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QUANTIFYING THE FUTURE

Measuring Portfolio Value for Government Programs and Initiatives

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Introduction

George Bayer

- Senior Director at Cobec Consulting
- Currently leads investment analysis consultant teams developing costs, benefits, and business cases for FAA acquisitions
- B.S. in Business Administration (Finance & English majors) from the University of Florida
- MBA in Corporate Finance from The University of Texas at Austin
- Project Management Institute (PMI) Project Management Professional (PMP)
- Over 20 years of Finance experience in capital investment valuation, forecasting & budgeting, cost estimation, benefits quantification, and business case development
- Developed discounted cash flow models in Investment Appraisal for major Power Generation capital investments at ConocoPhillips
- Evaluated major capital investments/acquisitions in the Business Case Group of Investment Planning & Analysis at the FAA

Bryan Anderson

- Management Consultant and Programmer at Cobec Consulting
- B.S. in Economics and Mathematics from Augsburg College
- M.S. in Industrial & Systems Engineering from the College of Science and Engineering at the University of Minnesota – Twin Cities
- Over 5 years of experience in industrial engineering and systems engineering in the private and public sectors
- Leading database development efforts for Cobec Consulting's Innovation Center

Capital Investments & AMS Process

- Federal Aviation Agency (FAA) has agency-specific capital investments evaluation process called Acquisition Management System (AMS).
  - Focus on Cost-Benefit Analysis to justify investments
  - Brings private industry investment rigor to the agency for investment decisions
    - Identify the agency need
    - What is the problem or “shortfall” to be solved?
    - Quantify the shortfall
    - Identify alternative solutions (at least 3 alternatives)
    - Develop requirements
    - Quantify both costs and benefits for each alternative
    - Develop Legacy reference case
    - Evaluate with Finance metrics – NPV, IRR, Payback, B/C ratio

What is a Portfolio?

What is a portfolio, and why is it important?

Shortfalls

- Government agencies attempt to solve agency inefficiencies and shortfalls
- They define agency initiatives and objectives to solve these shortfalls

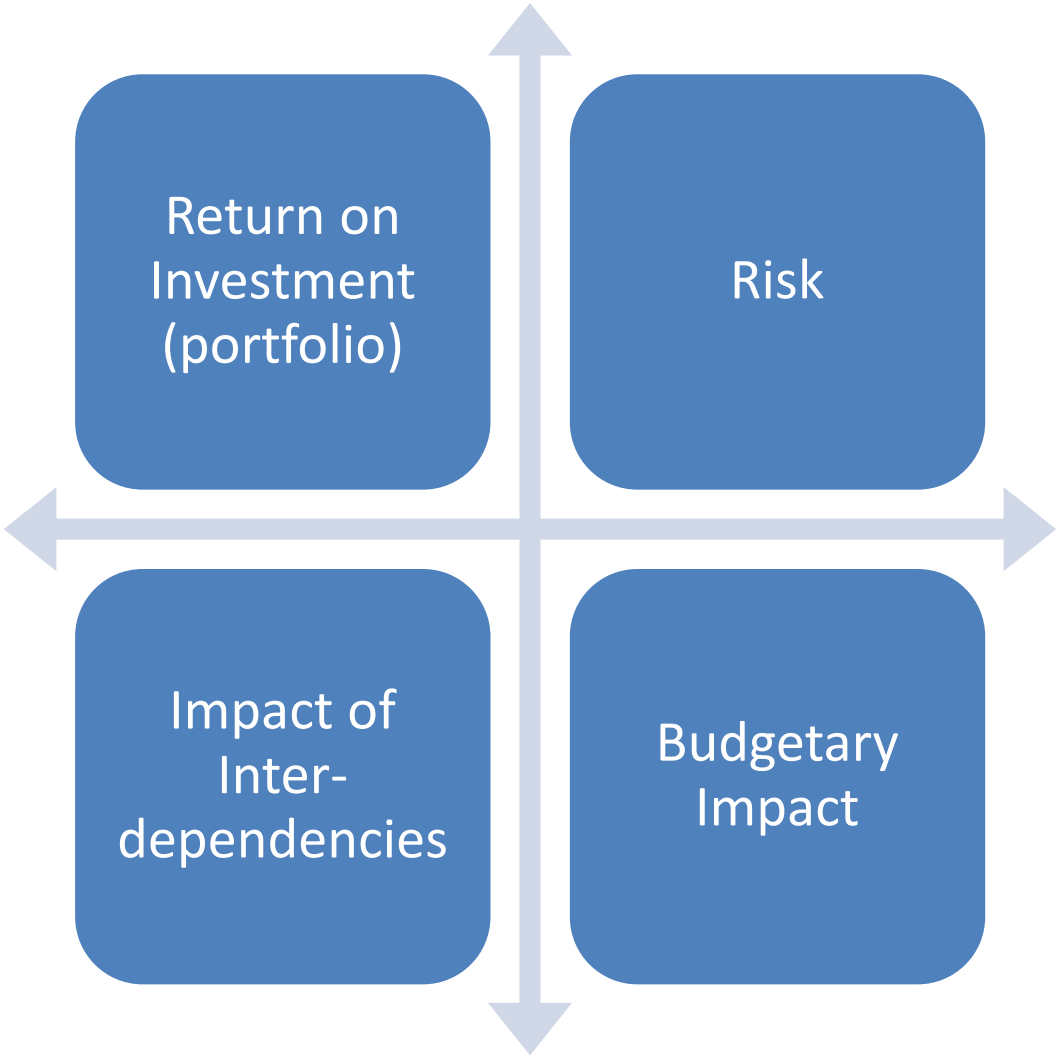
Portfolios

- Rarely can agencies execute those initiatives successfully with one single capital investment program or acquisition.
- Instead, agencies must define and aggregate multiple programs, acquisitions, and strategic plans into program portfolios to achieve ambitious initiatives

Initiatives & Measurement

- Success of initiatives dependent on the accuracy and success of the programs and portfolio design
- Challenging to measure investments at portfolio level (NPV, IRR, ROI)
- Measured by cost estimation, cost/benefit analyses, interdependencies, dynamic scheduling, and defined risk

Agency Needs for Measuring Portfolio Value



Agency Needs for Measuring Portfolio Value

Portfolio Value – What Needs to Be Measured

- **Return on Investment (ROI)**
  - **Consolidating Value** – Need means of aggregating value to calculate cost and benefits at portfolio level
  - **Discounts to Value** – Measure impact of program delays and scope changes on total portfolio cost and value
  - **Incremental Value** – Portfolio synergies realized when multiple programs amplify their individual contributions in a portfolio
  - **Adjustments** – Dynamically adjusting portfolio value based on program interdependencies
- **Risk**
  - Being able to isolate risk from individual programs and extrapolating across a portfolio
- **Interdependencies**
  - Portfolio estimate cost growth from schedule risk (multiple programs) and interdependencies
  - Implementation impact of any one investment in portfolio
- **Budget Impact**
  - Understand and quantify the impact of program funding decisions
  - Obligating more or fewer funds toward initiative
  - Changing timing of investment life cycle

Why Portfolios?

Portfolios – Why We Need New Way to Measure Value in Govt Acquisitions

- For public and private sector capital investments, finance professionals measure value by estimating project cost and revenue, applying risk, and discounting investments by the cost of capital
- This is best capital budgeting methodology only for stand-alone projects
- Most government capital investments are not stand-alone investments.
- For each investment decision, subsequent investments with interdependencies or impacts to strategic agency initiative
- Changes to scope, implementation, or schedule of the initial investment will have cascading effect on future investment phases

Impact of Not Using Portfolio Analysis

- Undervaluing Investments
- Cannot Measure Value to Portfolio
- Challenges Managing Separate Programs Solving the Same Shortfall
- Trouble Understanding the Impact of Budget Decisions

Programs' Impacts on Portfolios

Program Management

- How government acquisitions are managed, defined, and integrated drives investment value and can complicate aggregating programs into larger portfolios
- Program manager (PM) is assigned to specific investment and maybe follow-up segments
- PMs may or may not remain in charge of an acquisition leadership through definition, scope development, investment analysis, and implementation
- Lack of continuity adds risk to implementation success and continued integration with dependent and subsequent investments in same portfolio

Multiple Organizations

- In addition to direct leadership changes, programs within the same portfolio are sometimes led from different organizations within a government agency

Programs' Impacts on Portfolios

Budget Constraints Change Scope

- Budgeting offices restrict capital spending based on government funding allocations and cannot fund each initiative to full capacity
- Organizations, as result, segment investments and acquisitions
- Managing portfolios of separate programs in different organizations and programs with multiple segments complicates portfolio analysis, capital budgeting decisions, and budget allocations.

Budget Delays Cause Cascading Effect

- Budget delay for program phase could have a cascading effect on entire portfolio

Defining & Developing Portfolios

Identify Prioritized Initiatives

- Define portfolio scope – What are org. strategic initiatives? What capabilities does govt wish to achieve?
- What are the problems, shortfalls, agency needs to solve?
- What new capabilities need to be created? Legacy versus new state
- List requirements to achieve new end-state

Determine Intended Outcomes

- List and compare intended outcomes of new system to shortfalls of legacy system
- Define scope – acquisitions, process changes, constraints of legacy system design

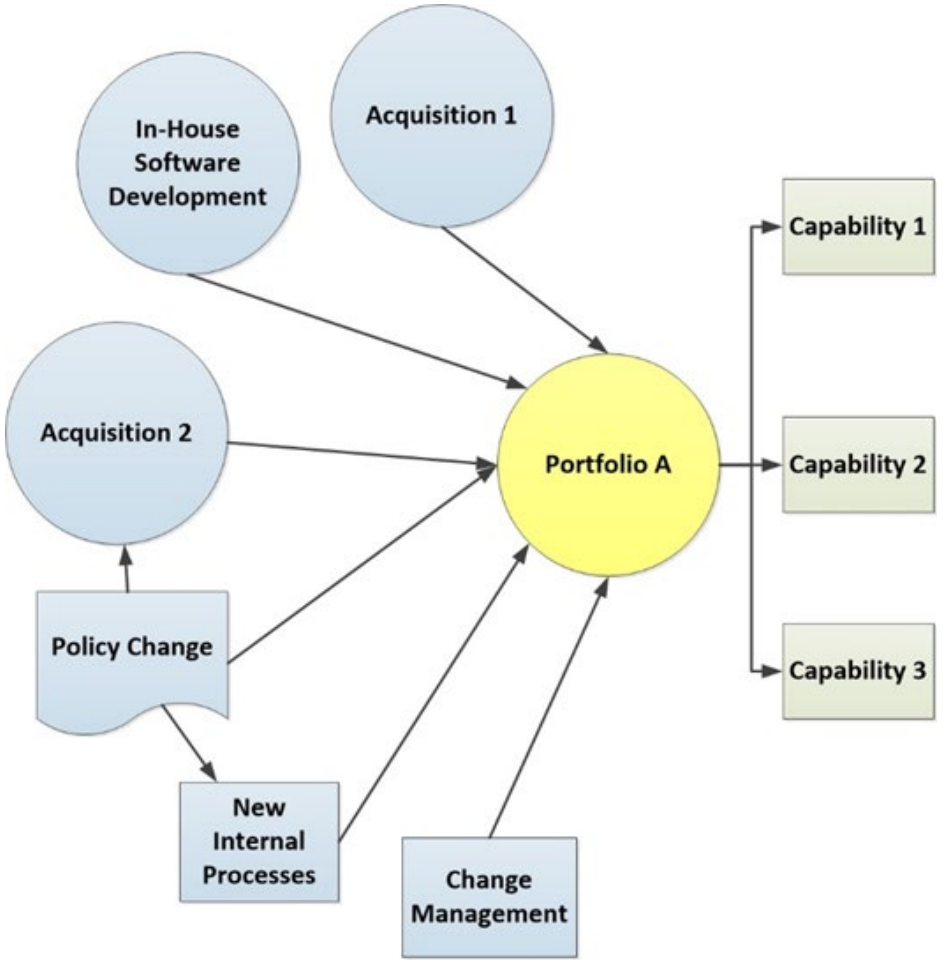
Influence Diagrams

- Government agencies must decide what changes must take place in each organization to achieve defined end-state goals.
- Agencies deciding on contents, design requirements, change management, policy, and processes to achieve portfolio initiatives can use influence diagrams as means of defining portfolio
- Top Down Approach – Influence diagrams start at the end-state capability and work backward one step at a time

Defining & Developing Portfolios

Influence Diagram – Portfolio 1st Level Consists of

- Multiple program acquisitions
- Agency in-house software development
- New processes to enable the full capability of the consumer-off-the-shelf (COTS) acquisitions
- Policy changes to facilitate the processes and enforce compliance with new COTS practices
- Change management incentives to ensure adoption of a new business model for the portfolio capabilities
- These interdependent relationships are foundation of a portfolio, which enables end-state capabilities and agency initiatives.



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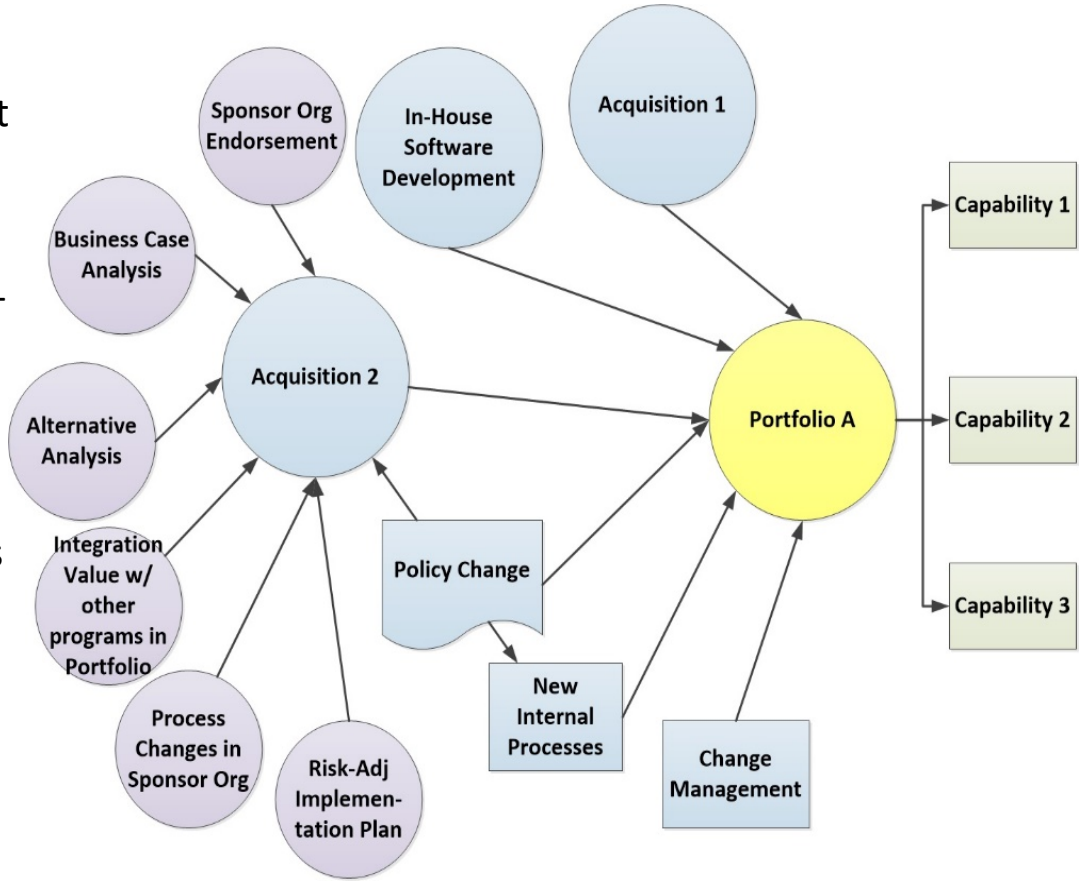
Defining & Developing Portfolios

Influence Diagram – Portfolio 2nd Level Consists of

2nd Level for Acquisition 2

- Getting advocacy or endorsement from the sponsor organization
- Development of a full business case cost-benefit analysis
- Compelling and completed down-selection to a preferred alternative in the alternative analysis
- Integration value with other dependent programs, organizations, and legacy systems
- Process changes within the sponsor organization to realize value of the COTS acquisition and to adopt efficient steps for new capabilities
- Development of an implementation plan that accounts for program and portfolio risks



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Calculating Portfolio Value – Decision Trees

Methodology to Calculate Portfolio Value

- Establish a methodology for estimating capital project value
- Quantify portfolio-level value using **Decision Trees** – way to capture the complex and intricate interrelationships and sequence of investments and policies
- Decision trees allow for dynamic changes to assumptions and investments over time to impact portfolio value and help management make informed portfolio decisions.

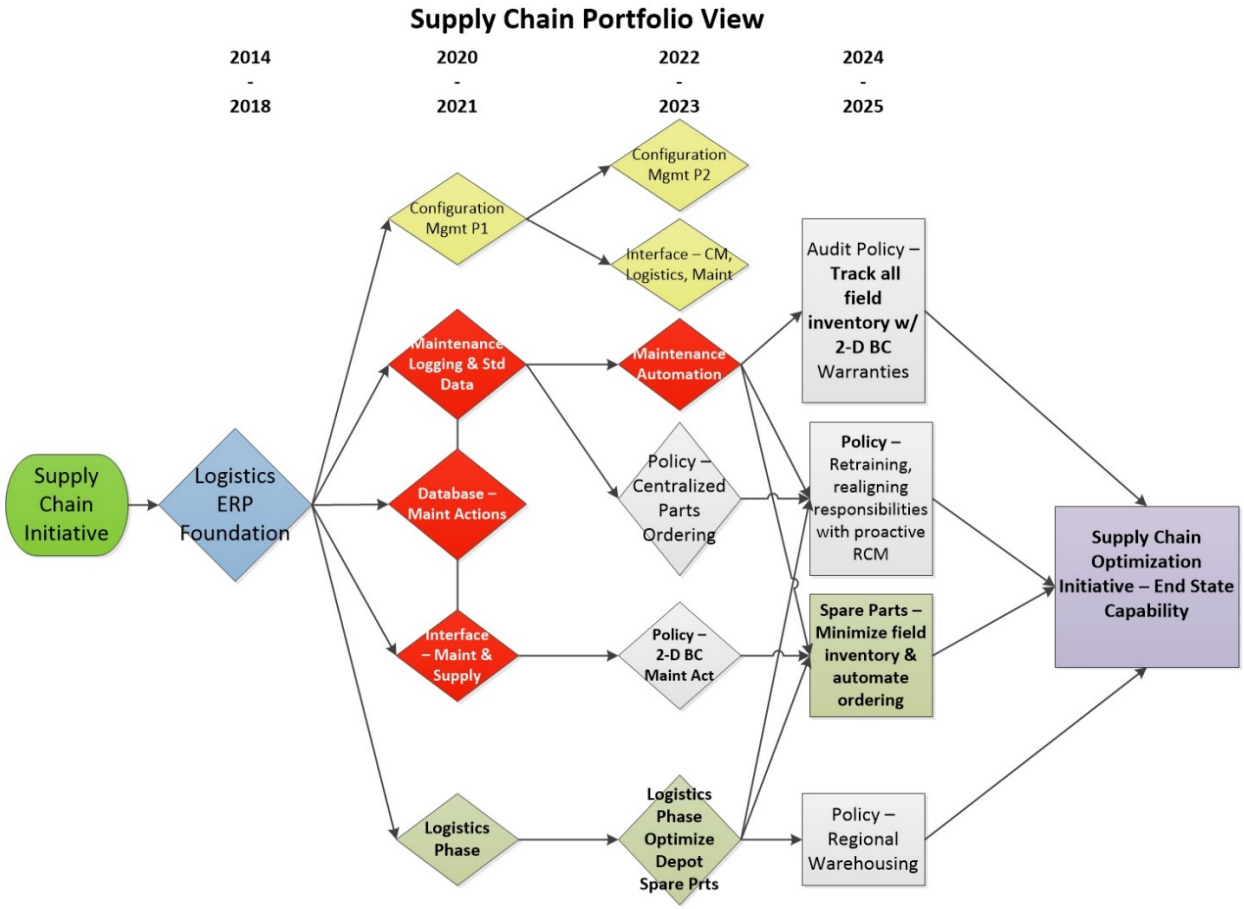
How Do Decision Trees Work?

- Determine multiple investment decision paths to achieve a program or portfolio capability. Top "branch" assigned as the most efficient and value-added path to achieve an end state.
- Apply probabilities and monetized value (cost and benefits) of each decision point, which when aggregated (multiplied through the entire probability series or "branch") sum to 100%.

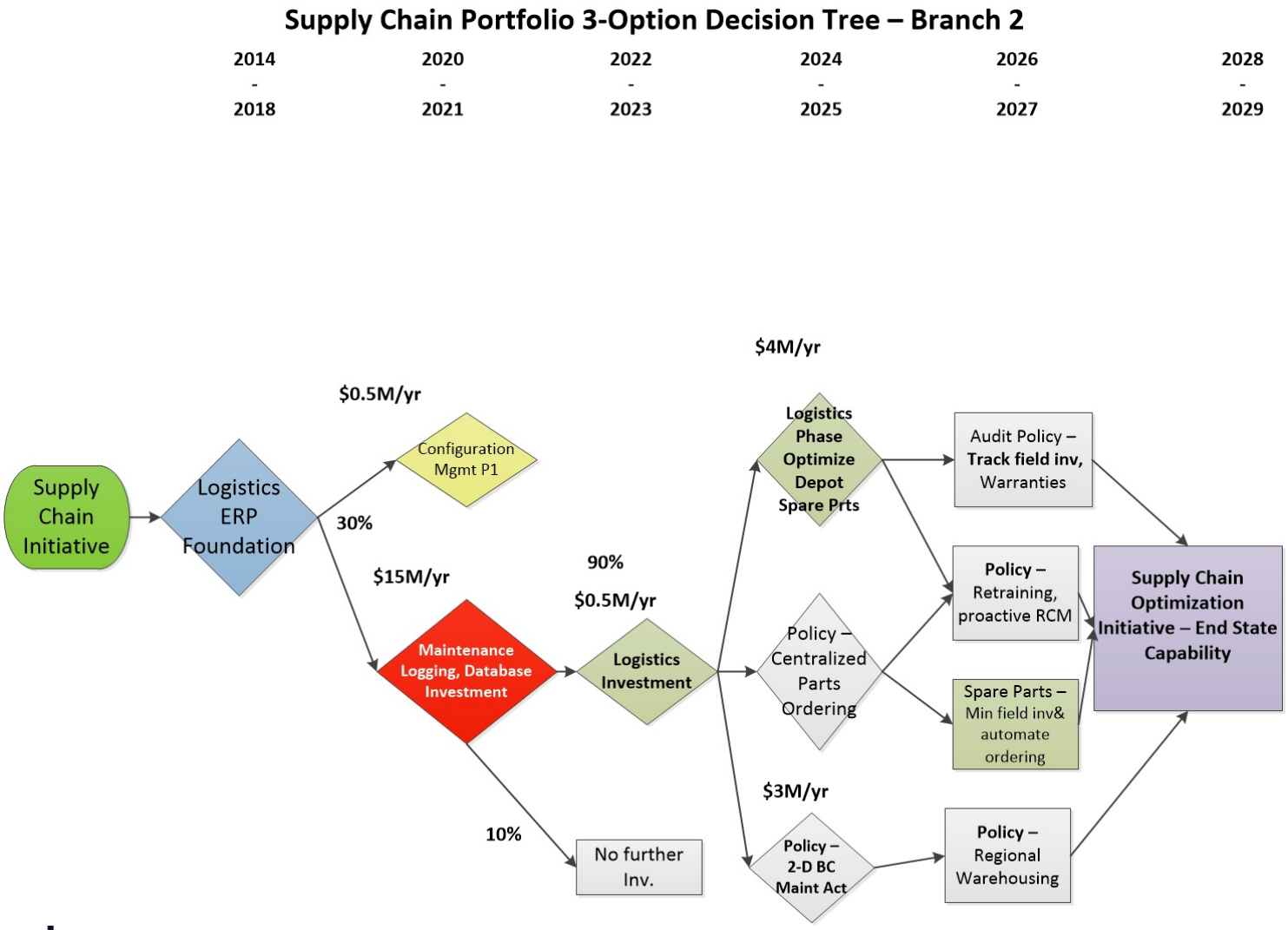
Calculating Portfolio Value – Process

Decision Tree Process

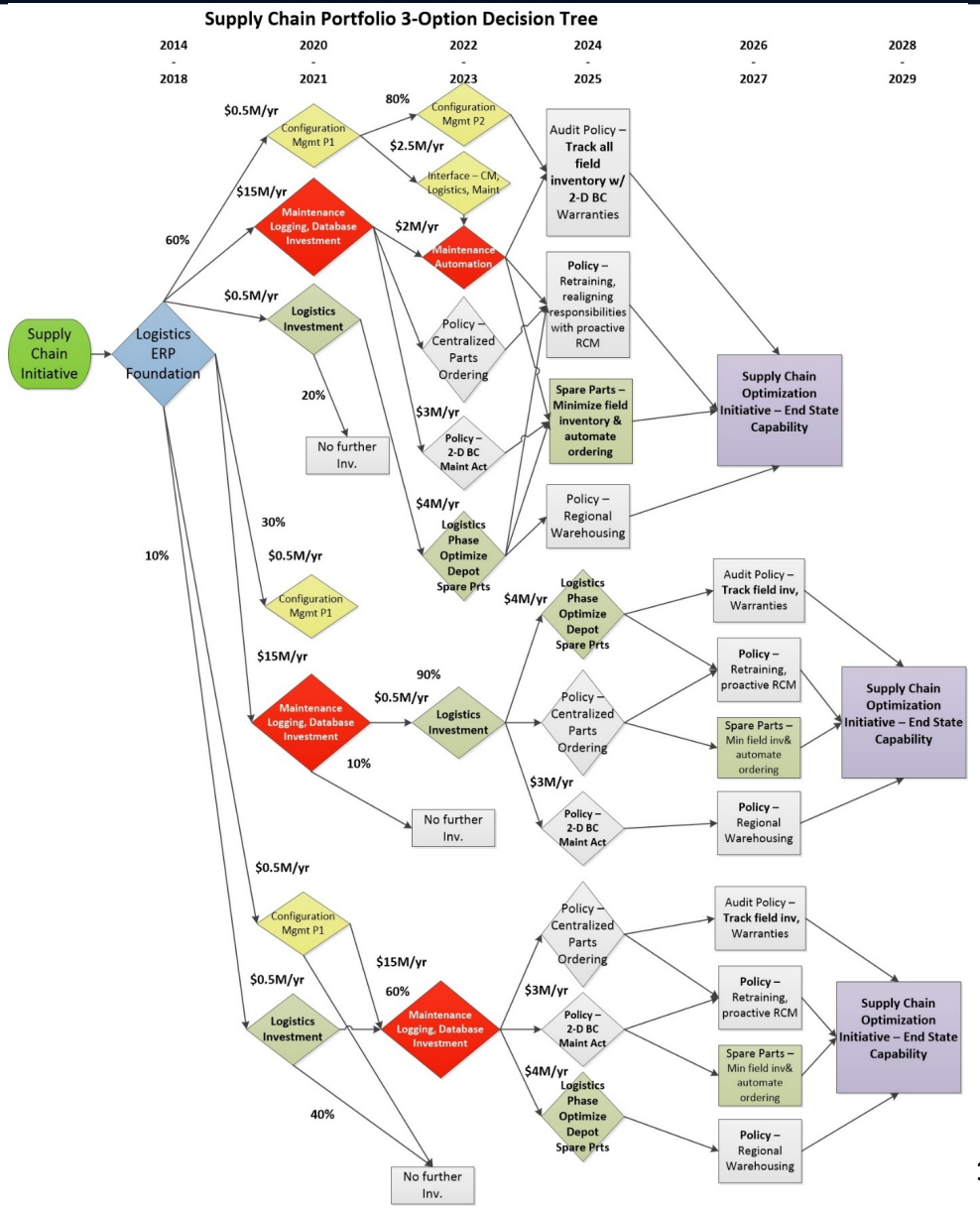
- Map out along a timeline the preferred or optimum path of sequential and parallel capital investments, policies, process changes, and internal operational changes
- Assign probabilities for each branch – first level should aggregate to 100%.
- Calculate incremental value of each decision – cost avoidance, benefits to stakeholders, etc.
- Multiply probabilities times the value at each decision point (yes and no of branch)



Calculating Portfolio Value – Branch 2



Calculating Portfolio Value – Value



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Calculating Portfolio Value – Calculation

Decision Tree Branch	Probability 1st Tier	Probability 2nd Tier	Potential Savings & Incremental Benefits ($M)	Probabiity-Adjusted Savings ($M)	NPV ($M PV)
Portfolio Branch 1 - Optimum Schedule & Funding of All Programs	60%	48%	$ 334.50	$ 185.52	$ 95.01
Portfolio Branch 2 - Delay of Investing in Logistics, Impact to Schedule & Probability of Not Investing in Full Supply Chain	30%	27%	$ 310.50	$ 89.88	$ 45.04
Portfolio Branch 3 - Delay of Investing in Maintenance and Logging, Impact to Schedule & Probability of Not Investing in Full Supply Chain	10%	6%	$ 310.50	$ 19.11	$ 9.55
Total Portfolio Benefit	**100%**		**$ 334.50**	**$ 294.51**	**$ 149.60**

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Portfolio Scorecard – Metrics & Ranking

What is a Scorecard?

- Once the agency calculates incremental probability-weighted portfolio value using **decision trees** for capital portfolios it is considering funding, portfolio management team needs
  - A method to rank portfolios
  - Metrics to evaluate and compare portfolios
  - A dynamic means for updating comparative values
- A scorecard is a simplified and dynamic tool (1) used for ranking and comparing portfolios and (2) for running funding scenario portfolio impact analysis.

Metrics & Ranking

To compare, prioritize, and fund portfolios, the primary considerations and metrics for these capital investments are two-fold:

- **Strategic objectives** – A strategic objective for each portfolio can superceed economic value. There are some portfolios, no matter the economic value, that best align with agency objectives and will receive funding prioritization no matter what.
- **Economic Value –** The main objective for scorecard metrics is economic value (NPV, IRR, B/C ratio), cost estimation, incremental benefits, and annual cost requirements.

Portfolio Scorecard – Help Agencies Budget

Budget Allocations with Limited Capital

- Government agencies are usually allocated limited capital budgets, a specific dollar allocation for a specific year to spend on capital projects.
- By aligning capital projects within capital portfolios with strategic end-state capabilities, budget offices can best assess which strategic objectives should be allocated more money in any given year.
- Scorecard to include:
  - Aggregate portfolio value and other economic metrics
  - Annual portfolio funding requirements
- Scorecard funding should be need-based and be prioritized by ranked order
- Main objective of a scorecard is to inform decision-makers with objective information, so management can decide how to best fund programs and portfolios.

Portfolio Scorecard – Rebalancing

Portfolio Scorecard Rebalancing

- Multiple objective data sources for scorecards:
  - Portfolio decision trees
  - Program/acquisition cost estimates
  - Cost/benefit analyses
  - Annual budget requests
- With multiple sources, portfolio managers and budget offices can update scorecards and their funding allocations multiple times a year.
- Individual program delays can impact full portfolio.
- Government boards can reallocate some of portfolio's funding for the impacted fiscal years to another portfolio
- Rebalancing of portfolio capital funding is a "trade-off," which can become more prevalent for agency capital teams when they have a dynamic and frequently updated decision tool – a program portfolio scorecard.

Portfolio Scorecard

Portfolio Scorecard Example

Agency Portfolio Scorecard

	Maximum Annual Budget		$1,000	Total Annual Allocation			$740	$1,000	$1,000	$1,000	$1,000	$990	$925	$935	$910	$1,000
Priority Rank	Portfolio	Components	Total Cost (PV$ M)	Incremental Benefits	NPV	B/C Ratio	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
1	Supply Chain		$500	$800	$300	1.6	$40	$100	$80	$60	$100	$60	$20	$20	$20	$0
2	Navigation		$700	$1,000	$300	1.4	$30	$120	$80	$100	$80	$110	$75	$75	$10	$20
3	Automation		$1,200	$1,500	$300	1.3	$80	$100	$70	$50	$200	$120	$130	$160	$90	$200
4	Surveillance		$1,600	$1,900	$300	1.2	$150	$200	$200	$200	$100	$100	$100	$150	$150	$250
5	Communication		$1,000	$1,200	$200	1.2	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
6	Information Technology		$1,000	$1,080	$80	1.1	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
7	Technical Operations		$1,500	$1,600	$100	1.1	$80	$200	$120	$120	$180	$200	$200	$80	$150	$170
8	Safety		$2,000	$1,500	($500)	0.8	$160	$80	$250	$270	$140	$200	$200	$250	$290	$160

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Conclusion

- Following a portfolio analysis process using
  1) **Influence diagrams** to define scope,
  2) **Decision trees** to calculate value,
  3) And **scorecards** to rank portfolios,
- Government agencies no longer need to be vulnerable to programmatic uncertainties, government capital funding constraints, and isolated investment decisions.
- Agencies can act confidently and decisively to fund critical initiatives at the right times and to ensure their success.