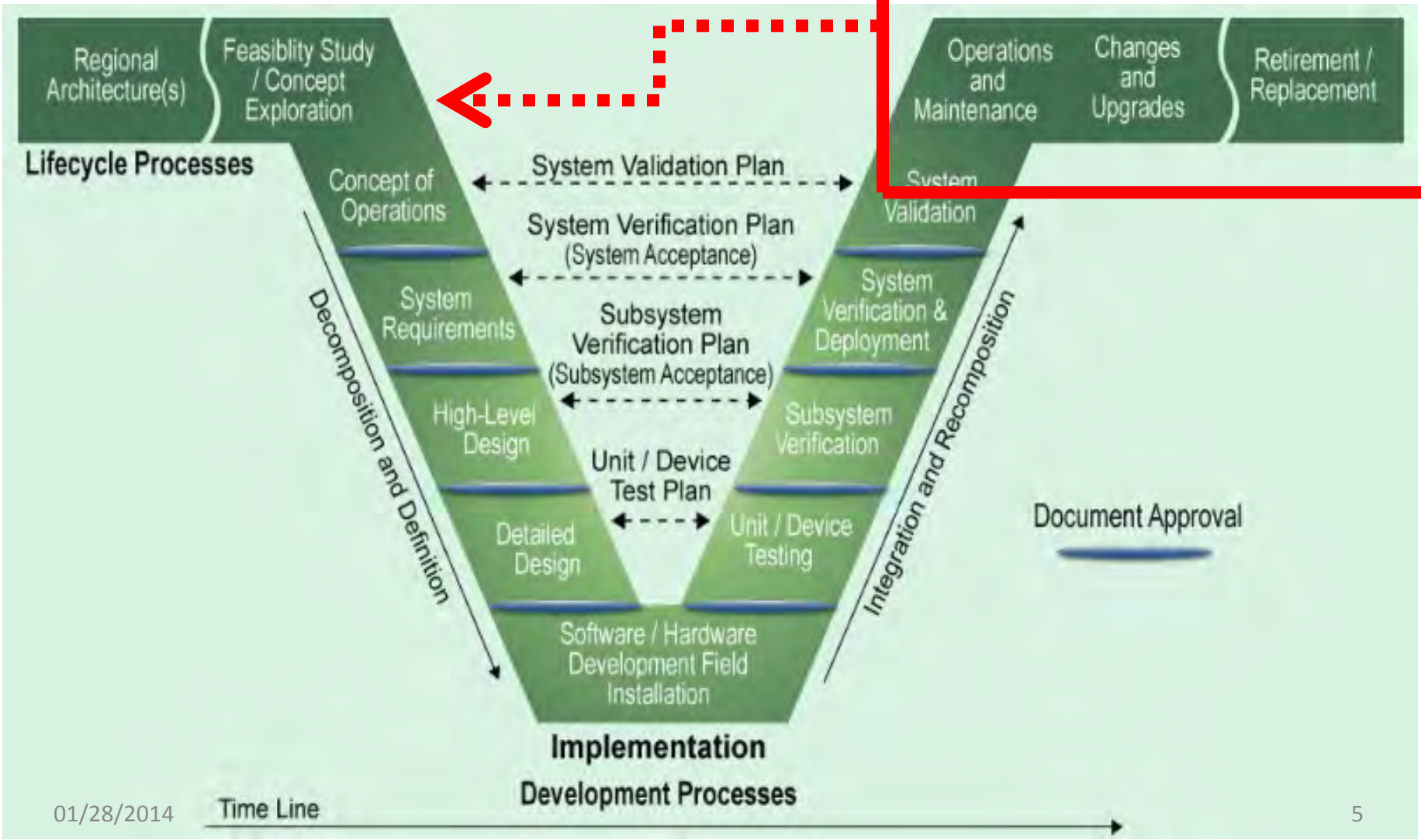
INCOSE, Los Angeles, CA - January 28, 2014

RISK-BASED ASSET MANAGEMENT

San Francisco Bay Area Rapid Transit (BART) District

CONTEXT

WHY RISK MANAGEMENT?



COMMUTER/METRO SYSTEM

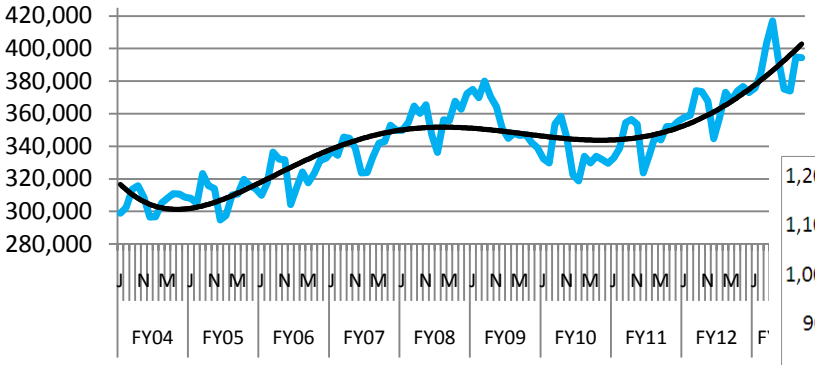
- BART operates the oldest heavy rail transit fleet in the U.S.
- In operation 41+ years
- 1st of its class built post-WWII
  - **One-of-a-kind, hard to maintain**
  - **Tailored infrastructure, inflexible**
  - **Spurred economic development**
  - **Environmentally friendly**

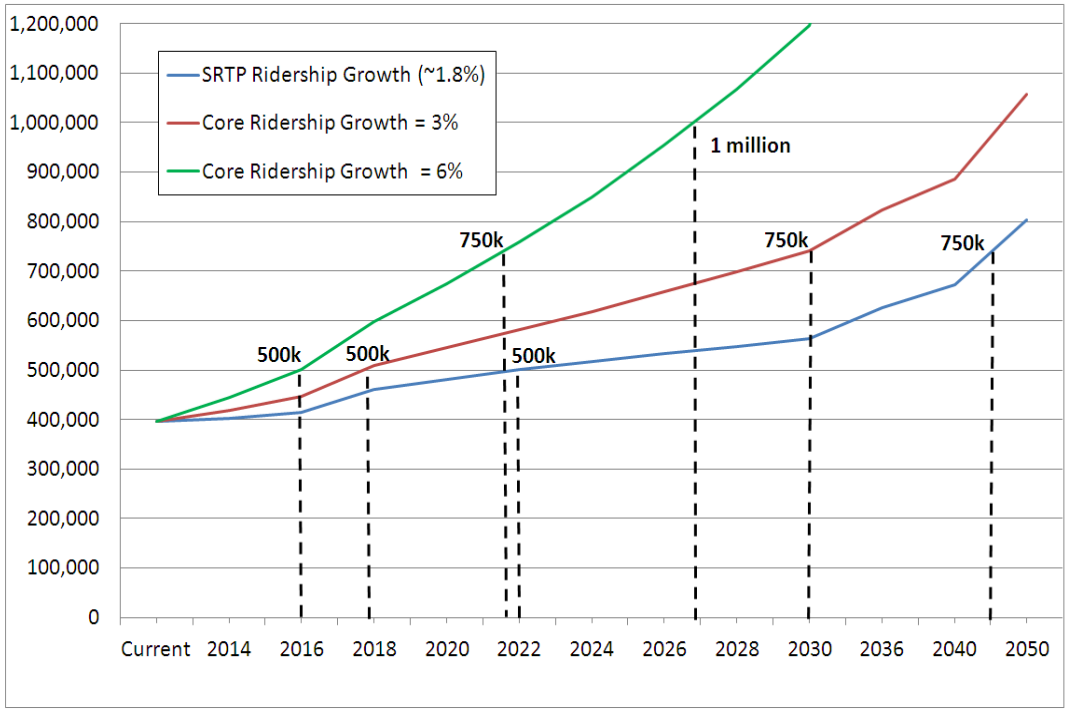
BACKGROUND

RAPID RIDERSHIP GROWTH

Average Weekday Ridership

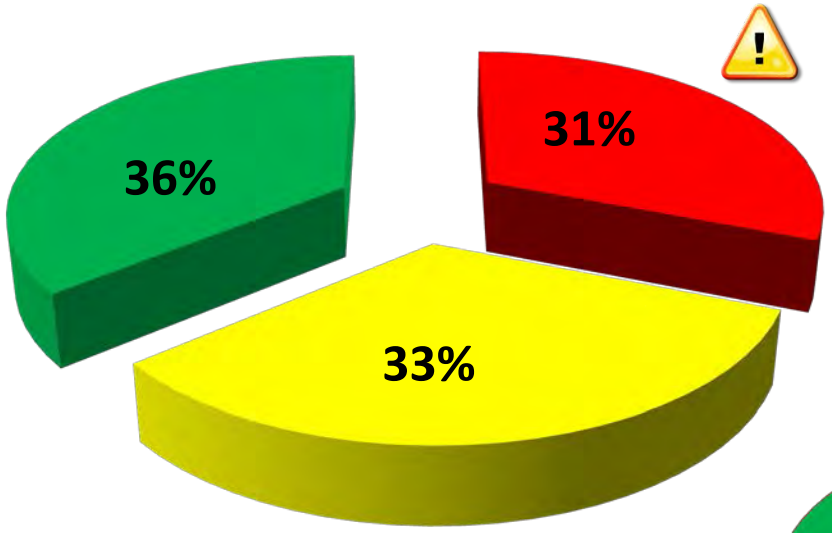
Up nearly 100,000 trips since SFO Extension Opened





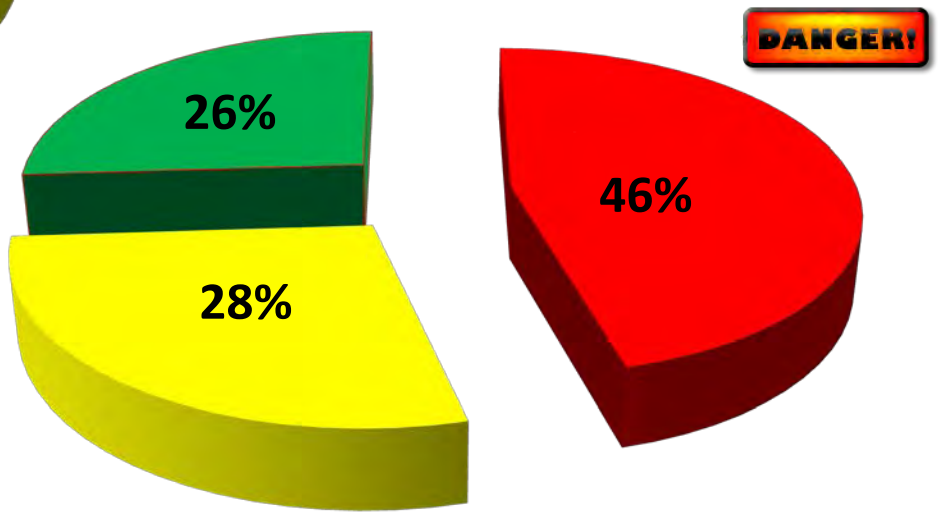
Average 6% ridership Growth over 2 years

A COMMON SCENARIO



Today:
30.5 % of BART assets are rated “Poor" and will cost **$6.5 Billion** to Fix

In 10 Years:
46 % of BART assets will be rated “Poor” and will cost **$9.7 Billion** to Fix



The longer we wait…the higher the risk and expense

Risk – Asset Management

Regional Impacts of Not Reinvesting?

- UC Berkeley / Bay Area Council study
- If performance declines, what are the consequences for ridership and for the region?
- Need to reinvest $500+ M / annually
- Failure to reinvest - net regional economic loss:

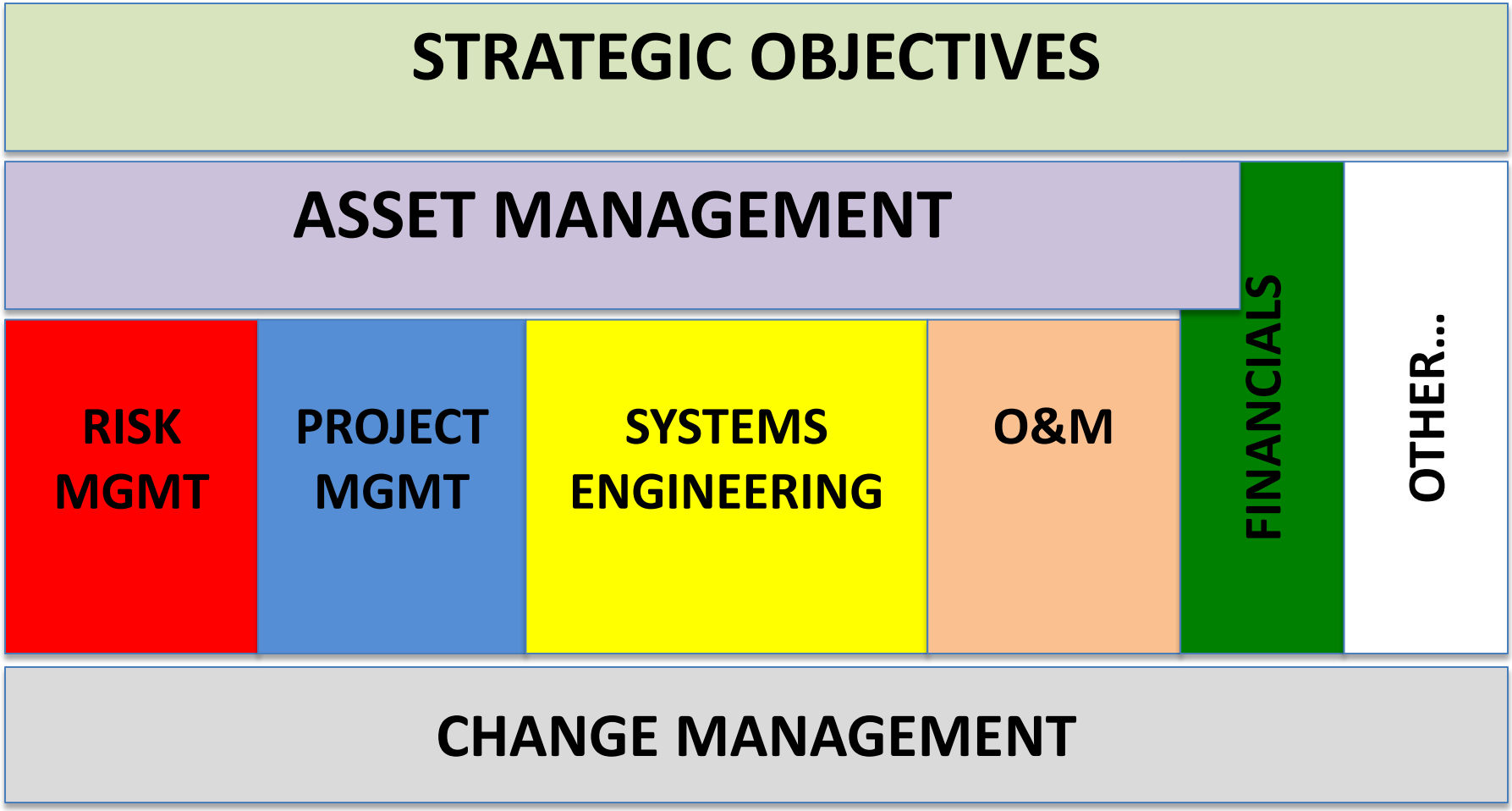
$22 - 33 Billion

RISKS EVERYWHERE!

- Legacy
- Security
- Business
- Environment
- Demographic
- Technology
- Operations
- Economic
- Ridership
- Future

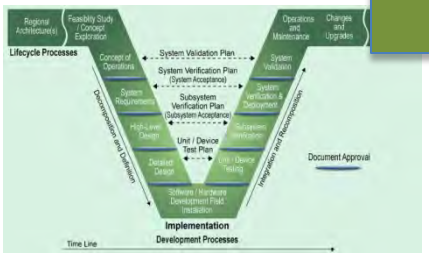
- Doing nothing is a risk (deterioration)
- Doing too much is a risk (complexity)

SYSTEMS ENGINEERING SUPPORTS STRATEGY

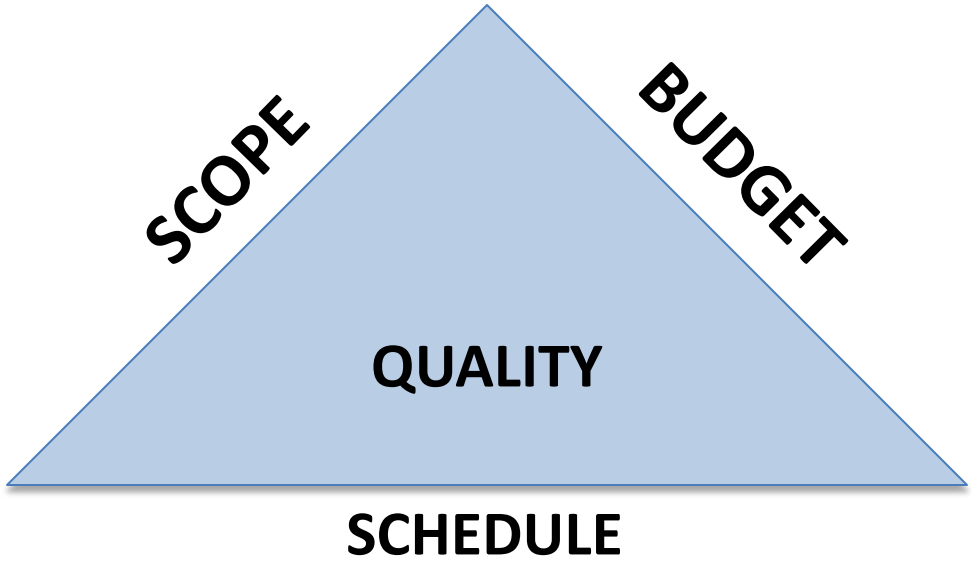


LIFE CYCLE COSTS

$$ $$$$$$$$$$



REAL LIFE



IF YOU HAVE ONLY $1, WHERE WILL YOU PUT IT AND WHY??

WHAT ARE 'AM' AND 'SGR'?

- Asset Management:
  - Maximize assets ability to generate value
  - Extend the economic life of assets
  - Minimize life cycle costs of assets

- State of Good Repair:
  - An asset is fit for its intended purpose and continues to provide value through its economic life

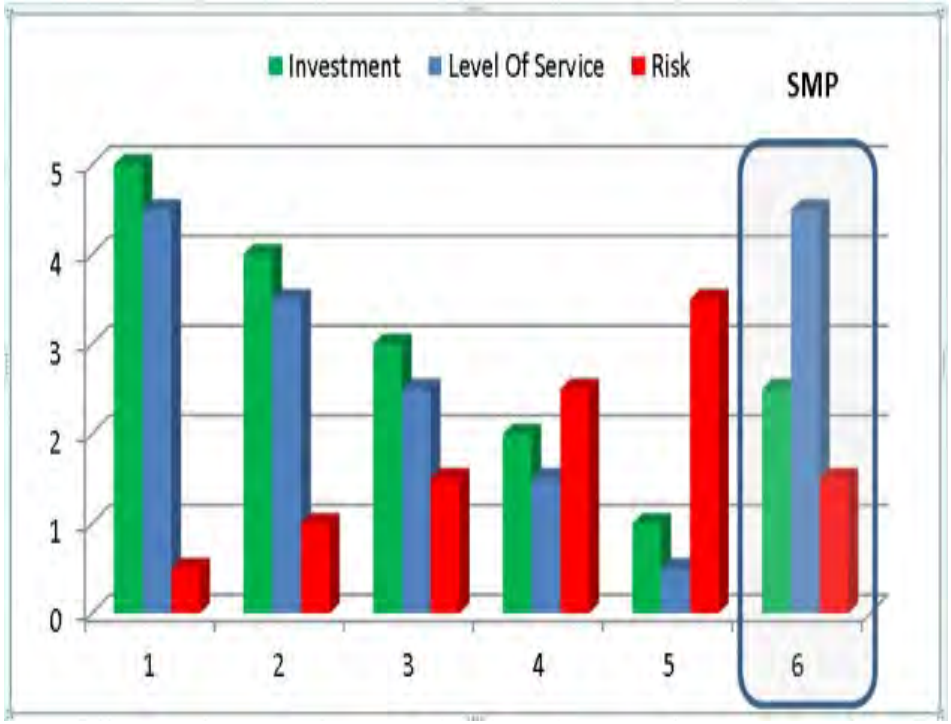
WHY ASSET MANAGEMENT?

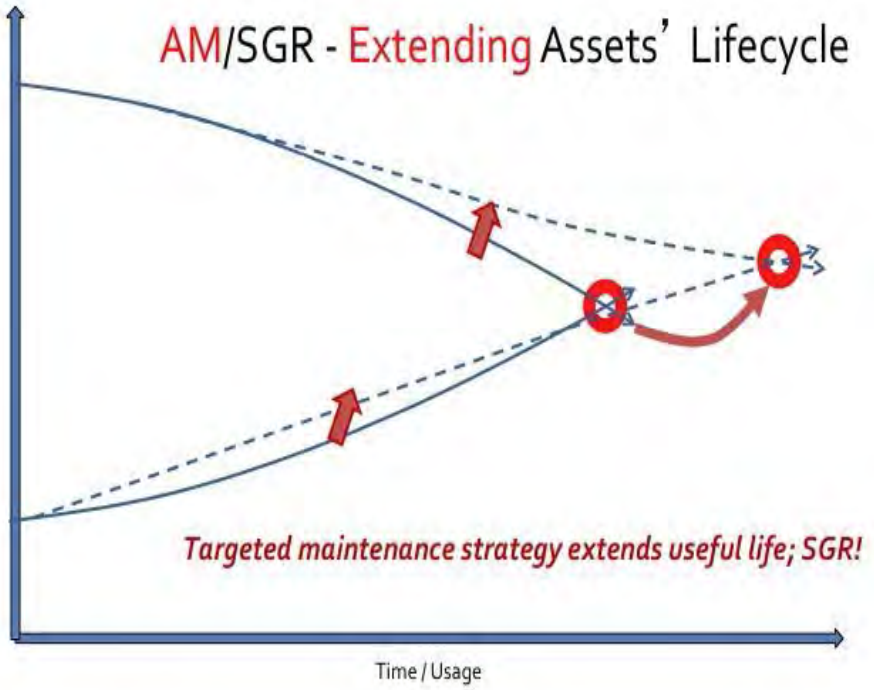
- **Business imperative** – organizational sustainability
- **Federal Legislation** – statutory requirement:
  - Asset Management Plan
    - ❑ Inventory of assets
    - ❑ Condition of assets
    - ❑ Capital rehabilitation program
    - ❑ Decision support system
  - ***Risk-based* decision making**
  - Performance Measurements
- Regional **economic viability**

THE ASSET MANAGEMENT MODEL

HOLISTIC APPROACH

Integrate extent of investment needed to meet desired service levels while managing the risk to reliable service

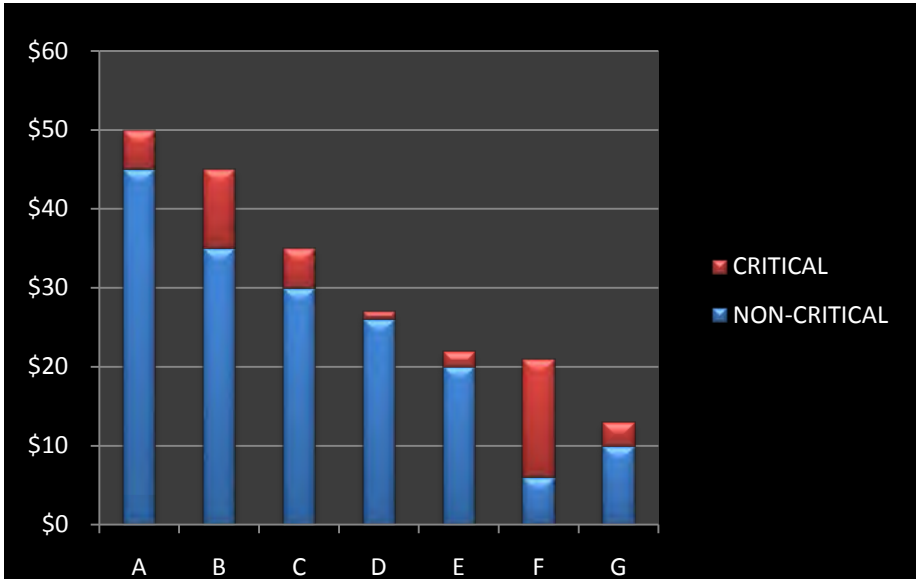




RISKS vs. COSTS

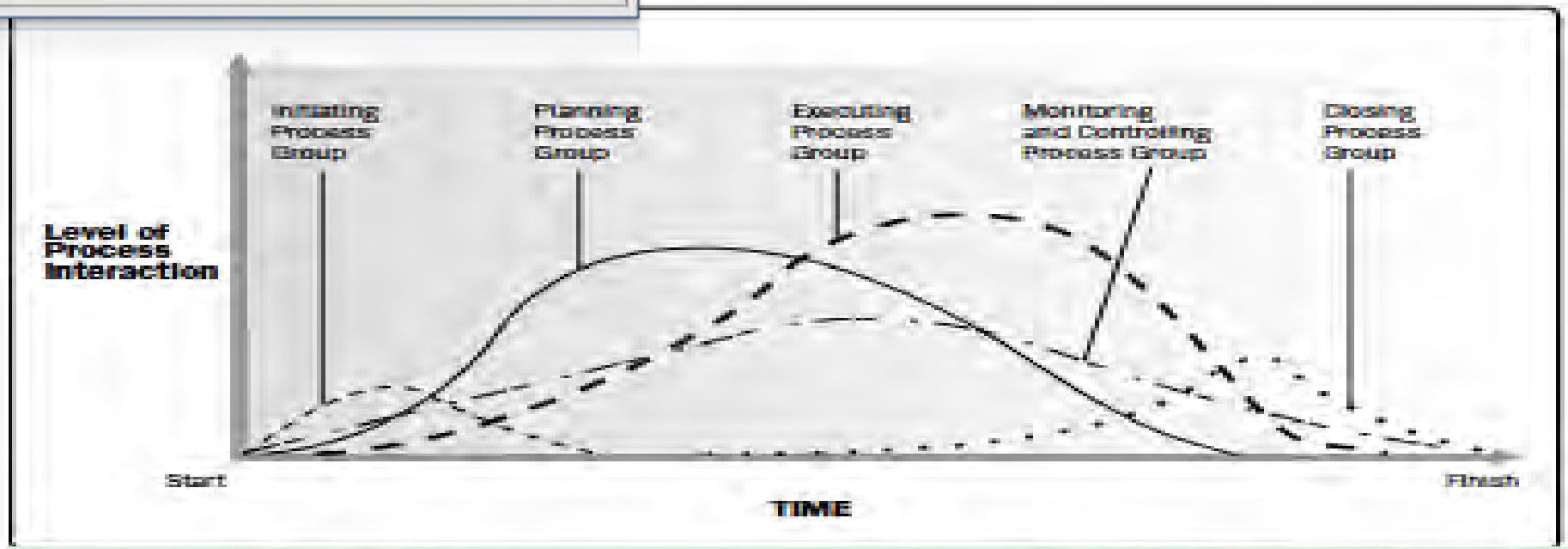
- Fiscal constraints lead to triage based on risk level
- Example shows how $41M investment can stave off a $243M crisis … for a time
- Any funds in addition to $41M contribute to reducing the speed of infrastructure decay and backlog build up.

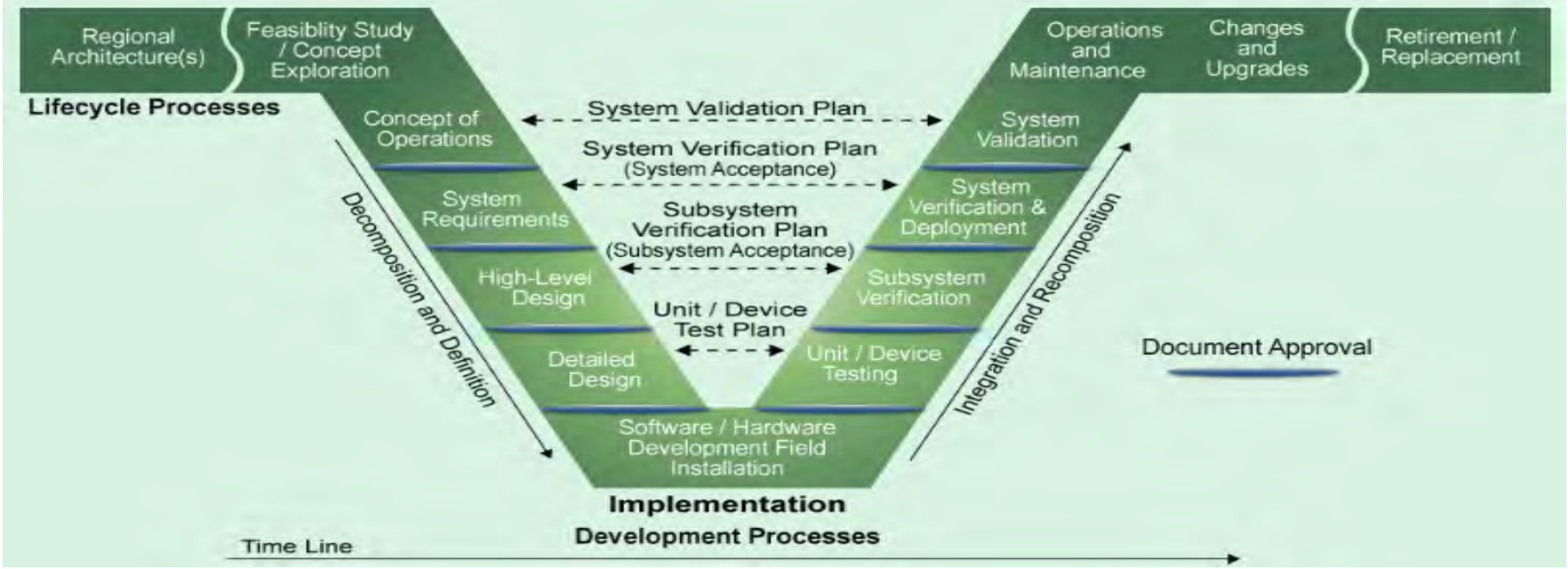
	C	NC	TOT
A	$5	$45	$50
B	$10	$35	$45
C	$5	$30	$35
D	$1	$26	$27
E	$2	$20	$22
F	$15	$6	$21
G	$3	$10	$13
	$41	$172	$213



SYNCHRONIZING FRAMEWORKS

Source: PMBOK Guide, 5th-Ed., PMI





SYSTEMATIC APPROACH

Source: PMBOK Guide, 5th-Ed., PMI

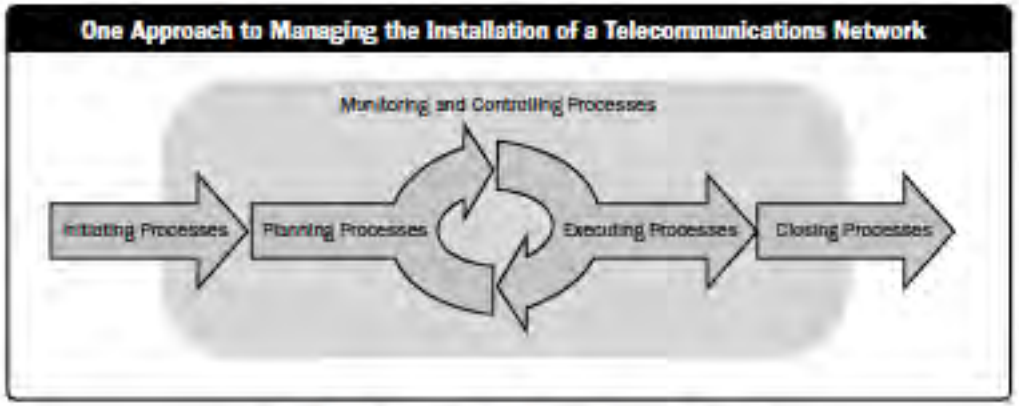


Figure 2-10. Example of a Single-Phase Project

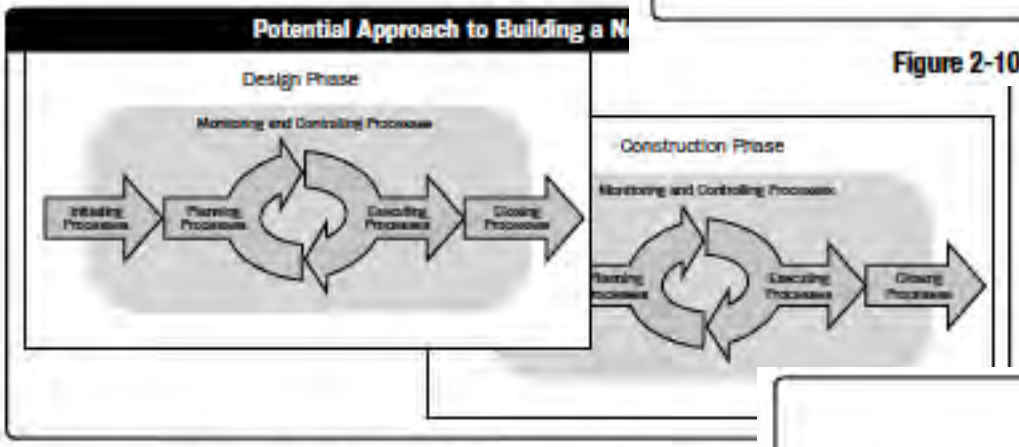


Figure 2-12. Example of a Project with Overlapping

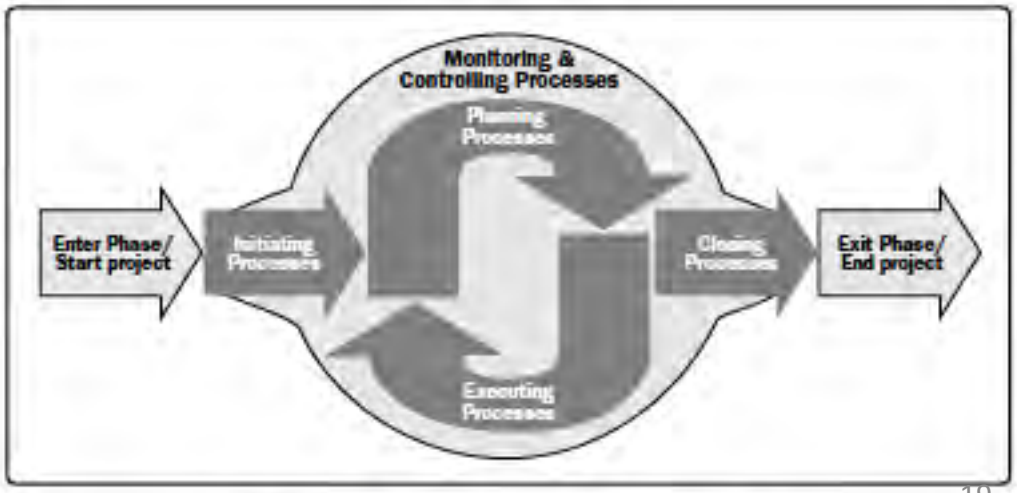


Figure 3-1. Project Management Process Groups

RISK - SYSTEM PLANING

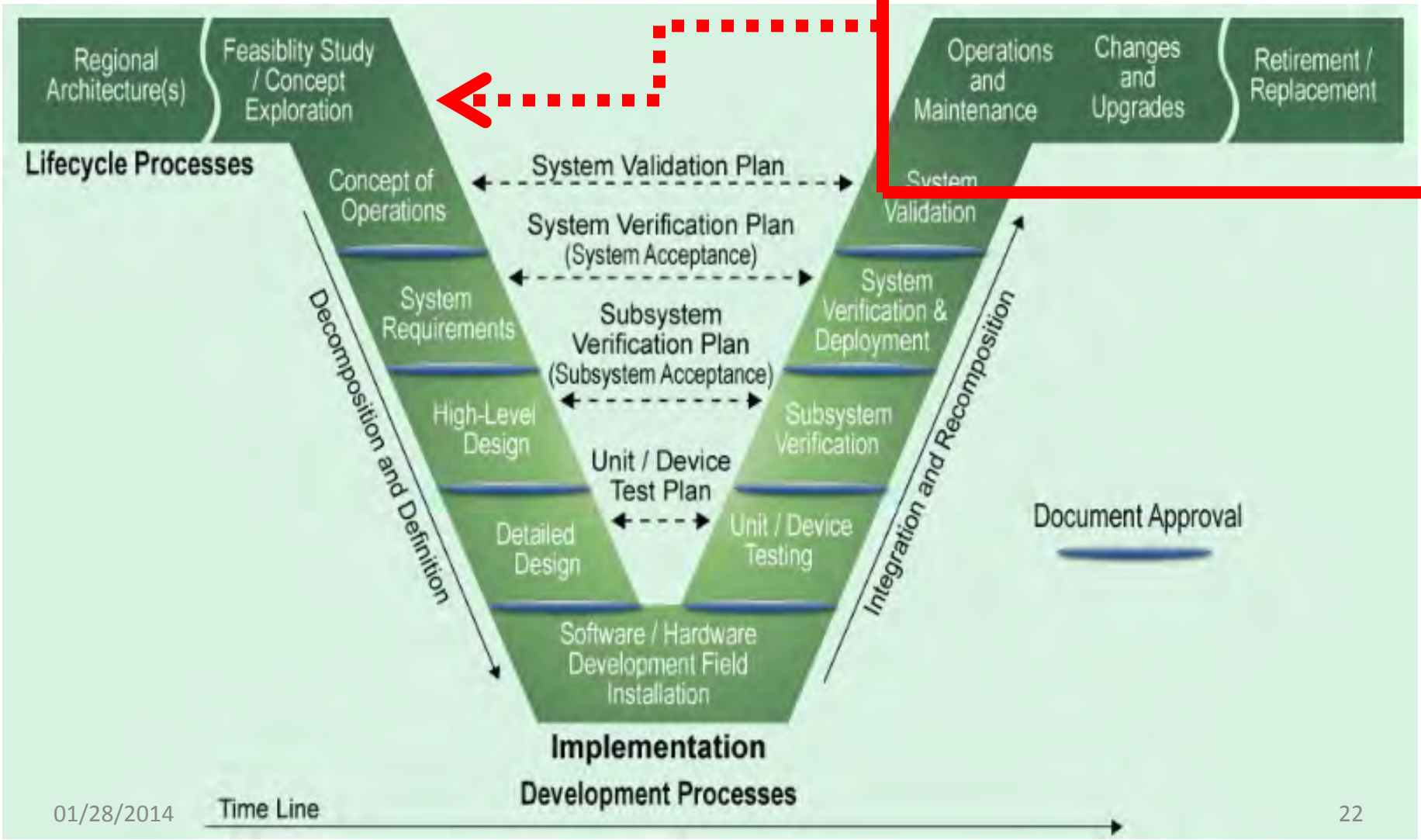
- Make allowances for technology evolution
- No single-points of failure
- Mind the "**ilities**' (keys to good LCC):
  - Maintainability
  - Reliability
  - Availability
  - Quality
  - Security
  - Workmanship

KEYS TO SUCCESS

- Communication
- Executive Support
- **Governance**
  - **Risk Management**
  - **Change Management**
  - **Program/Project Management**

- Bottom-up and Top-down (voice of the infrastructure)
- Cross-disciplinary (silo busting)

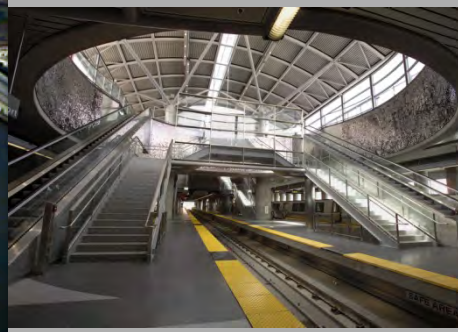
WHY SYSTEMS ENGINEERING?



TAKEWAYS

- Asset Management is a:
  - Business imperative
  - Legislative requirement
- Risk-based AM maximizes scarce resources
- AM is an element of the SE ecosystem
- SE builds the foundation to a stable future
- SE is an essential element of success

Questions?



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