

The Fundamentals of Asset Management

Welcome

A Hands-On Approach

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The Fundamentals of Asset Management

Executive Overview

A Hands-On Approach

A paradigm shift...

- Transition from *building and operating* to *managing* assets
 - Extending asset life
 - Optimizing maintenance and renewal
 - Developing accurate long-term funding strategies
 - *Sustain long term performance!*

Infrastructure is the foundation to sustained quality of life



Consequences of asset failure can be severe



Asset management improves...

Decision making throughout the life cycle of the asset

- Acquisition
- Operations
- Maintenance
- Renewal

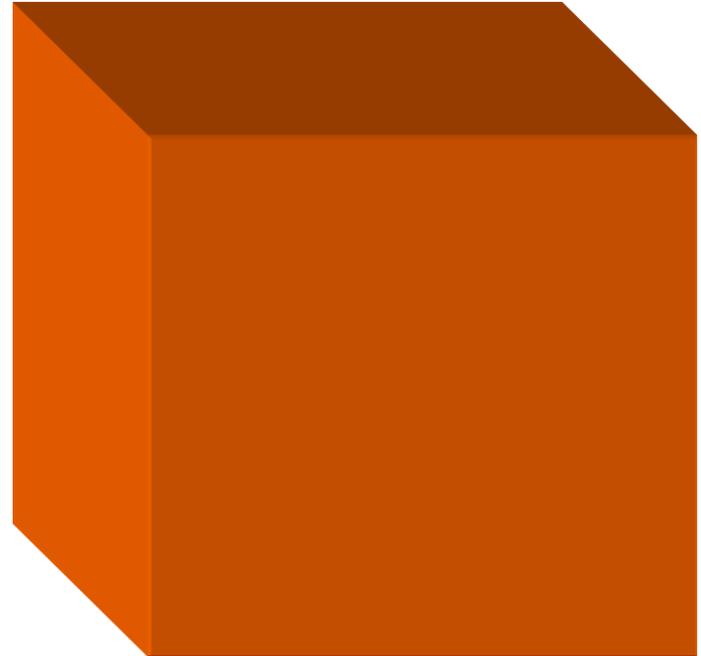
Resulting in *lowest total cost of ownership*

What is asset management (AM)?

- Systematic integration of advanced and sustainable management techniques into a management paradigm or *way of thinking*, with
- Primary focus on the *long-term life cycle* of the asset and its sustained performance, rather than on short-term, day-to-day aspects of the asset

Views on asset management – a framework

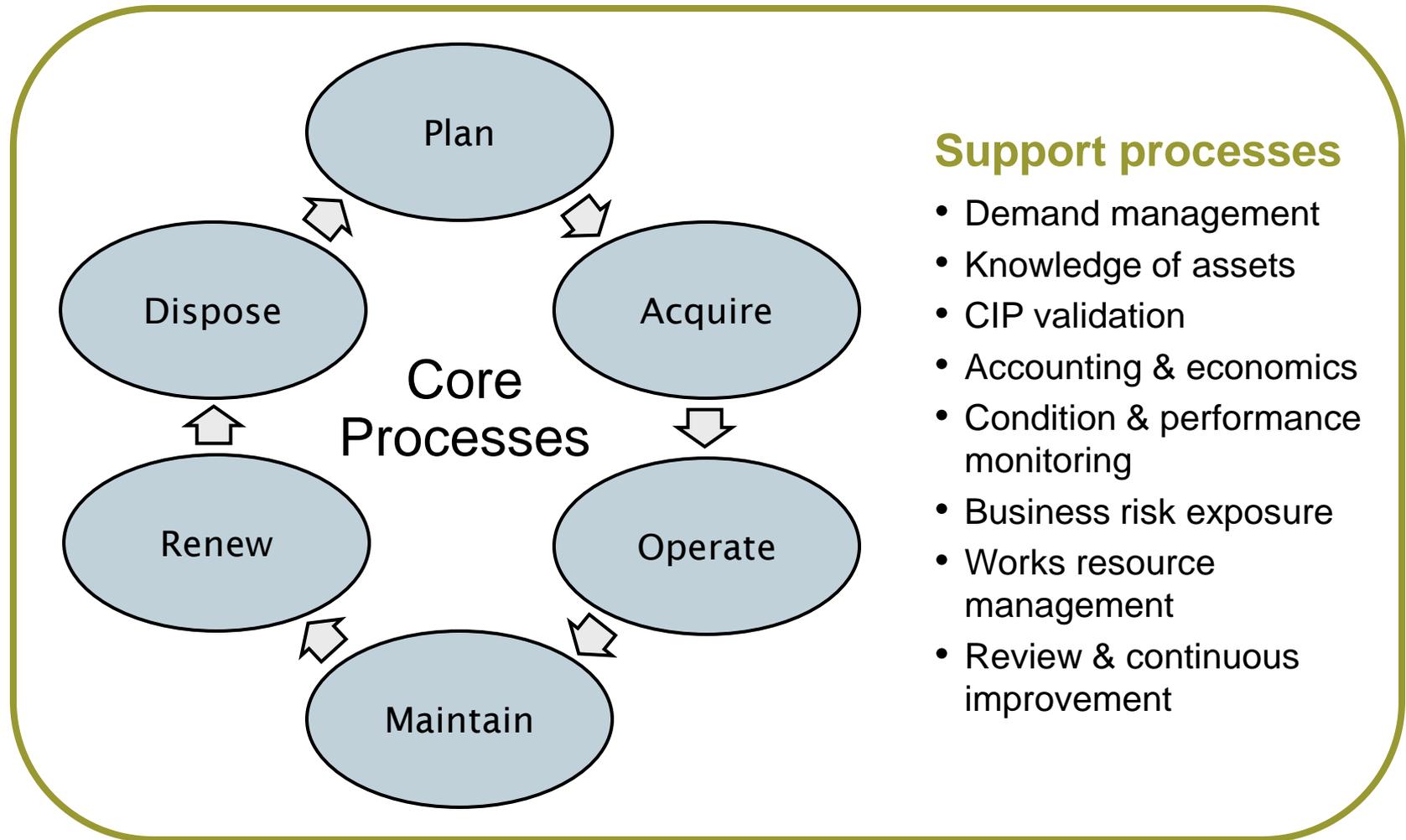
- Asset management can be thought of as an object - a box or framework
- Following is a brief characterization of 8 *different views* on asset management
- These views make up the framework



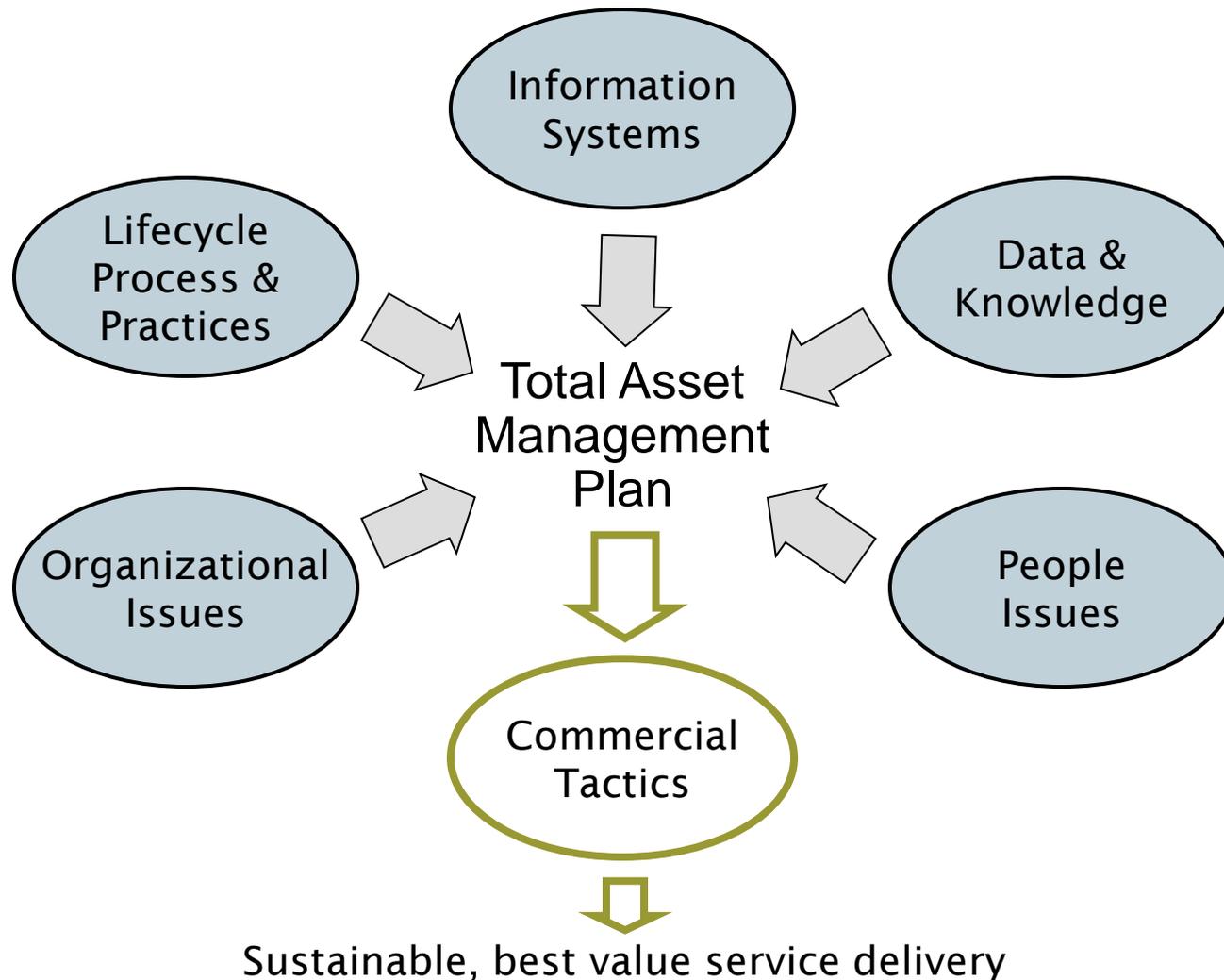
View 1: Definition - asset management

- *Management paradigm* and *body of management practices*
- Applied to the *entire portfolio* of infrastructure assets at all levels of the organization
- Seeking to *minimize total costs* of acquiring, operating, maintaining, and renewing assets...
- Within an environment of *limited resources*
- While *continuously delivering the service levels* customers desire and regulators require
- At an acceptable level of *risk* to the organization

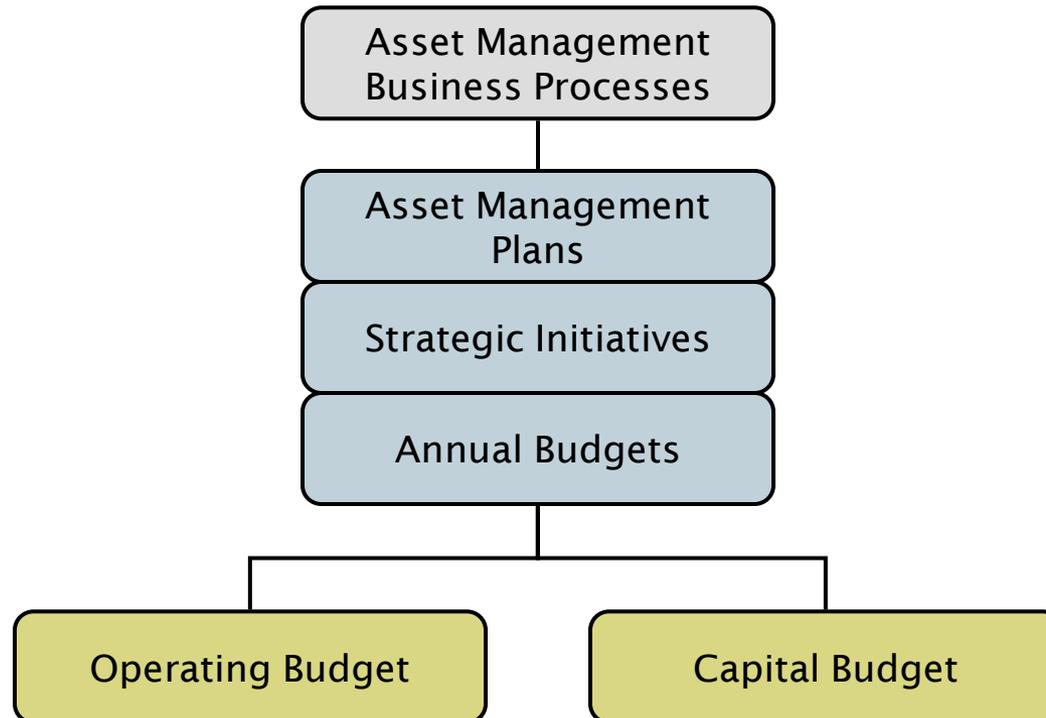
View 2: Life cycle business processes



View 3: Core AM program elements



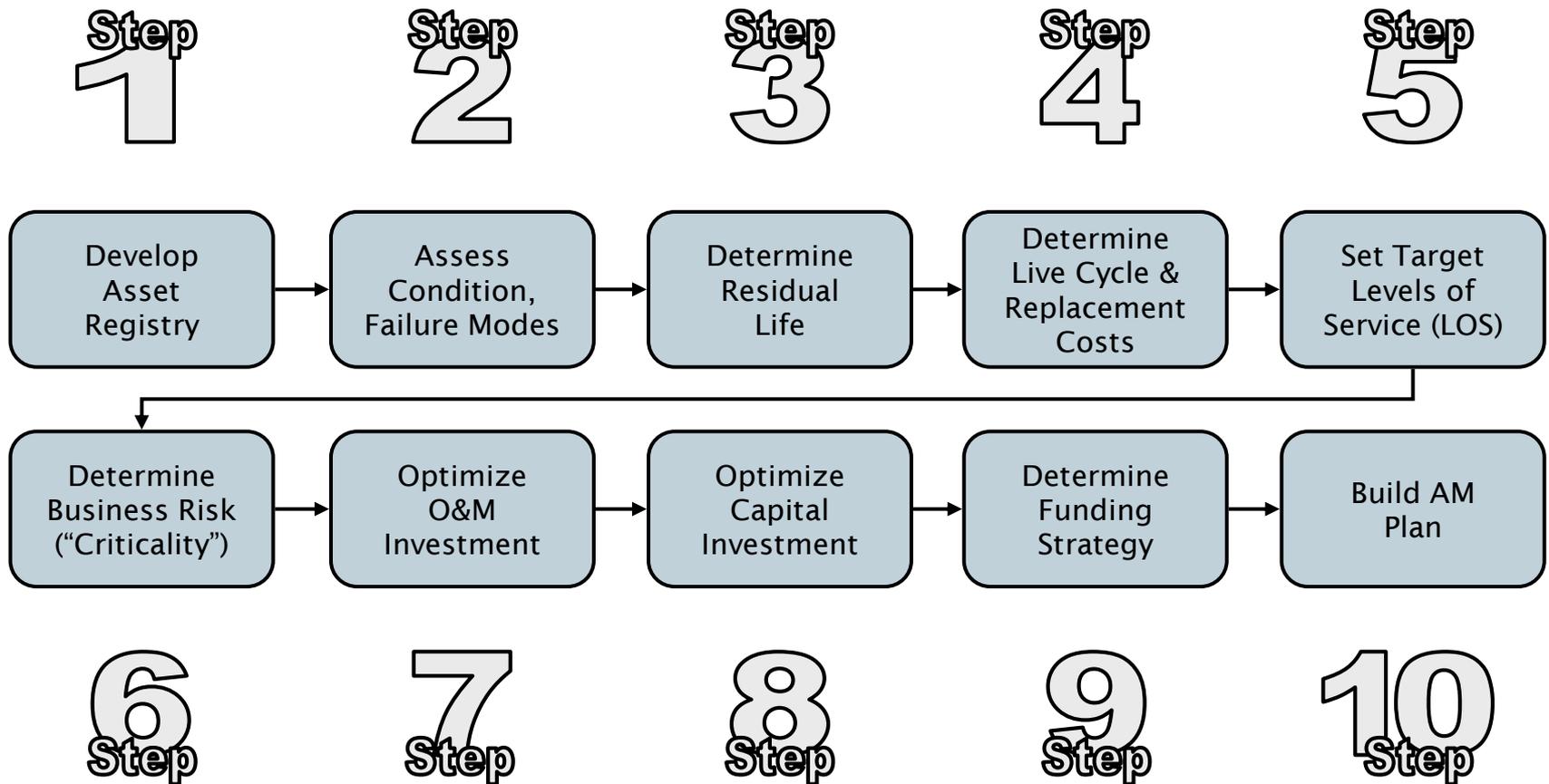
View 4: Management framework



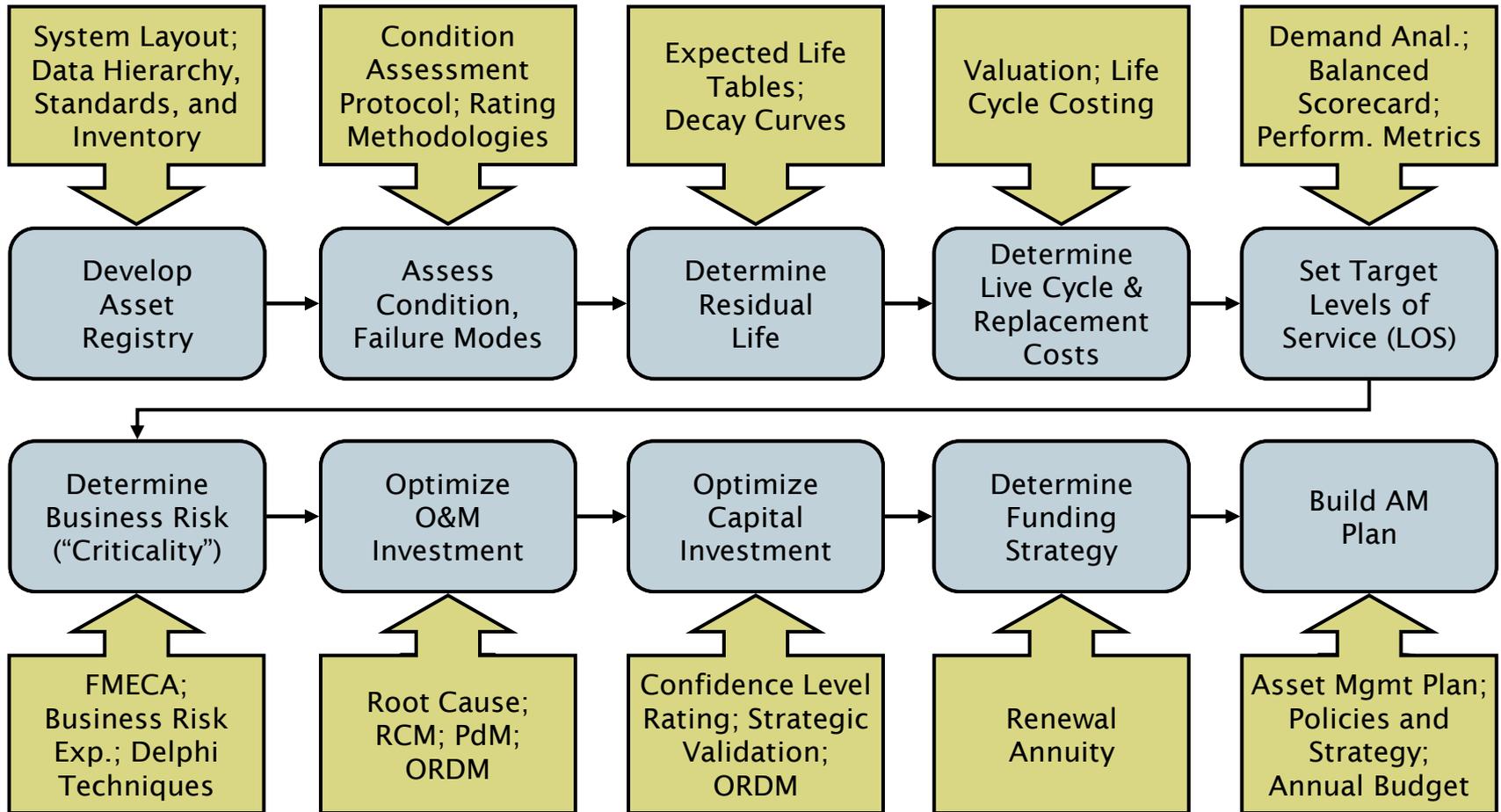
View 5: Five core questions

1. What is the current state of my assets?
 - What do I own?
 - Where is it?
 - What condition is it in?
 - What is its remaining useful life?
 - What is its remaining economic value?
2. What is my required level of service (LOS)?
 - What is the demand for my services by my stakeholders?
 - What do regulators require?
 - What is my actual performance?
3. Which assets are critical to sustained performance?
 - How does it fail? How can it fail?
 - What is the likelihood of failure?
 - What does it cost to repair?
 - What are the consequences of failure?
4. What are my best O&M and CIP investment strategies?
 - What alternative management options exist?
 - Which are the most feasible for my organization?
5. What is my best long-term funding strategy?

View 6: AM plan 10-step process



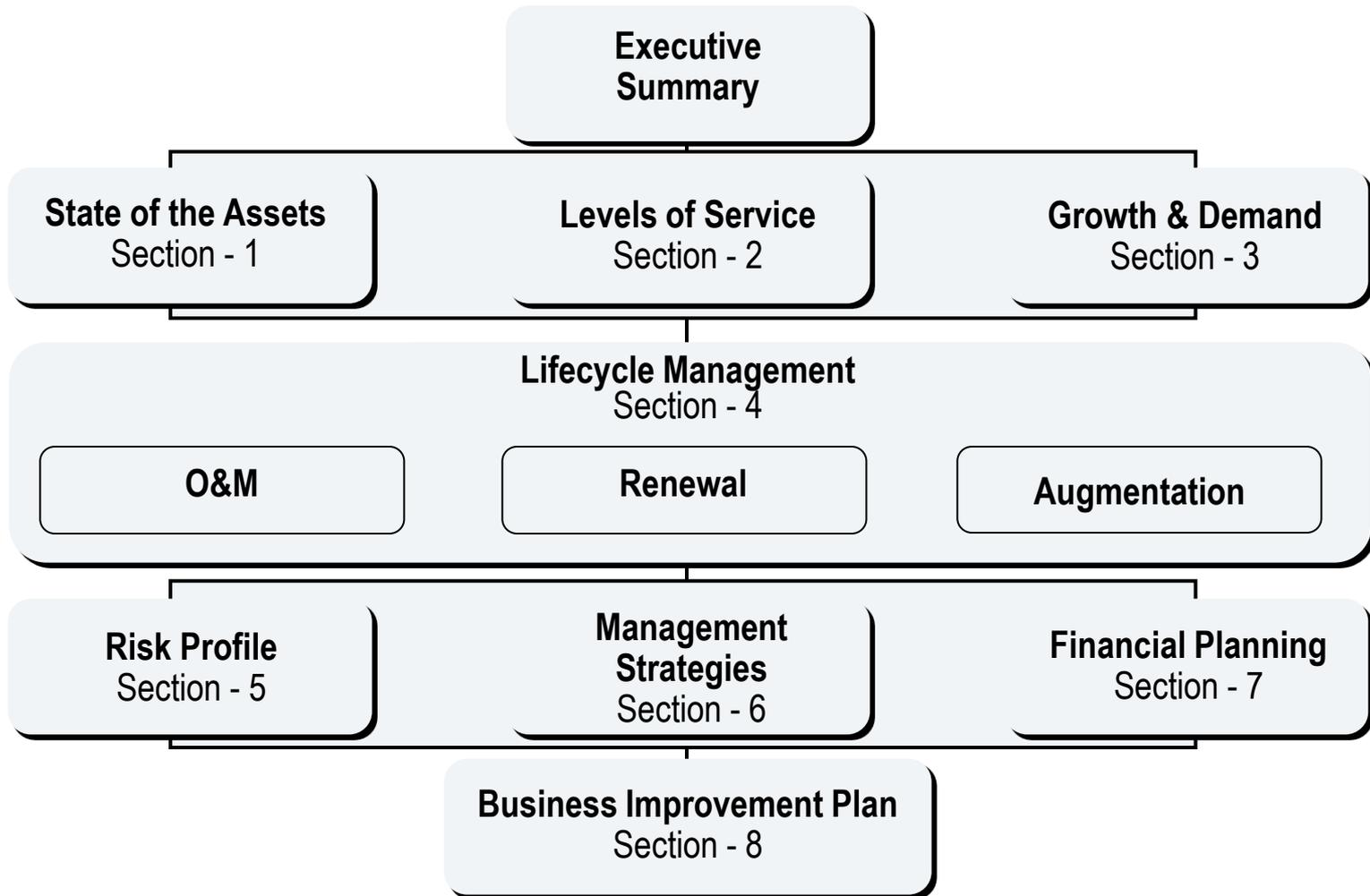
View 6: AM plan 10-step process



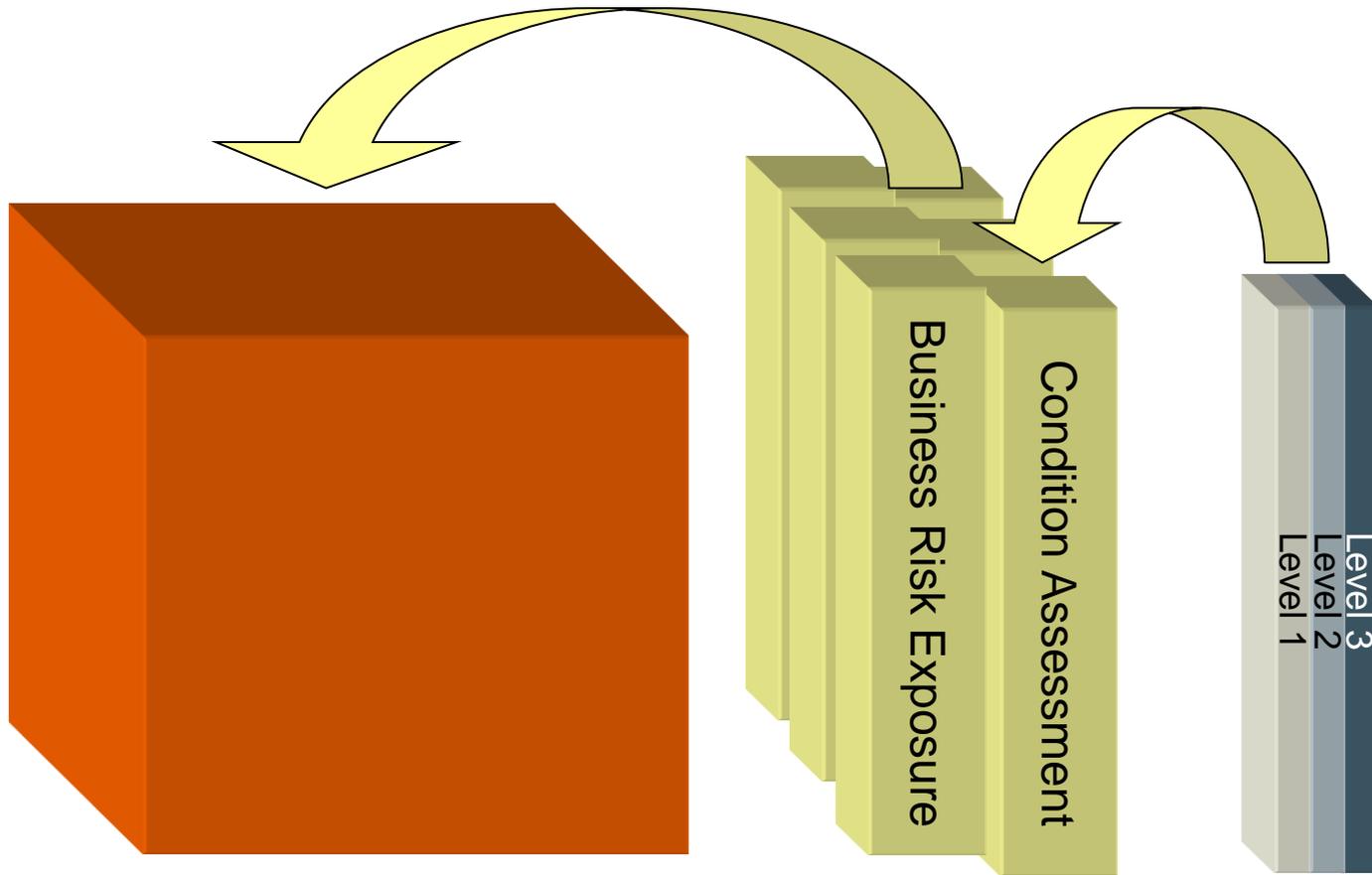
View 7: Seven principles of asset management

1. The “Value Added/Level of Service” Principle—assets exist to deliver services and goods that are valued by the customer-stakeholder; for each consumer-stakeholder there is a minimum level of service below which a given service is not perceived as adding value.
2. The “Life Cycle” Principle—all assets pass through a discernable life cycle, the understanding of which enhances appropriate management.
3. The “Failure” Principle—usage and the operating environment work to break-down all assets; failure occurs when an asset can not do what is required by the user in its operating environment.
4. The “Failure Modes” Principle—not all assets fail in the same way.
5. The “Probability” Principle—not all assets fail at the same time.
6. The “Consequence” Principle—not all failures have the same consequences.
7. The “Total Cost of Ownership” Principle—there exists a minimum optimal investment over the life cycle of an asset that best balances performance and cost given a target level of service and a designated level of risk.

View 8: Enterprise asset management plan



Inside the AM framework



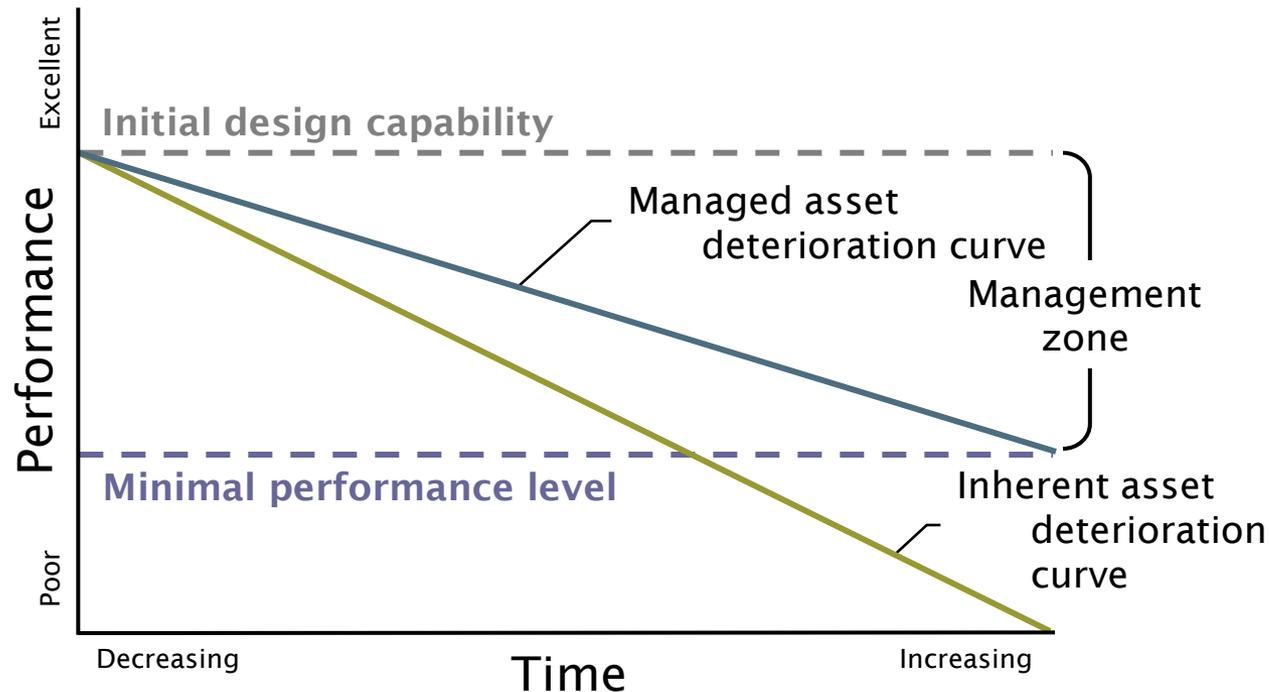
Three fundamental management decisions

1. What are my work crews doing, where are they doing it—*and why*?
2. What CIP projects should be done—*and when*?
3. When should I *repair*, when should I *rehabilitate*, and when should I *replace*?

These decisions typically account for *over 80%* of a utility's annual expenditures

Understanding how our assets fail

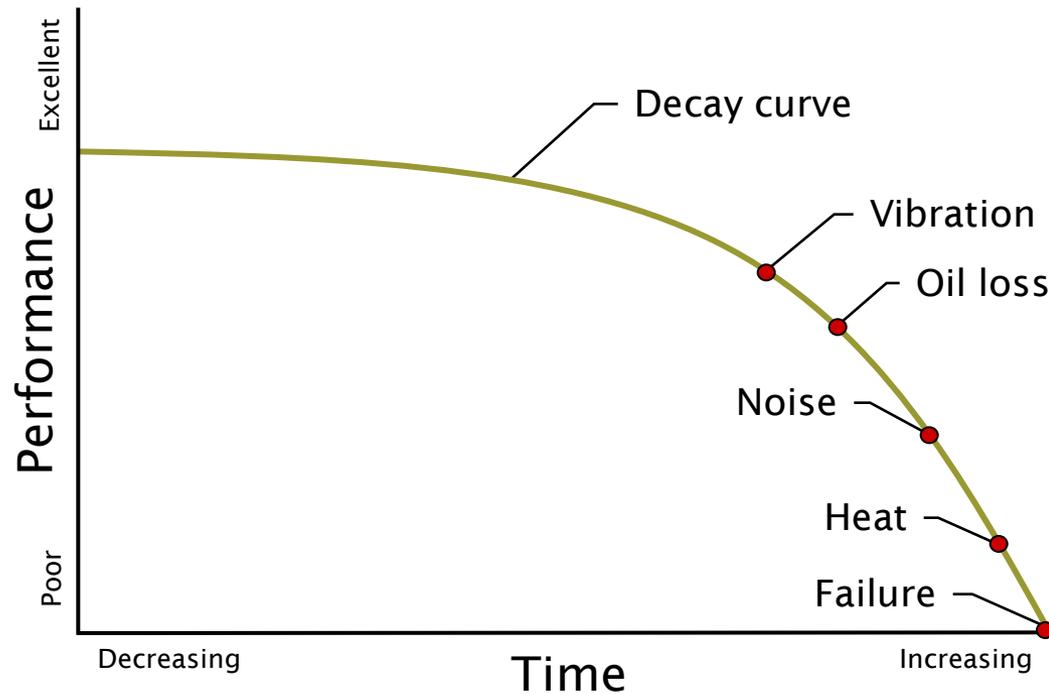
Managing asset deterioration



“Failure is...the inability of any asset to do what users want it do to.”
John Moubray

Understanding how our assets fail

Monitoring performance is a key to reliability



Understanding how our assets fail

Experience indicates...

- Failure can be subjected to systematic study – a science
- *30-70%* of equipment maintenance activity is typically *misdirected – it is not cost effectively deterring failure*

Understanding how our assets fail

From the science of failure - tools for *proactive* management

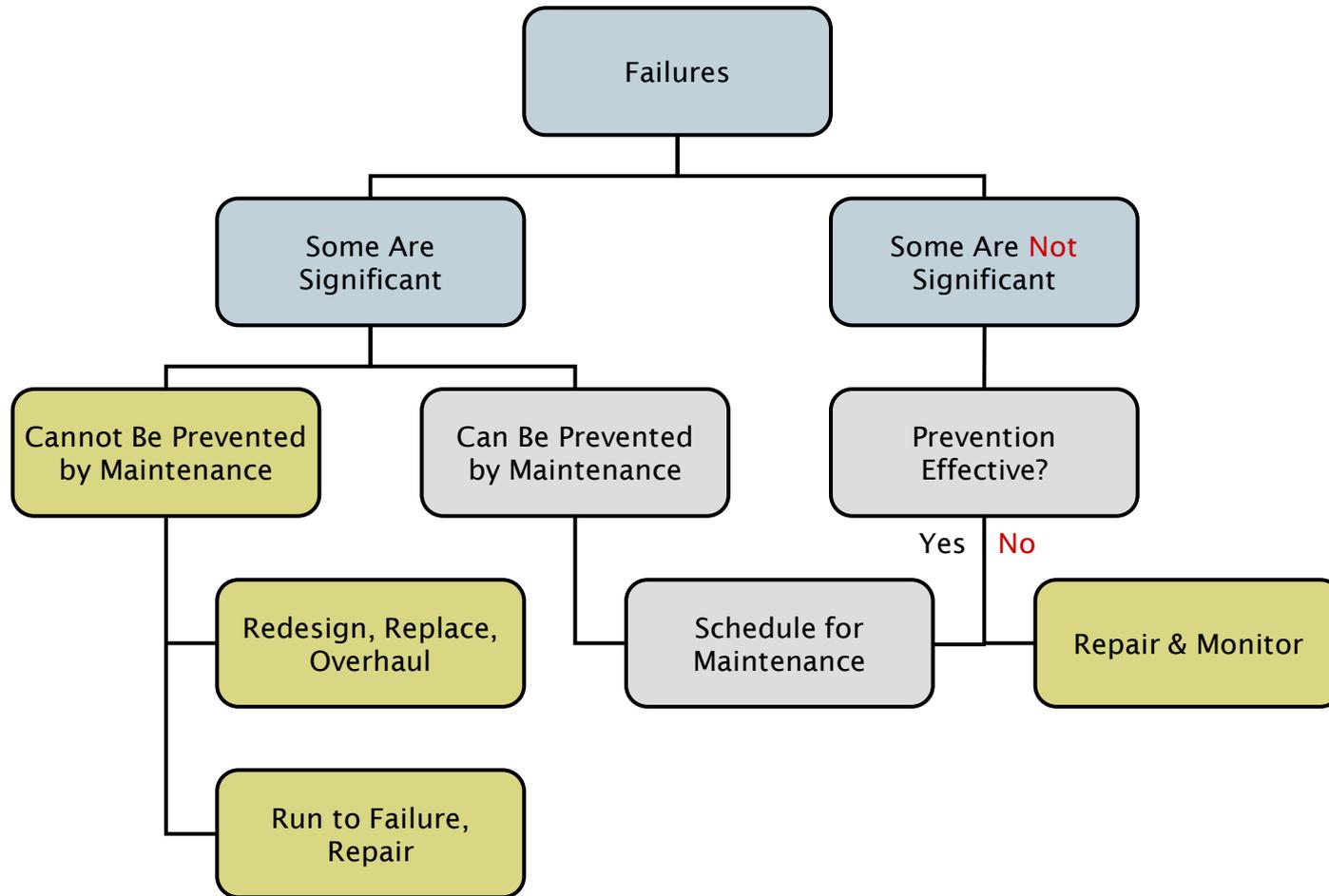
- Root cause analysis
- Failure mode, effects, and criticality analysis (FMECA)
- Condition-based monitoring, failure/survival curves
- Predictive maintenance (PdM)
- Proactive maintenance (zero breakdown, reliability centered maintenance, total productive maintenance)
- Reliability centered management (design, O&M)

AM is all about *managing the potential to fail*

Our investment *toolkit*

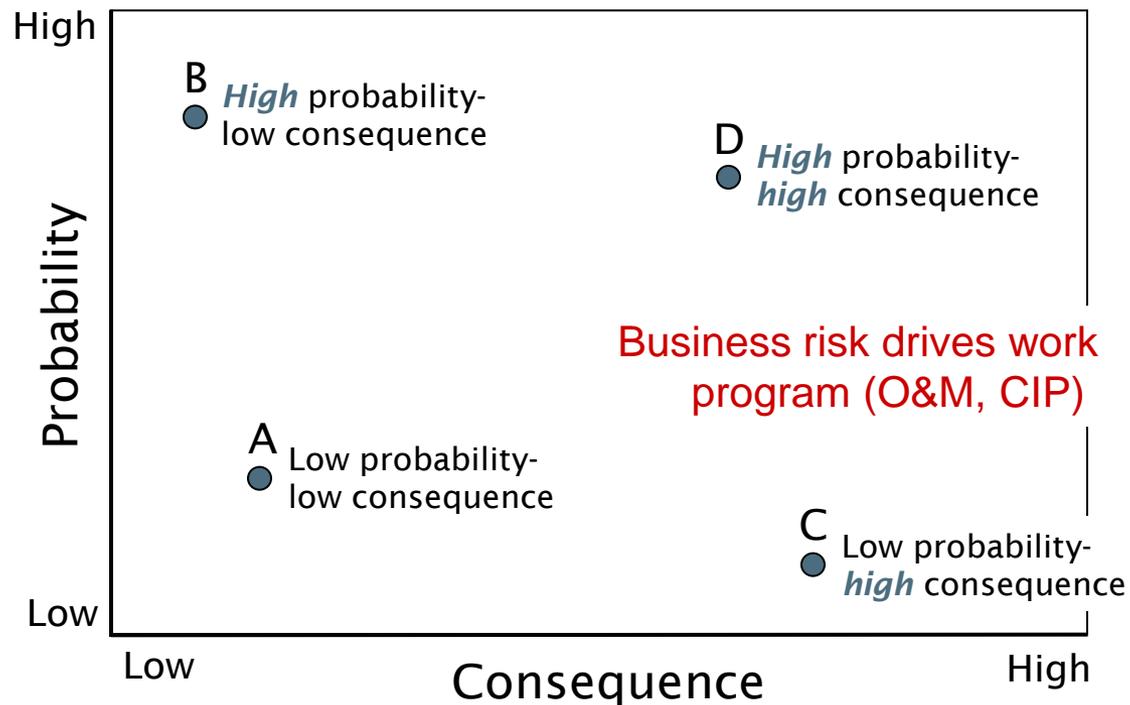
- Maintenance
- Renewal:
 - **Repair** – repair beyond normal periodic maintenance, relatively minor in nature, anticipated in the long-term operation of the asset; no enhancement of capabilities; typically funded by operating budget
 - **Refurbish/Rehabilitate**– replacement of a component part or parts or equivalent intervention sufficient to return the asset to level of performance above minimum acceptable level; may include minor enhancement of capabilities; typically funded out of capital budgets
 - **Replace**
 - **Without enhancement** – substitution of an entire asset with a new or equivalent asset without enhancement of capabilities
 - **With enhancement** - substitution of an entire asset with a new or equivalent asset with enhanced capabilities
- “Augmentation”

Failure mode-based management logic

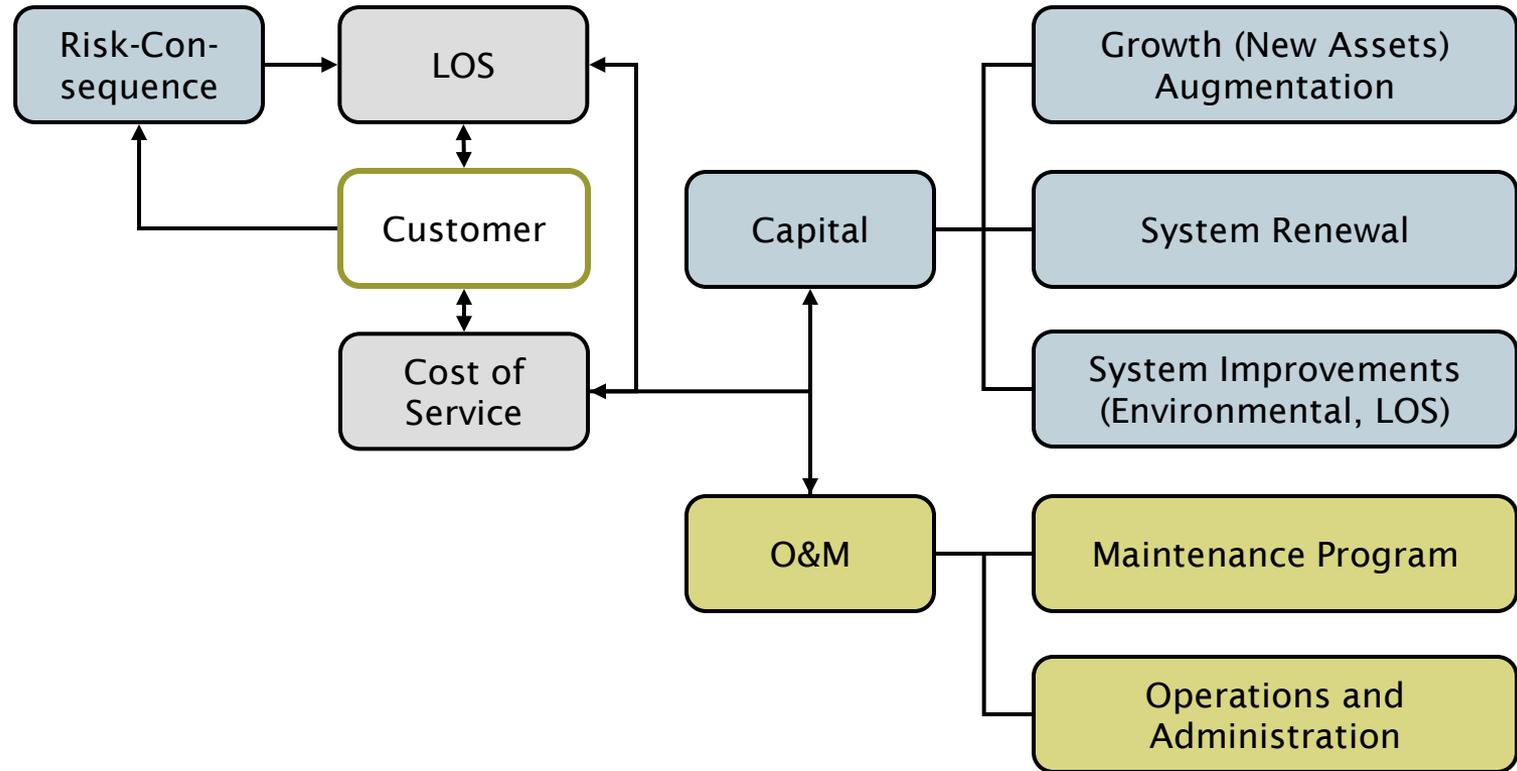


Determining significant failures

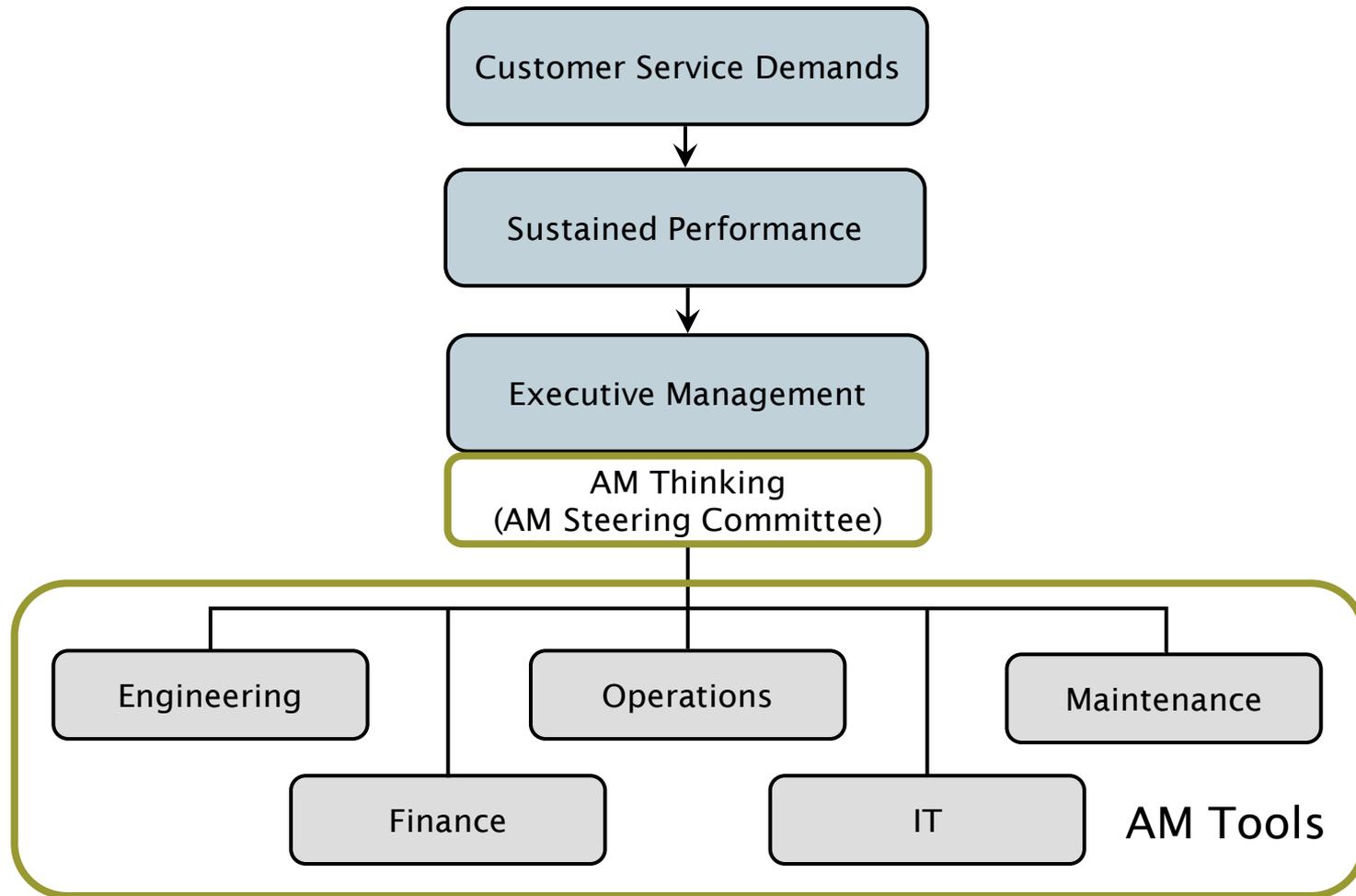
What is probability of failure? What is consequence of failure?



The big picture



AM-oriented structure



AM-based decisions produce real *savings*

From assessment of Australia's advanced management practices, *20-30%* future life cycle cost *savings* typically is achievable for US water and wastewater utilities

Where savings develop from...

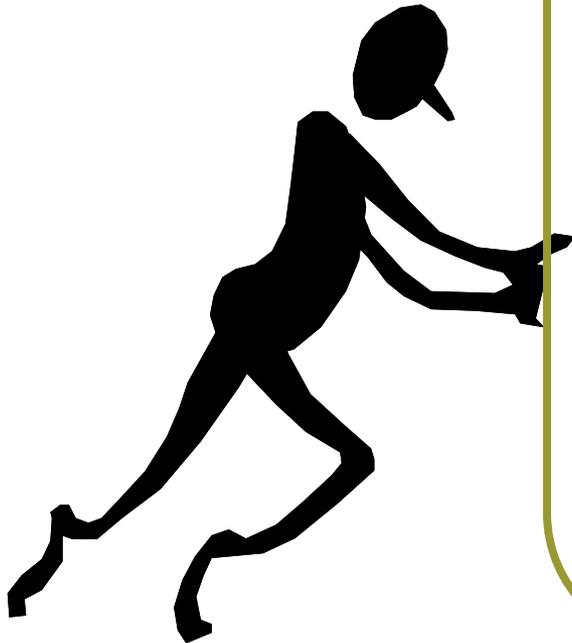
- Efficiency gains
- Cost avoidance (defer, eliminate, reduce)
- Cost effectiveness and redirection

AM payoffs

- Reduced life cycle costs from better-focused (redirected) resource use
- Better value-per-dollar spending
- Confidence in decision-making

The right work,
the right investment,
at the right time,
for the right
reasons.

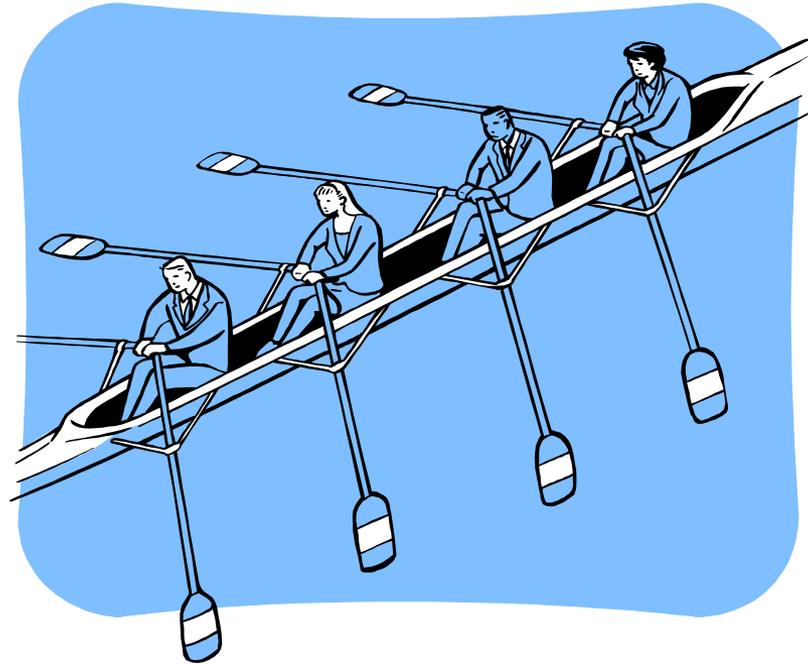
Realistic expectations for AM



- Takes several years of detailed, *nitty-gritty work* to fully deploy
- Requires eventual *buy-in* commitment of the whole organization
- Needs *upfront* investment to get started, with *hidden* returns for initial years

AM is a business model...

- *What* we do
- *Why* we do it
- *How* we do it
- *Where* we invest
- What our *costs* are
- What our *return* is



Integration of 5 core questions with 10-step process

