Design Accredited Professional, LEED A.P.
- Qualified SWPPP Developer, QSD
- Certified Cost Engineer, CCE
- Chartered Financial Analyst Level 1 Candidate, CFA
- Certified Lean Six Sigma Black Belt, LSSBB

# Robert Secrest, PE, CCE, PMP, LEED A.P., LSSBB, MBA
# City of Carlsbad, Asset Manager

| | |
|---|---|
| Education: | • B.S. Civil-Construction Engineering, Oregon State University<br>• MBA Master of Business Administration |
| Years of Experience: 20+ | • Specialized in turnaround of troubled projects; and real-time dispute management as a supplement to the agency's construction management field staff. |
| CMAA Affiliation: | • 2016 CMAA Co-chair, CMAA Member |

# Asset Management

Purpose, benefits

Process lifecycle

Maturity models

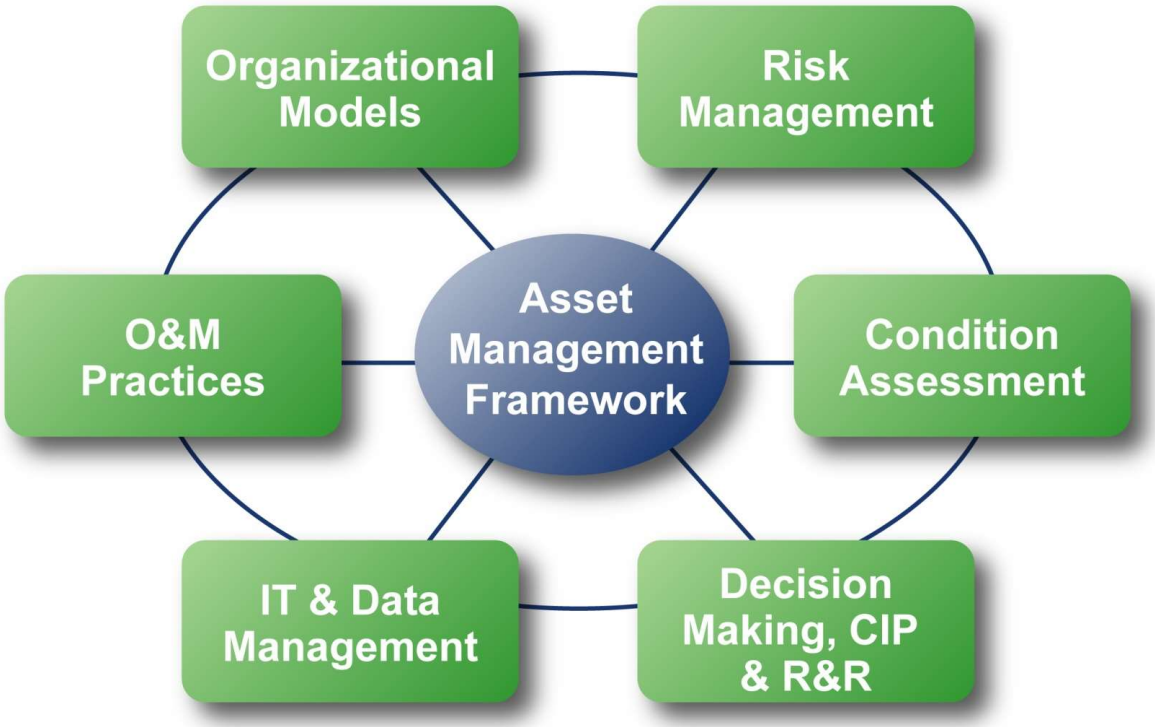
Leverage Technology

# Asset Management

Definition

Purpose

Benefits



# Asset Management

"Asset management is a systematic process of maintaining, upgrading, and operating physical assets cost-effectively. It combines engineering principles with sound business practices and economic theory, and it provides tools to facilitate a more organized, logical approach to decision-making. Thus, asset management provides a framework for handling both short- and long-range planning."

*Asset Management: Advancing the State of the Art Into the 21st Century Through Public-Private Dialogue, FHWA and AASHTO, 1996*

# Benefits

## Service Level

Share information

Improve condition

Minimize outages

Reactive to preventative

## Financial

Rehab prior to failure

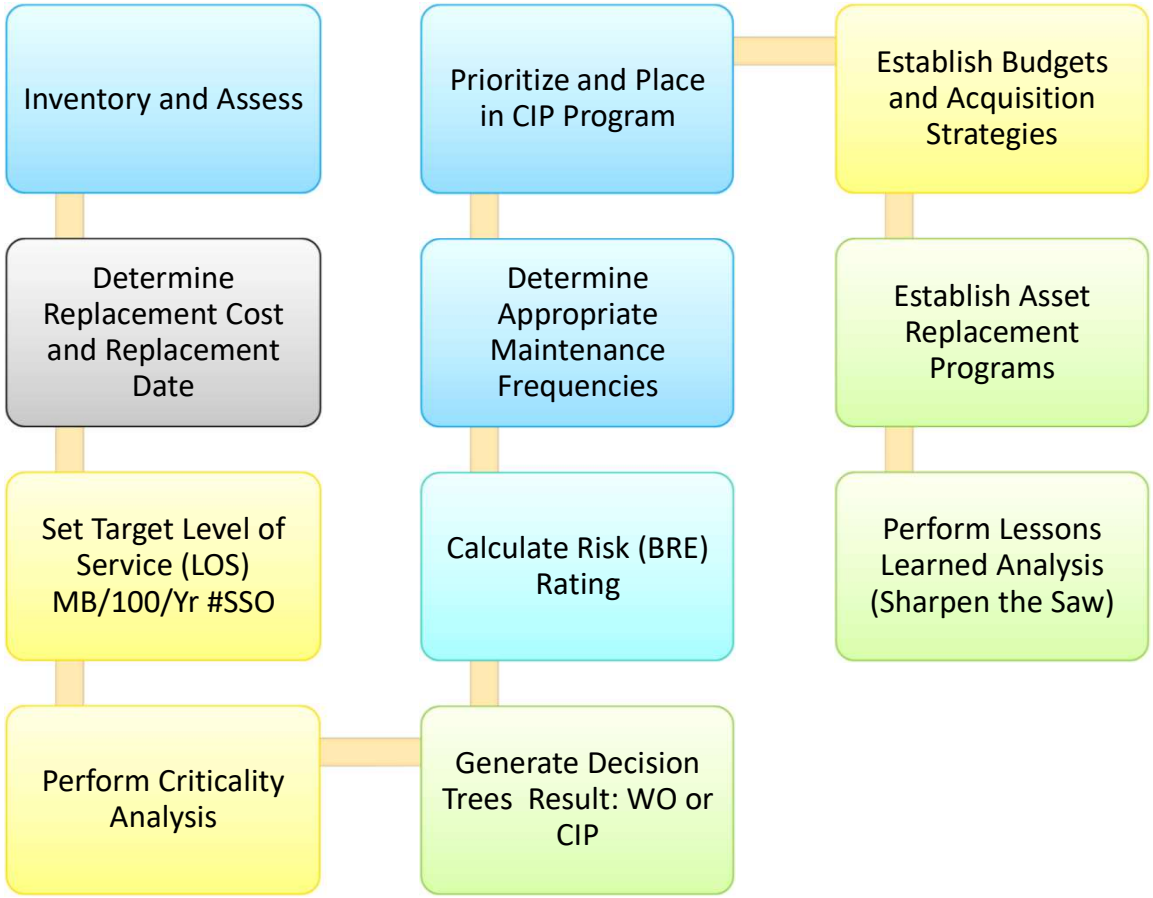
Helps prioritize

Justify financial plans

Extends useful life

Systematic decision-making

# Process Steps



# Business Risk Exposure

Probability of Failure (PoF) **X** Redundancy Factor **X** Consequence of Failure (CoF) **=** Risk Score (BRE)

Remaining useful life

Design standard
Construction quality
Material quality
Operational history
Maintenance history
Operating environment

- Failure mode
- Condition, Reliability

Peak vs. average
Failure mode
Operating environment

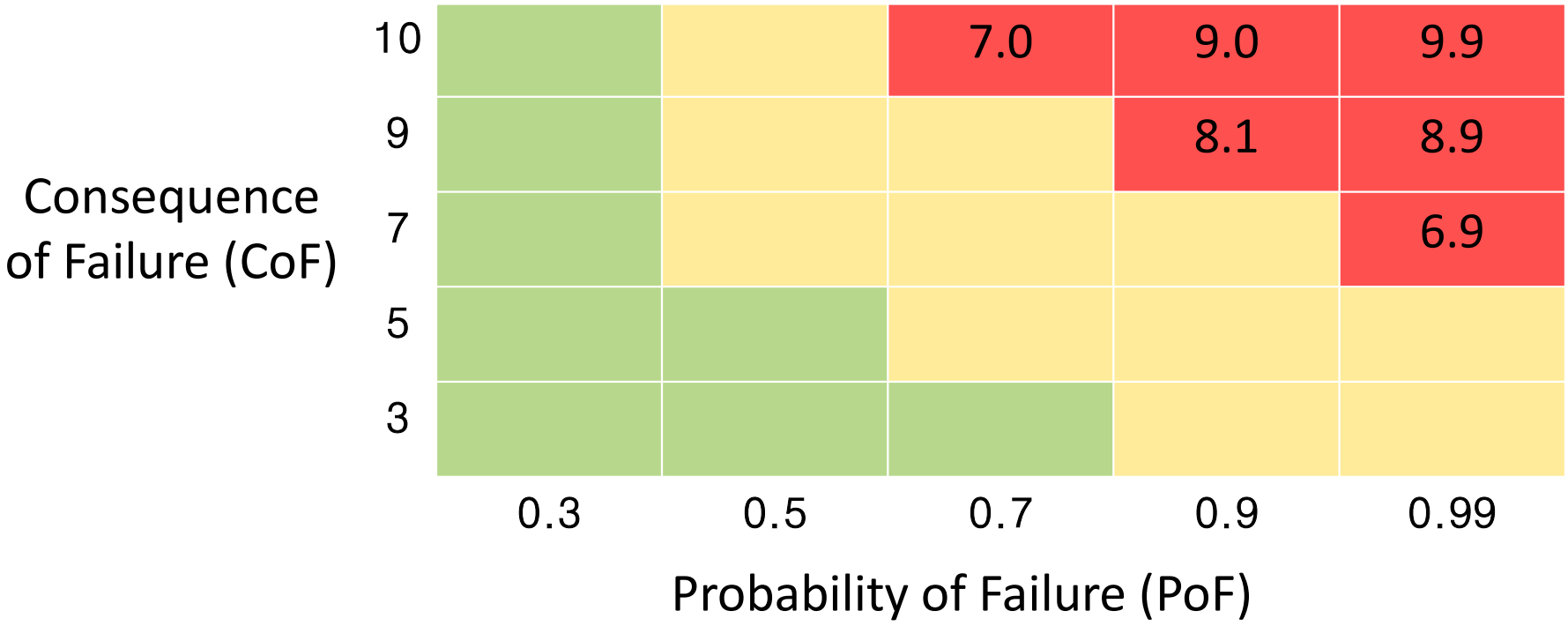
| Redundancy | Factor |
|---|---|
| Single | 0.7 |
| Multiple | 0.5 |
| Zero | 1.0 |

Safety, health
Environmental impact
Process criticality
Repair cost
Revenue impact

# Condition Scores converted to PoF

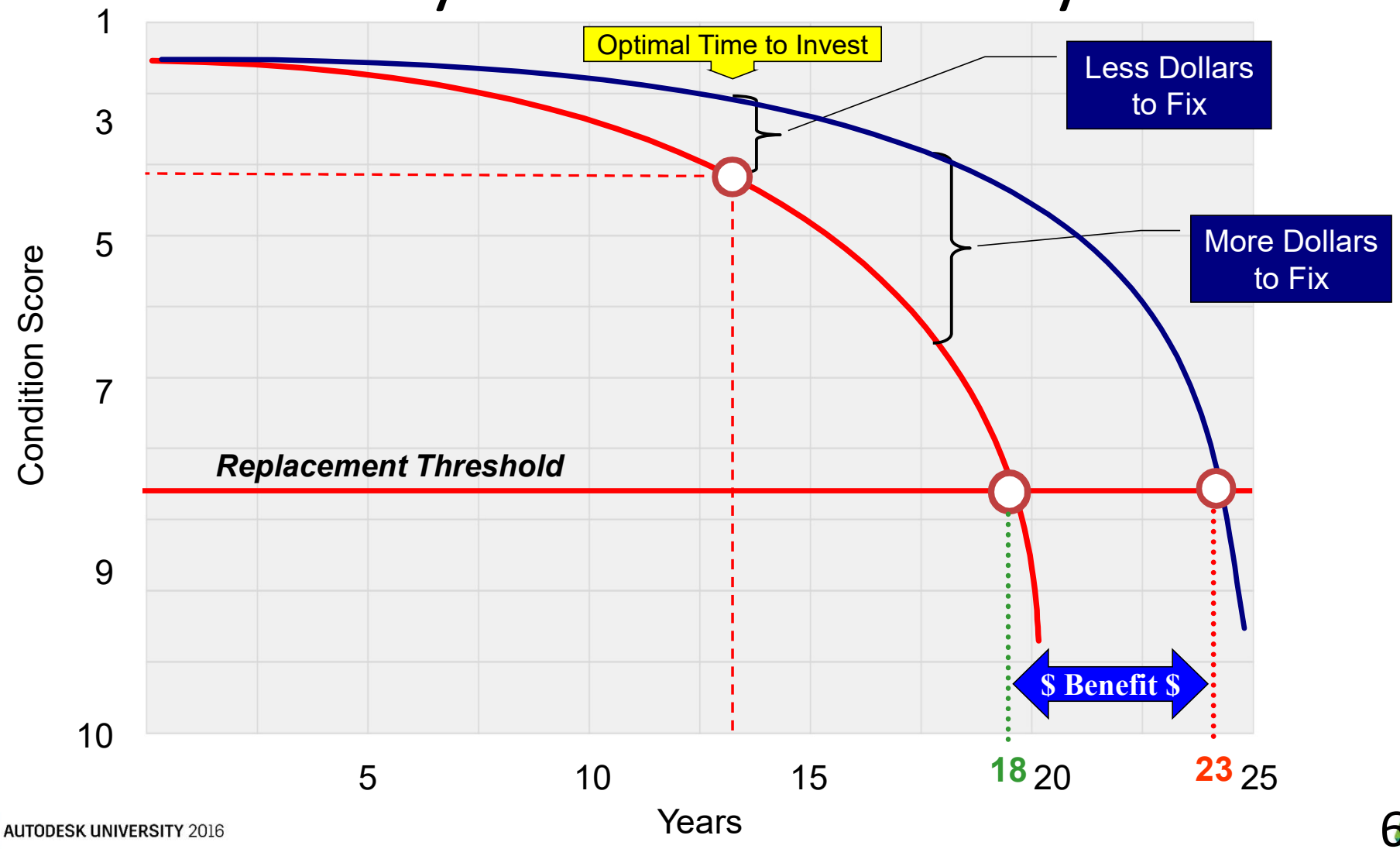
| Element | 1 | 3 | 5 | 7 | 9 | 10 |
|---|---|---|---|---|---|---|
| Technical Performance | Substantially exceeds current requirements | Exceeds current requirements | Meets current requirements but with room for improvement | Obvious concerns; cost/benefit questions | Inefficient; becoming ineffective, obsolete | Failing; not capable of sustaining required performance |
| Operational Performance | Negligible attention required | Exceeds current requirements | Meets current requirements but with room for improvement | Obvious concerns; costs/benefits questions | Difficult to sustain performance | Failing; not capable of sustaining required performance |
| Reliability | As specified by manufacturer | Infrequent breakdown | Occasional breakdown | Periodic Breakdown | Continuous recurrent breakdown | Virtually inoperable |
| Availability | Virtually always operational | Out of service only for very short periods | Out of service for moderate period; moderately difficult to return to service | Increasingly difficult to return to service; parts becoming a challenge | Extensive downtime duration; difficult to return to service; parts difficult to acquire, rare skills required | Virtually impossible to return to service; parts no longer available trained personnel |
| Maintainability | Easily maintained; OEM maintenance is straightforward | Largely preventive maintenance with some corrective maintenance beginning to show up; baseline monitoring | Increasing minor maintenance required; periodic corrective maintenance including some repair shortening of monitoring intervals | Scheduled maintenance becoming frequent; more experienced trades people required for maintenance; frequency of work orders increasing substantially with short monitoring | Work orders well above average for type of asset; recurrent minor repair; close monitoring required; most senior people required to sustain performance | Maintenance is frequent with recurrent patterns of failure; asset must be virtually constantly monitored to sustain performance |
| % Physical Life Consumed | Almost new; up to 10% consumed | Up to 30% consumed | Up to 50% consumed | Up to 70% consumed | Up to 90% consumed | Virtually completely consumed, imminent failure |
| Condition Score | 1 | 3 | 5 | 7 | 9 | 10 |
| Probability of Failure | 0.1 | 0.3 | 0.5 | 0.7 | 0.9 | 0.99 |

# Risk Matrix

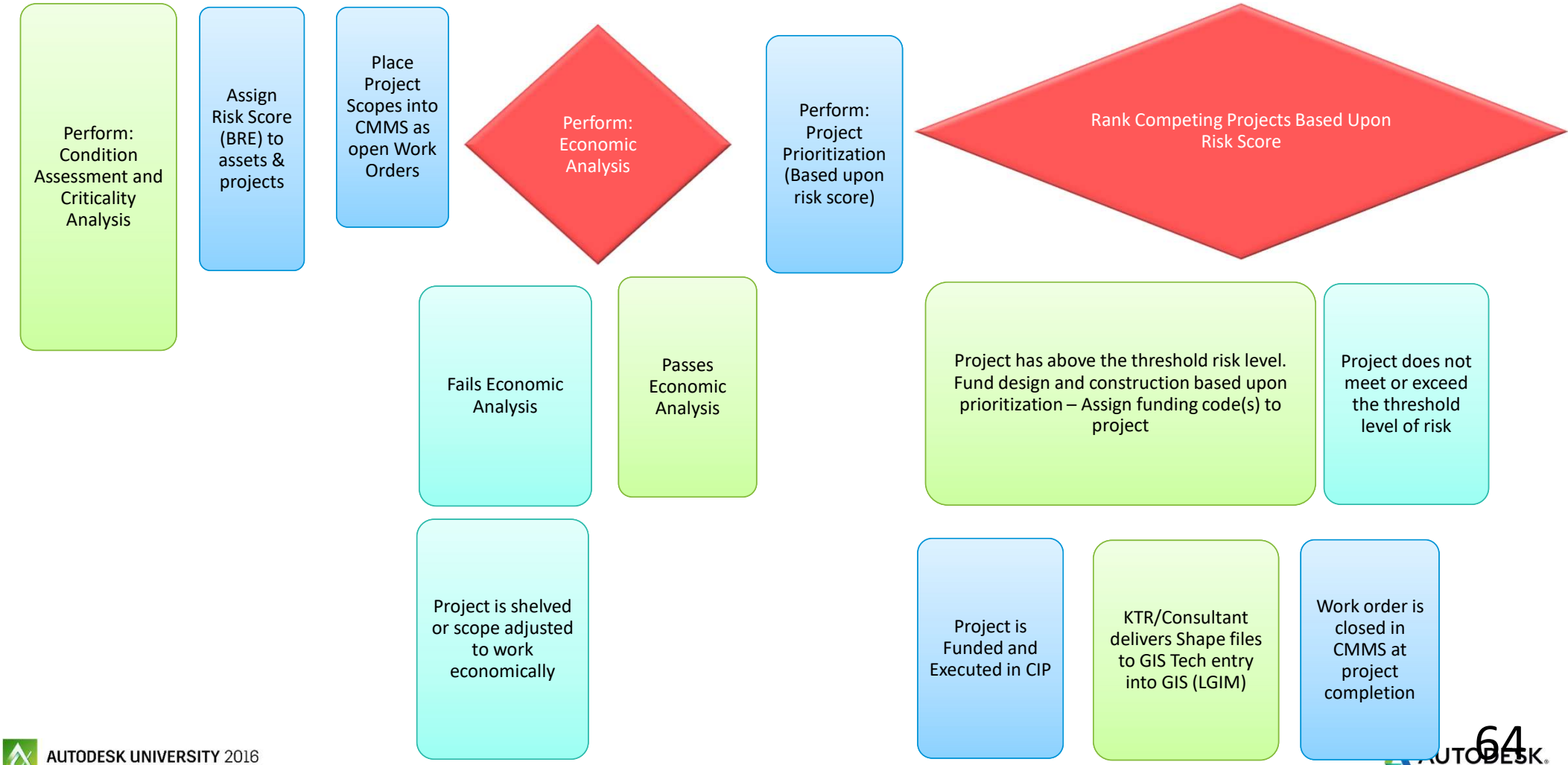

Consequence of Failure (CoF)
10
9
7
5
3
7.0
9.0
9.9
8.1
8.9
6.9
0.3
0.5
0.7
0.9
0.99
Probability of Failure (PoF)

| *Failure Mode and Effects Analysis (FMEA)* | *Definition* | *Tactical Aspects* | *Management Strategy* |
|---|---|---|---|
| ***Capacity (Operational Failure)*** | Volume of demand exceeds design or operational capacity | Growth, system expansion | Redesign |
| ***Level of Service (Operational Failure)*** | Functional requirements exceed design capacity | Codes & permits: NPDES, Breaks/100 miles/year, SSOs, outages, OSHA, noise, odor, life safety, service, etc. | O&M optimization renewal |
| ***Mortality (Structural Failure)*** | Consumption of asset reduces performance below acceptable level. End of useful life | Physical deterioration due to age, usage, (including operator error), corrosion, environment, or nature | O&M optimization renewal |
| ***Financial Efficiency*** | Operations costs exceed that of feasible alternatives | Payback period | Replace |

# Life Cycle Cost and Penalty Costs



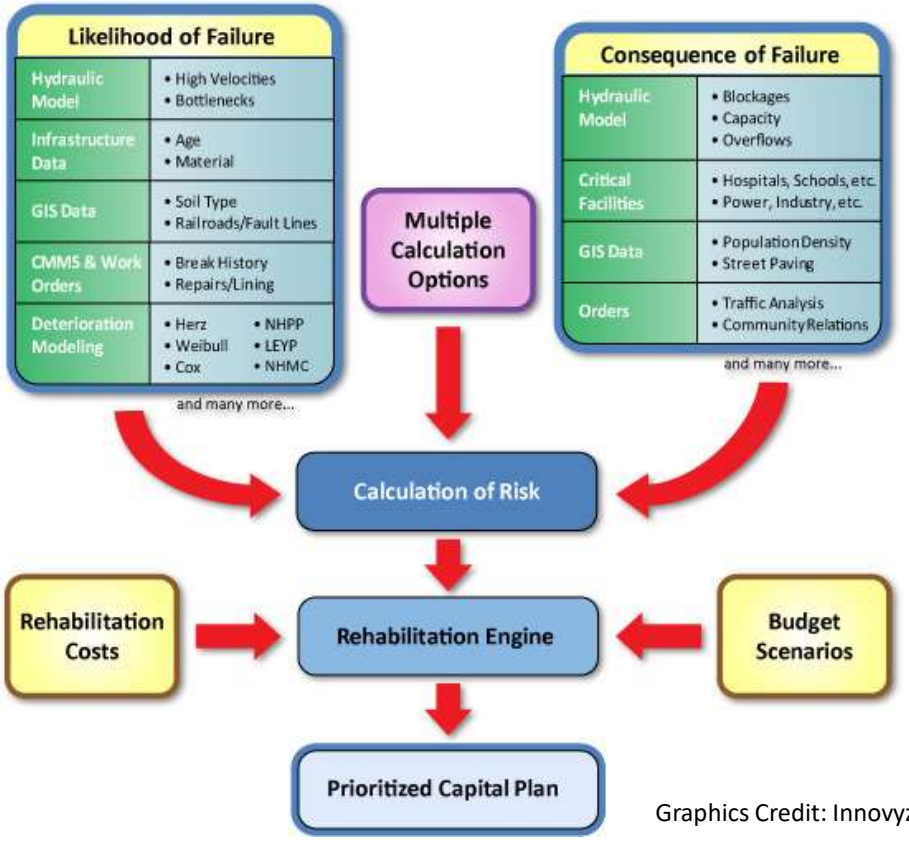
# Capital Projects Decision Logic Network



# Analytics to Action

**Analytics program**

- Shape files - layers
  - Sensitive customers
  - Soils
  - Streets moratorium
  - Main break
- Models
  - Leak logger




Graphics Credit: Innovyze

# Momo Savovic, PE, CCM, DEE
# Principal Engineer, West Yost

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|---|---|
| Education: | • M.E. Environmental Engineering, University of Alberta, Edmonton |
| Years of Experience: 30+ | • Specialized in water and wastewater process system design and construction management |
| CMAA Affiliation: | • 2016 CMAA President |

## Horizontal and Vertical Infrastructure Asset Management Approach

- Master Plan
- Inventory
- Risk Assessment (CoF; PoF and BRE)
- Condition Assessment
- Cost Estimation Analysis
- CIP

# BIM in Vertical Infrastructure, What is out there for Horizontal Infrastructure Asset Management?

Vertical: Navis works;CAD, Revit, GIS

Horizontal: Arc GIS; Innovyze hydraulic analysis; InfoMaster Risk Analysis; CMMS

# BIM 360 Infrastructure Asset Management?

Both Vertical and Horizontal assets under one umbrella