# Structured Decision Management using a Decision Driven® Approach

**Engineering**

**Achieving Product and Process Breakthroughs**

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## Engineering

### Achieving Product and Process Breakthroughs

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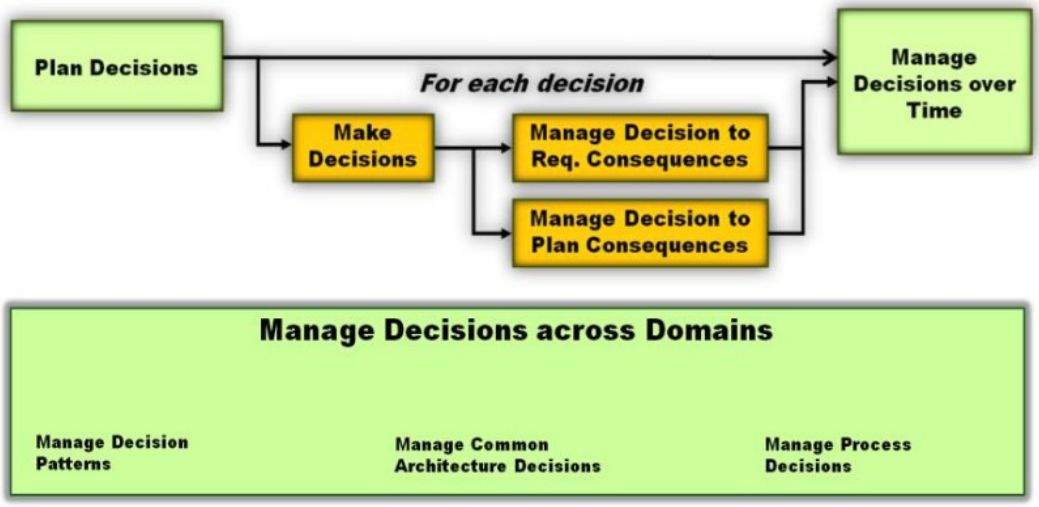
# PREFACE

# INTRODUCTION

This book offers an introduction to Structured Decision Management (SDM), a powerful, yet easy to use method for managing decisions: planning decisions, making decisions and protecting their outcome. This method is applicable to a broad range of business processes, including strategy, systems engineering, product development, and technology management.

These statements deserves some explanation as "decision" may not map to it's colloquial use. Our use of the term "decision" indicates a fundamental question/issue that demands an answer/solution. When we indicate an action on a decision (planning, making, protecting), we are indicating our focus on the answer/solution to the question or issue.




Mastery of these techniques is an essential step in transforming these "knowledge-worker" processes from a focus on DOCUMENTATION to a focus on THINKING. Our goal is to provide you with new or improved skills in performing the daily thinking tasks that form the core of your job responsibilities, both as an individual knowledge worker and as a business/project team.

This method have been refined through use in 150+ projects across 40+ organizations., including both formal and informal delivery of these techniques to a wide range of audiences. Success with this method depends upon you, your willingness to have your thinking processes stretched and transformed and your willingness to use creatively what you learn to tackle the real issues that you are facing.

This book is based on training workshops previously offered by Systems Process Inc. (also doing business as Decision Driven® Solutions from 1995 to 2017). Exercises are interspersed throughout and are most helpful when applying them to real project issues. While lacking an 'instructor', our community can be found at: TBD

Taking notes liberally to record your insights during your reading and exercises will enhance your understanding. Text in blue indicates a question or exercise that will help solidify your comprehension of the topic.

## Objectives for this Book

As an individual who has decided to read about Structured Decision Management (SDM), you are most probably a "knowledge worker". As such, you are paid to think, i.e. to identify and resolve issues by means of effective thinking skills. This places a premium on your ability to manage information efficiently and effectively. You will learn some of the fundamental principles for becoming an effective knowledge worker in this Age of Information. We will begin by exposing you to the four (4) fundamental human thinking processes and how these processes map to the issues you face on the job.

Decision-making is the thinking process that is central to business strategy, product development, and process re-engineering. Our primary objective is to give you a rich set of skills through a method originally developed as Decision Driven® Design. This method will enable you to proactively manage the decisions for your project or product creating a Decision Network using a Decision Breakdown Structure (DBS) technique. You will also learn the essential steps for making any individual design decision **ON TIME** and **RIGHT THE FIRST TIME**.

Even the **RIGHT** decision may fail on implementation. Therefore, you will learn the skills required to manage the consequences associated with your decisions. You will learn how to manage the relationships between decisions and other essential project and process information, such as requirements, architecture, technology, and plans. To maximize the results from each decision, you will learn how to mitigate risks and grow opportunities.

You will also learn how to "put decisions to time". This will help you anticipate future strategic decisions and "think ahead" concerning the evolution of current decisions. This will enable you to initiate research and development and capability growth initiatives NOW to answer the questions and supply the solutions needed in the future.

In addition to learning the method and applying it to your current, high priority decisions, you will also consider how to incorporate SDM into your personal and business processes. This begins with laying the foundation for a set of Decision Patterns that will help your organization leverage lessons learned from previous decisions when facing new business challenges.

We use a "Learn it, Do it, Review it" approach for each major topic presented. This provides an opportunity for you to consolidate information presented by using them to resolve real life issues. Our hope is for you to accomplish "real work" during your time with this book rather than just having added it to your shelf. Taking advantage of the exercises should provide you with a toolkit of improved thinking skills and a specific plan for using these tools to improve your business (or personal) processes.

In addition to process and methods concepts, our goal is to provide you with measurable, hands-on skills. Specific skills are summarized below.

# Learning Objectives

**By the end of this book, you will be able to:**

- Build and maintain a Decision Network for your business or project
- Isolate the “make or break” decisions that will create your future
- Make strategic, technical and management decisions using a rich, scalable & repeatable method
  - Define an effective, efficient and reusable set of criteria for a decision
  - Create breakthrough solutions using Decision Driven® Innovation skills
  - Capture and communicate the results of your decisions
  - Maintain and leverage traceability between requirements and decisions
  - Jump start risk and opportunity management
- Accelerate solutions by managing links between decisions/plans
- Build and maintain a set of Decision Patterns
- Identify and highlight the decisions “hidden” in your current methods and processes

A couple of questions to help focus your reading:

- Which skills do you believe will be most valuable to you as an individual?

- Which skills are most needed across your organization?

- What additional goals do you have for this reading?

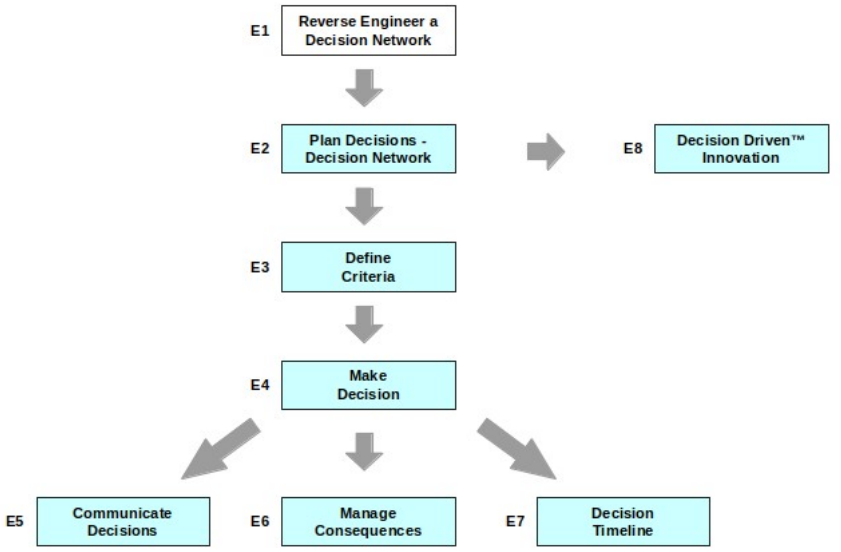
## Roadmap

As previously mentioned, this book is based on training sessions that extended over three days. As an indicator for the amount of time allocated to each section we offer the schedule for that training. This was a focused training activity with constant feedback and hasn't made a perfect transition to independent study.


All exercises, except Exercise 1, address real job concerns. In doing these exercises, you can accomplish actual work for your project. You can capture valuable knowledge using the tools available at the DMI website. You are encouraged to work on your current, highest priority "tough" decisions with the

goal of learning while doing. We are providing a rich coverage of the method, however the transfer of these skills to you is most successful by application of the method to current business and project decisions. While the less interactive mechanism of self learning does not offer the same potential, this book can still serve as a “beachhead” introduction of the concepts for personal or organization use.

## Flow of Exercises



# 1 Introduction To Structured Decision Management

The term “decision” indicates a fundamental question/issue that demands an answer/solution. When we indicate an action on a decision (planning, making, protecting), we are indicating our focus on the answer/solution (selected alternative) to the question or issue.

Structured Decision Management offers the potential to help both you and your organization achieve strategic excellence. The method can help you accelerate the growth of breakthrough capabilities and the delivery of innovative solutions to market. However, such change is not automatic. If successful, the method will reach to the core of how every individual thinks through and resolves business issues, both individually and in team settings. These changes are best accomplished when all stakeholders appreciate how such a transformation will affect their day-to-day behaviors and commit to “pay the price” together to gain these benefits.

The following graphic summarizes some of the factors that contribute to a successful deployment of SDM, as learned from engagements across a diverse set of organizations.

# Success Factors

**Better thinking skills essential for individuals and teams**

- Gather information (create knowledge pull)
- Transform information (add value)
- Organize information
- Reuse information

**Methods must balance human & process issues**

- A common approach and vocabulary essential
- **Scalable** methods - tailor the rigor to fit the situation
  - Balance ***time***, ***rational quality*** & ***buy-in***

**New roles must be established (Change management)**

- Coach, facilitator, mentor, champion
  - Model desired behavior, integrate into process by example

**Software tools are enablers**

- Capture and share knowledge; reinforce methods

Knowledge workers can improve their processes only if they improve their thinking skills. To do so, they must learn how to gather essential information by improving their questioning skills. Ideally, they will use a Just-in-Time approach for data gathering, asking the right question at the right time to gather the information they need to resolve issues. They must also learn how to transform this data using the appropriate thinking tools for each situation. Ideally, they will create the information needed by those downstream and minimize the production of "scrap" information. They must learn to organize and store the information they create in appropriate structures for ease of retrieval. Finally, they must learn how to reuse essential data and analyses across multiple projects and products.

Thinking methods must be human-friendly, balancing process rigor with flexibility for personal styles and intuition. Scalability of the method is essential so that constraints such as time (for decision completion), rational quality (how technically correct or superior the solution must be), and buy-in (commitment to implementation by stakeholders) may be balanced for each decision.

The deployment of a common set of thinking skills and methods across an organization demands that new roles be recognized. The role of decision "Black Belt" coach/facilitator is the most significant of these.

Software tools can be powerful enablers to reinforce new thinking patterns but low-tech information capture techniques will be used to demonstrate that the SDM value proposition lies in better thinking, not better software.

To start, think about examples of decisions that were driven primarily by:

- Time (to make the decision):

- Rational Quality:

- Buy-in (by stakeholders, implementers):

We will address these drivers as we go along.

## 1.1 Systematic Thinking/Rational Process

How can improved thinking dramatically improve your team's contributions to business strategy or product development? What principles should guide those who are attempting process re-design to achieve greater competitive advantage? What thinking processes are most significant in your job?

Structured Decision Management is founded on Systems Thinking principles. Systems Thinking has two primary dimensions, holistic thinking and reductionist thinking. First, Systems Thinking implies a holistic approach, viewing a system as a structure of interrelated elements that have emergent properties that deliver value. As such, Systems Thinking provides human beings with a way of viewing the real world as the "whole", while managing the complexity of its parts. Second, Systems Thinking promotes the use of “rational process” as as a way to reduce/decompose complex issues into manageable pieces that can be addressed with discrete processes. Once each individual concern is resolved through a rational process, the answer is integrated back into the whole to evaluate its impact on other elements.

Human thinking processes have been studied for many years. Dr. Charles Kepner and Dr. Benjamin Tregoe performed some of the most significant research in the late 1950’s. They interviewed and observed individuals in a wide variety of industries and jobs who were recognized by the peers as good thinkers. They discovered that effective thinkers tend to follow similar patterns of thought when attacking and resolving issues. From their research, four fundamental thinking processes emerged. These rational processes, though labeled by a wide variety of names, provide a universal set of thinking tools by which human beings can effectively manage the world around them. They form a set of "Best Practices" defined by observation, not by theory.

When thinking is viewed as a process, it becomes a set of skills that can be taught and improved. These four thinking processes provide a universal template for addressing and resolving all types of issues and situations. The specific steps in each process provide a data gathering and analysis plan that can empower teams to share their thinking abilities. This enables a true "Learning Organization" to be built that can effectively reuse past thinking.

Recommended Reading:

Kepner, Charles H. and Tregoe, Benjamin B. (1981). The New Rational Manager. Princeton Research Press.

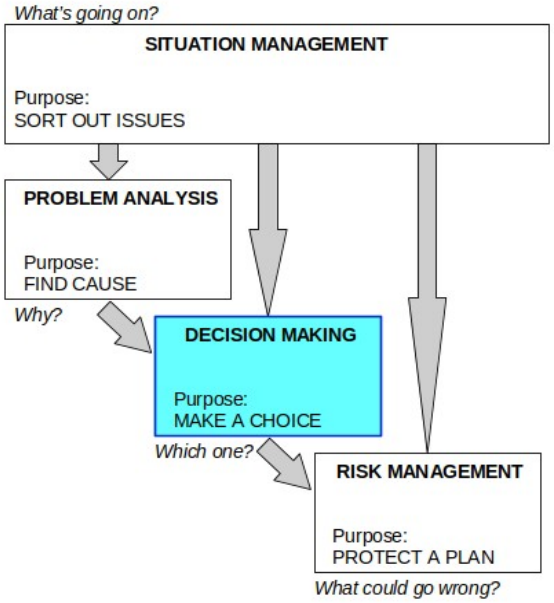
# Systems Thinking

**"Best Practices" - not theory**

- Identified by observation of good thinkers
- Four thinking processes address all situations
- Proven across many industries & disciplines

**Key to process improvement!**

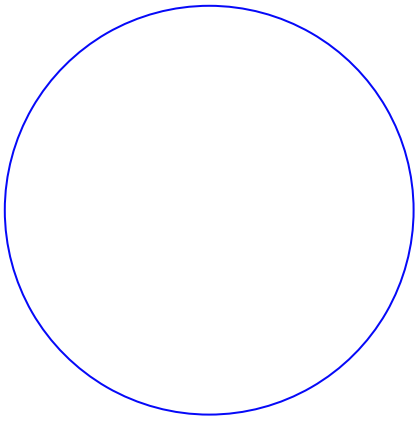
- Value-added steps
- Repeatable processes for the Learning Organization
- Point for multi-discipline integration
- Efficient information model




An improved thinking model can greatly improve your ability to gather, organize, transform, and communicate essential information. As a start, consider your current job responsibilities as each of the four thinking processes is explained. Think of the range of issues that you are called upon to resolve in a typical day, week or month.

Which thinking process do you use most frequently?

As you learn about the thinking processes, construct a pie chart that shows where your work time is spent by each of the four processes. What conclusions can you draw?



### 1.1.1 Situation Management

Situation Management is the thinking process by which humans survey their area of accountability or concern, identify the issues they should address, and develop a plan for resolving these issues. This process is also known as Issue Management, Situation Appraisal, Situation Assessment, or Environmental Analysis. No issues are resolved through this process; however, a plan of attack is prepared.

Situation Management is typically performed on an exception (for problems) or periodic basis (for on-going activities). It begins by brainstorming a list of the current issue or issues that must be addressed within the area of responsibilities. Issues are then separated and clarified using a set of focus statements. Priorities are assigned so that the most critical issues are given first consideration.

Focus statements typically point the issue toward one of the three remaining thinking processes for resolution. This is not an arbitrary result or a semantic game; all real world situations naturally fall into one of these processes. If an issue defies such mapping, it typically is a compound issue that should be further decomposed. Once each high priority issue is mapped to the appropriate thinking process, an analysis and resolution plan is prepared. This plan should specifically define WHO will perform WHAT analysis steps and WHEN.

Situation Management is one of the most essential skills of any manager. It is the fundamental thought process used when any project team manages a set of issues. It should be first task of any working group or organization when defining their charter. It may also be used to improve meeting results by translating an agenda into a thinking plan. A daily or weekly "to-do" list is a simple example of this process as well. Finally, Situation Management may be used when modeling any knowledge-based process so that the essential thinking steps are highlighted.

Situation Management helps us avoid the error of "diving into detail", trying to resolve each issue that is identified before the most significant issues have been isolated.

How have you seen this error hinder your team's effectiveness?

How much of your thinking time is spent in sorting out issues?

What is your most frequent or significant use of the Situation Management process?

### 1.1.2 Problem Analysis

Problem Analysis is the thinking process used to identify and confirm the cause of a deviation from the norm, expected or desired behavior. This process is also known as Root Cause Analysis, Failure/Fault/Defect/Deviation Analysis, Troubleshooting or Innovation. The outcome of Problem Analysis is the unambiguous identification of true or root cause.

This definition of Problem Analysis is more precise than the informal use of the word, “problem”. In general use, the statement, "I have a problem" may imply an impossible deadline, inadequate resources, a difficult or confusing decision, or a perceived risk as an observation or complaint. As used here, a problem exists only if actual behavior differs from expected or desired behavior AND the cause of this difference is unknown (or must be known with greater certainty before effective action may be taken) and there is a decision expected to resolve it.

In operational environments, Problem Analysis is not a planned activity; it is required only when the unexpected occurs. However, its use may be anticipated. Almost all complex systems (people, machines, processes, environments) will experience unexpected behaviors in normal day-to-day operations. Such deviations will occur even more often when these systems are being developed, tested and placed into initial operation. Therefore, both the non-recurring deployment of a system and its routine operations will require the use of Problem Analysis. During Research and Development desired behavior initiates Problem Analysis activities.

Problem Analysis skills are essentially questioning skills. The first step in the process is to get a complete, factual description of the problem. What the problem is, where and when it occurs, its magnitude and trends should be carefully defined. In addition, a clear boundary should be defined between what the problem is and what (where, when, etc.) it could be but is not. Differences should be identified on either side of these boundaries; these differences provide the ability to test each proposed cause mechanism.

Once the problem situation is fully defined, a variety of techniques may be used to identify possible causes. These causes are then compared with the facts about the problem; causes that can't explain the facts are eliminated. The goal is to converge on a single root or true cause. Once identified, this cause must be tested against the real world situation to verify that it is correct.

Operational Problem Analysis is a necessary evil. When things go wrong, it ensures that human beings don't attempt fixes without first confirming the true cause of a behavior. Problem Analysis is a commitment to analysis prior to action. In the long

run, effective Problem Analysis saves time, money, etc. when compared with a trial and error, fix and retry approach.

Effective Problem Analysis during Research and Development can positively impact cost and availability of new solutions or cancellation of untenable projects by focusing on the more difficult issues first and applying high quality options.

Cite one example of a problem situation where effective Problem Analysis produced (or could have produced) significant savings in time, money, quality, etc.

How much of your thinking time is spent finding the root cause of problems?

What is your most frequent or significant use of the Problem Analysis process?

### 1.1.3 Decision Making

Decision Making is the thinking process used to choose a preferred course of action in any situation. Decision Making is also known as Decision Analysis, Alternative Analysis, Concept Evaluation, or Trade-off Analysis.

Decision Making is the most significant element of human thinking. Strategic decisions are the process by which we conceive, evaluate, and create the future. Operational decisions define our daily activities. Crisis or reactive decisions often determine our success, failure, or even health and safety. Our lives are the sum of our choices; so also are our products and processes.

Strategic (Choose Future Direction), operational (Choose Today's Approach), or reactive (Choose Fix for Problem X) decisions may all be improved by use of structured methods.

Effective Decision Making begins with a clear statement of the choice to be made. This is essential to provide focus and to clarify the boundaries with other concurrent or related decisions. Evaluation criteria must then be defined so that what equals "success" is clearly understood. Alternatives (possible solutions, options) are then defined (identified or synthesized) for consideration. The estimated performance of

the alternatives are evaluated against the criteria so that non-viable options may be eliminated and viable options may be compared in an objective manner. The risks associated with implementing the alternatives should then be identified. The final choice identifies a preferred alternative, the option that best balances effectiveness per the criteria and inherent risks.

Decision Making is the engine of all business processes. Decisions are the fundamental building blocks of strategic planning, product development, detailed design, and process re-engineering. Therefore, one of the most valuable skills an individual can possess is the ability to isolate the critical decisions in any situation.

How much of your thinking time is spent making decisions?

What is your most frequent or significant use of the Decision Making process?

Are your decisions primarily strategic, operational, or reactive?

### 1.1.4 Risk Management

Risk Management is the thinking process used to protect a decision, plan, product, process, or organization from failure during implementation or operation. Risk Management is also known as Potential Problem Analysis, Threat/Opportunity Analysis, Safety Analysis or Hazard Analysis.

Risk Management is the process by which human beings anticipate negative future events and devise methods to reduce or mitigate these risks. Human experience has expressed the need for Risk Management is a variety of ways: "The best laid plans of mice and men..." or Murphy's Law: "If anything can go wrong, it will go wrong..." Risk Management is an attempt to manage Murphy.

Effective Risk Management begins with a focus statement that defines the scope of the risk assessment. "Achieve Product X customer acceptance by next March (20xx)" is an example. This end result may then be further decomposed into a structure, typically a plan composed of a sequence of events, tasks, or deliverables. Risks are then identified by experience against the elements of the plan.

Once identified, risks are prioritized so that risk mitigation may focus on the most significant threats to project success. Risk mitigation actions are identified for these threats. Preventive actions reduce the likelihood of the risk's occurrence. Contingent actions reduce the negative effects of the risk if and when it occurs. Risk monitoring methods are also set up so that early warning is provided when a risk emerges. Finally, risk mitigation actions are incorporated back into the plan so that the desired risk reduction is achieved.

Risk Management is most often applied to project plans, with analysis performed periodically for any significant project. An initial risk assessment and risk mitigation plan should developed prior to defining the baseline project plan. As plans are refined, additional risks assessments may be performed and mitigation plans may be updated monthly, quarterly, or at major milestones.

Risk Management may be applied to any structure or model of the real world. A Work Breakdown Structure (WBS), process flowchart, organizational structure, system architecture, or lists of milestones or deliverables are valid targets for risk assessment.

Risk Management is the natural follow-on process to Decision Making. Every significant decision is a logical candidate for risk assessment and mitigation. Experience suggests that many good decisions fail on implementation. Risk Management is the process used to protect the implementation of a good decision.

Opportunity Management uses the same thought process as Risk Management to identify and grow positive future outcomes. It answers the questions “What could go better than expected” and “What can be done to promote and exploit these opportunities?”

How much of your thinking time is spent in Risk Management?

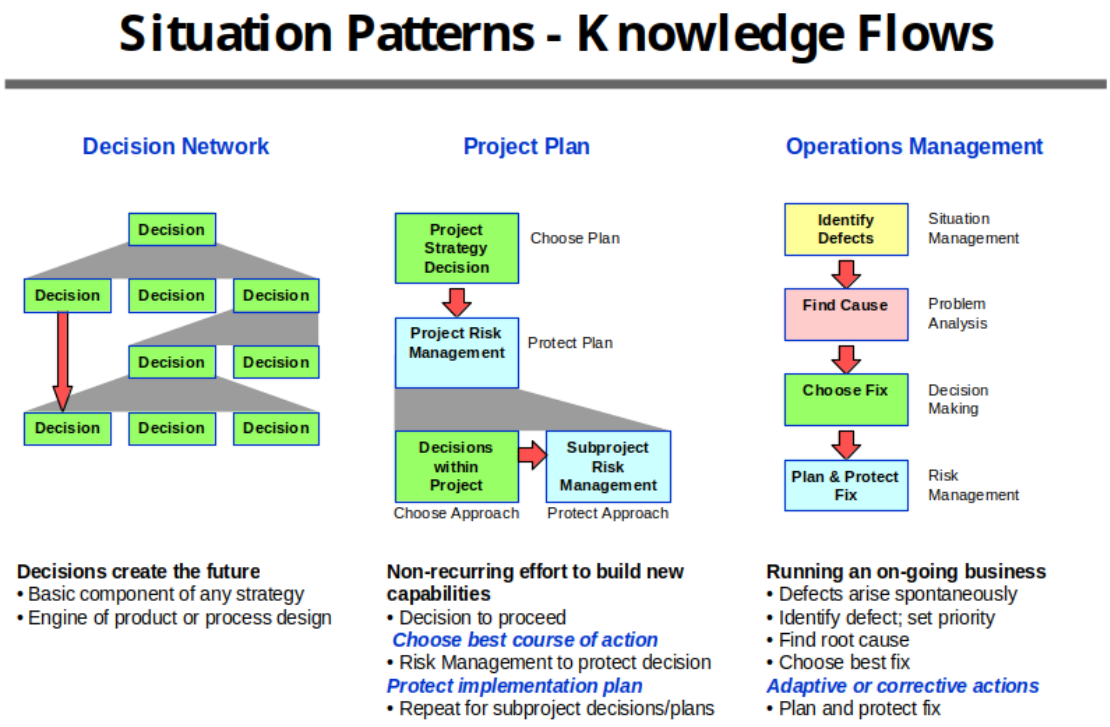
What is your most frequent or significant use of the Risk Management process?

### 1.1.5 Situation Patterns - Knowledge Flows

The four Systems Thinking processes are the atomic level building blocks that may be used to describe any situation. When this is done pervasively across an organization, three high-level situation patterns may be recognized. Each situation pattern represents a knowledge flow, i.e. a sequence of thinking tasks in which knowledge is created and used to successfully resolve situations.

- Create: Innovate and define strategy, capabilities and solutions.
- Implement: Translate strategy, capabilities and solutions into reality.
- Operate: Manage, deliver, perform or support the stuff conceived and deployed by the other 2 functions.

These roles reflect different **situation patterns** that call for different thinking tools and knowledge flows. If you accept the Kepner-Tregoe assertion that all human thinking can be mapped to 4 fundamental thinking patterns (rational process building-blocks), then a thinking model of the 3 situation patterns looks something like this:



Which knowledge flow best represents your job responsibilities?

Who in your organization provides the best example of each knowledge flow?

## 1.2 Structured Decision Management

This section presents the decision management concepts embodied in the Structured Decision Management method. We will discuss the purpose of each of the steps of SDM and you can apply these techniques to your current project, performing the full process on a subset of the critical decisions that you face.

Along the way, you will gain a variety of new skills that have tremendous potential in transforming the way you think. Please keep an open mind and let the experience stretch your boundaries. You can accomplish real work and leave with a decision management framework for your business or project; a bridge to practical use for your life.

Consider taking application-focused notes as these concepts are presented. Whenever a concept challenges your current process, capture the issues that are raised. Feel free to ask question on the discussion server. Our community may be able to help address your issue.

Structured decision-making methods have been widely taught for many years, with many useful (and some not so useful) variations. We present some of the most common alternate techniques, along with some guidance for when these options might be most valuable. If you have been exposed to other flavors of this process, we are extending your options. Please share your insights and best practices with the Structured Decision Making community at https://www.dminstitute.org/.

SDM is a comprehensive methodology for planning and executing the set of critical decisions that determine the direction and success of any business, product, or project. The methodology combines the best features of widely used multi-criteria decision making techniques (such as Kepner-Tregoe Decision Analysis or SMART) with key concepts from Systems Engineering, Requirements Management, Risk Management and Opportunity/Scenario Analysis.

The initial focus of SDM is proactive management of a set of decisions. The methodology is based on the observation that nearly all products or business strategies are defined incrementally. A set of five, ten, or perhaps twenty decisions will make or break your next project. Your challenge is to identify these decisions and plan and control their execution in a way that maximizes your chance of success. SDM provides a framework for identifying, visualizing, and communicating this set of decisions as a Decision Network.

A second key to your project's success is the ability to make any individual decision ON TIME and RIGHT THE FIRST TIME. SDM incorporates the proven features of common multi-criteria decision-making methods to help you improve your decision-making efficiency and effectiveness. The outcome of this approach is the commitment to a preferred alternative and preservation of the decision rationale within an Evaluation Matrix.

# Structured Decision Management

**WHAT:**

- Systematic, repeatable, scalable process for decision management
- Best of Multi-Criteria Decision Making & Systems Thinking/Eng'g
- Applicable to business, product, project & process decisions

**WHY:**

- Select preferred alternative (Best Fit Solution)
- Balance life cycle requirements & design goals
- Balance performance vs. implementation risk
- Capture implications on requirements, plans, etc.

**HOW:**

- Plan Decisions (Decision Network & Decision Plan)
- Make Decision (Evaluation Matrix)
- Manage Consequences (Derived Requirements, Actions, Tasks)
- Manage Decisions Over Time (Decision Roadmap, Critical Path)
- Manage Decisions Across Domains (Decision Patterns, Process Models)

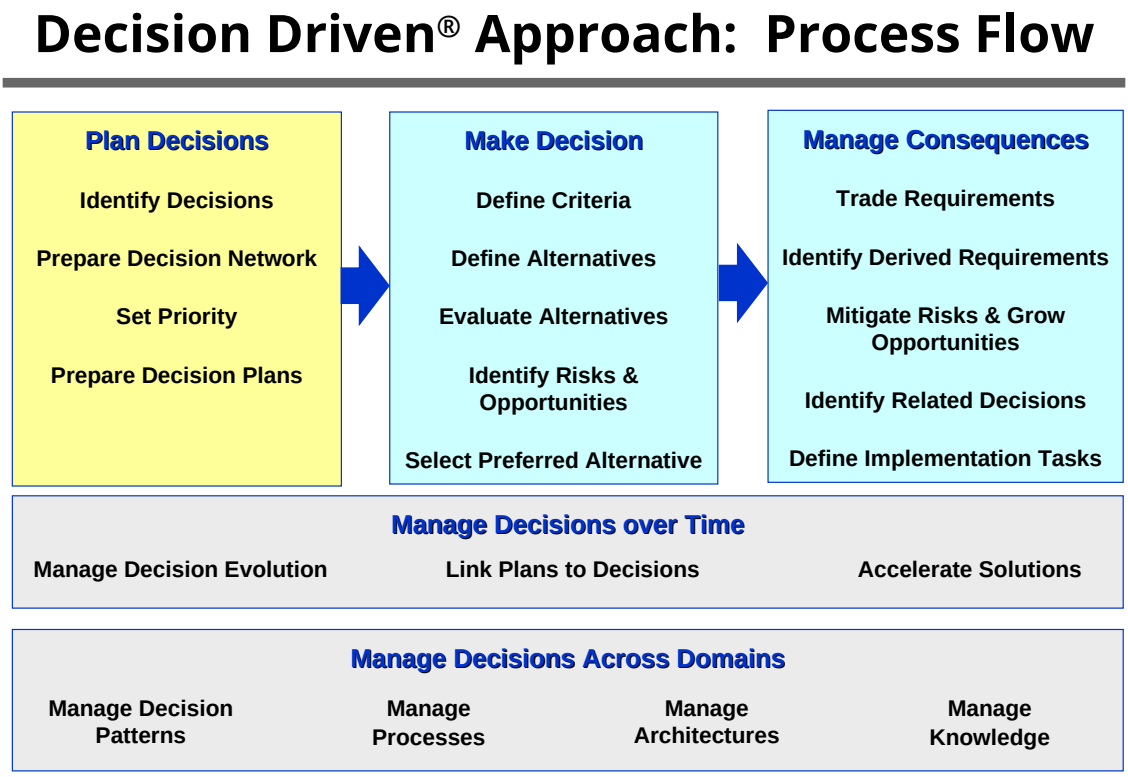
SDM manages the consequences associated with decisions by jump-starting related disciplines such as requirements management, risk management and opportunity management. The method includes techniques that will enable you to maintain traceability between requirements and the decisions they drive. Techniques to support the creation and capture of derived requirements are included. SDM will help you begin risk mitigation and opportunity growth at the ideal time, at the point of decision, to improve your probability of successfully implementing these choices.

All decisions have a time-context or horizon. Decisions are never static – they evolve. The evolving states of a network of decisions can be illustrated as a Decision Roadmap. Links between these states and related analysis, development and implementation tasks can be used to identify and manage the full idea-to-solution critical path.

The organization that adopts SDM as a way of life will grow a family of Decision Patterns. These patterns enable reuse of lessons learned across many domains. Patterns also serve as the basis for redefining business processes as a network of decisions. Structured Decision Management process models highlight the value-added thinking that occurs within any process and provide a common methodology that spans process boundaries.

### 1.2.1 Decision Driven® Approach - Process Flow

The Decision Driven® Approach (DDA) consists of three core processes. Plan Decisions produces a decision management framework for the project. The goal of this process is to produce a high-level analysis plan, without "diving to detail". The next two core processes, Make Decision and Manage Consequences, include the detailed analyses that are performed once for each decision identified in the Plan Decisions process. There is a feedback loop at the completion of each decision, in which the Decision Network and Decision Plans are refined to reflect the results of the just-completed decision.




Plan Decisions is normally performed at the start of a project and periodically (e.g. quarterly or after key milestones) thereafter. Its inputs include your knowledge of previous decisions that have formed the foundation for the current project and a set of decision patterns, if available. Its output is a decision management plan for the project extending to a reasonable "planning horizon". No design decisions are made during the Plan Decisions process. Plan Decisions produces an analysis plan; therefore, it is an extension of the Situation Management thinking process.

The Make Decision process is performed "according to plan" for each significant decision identified in the previous process. The goal of this process is to make the decision once, to make it correctly, and to make it within the schedule and budget constraints defined in the plan. Its inputs include the Decision Plan, the domain experience of the decision-makers, decision patterns, requirements and constraints from upstream decisions, and reusable analysis from similar decisions. Its output is the selection of a preferred alternative, approved for implementation, clearly defined and with its selection rationale.

The Manage Consequences process is performed for each decision, ideally before the decision is approved. At a minimum, these steps should be performed concurrently with or immediately after the decision approval. Inputs to this process include the preferred alternative, requirements that have not been satisfied and high priority risks and high value opportunities. Outputs include the implications of the decision in terms of requirements, risk mitigation plans, opportunity growth plans, and related decisions.

The Decision Driven® Approach (DDA) can be used to improve the “first pass yield” of a set of decisions, i.e. as a one-time engagement to jump start a product design or launch a new business strategy. However, the method may also be used to comprehensively “Manage Decisions over Time” by building a time-conscious and evolving Decision Network model of the business.

An organization may also “Manage Decisions across Domains” by maintaining a set of Decision Patterns that capture its best practice thinking. These patterns enable management of business processes, architecture definition and corporate knowledge infrastructures as a network of decisions. Cross-domain usage maximizes learning cycles by providing a common methodology and seamless process handoffs between organizations.

Compare your organization's current decision management processes against the steps of DDA. What are the primary differences?

Score your organization’s current decision management effectiveness against each of the three DDA processes (on a scale of 0-10).

What element of DDA would yield the greatest payback in your organization?

### 1.2.2 Big Ideas

The Decision Driven® Approach is not a theoretical methodology. It is a unique synthesis of numerous concepts from a variety of disciplines, all built around the fundamental belief in the centrality of decisions. The core concepts of DDA have been refined over a period of 30+ years and 100's of learning cycles. These learning cycles have "stitched together" the various components of the method and stress-tested these connections through real world usage. Along the way there have been numerous discoveries or "Aha!" moments during which a concept-under-test has been summarized into a "Big Idea".

Some of these Big Ideas are deceptively simple. The author believes them to be time-tested convictions whose power lies in their consistent application across business processes and even to personal life situations. You are not asked to take them on faith, but only to be adventurous enough to begin to test them against your own experience and try them against your real world challenges.

## Big Ideas

**Decisions create the future – Take control**

- Decisions are the controls for your business – grab them!
- Standardize – Expose – Operationalize decisions as the control interface
- Proactive decision management is the key to strategic excellence
- Decision management is much more than decision-making

**Any strategy or design may be quickly framed as a Decision Network**

- A Decision Network highlights the value-creating thinking "nodes"
- Decision Patterns = stable framework for the "fuzzy front-end"
- Business processes should be Decision Driven®!
- Decision (thinking pattern) reuse is far superior to solution reuse

**Decisions create and consume requirements**

- Current requirements-requirements traceability paradigm is flawed
- Requirements-decision traceability is essential

**You can't accelerate solutions without managing decisions**

- Decisions either comprise or create the entire Idea-to-Solution critical path

**Dramatic process improvement requires a revolution in decision management**

- Change human thinking patterns – deliver new, common, scalable skills

The Big Ideas challenge the "conventional wisdom" of leading AS-IS process models or paradigms. As each is discussed, identify the competing concept (industry paradigm or your personal belief) that each Big Idea must displace to become your conviction.

### 1.2.3 Decision Driven® Approach: Benefits

Comprehensive use of the Decision Driven® Approach can provide significant competitive advantages to any business enterprise. The following graphic summarizes DDA's value proposition under the heading of four "verbs": Focus – Anticipate – Innovate – Accelerate.

DDA can improve the strategic focus and alignment of any business, its ability to "think ahead" and anticipate critical trends and events, to innovate new technologies and products and to accelerate their delivery to the market.

## Decision Driven® Approach Benefits

**FOCUS**

- Decision Network = "Big Picture" questions => Decision Breakdown Structure
- Prioritize decisions; tailor method and scale analysis rigor to match
- Assign decision owners, define stakeholders, orient new team members
- Know what you know and what you don't; build data gathering plan
- Framework to tame the complexity of dynamic business/solution strategies

**ANTICIPATE**

- Extend planning horizon by forecasting decision evolution
- Identify and address risks and opportunities at earliest and optimum time

**INNOVATE**

- Provides innovation framework at every step in the method
- Multiple innovation techniques to increase likelihood of breakthroughs

**ACCELERATE**

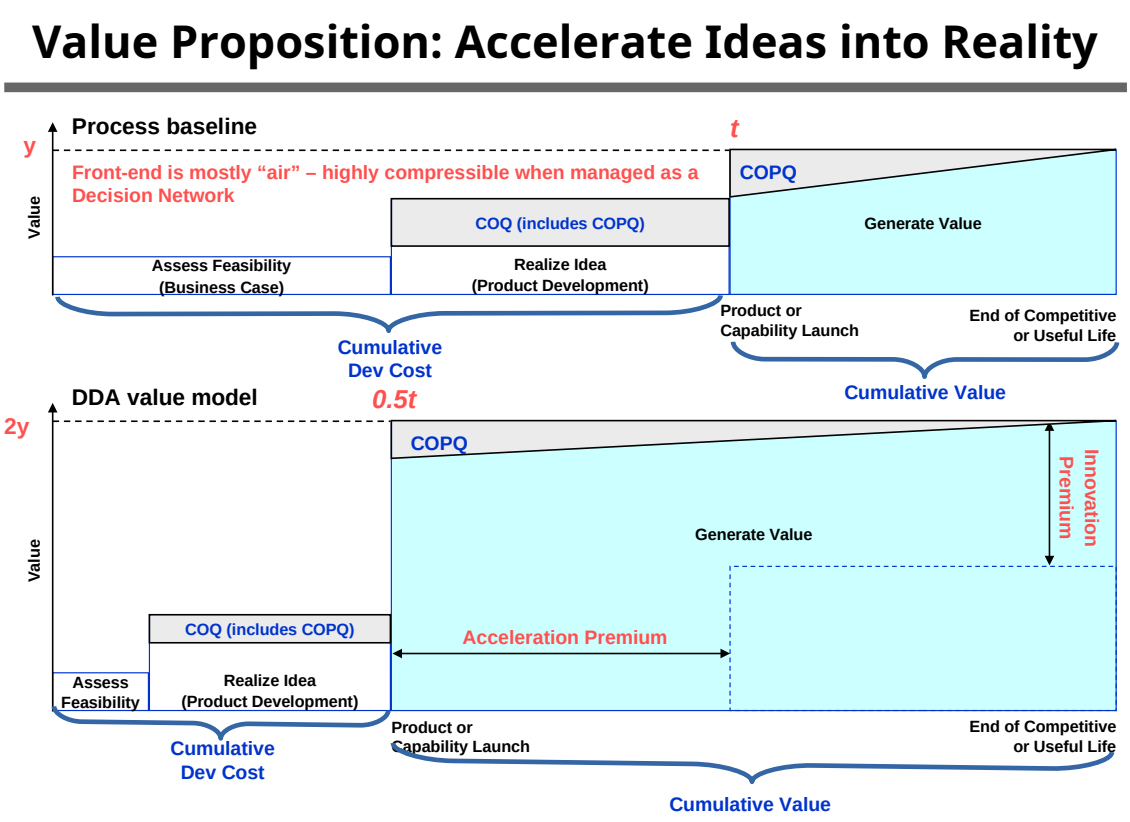
- Reduce decision churn and rework, dead end solutions, failed execution
- Enable parallel thinking and efficient concurrent cross-functional design
- Decision Network creates continuous knowledge/solution "pull"
- Identify and manage the full Idea-to-Solution critical path as a set of decisions

Which benefits would be most valuable for your organization today?

### 1.2.4 Value Proposition – Accelerate Ideas into Reality

The following graphic summarizes the fundamental value proposition that can be delivered by the Decision Driven® Approach. These benefits include:

- Acceleration Premium – Reduced time to market or capability by better sequencing of decisions and associated work activities and the associated decrease in development cost
- Innovation Premium – Improved solutions that delight customers and anticipate their needs, using methods that expose product/capability shortfalls that can be tailored and are repeatable and improvable
- Efficiency Premium – in both development and operations by reducing Cost of Quality (COQ) through fewer test cycles and less operational inspection and Cost of Poor Quality (COPQ) through less decision rework and escapes.




0.5t and 2y are examples, but indicate the areas of advantage.

Which components of the DDA value proposition would be most significant for your organization?

How much “air” do you believe exists in your current front-end processes, i.e. how much could solutions be accelerated into reality in your business?

What sets the theoretical or practical limit on how fast you can translate ideas into reality?

What limits your ability to create breakthrough solutions that delight your customers and lead to new markets?

### 1.2.5 Why The Decision Driven® Approach Works

The Decision Driven® Approach has a number of significant advantages over traditional design and strategy models. Its primary advantage is the flexibility it offers in providing a common approach that applies to all projects, products, or business processes. The success of any project, product, and knowledge-based business process is driven by a set of critical choices. DDA offers a single, "elastic" methodology that can be shared by all knowledge workers when attacking these critical decisions.

The DDA is more efficient than document or task-based processes. Decisions are the creators of all value-added information that may be embedded in the work products associated with either business strategy or product development. Focusing on the essential data to support each choice reduces the volume of costly "scrap" information.

# Why The Decision Driven® Approach Works

**UNIVERSAL, COMPREHENSIVE, ROBUST MODEL:**

- Set of critical decisions will drive success of any business, project or product
- Decision model spans process boundaries – common enterprise approach

**EFFICIENT AND SCALABLE METHOD:**

- Highlights value-added steps – "pulls" essential & relevant information
- Decisions provide scalable framework – flexible rigor and level of granularity
- Promotes sharing of expertise in Integrated Product Teams (IPTs)

**PROVIDES UNIQUE MANAGEMENT TOOL:**

- Decision Network = Decision Breakdown Structure + status, control and branch points
- Earliest point to identify & avoid risk, grow opportunities

**DELIVERS RICH TRACEABILITY:**

- Decisions are the source of derived requirements
- Decision-Requirement traceability enables impact analysis before changes

**REALISM**

- All knowledge is preserved with its context
- Problem domain – solution space distinction maintained in every decision
- Dynamic – supports evolution of decisions over time
- Captures full Idea-to-Solution critical path; across multiple projects/organizations

**PROVEN INFORMATION MODEL**

- Simple, yet complete; provides the knowledge "glue" – demystifies other methods
- Reduces inter-process "friction"; enables cross-domain use

Decisions also provide a scalable framework for attacking complexity. No product is designed or strategy conceived one requirement at a time; neither are products or strategies created through a single decision. A set of decisions, perhaps 10-20, drives the development of most strategies and products. A decision model breaks up this analysis "cloud" into manageable analysis tasks, each of which can be tackled using an appropriate level of rigor and effort. These tasks also provide efficient points for Integrated Product Teams (IPTs) to share their cross-discipline knowledge and expertise.

The DDA helps bridge the gap between the manager and the engineer. It provides a method for management oversight of key decisions without meddling in the technical details. Each decision possesses three logical points for management intervention and review. First, the Decision Plan provides managers with a method of communicating the outputs required from the decision and the budget and schedule constraints imposed on the analysis effort. Second, a requirements (or criteria) review may be used to validate that the evaluation criteria support the needs of all decision stakeholders. Third, an approval review may be used to ratify the recommended outcome and to communicate to affected parties any derived requirements or other consequences of the decision.

Decisions are the conditional branch points (forks in the road) that drive the direction of business strategy and product development. If Path A is chosen over Path B, the future may be different, requiring adjustment in project plans and schedules. The risks associated with each direction may also differ, requiring different risk mitigation actions to be implemented. The ideal time to either avoid a risk or to identify and implement risk mitigation is at the point of decision, when the risks associated with the chosen path are assumed.

Decisions are the creators of derived requirements. Most development processes assume that requirements spawn other requirements (e.g. User requirements drive system requirements, which drive component requirements). These processes focus on "requirements to requirements" traceability. However, most requirements are actually capabilities or constraints imposed by upstream solutions. Decisions are made that balance a set of requirements. Attached to (or inherent in) the preferred alternative are limits on other decision-makers. These limits may be stated as derived requirements. The DDA provides for "requirements to decision" and "decision to requirements" traceability. This enables effective impact analysis to be performed when upstream requirements or decisions change.

The DDA produces a comprehensive Decision Network model that faithfully represents the fundamental questions that must be answered by any business or product. This decision model is dynamic – it supports evolution of every element of the decision independently and asynchronously. This enhances the realism, fidelity and usefulness of the model for managing decisions over time. By linking together a set of decisions and their future states, the full Idea-to-Solution critical path may be managed to accelerate solution delivery.

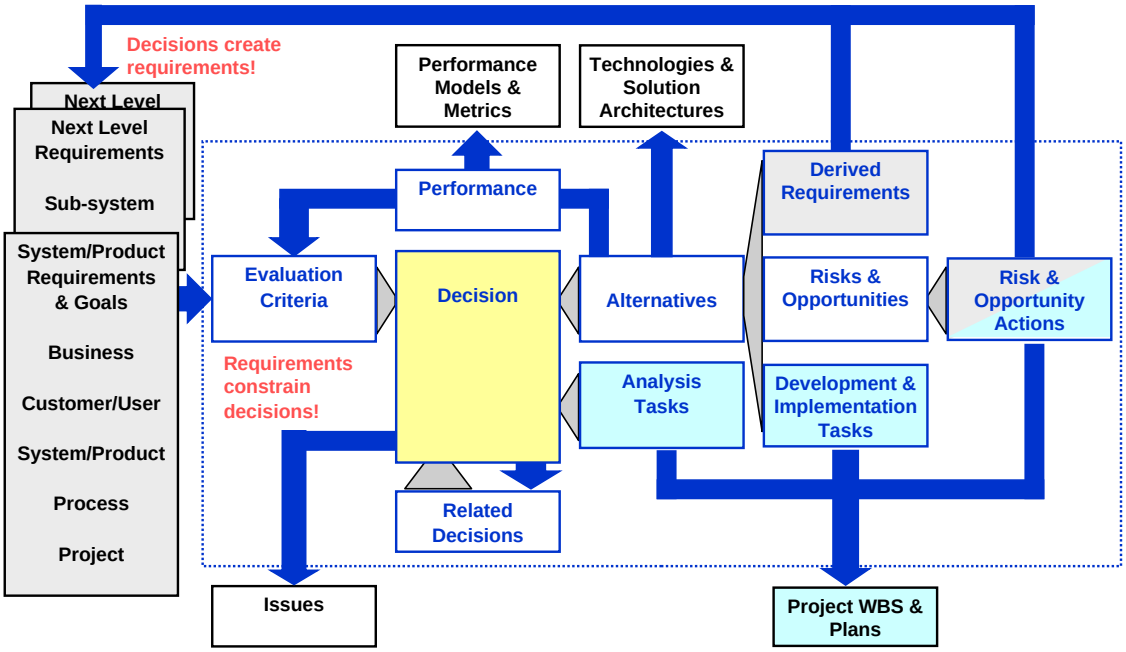
The DDA creates a Decision Network model that can provide the knowledge “glue” for any organization. This enables seamless process-to-process handoffs, all based on a common information model and value-creation methodology.

### 1.2.6 Decisions are Central

The Decision Driven® Approach is based on the belief that DECISIONS are CENTRAL; they are the value-added thinking process that creates and consumes the essential data associated with product development, project management, or business strategy.

The following graphic illustrates the relationship between decisions and the other types of information (object classes) that are essential to any strategy or design process. Document and task-based development processes often lose essential information, particularly relationships between key data elements. A “Decisions are Central” information model captures all relevant knowledge in context of decisions, with explicit traceability to a specific decision and its criteria, alternatives, etc.

# Decisions Are Central




The Information Model includes 12 classes of objects that comprise “decision data”, linked to 5 “external” classes of objects whose meaning/context is dependent on the decision data to which they are linked (arrows on the diagram). Any decision may be broken down into a hierarchy of child objects, as illustrated by the parent-child “fan-out” relationships on the diagram.

| Decisions | Analysis Tasks | | |
|---|---|---|---|
| | Evaluation Criteria | | |
| | Alternatives | Performance | |
| | | Risks | Risk Mitigation Actions |
| | | Opportunities | Opp. Growth Actions |
| | | Development Tasks | |
| | | Implementation Tasks | |
| | | Derived Requirements | |

Three additional types of relationships exist between these 12 classes of objects:

Decision-to-child decision – Form the logical tree of decisions, a Decision Breakdown Structure

Decision-to-decision constraints – Cross-connects that reflect the influence of one decision on decisions in another "branch". These transform the tree of decisions into a network.

Performance-to-evaluation criteria – Form the cells of the evaluation matrix by mapping alternative performance to specific criteria.

The following relationships may be captured between decision data and "external" objects of interest:

Decision-to-issue – Transform a list of issues into a manageable Decision Network

Requirement-to-decision and decision-to-requirement - Capture the actual requirements derivation process. Enable impact analysis to be performed without the need to reinvent the decision rationale.

Alternatives-to-solution descriptions – Associate alternatives with their technology/component descriptions and architectures.

Performance-to-models/metrics – Link alternative performance estimates to the simulations, models or data sources that provide these estimates.

Risk Mitigation/Opportunity Growth Actions-to-plans – Link actions identified to address risks and opportunities to project plans and schedules.

Tasks-to-plans – Link decision analysis and alternative development and implementation tasks to project plans and schedules.

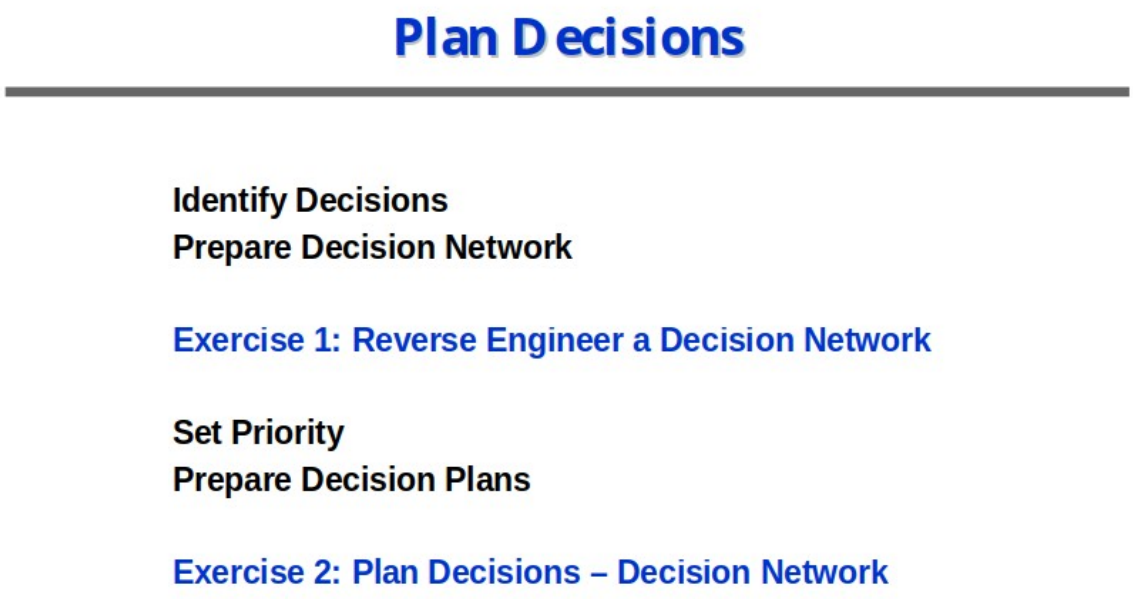
Note that risk mitigation and opportunity growth actions may also be the sources of external requirements.

What essential information and relationships are being lost in your current strategy, technology management and product development processes?

Where are assumptions captured in the DDA Information Model?

## 2 Plan Decisions

Decision-making is a process that can be managed proactively. The Plan Decisions process provides a simple, yet powerful method of identifying in advance the critical decisions that must be made for your success. This process produces a Decision Network that serves as a decision management framework. The Decision Network provides a Decision Breakdown Structure, an overall analysis plan that is tuned to your project goals and constraints. Within this framework, open decisions are prioritized and a realistic, executable Decision Plan is defined for each. This plan will enable you to focus your precious data gathering, analysis, and decision-making resources on the decisions that are most critical to your success.

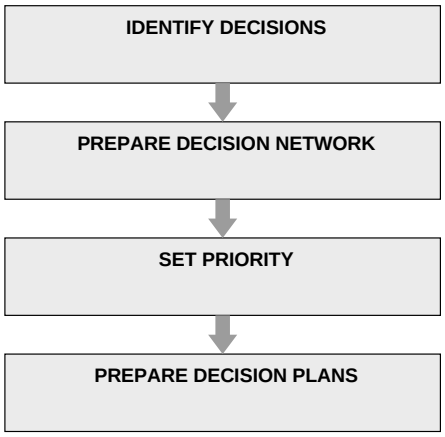



Plan Decisions is the first step in managing decision-making as a process, rather than as a mystical art. This process approach will actually stimulate creativity by providing focus to the your synthesis and evaluation efforts or your team's.

Plan Decisions is normally performed at the beginning of a project or a new strategic initiative and periodically (at major milestones or review points) thereafter. It is important to note that no design decisions are made during the Plan Decisions process. The output is a decision model, a form of **Decision Breakdown Structure**. This Decision Network provides an analysis plan that will help you avoid the common

pitfalls of "diving to detail" and "analysis paralysis" (e.g. spending $100 in analysis effort to make making a $10 decision). Clear ownership will be assigned to each decision. Its scope will be clarified; cost and schedule constraints for the analysis will be communicated.

# Plan Decisions




**KEY POINTS:**

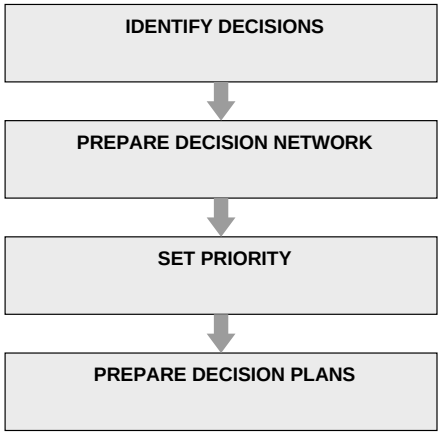
- Proactive management of decisions
  - Decision making is a process
  - Skills can be taught & improved
  - Focus, not stifle, creativity
- Build analysis plan
  - Avoid “diving to detail” & “analysis paralysis”
  - Decision Breakdown Structure
    - Assign ownership for each decision
    - Set budgets/dates
  - Communication tool
    - Decision context and status
- Opportunity for decision reuse
  - Corporate memory for a learning organization

Plan Decisions creates an opportunity for decision reuse. Decision Network Patterns and decision patterns may be used to leverage past analyses. A library of such patterns is an essential element in building a corporate memory for a true "Learning Organization".

Does your organization's culture promote the view that decision-making is a science or an art?

Describe an example of when you've seen or experienced "analysis paralysis" when making a decision.

# Plan Decisions - Steps




**Identify a set of discrete decisions for the project:**

- List decisions made previously, with outcome (preferred alternative)
- List decisions in progress or anticipated during the next phase

**Prepare a Decision Network**

- Time-phased and dependency relationships between decisions
- Adjust decision scope and relationships to partition the "Problem Domain" into studies of manageable size, complexity, & independence

**Prioritize decisions**

- Criticality to system success, innovation opportunity, inherent complexity - unknowns

**Prepare a Decision Plan for each key decision**

- Realistic, executable analysis plan
- Who, what, when, supporting models & analyses, documentation

## 2.1 Identify Decisions

The first step in the Plan Decisions process is to identify the critical decisions that your business or project faces during its next phase or within a reasonable planning horizon such as 3, 6 or 9 months. This is typically performed as a brainstorming process with key members of your project or business team.

Asking the following questions may stimulate brainstorming:

- What important decisions have been made recently?
- What important decisions do we anticipate making in the next N months?
- What decisions have we made in similar projects?
- On what issues or decisions has the customer or management asked for our recommendations?
- What additional decisions will result from each of the decisions we've identified?

Note: While the focus is on Decisions for the next phase, capture and park any decision that is expressed for future review.

Each decision should be given a short title using a focus statement such as "Choose XYZ Interface Protocol" or "Select Maintenance Concept". Use of the verbs CHOOSE or SELECT is recommended to ensure that the issues identified are truly decisions, rather than other types of issues (e.g. problems, risks) or data (e.g. requirements, alternatives, etc.)

The use of decision patterns is highly recommended as a brainstorming aid. These patterns provide lists of typical decisions to be made during the phases of product development. As such, they provide a valuable form of corporate memory that enables decisions to be reused across multiple projects.

Organizations that have experience in using decision patterns have found it even more valuable to rewrite their development processes to be decision-centered.

## 2.2 Prepare Decision Network

After brainstorming has yielded a list of 10-50 decisions, a Decision Network should be prepared that shows the logical relationships between these choices. Decision Networks are typically drawn in a top-down manner, starting from a few parent or root decisions that have been made previously.

A Decision Network is a practical tool that represents a plan of attack for accomplishing the analysis to produce any design, solution, or strategy. Decision Networks are based on two simple observations. First, all complex product designs, processes, or business strategies are defined incrementally. Nothing of any significance is ever fully defined by a single decision; nor are such products defined one requirement at a time. Rather, a set of decisions is made.

Second, decisions are made in real time and may be modeled as a set of discrete events. These events possess logical relationships that may be depicted in network form.

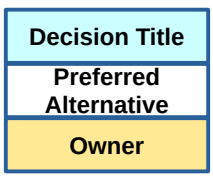
Theoretically any decision is potentially related to any other. Practically this relationship may be may be shown to be one of three types:

Parent-Child: A child decision would not be required and could not be made until the parent decision has been made. Parent-child relationships form a pure hierarchy or decision tree.

Constraint Link: Decisions that are coupled and should be made sequentially. Such coupling typically occurs when two decisions share (compete for) a similar criteria or constraint; one decision is deemed to be the most critical and therefore is shown as a predecessor. Derived requirements from the predecessor decision may constrain the successor decision. Linked decisions transform a set of decision trees into a Decision Network.

Independent: Two decisions are determined to have no or negligible coupling and therefore may be made in parallel.

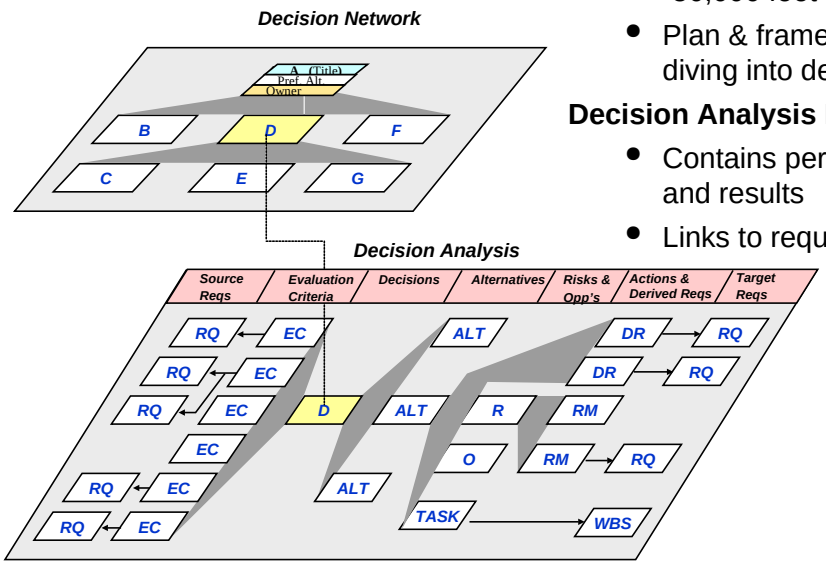
While a specific (though intentionally loose) notation is used to represent a Decision Network, any network drawing approach that supports activity-on-node diagrams, parent-child trees and dependency links may be used. Decisions are typically shown as multi-panel rectangles, with the one panel used for the decision title, a second used for the name of the preferred alternative (solution, if selected). A third panel may be added to identify the decision's owner or other key planning attributes (target date, priority).



### 2.2.1 Decision Management Layer Model

The Decision Network prepared during the Plan Decisions step is the top layer of an information model for decision management. The Decision Network provides a "50,000 foot" view of the decision-making process. It serves to focus resources on the most critical decisions and provides a higher-level method of communication concerning a decision-making situation.

A Decision Analysis information layer exists "below" each decision. This layer contains the explosion of detailed information that makes up the decision rationale. The Decision Analysis layer contains traceability relationships between decision data, the requirements that drive these decisions and the consequences that flow from them.




**Decision Network Layer**

- "50,000 foot" view
- Plan & frame decisions before diving into detail

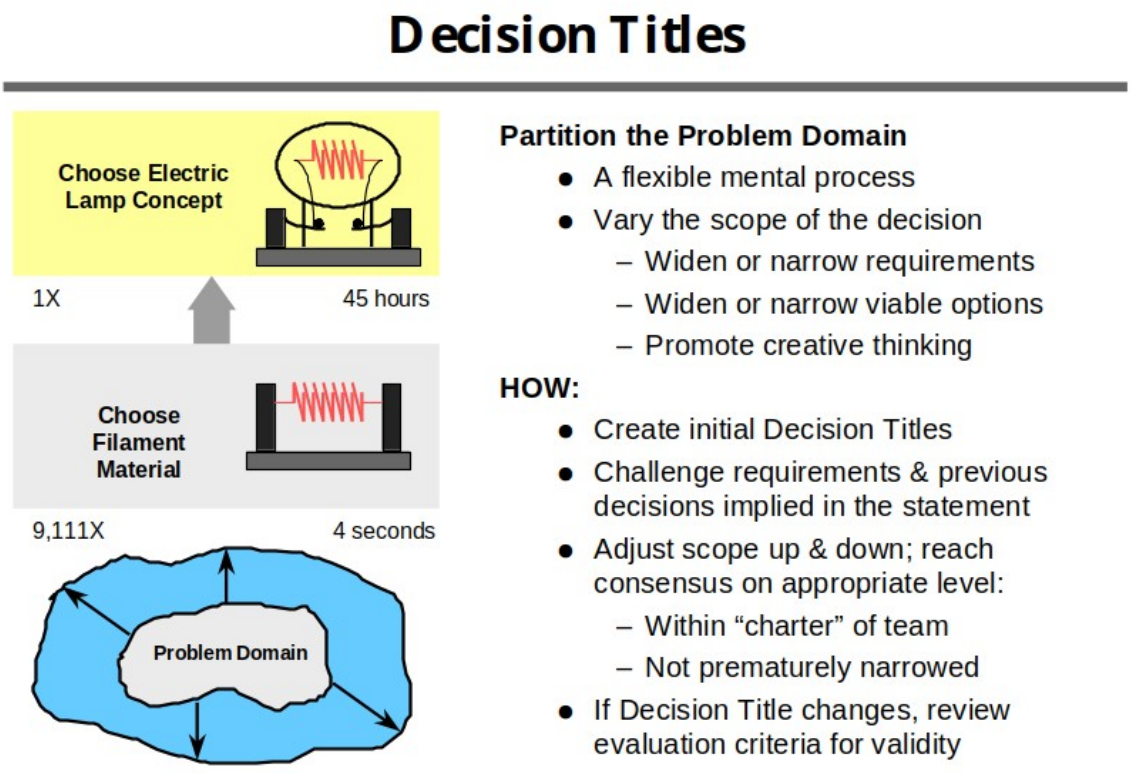
**Decision Analysis Layer**

- Contains performance analysis and results
- Links to requirements & plans

### 2.2.2 Decision Titles

A Decision Title is a focus statement used to define the scope of a specific choice. It is the key to defining the boundary of any individual decision. The ability to write a concise Decision Title is one of the most powerful skills any knowledge worker can gain. Decision Titles partition the Problem Domain into specific choices of manageable complexity. Creating Decision Titles is a flexible mental process, simple to perform, but not easy to perform well.

When Thomas Edison was pursuing the creation of an electric lamp in 1878-1879, he initially (though probably subconsciously) focused his effort on making the decision, "Choose Filament Material". Edison and his team worked feverishly for 18 months on this decision. The results of 9,111 "smoke test" trials was a mere 4 seconds of filament life for any materials investigated. From this experience emerged the famous quote, "Genius is 99% perspiration and 1% inspiration".




If Edison had read this book, he would have realized his need to re-frame this decision and widen its scope to "Choose Electric Lamp Concept" or perhaps "Choose Non-oxidizing Filament System", accelerating his process and saving thousands of filaments.

After an initial Decision Title is created for a specific choice, it should be "flexed" to assess the appropriate scope. This is done by challenging the key adjectives and nouns in the title and proposing modifications that either widen or narrow the decision scope. There is no absolute "right" level for any decision; however, the scope should be consistent with the charter of the decision-maker or team. It should also not be restricted prematurely, without challenging the validity and firmness of prior decisions.

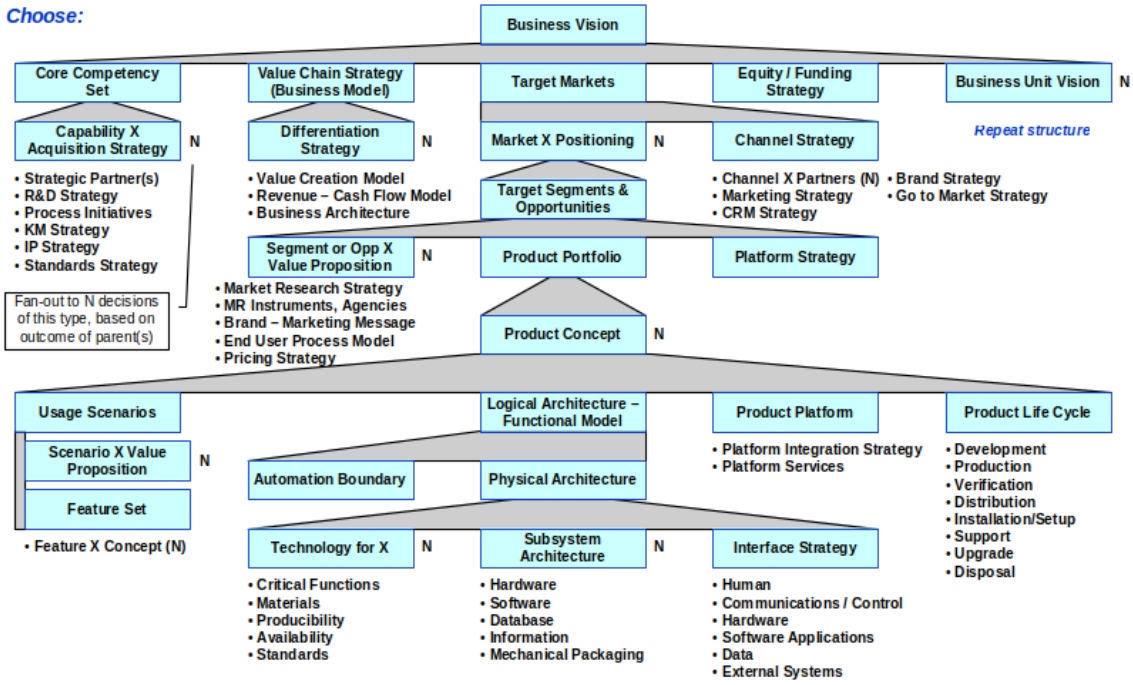
When have you seen broadening the decision scope lead to a breakthrough?

When have you seen an incorrectly framed decision lead to failure?

### 2.2.3 Business/Product Strategy Decision Network

While it is possible to create a Decision Network from scratch, one of the greatest benefits of the Decision Driven® Approach is the reuse of best practices in the form of Decision Network Patterns. The following graphic includes the typical decisions that must be addressed to create a business strategy and the top-level design of a system or product. This Decision Network Pattern may be used as a powerful brainstorming aid when performing a Decision Blitz, a working session during which a project or business is framed as a set of decisions. The pattern highlights the vital questions that must be answered for a strategy or design to be complete and successful. During a Decision Blitz, the “preferred alternative” for each completed decisions is stated (made explicit). The Decision Network structure is adjusted to show the fan-out at the “branch” decision nodes (signified by the “N”). This has the effect of pulling implicit assumptions out of the team so that they may be validated.

# Business/Product Strategy Decision Network




The Decision Network Pattern shows the typical parent-child relationships that exist between the decisions. There may be additional "cross-connects" or constraint links between the choices in your project; these dependencies vary from project to project.

Please note that each Decision Title has been written in a consistent Choose-Adjective-Noun format. You are encouraged to use a consistent syntax and phraseology for all your Decision Titles to improve communications efficiency with your decision stakeholders and contributors.

Identify 3 decisions from the Decision Network Pattern that you have made or participated in making in your work experience.

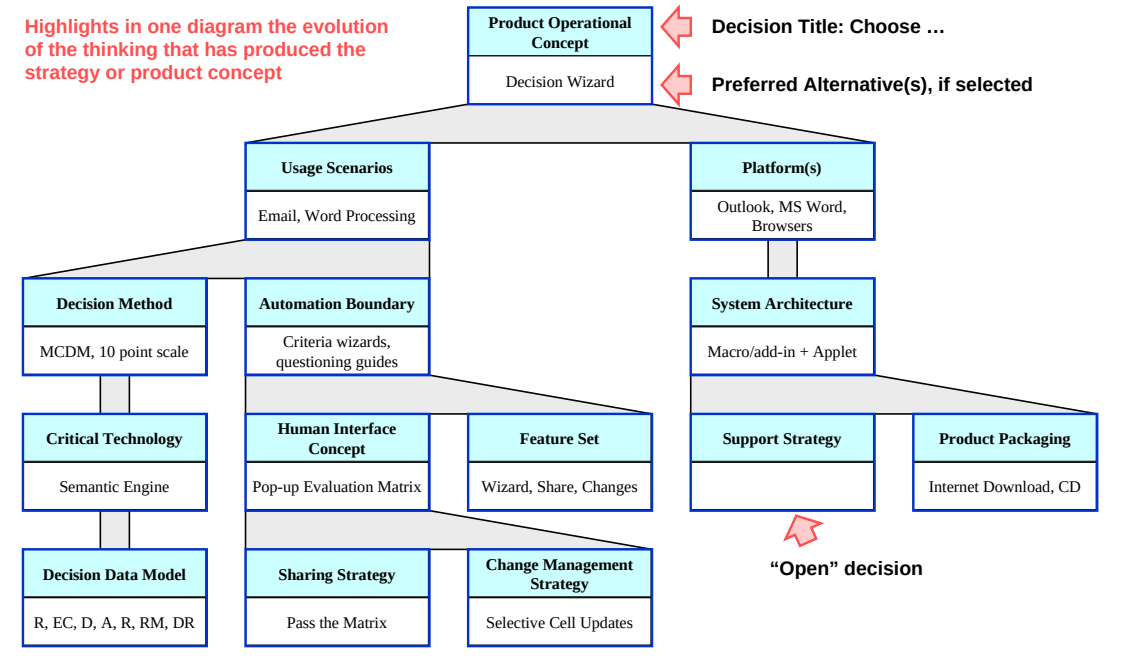
Identify one decision that you are currently facing.

Identify a significant business strategy or product development decision that is missing.

### 2.2.4 Decision Network: Multi-Panel Format

The Decision Network provides a top-level summary of the decision-making process. When a "two-panel" box format is used, the Decision Network presents both the decision management plan and its results (evolution of your thinking) in a single diagram.

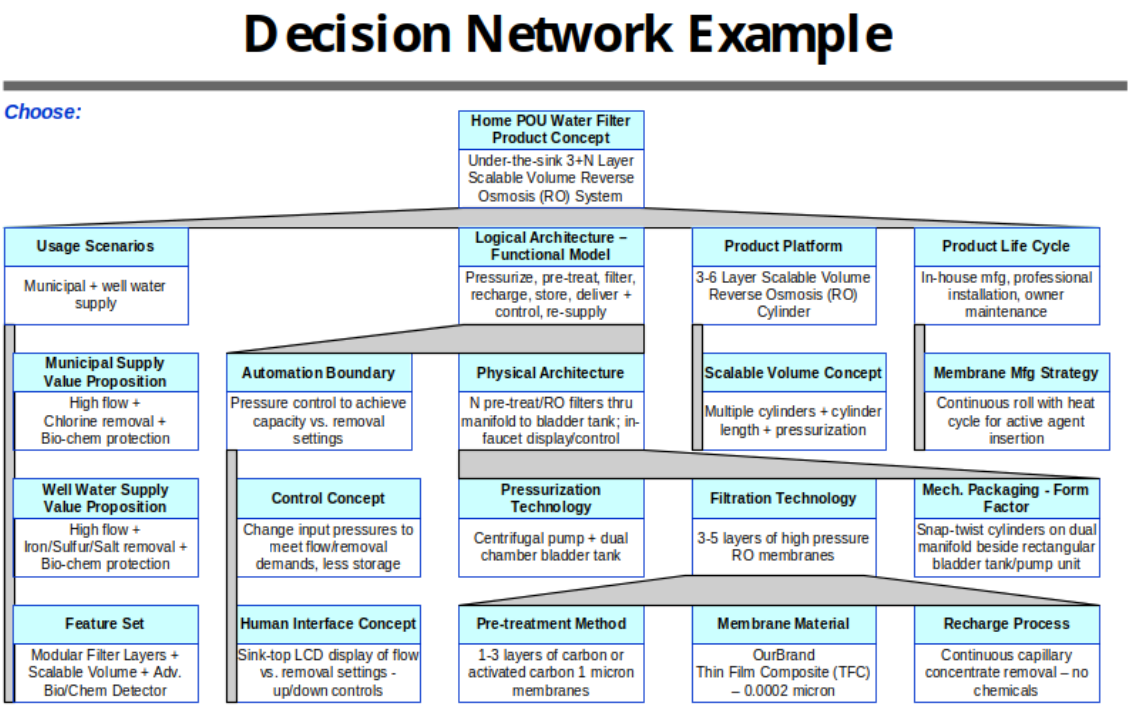
## Decision Network: Multi-Panel Format



Use the two-panel Decision Network format when "reverse engineering" legacy decisions as part of a Decision Blitz. Reverse engineering exposes implicit decisions by asking "What is the current AS-IS solution (preferred alternative) to this question (decision)?" This often leads to hearty debate and the discovery that the existing solution just happened, rather than resulting from analysis and commitment to a specific alternative. You may also turn this thought process around by asking "If X is the answer (AS-IS solution), what was the question (decision)?" In either case, the goal of reverse engineering is to capture both the fundamental questions (decisions) that have shaped the current strategy or design, coupled with an agreement on the current "preferred alternatives" for each decision.

### 2.2.5 Decision Network Example

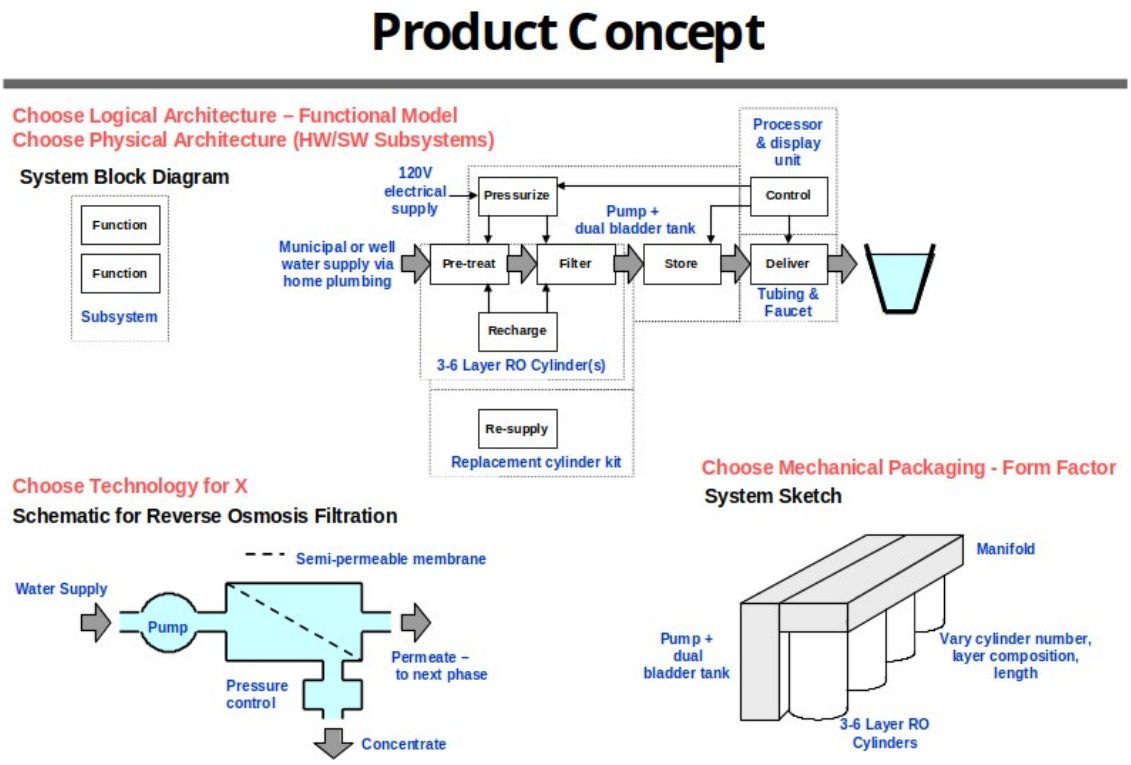
The following graphic represents the Decision Network for a sample product, a Home Point-of-Use Water Filter. This example will be used throughout the book to illustrate various Decision Driven® Approach steps and concepts.




Note how effectively the product concept can be summarized on a single page by a network of 20 decisions, each with a brief statement of the "Preferred Alternative".

How might such a Decision Network be used to orient a new engineer to the project?

The following graphic illustrates the relationship between typical product design decisions (for the Water Filter example) and other common design artifacts (functional flow block diagrams, technology schematics and system sketches or layout drawings).




For two additional decisions on the Home Point-of-Use Water Filter Decision Network, identify how the alternative might be represented in graphical form.

## 2.3 E1: Reverse Engineer a Decision Network

Using the sample Decision Network Pattern as a guide, try your hand at "reverse engineering" the design evolution of a computer projector.

# E1: Reverse Engineer a Decision Network

**Reverse Engineer the decisions that drove the design of a computer projector:**

- Populate the Product Decision Network template on the next slide with Preferred Alternatives for each decision
- Identify 2 additional design decisions that are missing from the template and place them on the Decision Network
  - Capture Preferred Alternative(s) for these decisions also
- Identify a decision that would significantly constrain another "across" the Decision Network. Show this constraint link with an arrow.

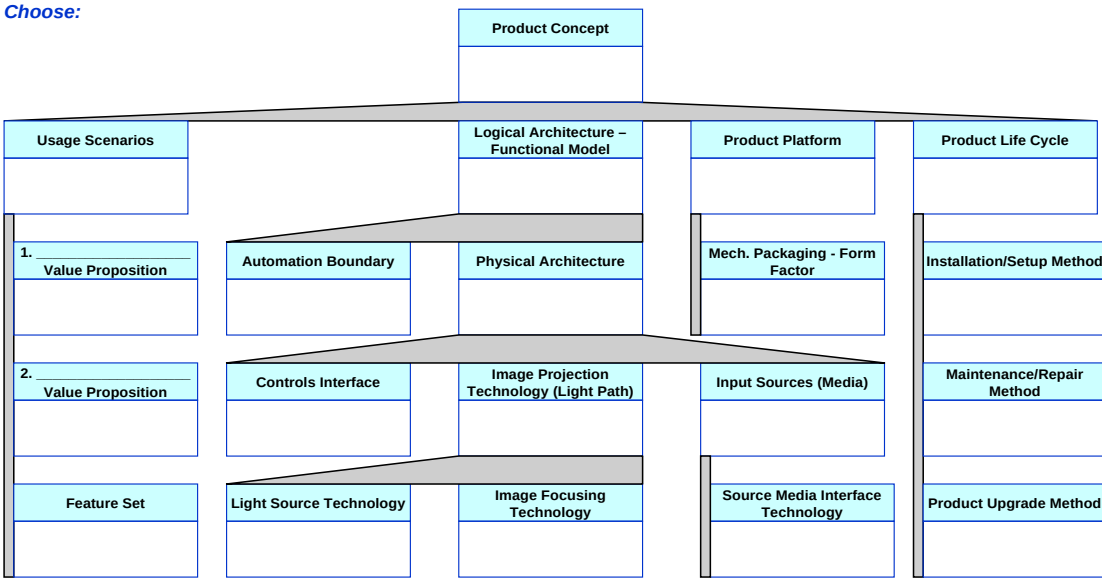
**Share your Decision Network with another team**

- Identify and explain differences between your results
- Where do business/product requirements appear on the Decision Network?

Your Decision Network:

# E1: Reverse Engineer a Decision Network

***Choose:***

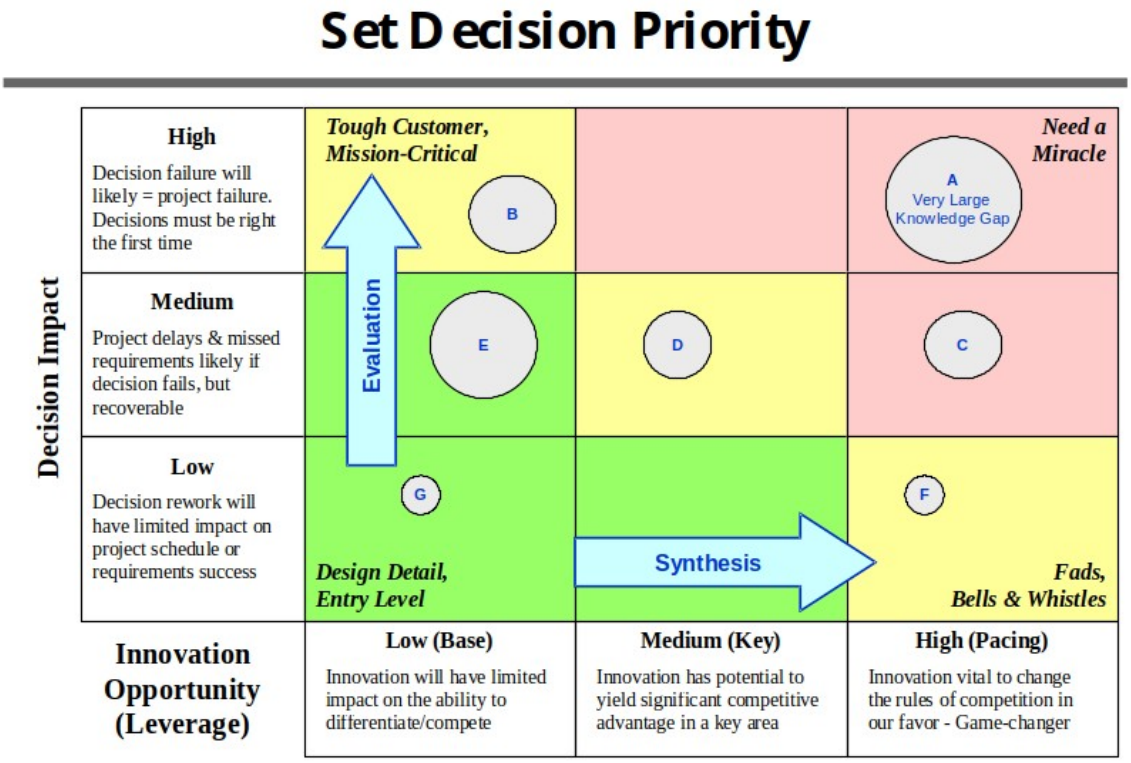



Exercise Notes:

## 2.4 Set Decision Priority

Decision Networks are valuable communication tools that enable teams to rationally discuss decision priorities. Applying the principles of Pareto's Law to decisions, it may be expected that 20% of all decisions identified may make 80% of the contribution to project success or failure.

Decision priorities may be used to focus limited project resources on the most critical choices. The basic principle should be to "tailor the rigor to the risk". High-risk decisions, critical to project success, should be considered for significant data gathering and analysis effort (via simulation, prototyping, vendor or market research); lower priority choices are often made by a "paper-only" analysis based on the team's experience.



A Decision Network provides a very powerful focusing tool for a project or business team. Considering multiple factors when setting decision priorities may enhance its focusing power.

The Decision Priority Matrix shown above supports prioritization against three factors in Bubble Diagram form:

- Decision Impact – How important is it to make the decision right the first time?
- Innovation Opportunity (Leverage) – How much competitive advantage could result from innovation in this decision?
- Knowledge Gap – How little do we know either about the stakeholders' needs or concerning the solutions available?

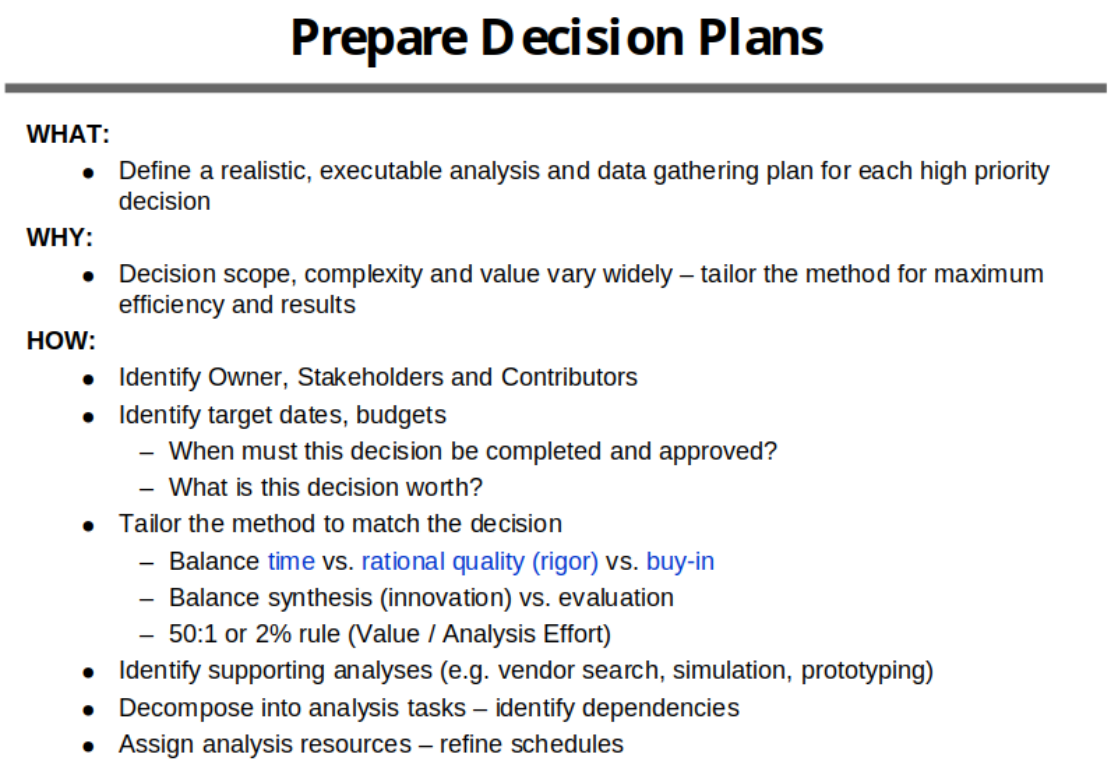
A High value for Decision Impact should trigger significant investment in the rigor and effort applied to the evaluation process, perhaps through simulation, modeling and prototyping. A High value for Innovation Opportunity should lead to a greater investment in creative synthesis techniques and the addition of "out-of-the-box" thinkers to the team. A High value for Knowledge Gap indicates the need for increased effort in market research or technology/solution R&D (and perhaps a valid question concerning the likelihood of achieving success).

The circles labeled "A" through "G" are the suggested sequence of decision consideration for focus. Your needs could change this order.

## 2.5 Prepare Decision Plans

A brief Decision Plan should be prepared for all decisions, with additional planning detail supplied for high priority decisions. All Decision Plans should include the following data:

- Clear definition of the decision's scope.
- Decision priority.
- Assignment of the decision to an individual owner.
- Identification of key stakeholders and contributors.
- Team responsibility for analysis activities.
- Target date for completion.
- Budget for the analysis.



## 2.6 E2: Plan Decisions - Decision Network

It is now time to roll up our sleeves and build a decision model of your current project, strategy and/or product design. This exercise will lay the foundation for your hands-on application efforts throughout the remainder of the book. Please focus on the high priority decisions that you would be working on for your example!

Using the sample Decision Network as a guide, prepare a Decision Network for your project, business strategy and/or product design.

If a Decision Network has already been framed through a reverse engineering or a Decision Blitz, then use this exercise to validate and extend the decision model and take ownership of its contents.

AREA OF FOCUS:

TEAM MEMBERS:

# E2: Plan Decisions - Decision Network

**For your current project:**

- List significant decisions (business, technical, project management) that have been made to date.
- Use a Decision Title (Choose_____) format.
  - Identify the preferred alternative for completed decisions
- Add decisions currently in process or anticipated during the next __ months. Use the Decision Patterns provided as an aid.
- Prepare a Decision Network (2 panel format) to represent the logical dependency relationships between these choices.
- Test the Decision Titles and adjust the decision scope as needed. Modify the network to reflect the desired scope & dependencies.
- Populate the Decision Priority Matrix with “open” decisions
  - Capture 1 decision in every “cell”; Knowledge Gap = bubble size
- For the top 2 decisions capture a brief Decision Plan:
  - Owner, stakeholders, target date/budget, supporting analyses

Exercise Notes:

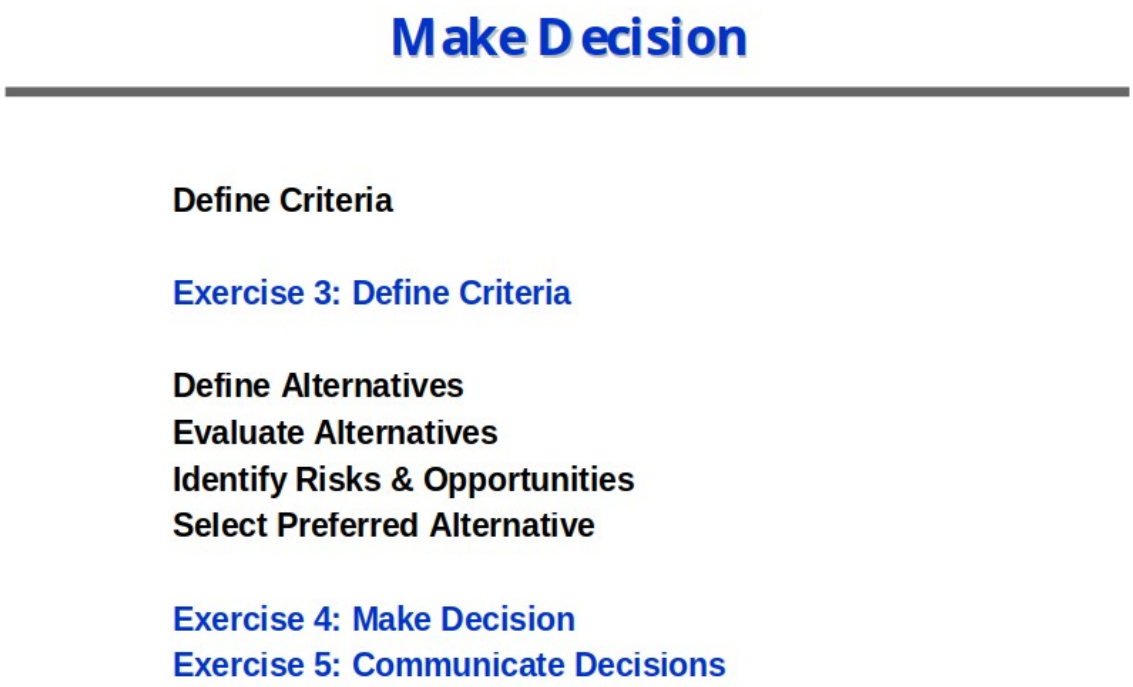
# E2: Decision Priority Matrix

| Decision Impact | | | | |
|---|---|---|---|---|
| | **High**<br>Decision failure will likely = project failure. Decisions must be right the first time | | | |
| | **Medium**<br>Project delays & missed requirements likely if decision fails, but recoverable | | | |
| | **Low**<br>Decision rework will have limited impact on project schedule or requirements success | | | |
| | **Innovation Opportunity (Leverage)** | **Low (Base)**<br>Innovation will have limited impact on the ability to differentiate/compete | **Medium (Key)**<br>Innovation has potential to yield significant competitive advantage in a key area | **High (Pacing)**<br>Innovation vital to change the rules of competition in our favor - Game-changer |

Exercise Notes:

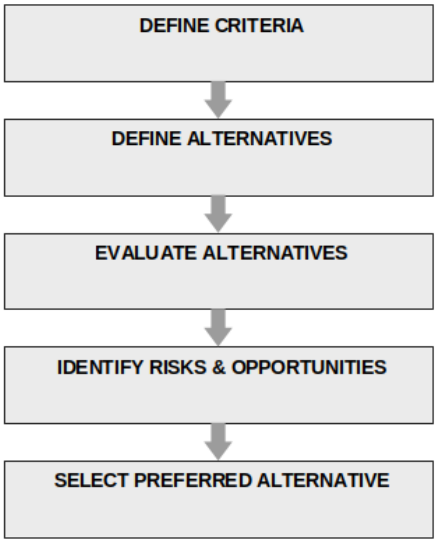
# 3 Make Decision

The Make Decision process is based on a synthesis of the proven techniques employed by various multi-criteria decision-making methods. These steps are performed once for each decision identified in the project Decision Network. The objective of this process is to improve the effectiveness and efficiency of your decision-making efforts. A successful decision is one that is made on time (within project schedule and budget constraints) and right the first time (provides a viable and optimum solution).




While the Make Decision process defines the steps that should be performed for every decision, there is much room for tailoring how the process is applied. The following graphic includes some tips for effective use of the Make Decision process.

# Make Decision

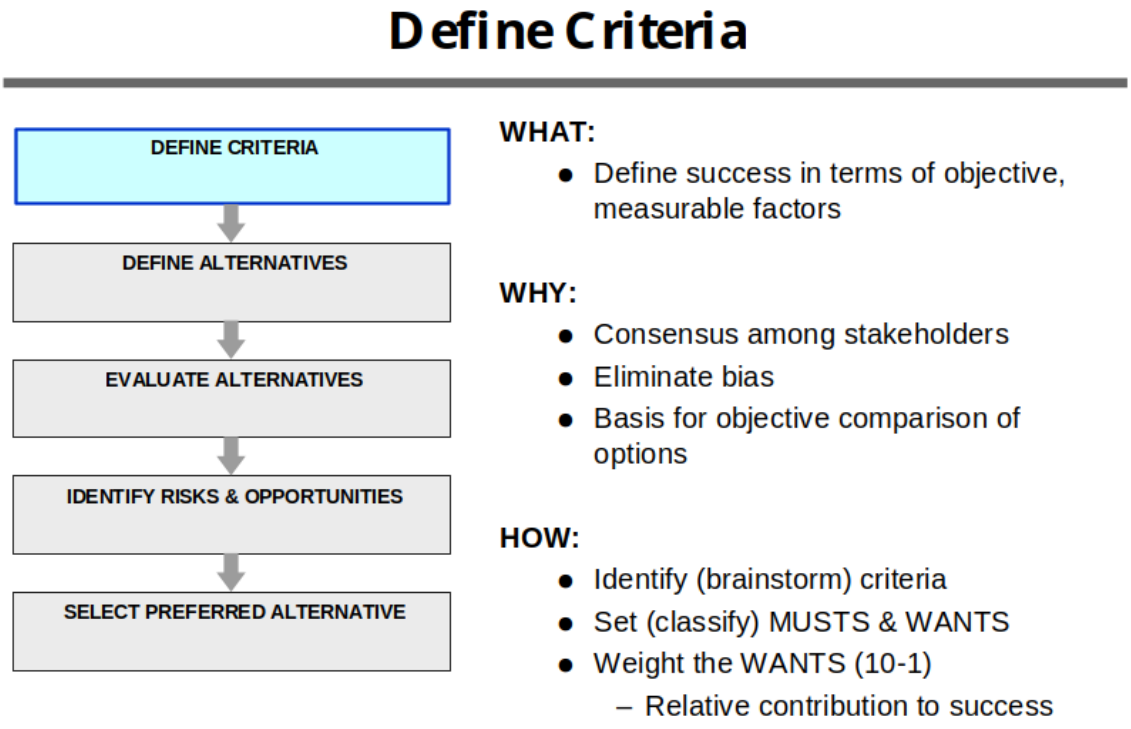



**KEY POINTS:**

- Focus on one decision at a time
- Define criteria prior to alternatives
  - Limits bias
- Stakeholder Review
  - Allow incubation period
  - Audit criteria against checklist
- Use criteria as data gathering plan
- Delegate steps for efficiency
  - Not “design-by-committee”
- Tailor rigor to criticality & risk
- Document decision rationale & outcome
  - Evaluation Matrix
  - Preferred alternative

### 3.1 Define Criteria

Success for any specific decision may be defined in terms of a set of evaluation criteria. Evaluation criteria are the set of factors that are used to assess the viability and "goodness" of proposed alternatives. Evaluation criteria should be defined and approved by all the stakeholders in the decision prior to consideration of the solution options. This helps prevent bias that may be introduced when one stakeholder has a personal favorite alternative. This can also restrain a team from prematurely locking in on a single solution and experiencing tunnel vision.




The process of defining criteria is an opportunity for building consensus among stakeholders, many of whom have valid goals that may be in opposition to one another. Time spent at this step is essential not only to choosing the right solution, but also to building commitment to its implementation.

### 3.1.1 Identify Criteria

You may identify evaluation criteria by brainstorming a set of objectives and constraints associated with the current decision. Brainstorming should focus on the decision title and ask, "For this specific decision: . . . . . "

- What are the minimum results that are required of any viable solution?
- What factors will we use to measure the effectiveness of the alternatives in meeting our objectives?
- What constraints impose limits on proposed solutions?
- What factors would cause one of our stakeholders to walk away from our decision?

Over time your organization will find that decision patterns (and similar prior decisions) are extremely valuable sources of criteria. Experience indicates that use of decision patterns can reduce the time/effort required to define criteria by at least 80%, when compared to brainstorming criteria from scratch. Patterns also improve decision quality by making it less likely that an important criterion is overlooked in the analysis.

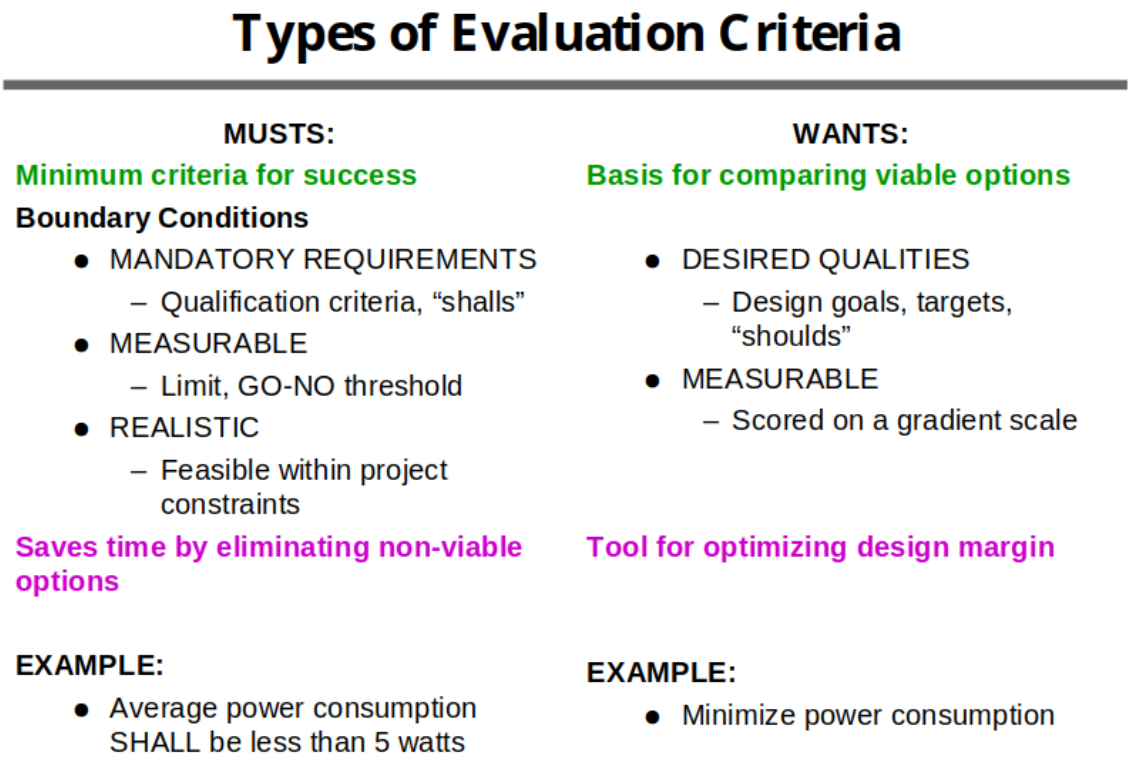
### 3.1.2 Types of Evaluation Criteria

Evaluation criteria may be grouped into two categories, MUSTS (or requirements, shalls, or specs) and WANTS (goals, shoulds, desires).

MUSTS are the minimum criteria for success in any decision. MUSTS are used to assess the viability of proposed alternatives and screen out those that don't satisfy these constraints. MUSTS save precious analysis time by helping the decision-maker quickly rule out alternatives that don't meet the boundary conditions for success. To be useful for GO-NO GO screening, all MUSTS should have clearly defined pass-fail or specification limits.

WANTS are the basis for objective comparison of the viable alternatives. WANTS provide a yardstick for measuring the effectiveness or goodness of the alternatives.

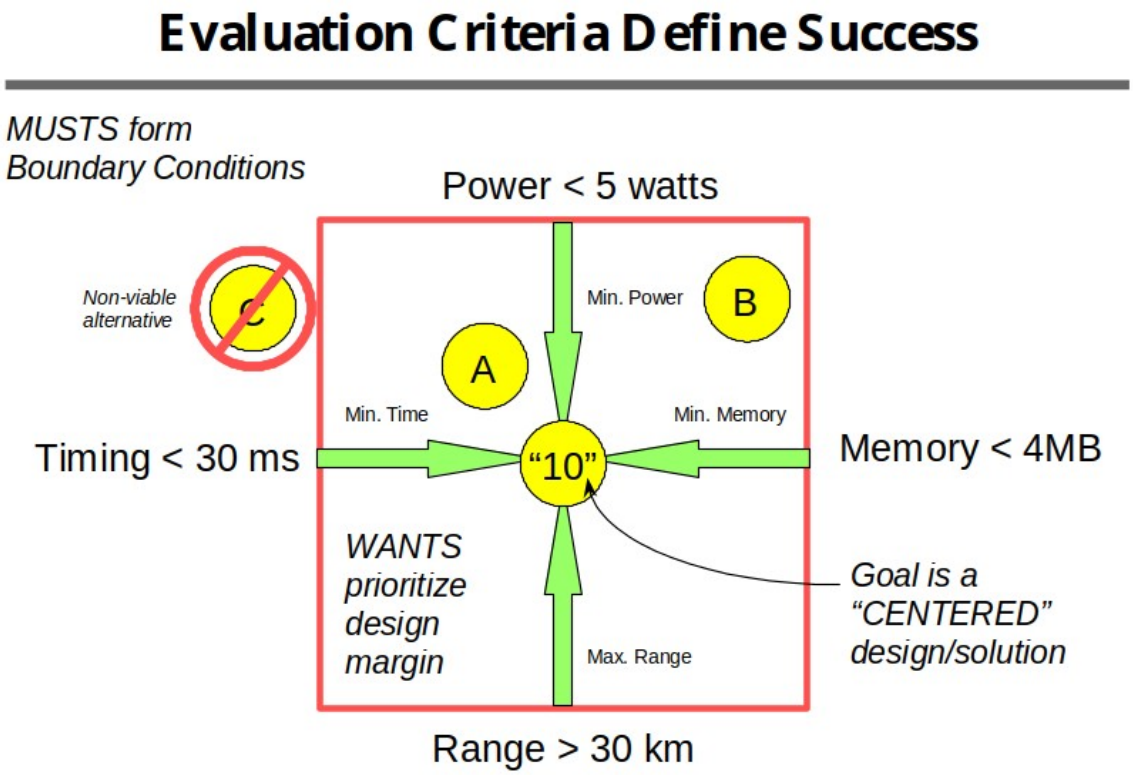
Theoretically, there could be at least one MUST paired with each WANT and vice versa. For example, a MUST, "Costs less than $50", could have a paired WANT, "Minimize cost".




### 3.1.3 Evaluation Criteria Define Success

Product development processes use the terms "centered design" or "balanced design" to define the best fit solution for a decision. As shown in the following graphic, MUST criteria may be thought of as the boundaries of an N-dimension "box".

WANTS may be viewed as a method of prioritizing design margin inside the box, so that a centered solution is found that best balances all factors. Weights on the WANTS express a preference for design margin in one factor over another. Weights answer the question, "Assuming their MUST limits are satisfied, how important is additional margin in Factor A compared to margin in Factor B?"




### 3.1.4 Weight WANTS

All WANTS should be weighted on a relative scale to reflect their importance. Any numeric scale may be used. A 10-1 scale is most commonly used.

A variety of techniques may be used when assigning weights; the simplest approach is to assign the most important WANT a weight of 10 and then weight all other WANTS relative to the "10". More than one criterion may be assigned the same weight, i.e. there may be two 10's or three 7's. Note that WANTS are weighted, not ranked, so that relative importance may be accurately reflected.

Whenever a paired MUST exists for a WANT, the WANT should be weighted in terms of the **value of additional margin** provided within the MUST limit. In the previous cost example, the weight of the "Minimize cost" WANT should be set by asking, "Given that the cost will be less than $50, how important are further reductions in cost when compared with other criteria?"

### 3.1.5 Evaluation Criteria Template

It is quite helpful to use a consistent model or template when defining evaluation criteria. Criteria templates save decision-making time, improve decision quality by preventing key factors from falling through the cracks and improve communications by applying a consistent set of criteria categories (based on a common thinking model) across all decisions.

The following graphic advocates a six-factor model that may be used with any decision.

- Cost
- Schedule
- Performance
- Compliance
- Compatibility
- Consistency

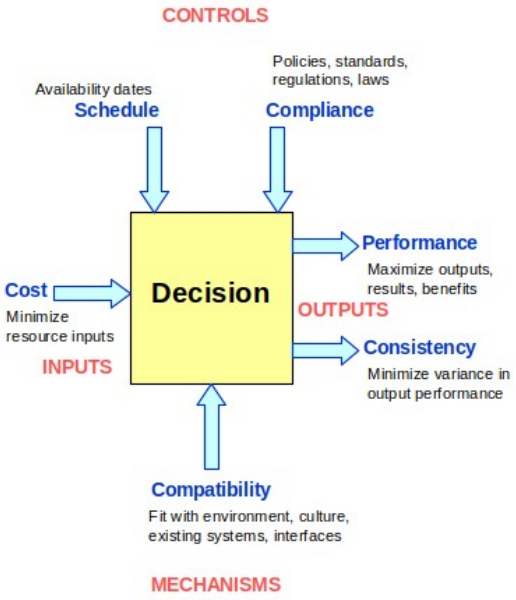
The criteria template is used as a brainstorming aid to ensure that all types of factors are considered in each decision. There are typically multiple criteria defined for each category with Performance factors representing the largest number of criteria and total weight.

Alternate models may be used. The following model is based on the IDEF model of any system.

- Inputs (resources to be minimized or consumed)
- Outputs (results to be maximized or produced)
- Controls (Laws, regulations, or policies to be complied with)
- Mechanisms (Environmental factors to be compatible with)

Global use of a criteria template across multiple classes of decisions (business, system, project, process, organization) is a very advanced form of Organizational Learning.

# Evaluation Criteria Template




**Generic criteria model ($C^4SP$)**

- Decision = System (Black box)
- Criteria brainstorming aid
- Stakeholder review checklist

**Cost**

- Non-recurring, recurring, $, hours

**Schedule**

- Time to capability, available by ?

**Performance**

- Effectiveness, results, benefits

**Compliance**

- Internal/external constraints

**Compatibility**

- Environment, interfaces

**Consistency**

- Variance, robustness

Identify at least two (2) criteria in each category for a typical decision that you face:

DECISION: Choose _____

CRITERIA:

Cost -

Schedule -

Performance -

Compliance -

Compatibility -

Consistency -

Which criteria category drives the majority of your decisions?

From your experience, which criteria category creates the largest number of MUSTS/WANTS?

### 3.1.6 Criteria – Example

The Evaluation Criteria for the sample decision, "Choose Home Point-of-Use Water Filter Concept", are shown in the following graphic.

## Criteria - Example

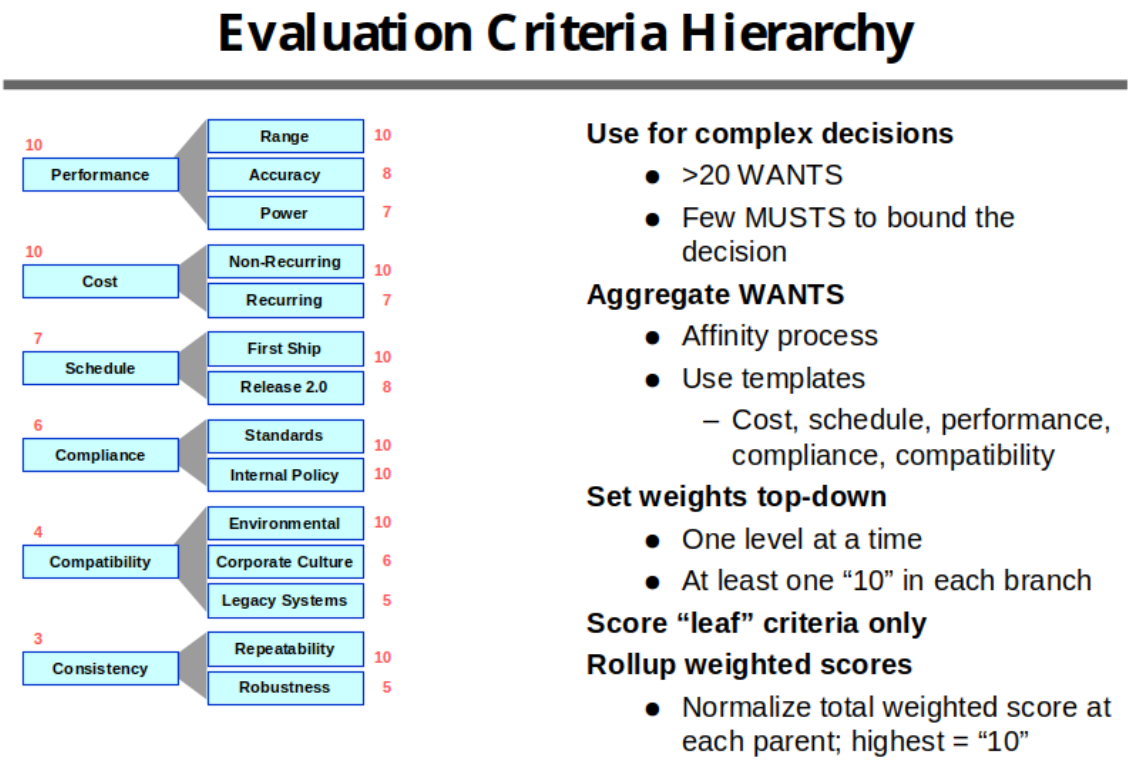
**Decision:** Choose Home Point-of-Use Water Filter Concept

| Category | Wt. | WANTS | MUST Limit |
|---|---|---|---|
| Performance | 10 | **Iron/sulfur/chlorine/salt removal capability** | > 90% vs. standard spectrum |
| Cost | 10 | **Initial (non-recurring) cost** | < $500 new, $800 retrofit |
| Performance | 10 | **One gallon - One glass fill time** | < 60 / 20 seconds |
| Performance | 8 | **Chemical hazard removal capability** (range of hazards, % removal) | |
| Cost | 8 | **Recurring cost** (annual) | < $100 |
| Performance | 7 | **Biological hazard removal capability** (range of hazards, % removal) | |
| Consistency | 7 | **Water quality consistency** (vs. inputs, environment, life/duty cycle) | |
| Cost | 7 | **System life** | > 5 years |
| Compatibility | 6 | **Retrofit compatibility** (with existing plumbing/electrical fixtures, etc.) | |
| Schedule | 5 | **Filter replacement period** | > 3 months |
| Compatibility | 5 | **Strategic compatibility** (vs. market, product line, technology) | |
| Compatibility | 4 | **Footprint** | Fits std. kitchen with disposal |
| Performance | 3 | **Daily delivery capacity** | > 5 gallons per day |
| Performance | 3 | **System health/status awareness** | |
| Performance | 2 | **"Cool" water temperature** (~ 55 deg. F) | |
| Cost | 2 | **Waste water usage** (effluent volume compared to "good water") | |

As a stakeholder in this decision (someone who wants to drink pure water at home), suggest additional criteria or a change to this set of criteria that would better reflect your interests and goals.

### 3.1.7 Evaluation Criteria Hierarchy

Complex decisions with 20+ evaluation criteria may benefit from the use of a hierarchy in the evaluation criteria. This is particularly valuable when weighting the WANTS. It is difficult for human beings to mentally compare large sets of items. A hierarchical approach enables the user to weight major criteria first, then their child criteria.




### 3.1.8 Financial Criteria

Technical decisions often suffer from a lack of clearly and consistently stated financial criteria. This results from a "Design for Performance" paradigm, aggravated by the lack of a universally accepted standard for financial metrics (across industries and vertically within an organization).

Financial factors are relevant to almost all decisions, but are often expressed in units that cannot be easily related to the criteria in higher-level business choices. Decision

effectiveness can be improved if an organization uses a coherent set of financial criteria that covers the broadest possible range of decisions.

It is recommended that you use the financial criteria models that follow as a starting point for building your organization's standard set of financial criteria.

## Financial Criteria

**Develop standard financial criteria for use in all decisions**

- Improve communications and understanding of business drivers
- Support rollups across multiple decisions
- Avoid redundancy
- Balance performance criteria (engineers don't care about money!)

**Various models:**

- Recurring vs. Non-recurring costs
- Development Cost (yours) vs. Cost of Ownership (customers)
- Net Present Value (of future cash flows)
  - Handles income and expense over time as a single factor
  - Doesn't replace qualitative criteria - no magic equation
- Business Metrics
  - N-year Sales ($ or Share of Total Available Market)
  - Return on Assets = Asset Turnover X Profit % $\left(\frac{\text{Sales}}{\text{Capital}} \times \frac{\text{Net Profit}}{\text{Sales}}\right)$

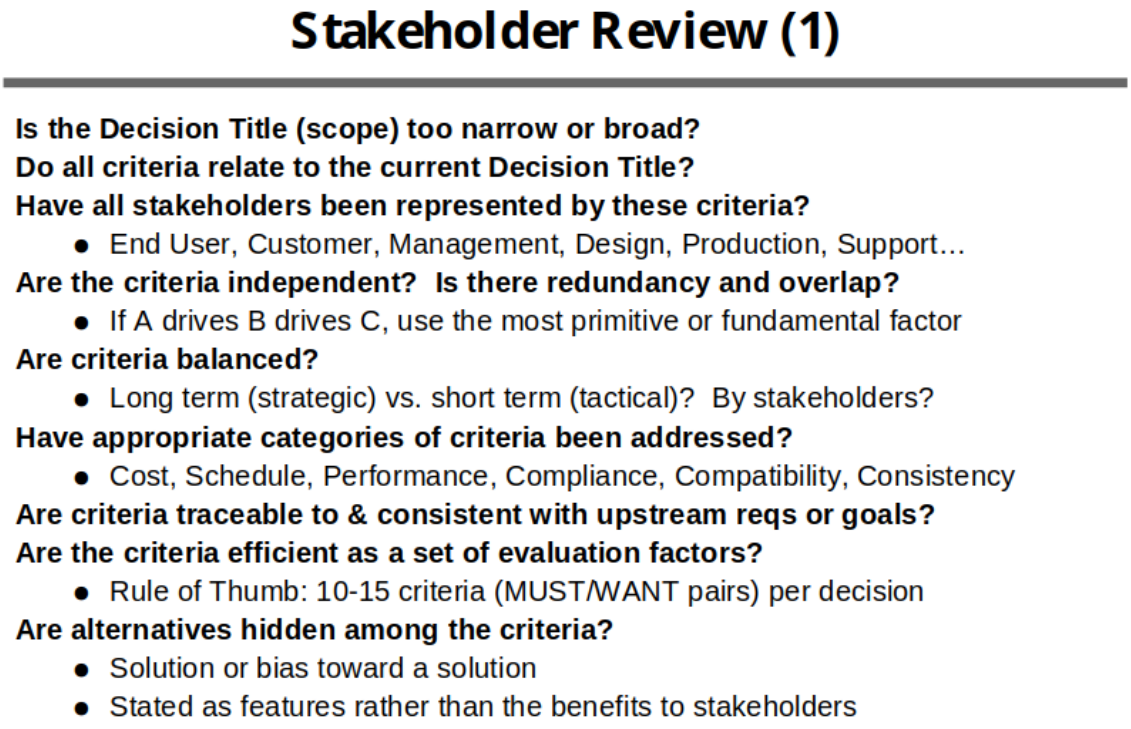
What financial criteria are most broadly used in your organization today?

What engineering criteria are the primary drivers of your financial metrics?

### 3.1.9 Evaluation Criteria - Stakeholder Review

Evaluation Criteria are the primary method by which decision stakeholders influence the outcome of a decision. For the sake of efficiency, all stakeholders do not need to participate in the initial generation of evaluation criteria. However, after a core team has generated the initial criteria set, a Stakeholder Review should be conducted to obtain stakeholder approval. It is helpful for the stakeholder review to occur one or two days after the criteria are generated to provide an incubation period for new criteria or proposed changes to emerge.

The following graphics include the typical questions to be asked during a Stakeholder Review. These questions cover both the quality of individual criteria and the completeness, consistency, and validity of the entire set of criteria for the current decision.



# Stakeholder Review (2)

**Is each MUST clear and:**

- Mandatory? - stakeholders agree that this is essential to success
- Measurable? - clear GO - NO GO limit
  - Expressed in criteria type, target value, units
  - Not always equal to specification limit or acceptance criterion
- Realistic? - feasible in current context

**Is each MUST paired with a WANT and vice versa?**

- Weights on WANTS based on size of "BOX" formed by MUSTS

**Is each WANT clear and measurable?**

- Expressed in criteria type, units
- Full definition captured and agreed to by stakeholders
  - CLUE: Wide variance in proposed weights?

**Is the Decision Title (scope) still valid?**

- Any change requires re-validation of the criteria

From your experience, which questions are most commonly overlooked when making decisions?

Share a decision in which a stakeholder review could have prevented an error in decision-making.

## 3.2 E3: Define Criteria

It is now time to dive into the Decision Network that you prepared for your project. In this exercise, you will begin the Make Decision process by defining the evaluation criteria for a high priority, current decision that you are facing.

DECISION:

STAKEHOLDERS:

# E3: Define Criteria

**Begin the Make Decision process for a key business/project decision**

- Use a high priority, OPEN decision for which you have a reasonable knowledge of the stakeholders' needs and possible solutions

**Capture the Decision Title in "Choose _____" format**

- Test the scope of the decision before proceeding
- Refine the Decision Title as needed

**Brainstorm 10-15 evaluation criteria.**

- Use the Criteria Template as a brainstorming aid
- Capture first as WANTS in the Criteria Table
- Create MUSTS from WANTS by identifying "GO-NO GO" limits
- Weight the WANTS

**Conduct a Stakeholder Review to validate and refine the criteria**

- Highlight unknowns and identify stakeholders to contact
- Be prepared to share your criteria with the class

# E3: Evaluation Criteria

| Category | Wt. | WANTS | MUST Limit |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
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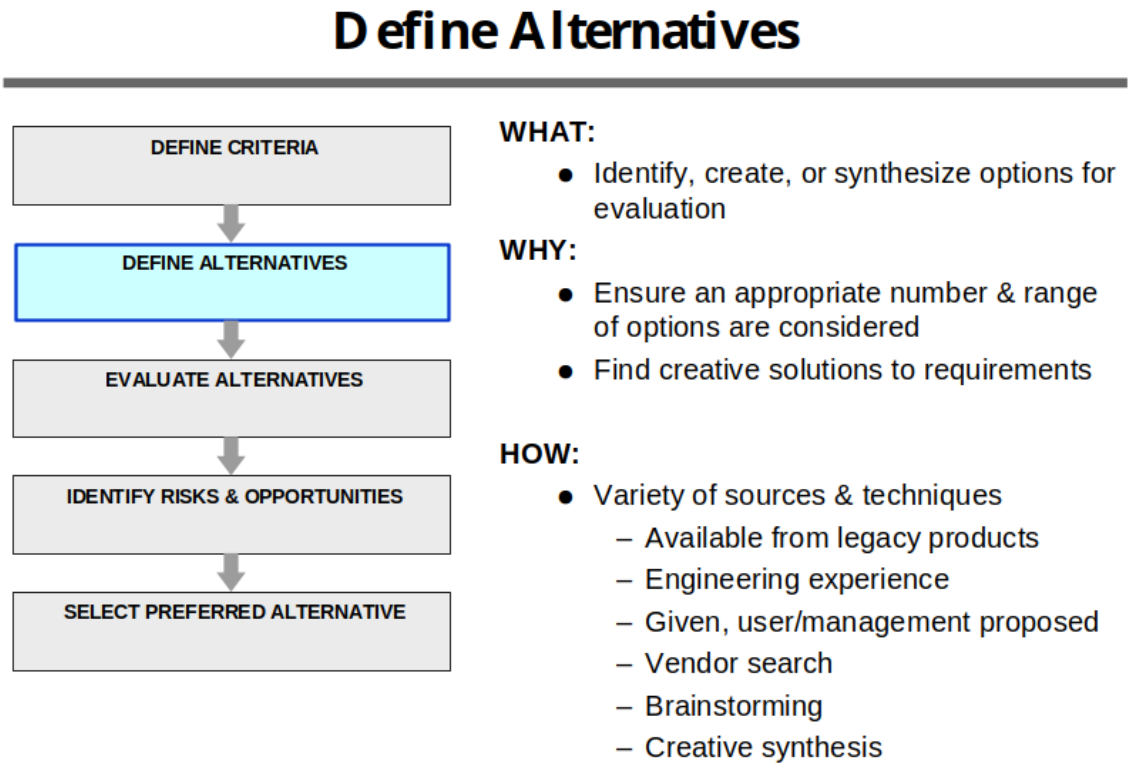
Exercise Notes:

### 3.3 Define Alternatives

Alternatives are the solution options that are either created or identified to satisfy the objectives of a decision. Alternatives are often available off-the-shelf based on previous experience or through vendor research. Alternatives may also be synthesized by combining available components and partial solutions in new and creative ways.



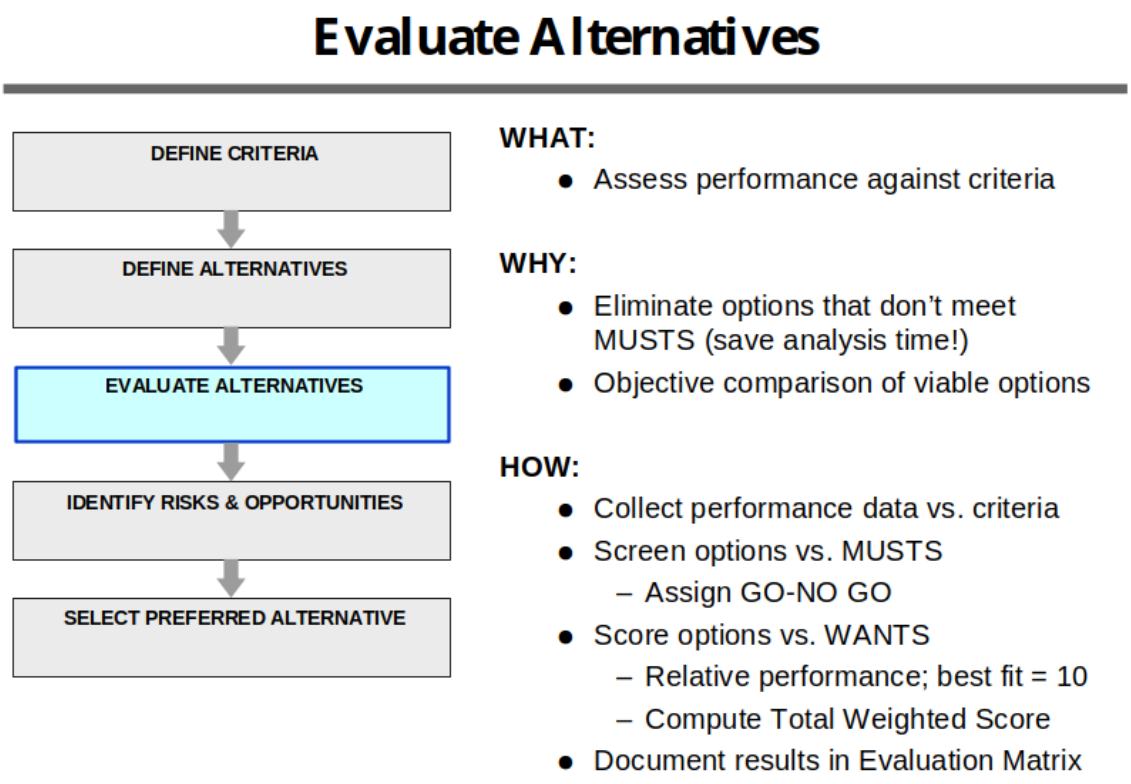

An infinite number of alternatives are available for any decision. Practically, a broad range of alternatives (5-15) are typically identified through brainstorming and a smaller number of alternatives (3-6) are formally evaluated.

At a minimum, alternatives should be given a short title that distinguishes them from other options. A textual description should be provided to clarify the details of the solution, supplemented by figures, models or supporting data where appropriate. Alternatives should be described factually; evaluation of their performance will be done later.

When a large number of alternatives have been identified for a decision, it can be quite costly to fully evaluate each option. In order to manage this complexity, it is often efficient to group alternatives into families, evaluate and select the best family of options, and then select the best specific solution. When few options exist or a binary choice has been proposed, new options may be created by synthesis, picking the best features of existing solutions to form a new approach.

### 3.4 Evaluate Alternatives

In the Evaluate Alternatives step, each alternative that has been nominated for formal evaluation is compared objectively against all the evaluation criteria. This analysis is typically visualized as the task of populating an Evaluation Matrix. An Evaluation Matrix provides an efficient method of capturing and communicating decision rationale. It serves initially as a data-gathering plan; each cell in the matrix represents performance data of a specific alternative against a single MUST or WANT (or MUST/WANT pair).




Alternatives should first be compared with each MUST criterion and assigned a GO-NO GO rating based on their performance against the MUST limit. Alternatives that fail on one or more MUSTS are considered non-viable and eliminated from further analysis.

Viable alternatives should then be evaluated against the WANTS. To do this, identify the alternative that performs best against a specific WANT and assign that alternative a best-fit score of 10. Then assess the relative effectiveness of the remaining alternatives. An alternative that is 60% as effective as the best-fit alternative should be assigned a score of 6 against this criterion. When scoring is completed for all alternatives, repeat the process for the next WANT.

All data used to justify the GO-NO GO and scoring assessment should be captured (summarized) in the Evaluation Matrix. This should include documentation of the source and uncertainty associated with the performance data. Capturing this rationale enables decision-makers to factor data uncertainty into their final deliberations.

A weighted score is produced for each alternative by summing up the Weight X Score product for the alternative against all the WANTS. The Total Weighted Score for each alternative serves as a figure of merit or overall measure of effectiveness. A Normalized Weighted Score is often used to simplify communicating the relative effectiveness of each alternative.

A typical Evaluation Matrix is shown in the following graphic.

## Evaluation Matrix - Example

**Decision:** Choose Home Point-of-Use Water Filter Concept

| | | | Alternatives | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EVALUATION CRITERIA | | | Under-the-sink 3+N Layer Scalable Volume RO system | | | | In-the-fridge 3 Layer RO system | | | | In-the-tap 2 Layer mini-RO system | | | | At-the-tap 1 Layer pass-through filter | | | |
| Wt | WANTS | MUST Limit | Performance | Go | Sc | Ws | Performance | Go | Sc | Ws | Performance | Go | Sc | Ws | Performance | Go | Sc | Ws |
| 10 | Iron/sulfur/chlorine/salt removal | > 90% | > 98% for 5-6 layer; > 99% tuned layers | Go | 10 | 100 | > 95% for 3 layer RO system | Go | 6 | 60 | > 92% for 2 layer mini-RO system | Go | 2 | 20 | > 90% for 1 layer, but short filter life | Go? | | |
| 10 | Initial (non-recurring) cost | < $500 new, $800 retrofit | New $450 Retrofit $700 | Go | 1 | 10 | New $300 Retrofit $400 | Go | 5 | 50 | New $150 Retrofit $200 | Go | 10 | 100 | New or Retrofit: $100 | Go | | |
| 10 | 1 gal - 1 glass fill time | < 60 / 20 sec. | 30 / 5 sec. | Go | 10 | 100 | 45 / 10 sec. | Go | 7 | 70 | 60 / 15 sec. | Go? | 1 | 10 | 300 / 60 sec. | No | | |
| 8 | Chemical hazard removal | | 10 of EPA top 10; 23 of top 25 | | 10 | 80 | 8 of EPA top 10; 20 of top 25 | | 8 | 64 | 7 of EPA top 10; 17 of top 25 | | 7 | 56 | | | | |
| 8 | Recurring cost | < $100 | $60 - filters | Go | 10 | 80 | $80 - filters | Go | 5 | 40 | $100 – filters/chem | Go? | 0 | 0 | | | | |
| 7 | Bio-hazard removal | | 9 of EPA top 10 | | 10 | 70 | 7 of EPA top 10 | | 8 | 56 | 6 of EPA top 10 | | 7 | 49 | | | | |
| 7 | Water quality consistency | | Robust – N layers + pressure tank | | 10 | 70 | Robust – 3 layers + pressure tank | | 9 | 63 | Varies with pressure & contamination | | 4 | 28 | | | | |
| 7 | System life | > 5 years | 8 yrs - complexity | Go | 4 | 28 | 6 yrs - environment | Go | 2 | 14 | 15 yrs - simplicity | Go | 10 | 70 | | | | |
| 6 | Retrofit compatibility | | Under-sink space | | 3 | 18 | High end fridge | | 3 | 18 | Any std. faucet | | 10 | 60 | | | | |
| 5 | Filter replacement | > 3 months | 6 months | Go | 10 | 50 | 4 months | Go | 6 | 30 | 2 months | Go | 3 | 15 | | | | |
| 5 | Strategic compatibility | | New mkts/channels; Tech growth | | 8 | 40 | OEM. No new mkts. Tech. growth | | 7 | 35 | New mkts/channels; Miniaturization tech. | | 10 | 50 | | | | |
| 4 | Footprint | Std kitchen | Under-sink limits | Go | 4 | 16 | Lose freezer space | Go | 7 | 28 | Fat faucet | Go | 10 | 40 | | | | |
| 3 | Daily delivery capacity | > 5 gal / day | 40 gal / day | Go | 10 | 30 | 12 gal / day | Go | 5 | 15 | 8 gal / day | Go | 2 | 6 | | | | |
| 3 | System health/status awareness | | Indicator options but space problems | | 8 | 24 | Digital indicators: layer + output | | 10 | 30 | Filter indicator only | | 5 | 15 | | | | |
| 2 | "Cool" water temp | | 60 deg. F | | 3 | 6 | 40 deg. F | | 10 | 20 | 55 deg. F | | 4 | 8 | | | | |
| 2 | Waste water usage | | 200% | | 5 | 10 | 150% | | 7 | 14 | 100% | | 10 | 20 | | | | |
| 970 | Ideal Score | | | Total WS | | 732 | | Total WS | | 607 | | Total WS | | 547 | | Total WS | | |
| 1.33 | Ideal Score/Best | | | Normalized WS | | 1.00 | | Normalized WS | | 0.83 | | Normalized WS | | 0.75 | | Normalized WS | | |

### 3.4.1 Utility Curves

Utility curves are a common method used to improve the consistency and repeatability of scoring judgments. A utility curve is scoring scale, defined in advance, that converts performance estimates into scores (50 mw = a "10", 30 mw = a "7", etc.).

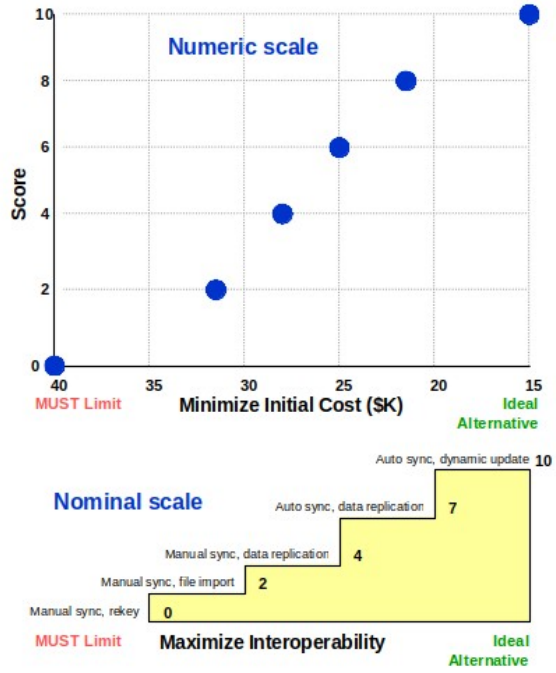
Utility curves reduce scoring fluctuations over time by nailing down the mapping of performance to scores. They may be used to reduce (or expose) bias and to capture the value judgments of key stakeholders. Utility curves are used primarily on high priority criteria, particularly those that are deemed to be politically sensitive or volatile. The majority of decision-makers and contributors find them too rigorous for universal use on all decisions; however they offer great benefit by making the scoring rules explicit on the vital few criteria.

Utility curves are used when scoring against an "absolute" scale (ideal alternative = 10), rather than a relative (best fit = 10) scale.

Utility curves may be shown in a variety of formats. Both numeric (real world numbers/units to 10 point scale) and nominal (words to numbers) utility curves are valid.

Utility curves provide an opportunity to express the real world non-linearity of scoring judgments. One of their primary values lies in uncovering scoring "breakpoints" or discontinuities among the stakeholders.

# Utility Curves




**WHAT:**

- Scoring scales for key criteria

**WHY:**

- Eliminate bias, variability in scoring
- Capture stakeholder sensitivities & expert judgments
- High priority or subjective criteria

**HOW:**

- Define scale prior to start of scoring
- Use with "absolute" scoring against the "ideal" alternative
- Numeric or nominal scales
- Realistic ideal = 10, MUST Limit = 0
- Define intermediate points
- Record rationale for curve "shape"
  - Linear? Curve? Step?

How has your organization used utility curves in previous decisions?

## 3.5 Identify Risks & Opportunities

Effective decisions must also include consideration of the risks associated with each viable alternative. Risks are potential problems or unintended side effects that may arise when a proposed alternative is implemented. Risks are typically considered only for the top two or three alternatives (based on score).

Identify risks by asking the following questions:

- What could go wrong during the implementation of this alternative? What else?
- What unintended negative side effects might be produced by this alternative?

Risks should be given a brief title such as "Excessive staff turnover". A detailed description should also be supplied, such as "IF excessive turnover occurs among key project staff, THEN milestone X delayed".

Risks should be prioritized using two factors, Probability (likelihood of occurrence) and Seriousness (Severity of negative effects, if the problem occurs). Risk priorities may be assigned using either a High-Medium-Low or numeric scales.

Care should be taken not to duplicate or double-dip evaluation criteria when risks are identified. Risks should be "one-time" probabilistic events that produce a significant negative impact on the decision if they occur. In general, if a factor may be estimated by a single number, rather than by Probability and Seriousness, it should not be treated as a risk.

To test whether an issue that you've identified against an alternative is a risk, ask:

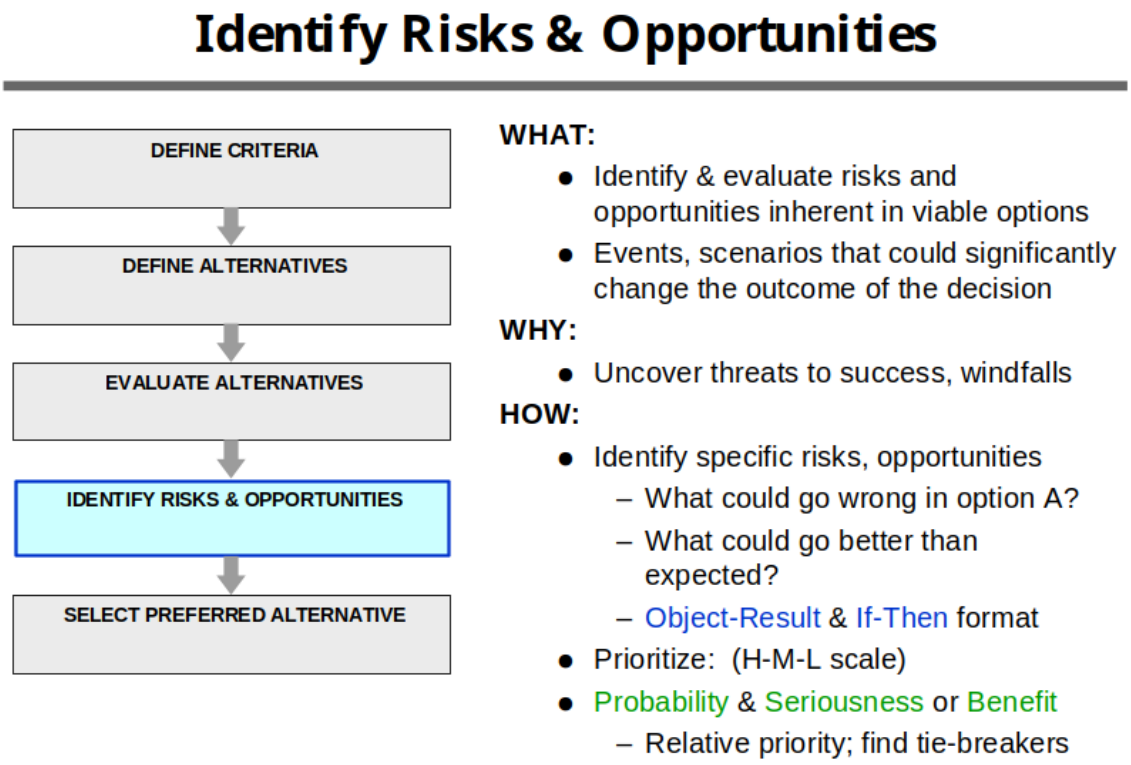
Is the probability that this will occur 1.0 (100%)? If so, the issue is not a risk, but a fact, an inherent consequence of the alternative. Such data should be reflected in scoring the alternative against a criterion (that you may have missed) or as a derived requirement (constraint or "hole to be filled" to be communicated to downstream decision-makers and implementers).

Risks address negative events that have significant effects on the outcome of the decision. Opportunities are their positive corollary - potential events that significantly alter the performance of an alternative for the good.

Identify opportunities by asking the following questions:

- What could go better than expected during the implementation of this alternative? What else?
- What unexpected windfalls might be produced by this alternative?

Opportunities are prioritized using two factors, Probability and Potential Benefit (Magnitude of positive effects). Opportunity priorities may also use either a High-Medium-Low or numeric scale.




### 3.5.1 Uncertainty in Decision-Making

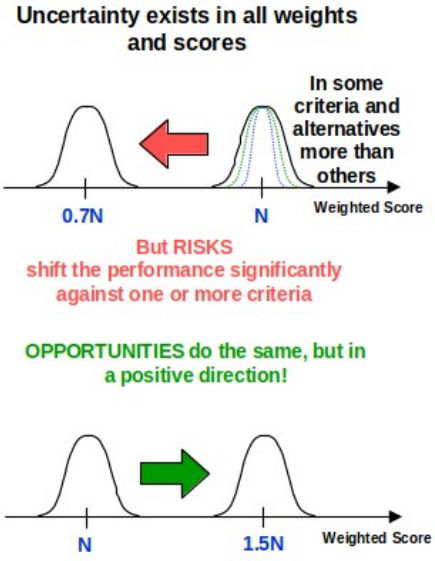
Uncertainty is a fact in all decision-making. Human-friendly techniques are required to address our inability to know all things with all confidence. Risks and opportunities are simple tools that the decision-maker can use to address the unknown and to factor it into the decision-making equation.

Uncertainty exists in both weights and scores. This produces a bell-shaped curve, a probability distribution, in all the (weight x score) products used to express the performance of an alternative.

To some extent, all of the possible future scenarios that contribute to uncertainty in a weight or score could be expressed as a risk or an opportunity. But where such scenarios produce only a minor change in the variance (width of the bell-shaped curve), these are best handled by sensitivity analysis (what-if adjustments to weights

and scores). However, when a scenario produces a significant shift in the mean value of a weighted score, this scenario is best expressed as a risk or an opportunity.

## Uncertainty in Decision-Making




**Uncertainty is a fact of decision-making**

- Need a human-friendly method to address it
- Weights/scores = bell shaped curves around a mean estimate

**Risks & opportunities = probabilistic events**

- Shift the mean significantly
  - Invalidate scoring assumptions
- Produce consequences outside the range of the criteria
  - Collateral damage
  - Unexpected windfalls
- Provide a way to factor in multiple scenarios or minority report(s)
  - Avoid group-think

Risks and opportunities also address scenarios in which an alternative has a failure mode or positive consequence that affect some factor that has not been expressed as a criterion (collateral damage or unexpected windfalls). In such cases the proposed solution breaks the boundaries (exceeds the scope) of the decision it has been created to answer.

Describe an alternative that led to an unexpected windfall beyond the scope of the intended decision.

Describe an alternative that led to unexpected damage beyond the scope of the original decision.

### 3.5.2 Evaluation Matrix: Risks & Opportunities

Risks and opportunities are typically added to the Evaluation Matrix as shown in the following graphic. Note that risks and opportunities are not defined for all alternatives, but only for the viable alternatives and perhaps only a subset of those (top two or three based on weighted score).

## Evaluation Matrix: Risks & Opportunities

**Choose Home Point-of-Use Water Filter Concept**

| Alt 1: Under-the-Sink 3+N Layer Scalable Volume Reverse Osmosis (RO) System | | | Alt 2: In-the-fridge 3 Layer Reverse Osmosis (RO) System | | | Alt 3: In-the-tap 2 layer mini Reverse Osmosis (RO) System | | |
|---|---|---|---|---|---|---|---|---|
| **Risks** | **Prob** | **Ser** | **Risks** | **Prob** | **Ser** | **Risks** | **Prob** | **Ser** |
| **Excessive membrane fouling:** IF unique mix of contaminants occurs, THEN excessive membrane fouling triggers the need for frequent filter change-out and results in low flow rates. | VL | M | **Excessive membrane fouling:** IF unique mix of contaminants occurs, THEN excessive membrane fouling triggers the need for frequent filter change-out and results in low flow rates. | L | H | **Excessive membrane fouling:** IF unique mix of contaminants occurs, THEN excessive membrane fouling triggers the need for frequent filter change-out and results in low flow rates. | H | VH |
| **Loss of pressurization:** IF the pressurized portions of the system experience (e.g. bladder tanks) significant leaks and pressure loss, THEN capacity greatly reduced and repair cost high | L | H | **Liability for refrigerator failures:** IF refrigerator with retrofit Water Filter fails, THEN customers and/or refrigerator dealers/manufacturers initiate liability claims against us | M | M | | | |
| **Risk Summary: Moderate (1) Limited (1)** | | | **Risk Summary: Moderate (2)** | | | **Risk Summary: Severe (1)** | | |
| **Opportunities** | **Prob** | **Ben** | **Opportunities** | **Prob** | **Ben** | **Opportunities** | **Prob** | **Ben** |
| **Sell premium surge capacity feature:** IF scalable volume can be supplied in easy-to-activate increments, THEN we could sell "surge capacity" at a premium | M | H | **Must-have accessory fad:** IF the In-the-Fridge becomes the homeowners "must-have" accessory of the year, THEN sales/profits greatly exceed expectations as OEMs clamor for more of our product | VL | VH | **Multiple buys exceed plan:** IF consumers really like the In-the-tap product, THEN the number of multiple faucet buys per home may significantly exceed expectations (greatly increasing sales). | L | H |
| **Sell analysis services:** IF scalability achieved across the spectrum of hazards, THEN we may sell water analysis and solution matching as a premium service. | L | H | | | | | | |
| **Opportunity Summary: Significant (1) Moderate (1)** | | | **Opportunity Summary: Moderate (1)** | | | **Opportunity Summary: Moderate (1)** | | |

Do any of the risks or opportunities shown in the matrix represent double dipping? If so, against which criteria?

Could any of these risks or opportunities be better represented through criteria? Which criteria would be used?

### 3.5.3 Risk and Opportunity Priority "Class"

A summary risk priority or risk classification may be used to separate risks into bands or layers.

Risk classification schemes are used to communicate the project's Standard Operating Procedure (SOP) for managing risks formally. Risks classified as Severe require a more formal and rigorous approval and tracking process than those of lesser magnitude.

## Risk Priority "Class"

**Tailor rigor of risk mitigation actions to priorities**

- Level of approvals and implementation monitoring

**Severe:**

- Formal mitigation required
- Typically requires customer-approved modification to project cost/schedule/technical baselines

**Moderate or Significant:**

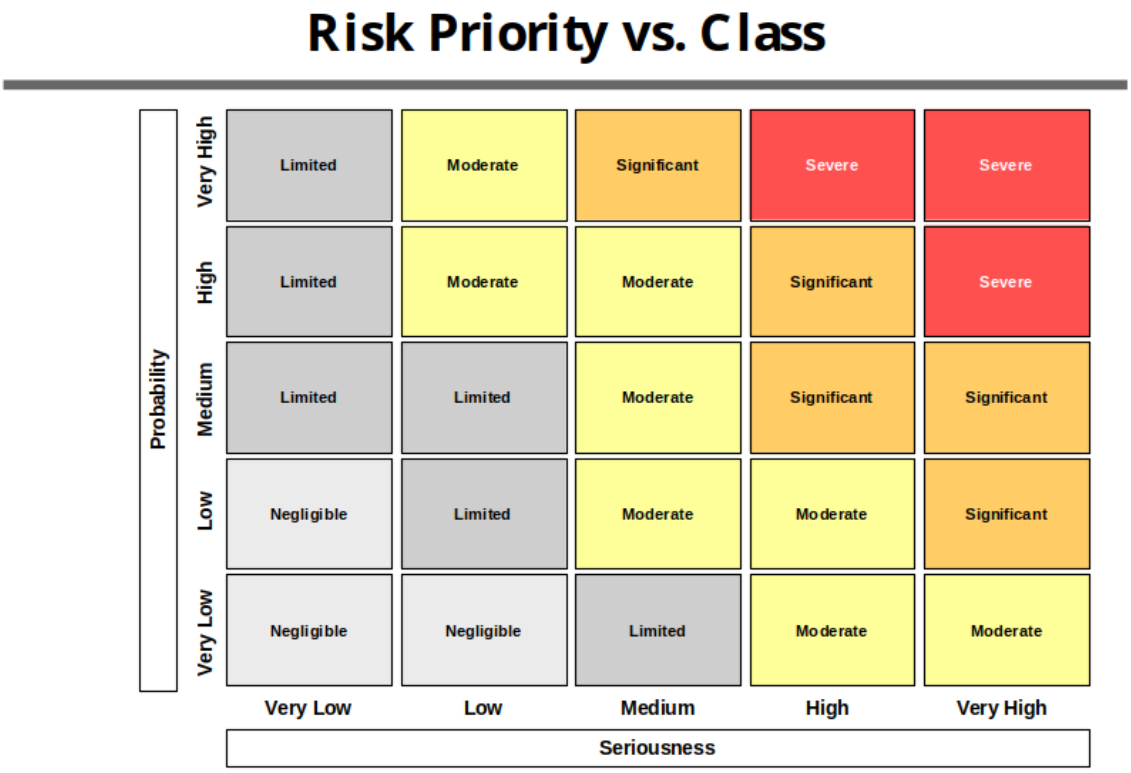
- Formal mitigation desirable
- Within project capabilities to implement risk mitigation by:
  - Requirements re-allocation
  - Schedule float
  - Management reserve (budget)

**Limited or Negligible:**

- Manage risk through routine processes, informal adaptation

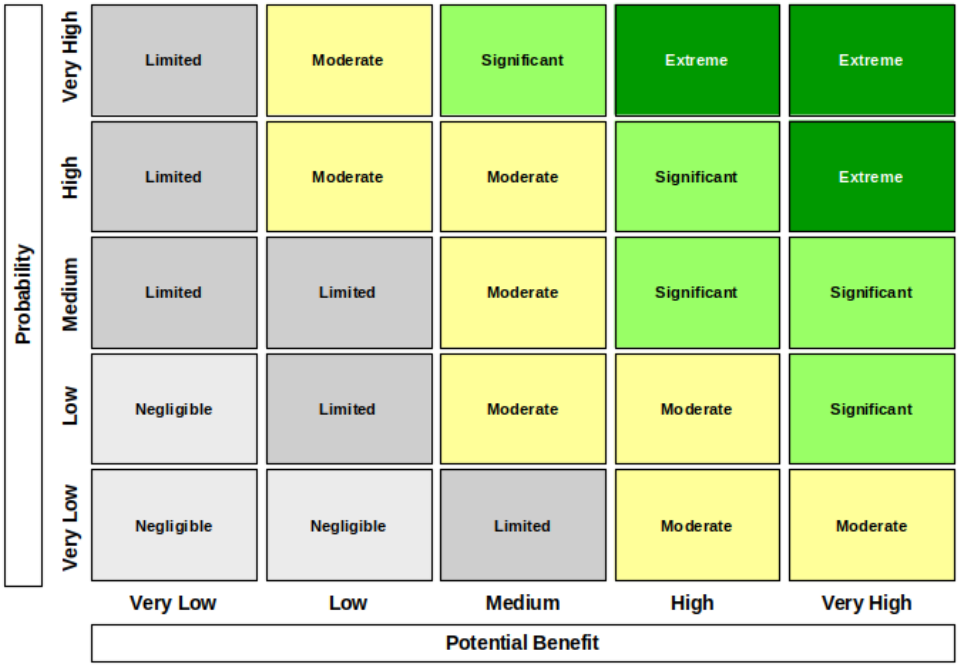
A wide variety of Risk Prioritization Tables are used. Disciplines such as Safety and Hazard Analysis have specialized formats that are tuned to highlighting risks to human safety.

The Risk Prioritization Table shown in the following graphic represents a typical prioritization scheme.




A similar table may be used to express Opportunity Priority in terms of Probability and Potential Benefit layers.

# Opportunity Priority vs. Class



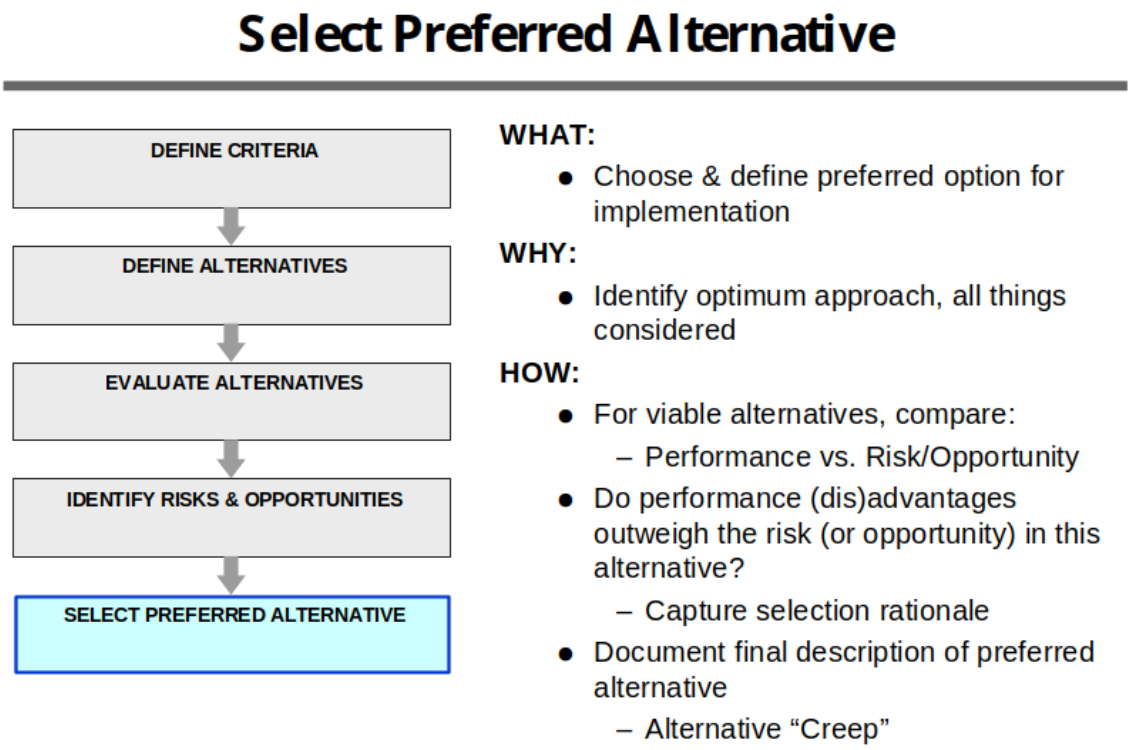

What priority schemes are in use within your organization's risk and opportunity management processes?

### 3.6 Select Preferred Alternative

From the context of decision-making, risks and opportunities are used as tiebreakers between alternatives with similar effectiveness (Total Weighted Score). It is common for the alternative with the highest score to also be based on newer, less proven technology or methods. In such cases, do a final performance vs. risk trade-off by asking:

- Is the performance advantage (N%) in Alternative A worth the additional risks associated with this option?
- Am I willing to accept the additional risks inherent in Alternative A in order to gain (N%) additional benefits?

It is common for the definition of alternatives to "creep" during the evaluation process. Therefore, the definition of the preferred alternative should be clearly documented at the end of the Make Decision process.



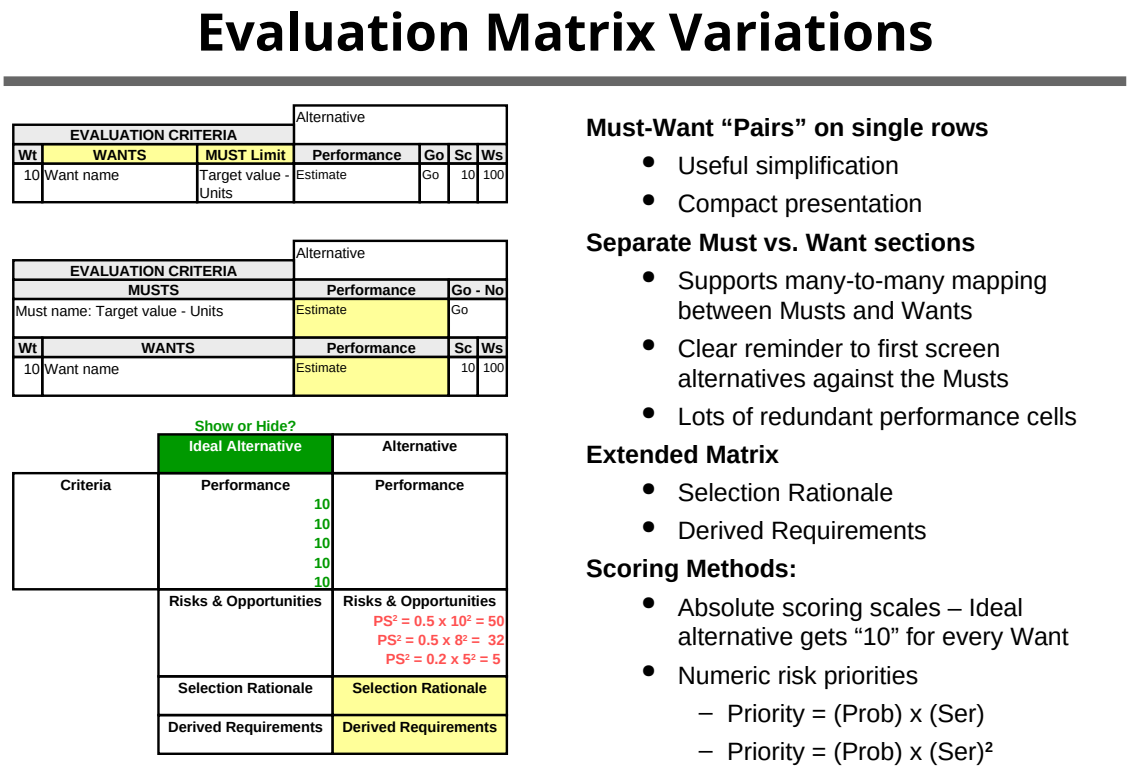
A number of visualizations of decision data may be used to assist decision-makers in performing the final performance, risk and opportunities trade-offs that lead to a decision. These tools are also very useful in summarizing and communicating the essence of the decision to key stakeholders.

### 3.6.1 Evaluation Matrix Variations

The Evaluation Matrix is the knowledge repository for the Make Decision process. It captures the decision rationale in a compact form at whatever level of depth and rigor is justified for the decision.

Evaluation matrices are often captured in spreadsheet applications such as Excel or LibreOffice Calc. This permits ease of manipulation, automatic calculation of weighted scores, and creation of other chart formats to summarize the scoring data.

The following graphic illustrates several common variations in the content and format of the Evaluation Matrix.



The Evaluation Matrix may display MUSTS and WANTS as pairs on a single line or provide separate MUST and WANT sections. The former approach depends on a useful simplification to the method, i.e. that every WANT is mapped to a single MUST limit and vice versa. This pairs approach yields a more compact and space-efficient matrix, with less redundant data displayed. However, there are situations in which it may be more intuitive for a stakeholder to define 3 MUSTS for a single WANT or map a single MUST to 2 WANTS.

The Evaluation Matrix may also be extended to capture the full results of the decision, including the Selection Rationale for the Preferred Alternative and the Derived Requirements that flow from this alternative.

A variety of weighting and scoring scales may be used in an Evaluation Matrix. The range of the scale may be adjusted for simplicity (5 point scale) or complexity (100 point scale). An absolute scale may be used for each WANT, with a utility curve predefined to govern the scoring for each performance value. An Ideal Alternative may also be defined that receives the "10" for every factor, with other alternatives scored against this benchmark.

Weights may be assigned using a "slice of the pie" approach. In this approach the total value of all WANTS is set to a fixed value, typically 100. WANTS are weighted by considering their % contribution to success. Finally, several methods are used to establish weights. Consensus weighting, wherein stakeholders in the decision discuss and agree on relative importance, is most common method. However, some methodologist believe that isolating the stakeholders and aggregating their opinions through pair-wise comparisons yields better results.

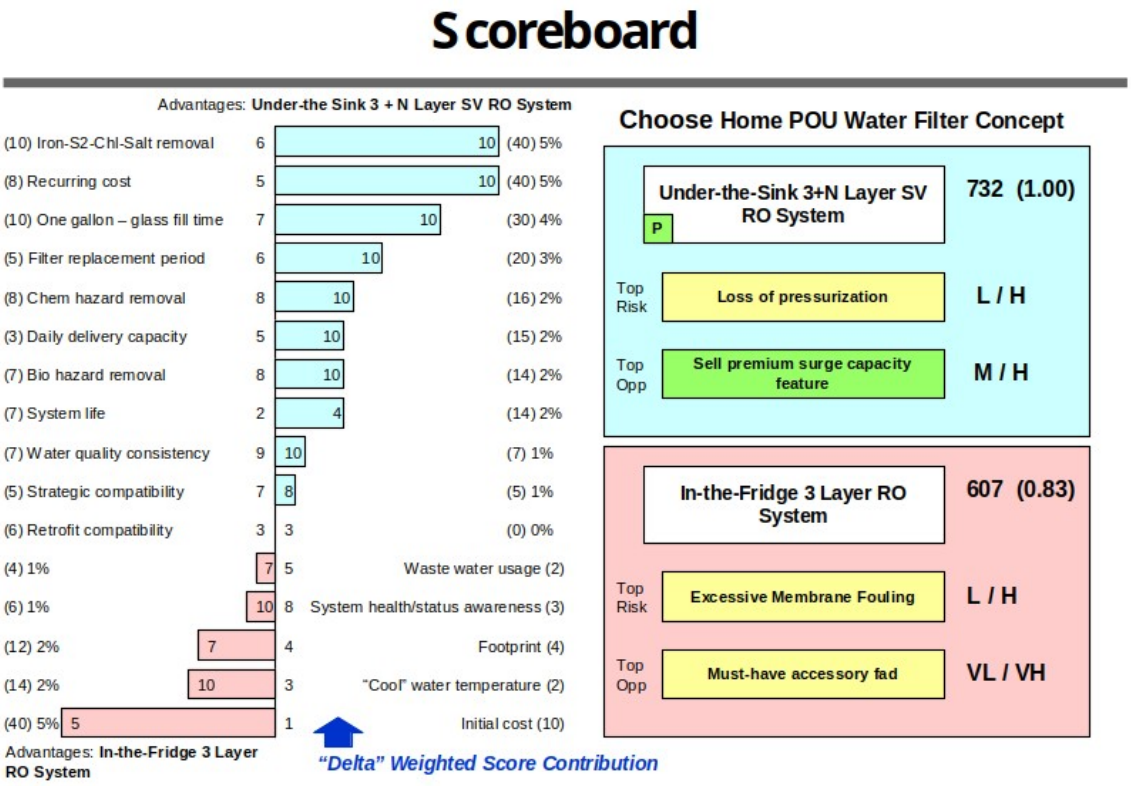
The use of a numeric scale is another option when setting risk priority. In this approach, Probability is assigned a decimal value between 0.00 and 1.00. Seriousness may be assigned in a range between 1 and 100, 1 to 10, or 0.00 to 1.00. The total risk inherent in an alternative may be computed as the Sum(Probability X Seriousness). In another variation, overall Risk Priority is calculated as Sum($P \times S^2$) to give increased emphasis to Seriousness. A nominal scale may also be used for risk, in which Probability and Seriousness ranges are described by adjectives that express their real-world consequences.

Sensitivity Analysis is a technique used to account for the uncertainty inherent in a weighted scoring process. Weights and scores may be assigned with multiple estimates (min, mid, max) or through a probability distribution to represent uncertainty. A less rigorous form of Sensitivity Analysis identifies the drivers to the decision as those that make the most significant contribution to the weighted score differences between alternatives. These Weight X Score products are varied to their reasonable limits to determine in which situations the outcome of the decision might be overturned.

### 3.6.2 Scoreboard

The Scoreboard provides a two alternative summary of the decision rationale. The left side of this view (an S or Tornado Diagram) may be used to highlight the decision drivers, i.e. which criteria contributed the most to the weighted score victory of the preferred alternative over its competitors. It may also be used to show the inherent weaknesses of the preferred solution to focus on areas for continued investment and optimization.

A sample Scoreboard is provided in the following graphic:



The right side of the diagram (Summary Scoreboard) presents a scoring summary that includes the following information for each alternative:

- Total weighted score
- Normalized weighted score
- Top risk and its priority
- Top opportunity and its priority

The Scoreboard provides an ideal tool for explaining the selection rationale behind the preferred alternative. However, because the diagram only supports a two alternative comparison of performance, multiple diagrams (preferred against alternative B, preferred against alternative C, etc.) must be produced to fully explain the selection rationale.

How might a Scoreboard be used during design reviews?

### 3.6.3 Spider Chart

A Spider Chart provides a compact method of presenting the relative strengths and weaknesses of multiple (2-6) alternatives against multiple criteria (3-10). Spider Charts (also knows as Radar Diagrams) may be produced from the criteria and scoring data stored in an Evaluation Matrix.

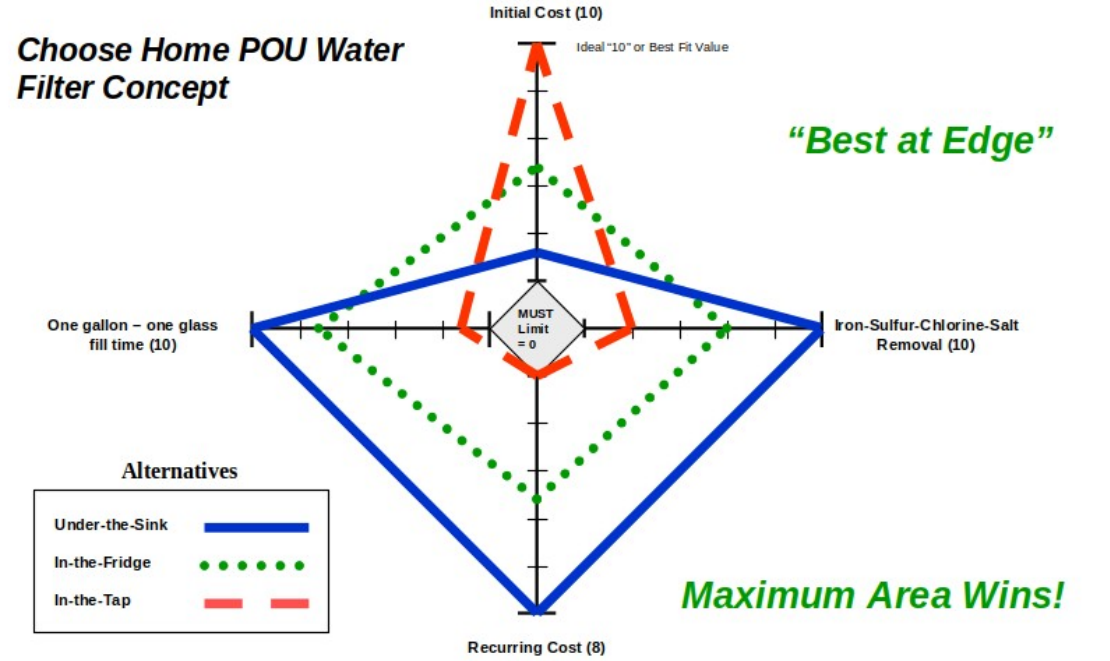
Spider Charts represent criteria a spokes or radials. Alternative performance (effectiveness against the criteria) is shown as a "web". The best-fit alternative against any criterion, the "10", appears at the outside end of each radial. The MUST limit (score = 0) appears near the center of the diagram for all criteria.

The superior solution appears to surround or envelop the competition, i.e. maximum area wins (at least as far as scoring is concerned).

Ideally, the length of each radial should be adjusted to reflect the weight of the WANT or the Weight x Score product should be shown on the radial.

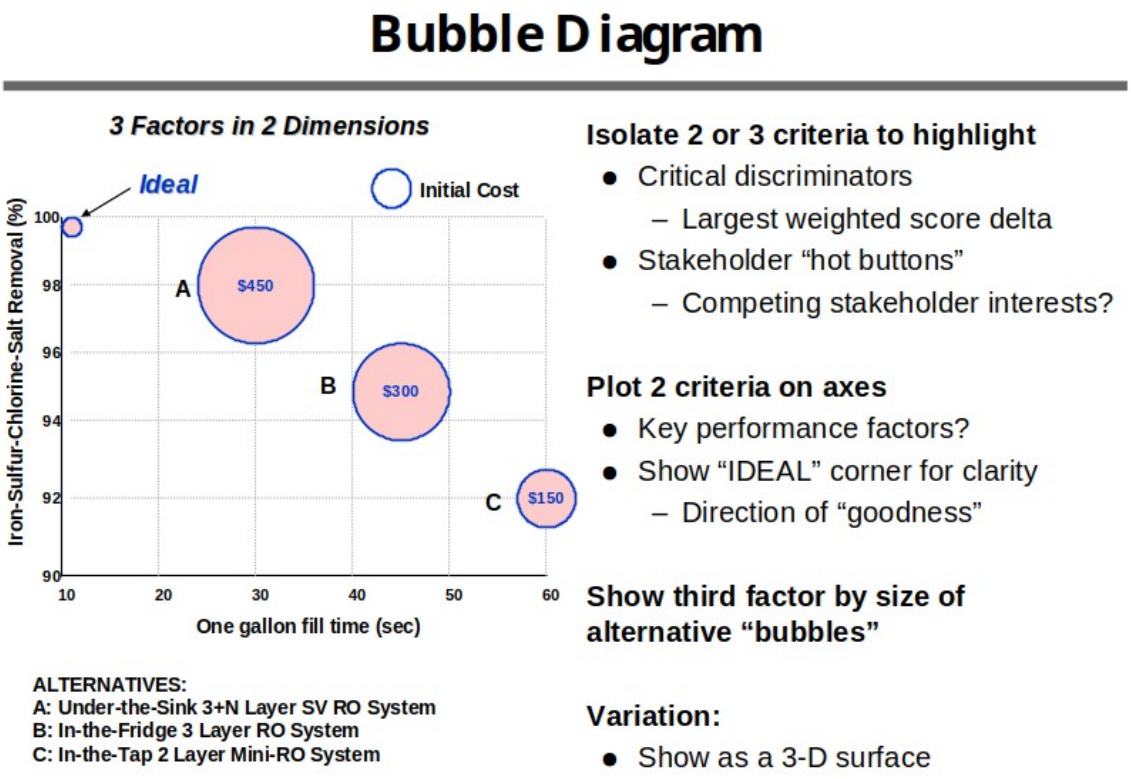
One variation of the Spider Chart shows the criteria units and estimated values on the radials, rather than the conversion of these estimates to a "unit-less" 10-point scoring scale. Another variation, the Kiviat Diagram, inverts the chart and places "best" at the middle to highlight the "centered" solution.

# Spider Chart



### 3.6.4 Bubble Diagram

A Bubble Diagram may be used to present alternative effectiveness against three criteria. This view is useful when a small number of factors are the true discriminators.




A Bubble Diagram typically shows two criteria mapped to the X and Y axes of the chart. The scales typically express the criteria in terms of real-world units, but may also show the mapping of these values to a 10-point scoring scale. The alternative performance against the third criterion is expressed by the size of the data points for each alternative.

Bubble Diagrams help to isolate the distinctions between the alternatives, i.e. which alternatives break from the pack against a specific criterion.

### 3.7 E4: Make Decision

Let's continue your hands-on use of the Make Decision process by completing the decision that you started in Exercise 3.

Ideally, you will fully complete the analysis and make a decision. If you find that significant data is missing, feel free to contact experts to fill in the holes. Make a conditional recommendation of the preferred alternative even if you can't assemble all the data; identify the holes that remain and define how you will fill them.

## E4: Make Decision

**Use the Make Decision process to complete your decision (from E3)**

- Complete/refine criteria as needed based on stakeholder inputs

**Define 3-5 alternatives for evaluation. Set up an Evaluation Matrix**

- Screen the alternatives against the MUSTS; Score vs. the WANTS
- Compute a Total Weighted Score for viable alternatives
- Highlight "holes" in your data – identify sources

**Identify the risks & opportunities in the top 2 viable alternatives**

- Estimate risk/opportunities priorities – highlight the "vital few"

**Select a Preferred Alternative (conditionally, if needed)**

- Balance performance vs. risk/opportunity to identify best solution
- Summarize the results
  - Describe the preferred alternative (paragraph + diagram)
  - Capture your selection rationale in a brief paragraph

Exercise Notes:

## 3.8 E5: Communicate Decisions

In order to improve your decision communication skills, create a range of graphical decision views to sell the rationale for the decision you completed in the previous exercise.

# E5: Communicate Decisions

**To communicate your decision rationale, create the following:**

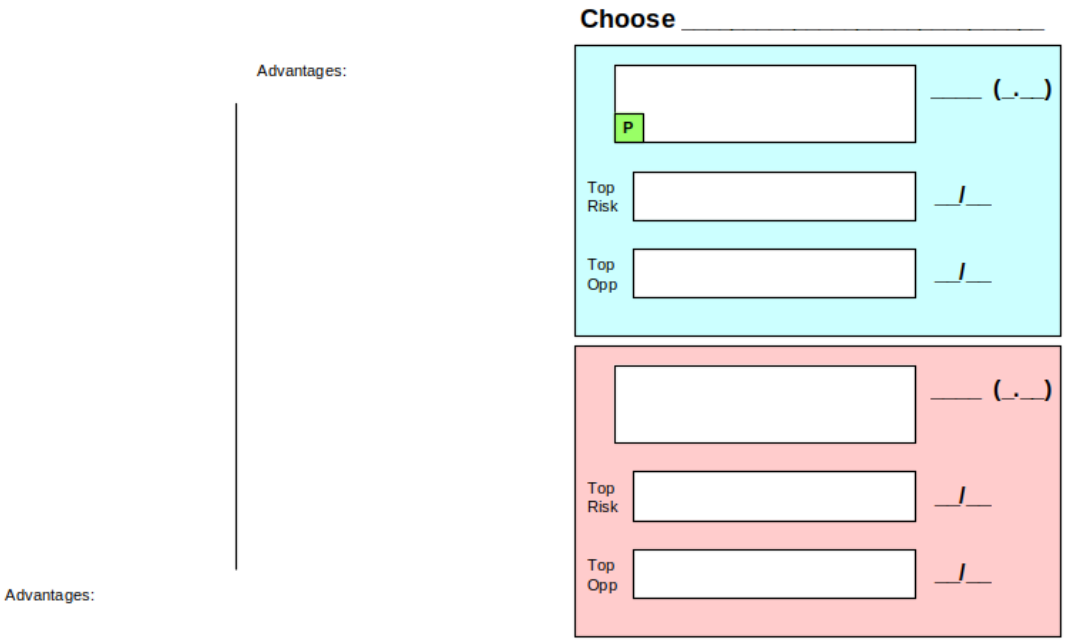
- Scoreboard
  - Preferred Alternative vs. nearest competitor, 6-8 criteria
- Spider Chart
  - Preferred Alternative vs. 2 closest competitors, 4 criteria
- Bubble Diagram
  - Preferred Alternative vs. 2 closest competitors, 3 criteria

- Refine your "Selection Rationale" paragraph to narrate these charts and highlight the drivers/discriminators behind this decision

- Share each diagram and the Selection Rationale with a partner to "sell" your decision
  - Which diagram best sells your story? Why?

Exercise Notes:

# E5: Scoreboard




Exercise Notes:

# E5: Spider Chart

***Choose*** _____

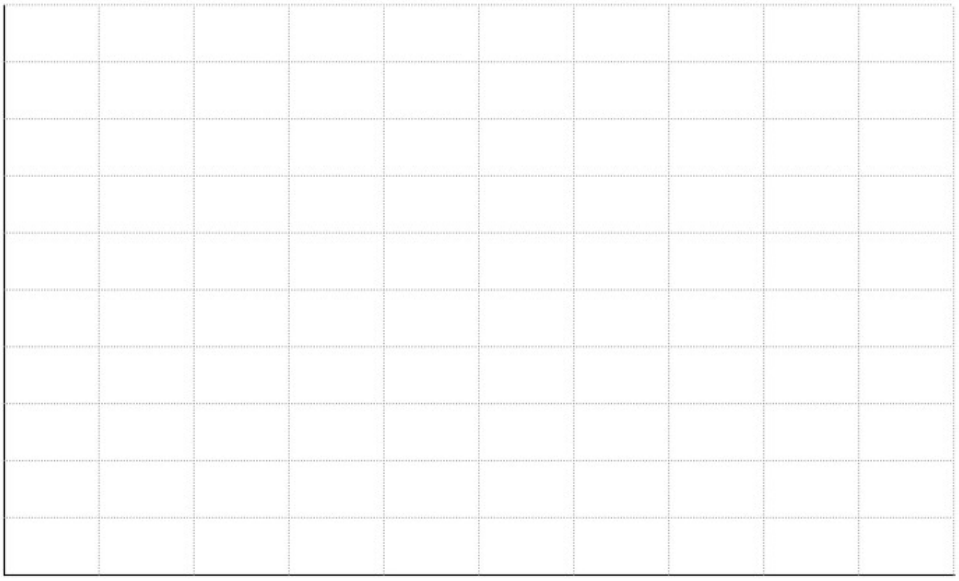
_____





Exercise Notes:

# E5: Bubble Diagram



Exercise Notes:

# 4 Manage Consequences

The primary outcome of a decision is the selection of a preferred alternative. However, there are many secondary effects of any decision, results or implications of the preferred alternative in other dimensions. At a minimum, these consequences should be captured at the point of decision and communicated to other stakeholders in the decision. Ideally, the decision should not be ratified until these consequences have been identified, understood, and accepted by these stakeholders.


In general, the various types of decision consequences may be captured independently. However, it is more efficient to document the full set of results (requirements trad-offs, derived requirements, risk mitigation actions, related decisions) as a single activity.

# Manage Consequences


**KEY POINTS:**

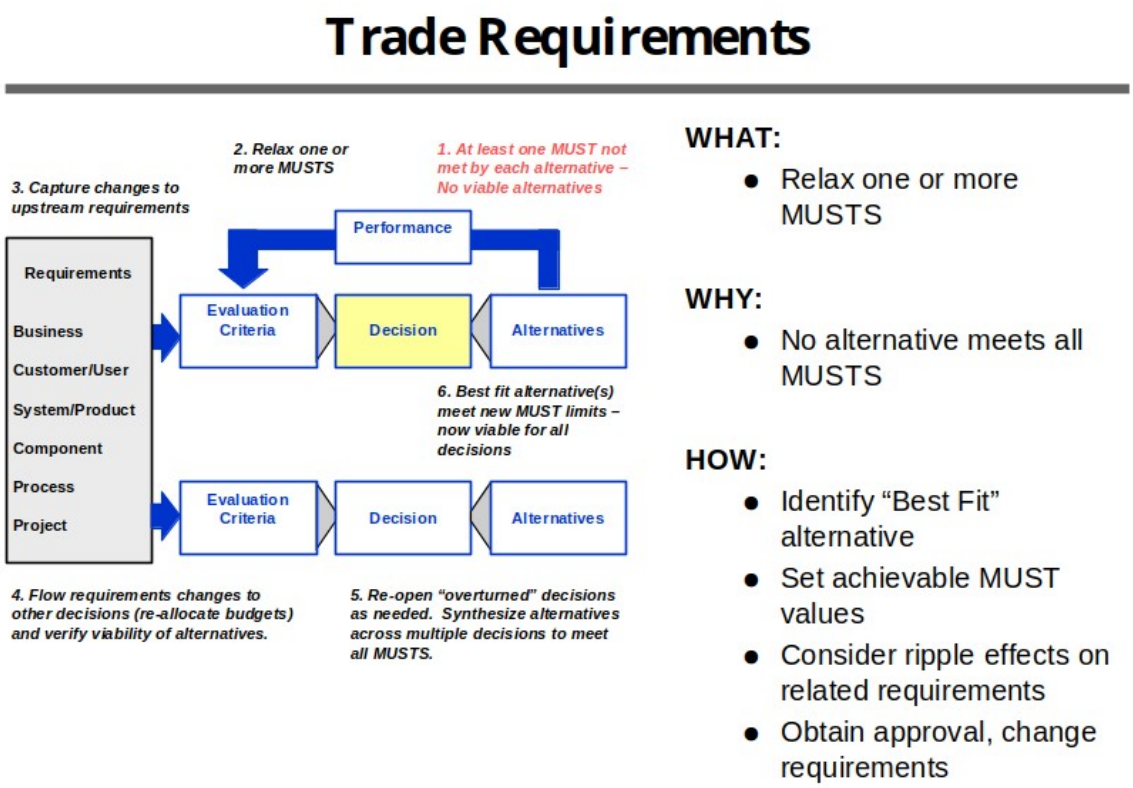
- Capture, communicate and address the implications of a completed decision
  - Upstream & downstream impact on requirements
  - Protect & enhance implementation plan
  - Update Decision Network
- No decision is complete until these steps are done
  - Exit criteria for approval
- May be performed in parallel

From your experience, what actions are taken in your organization to “close out” a decision?

## 4.1 Trade Requirements

One possible outcome of a decision is that all proposed alternatives fail to satisfying at least one MUST criterion. This situation invokes a process known as a requirements trade-off. To perform a requirements trade-off, identify a best-fit alternative, typically the one that fails only a single MUST or most nearly meets all the MUST criteria. Use the estimated performance of the best-fit alternative to propose a new target value (specification or GO-NO GO limit) for the MUSTS in question. If the owners of these MUSTS accept the new target values, the trade-off is complete. If the owners are unwilling to relax the requirements, then additional requirements must be traded until a viable solution is achieved.

A requirements trade-off typically produces no new requirements, but may produce a ripple effect of changes to upstream requirements. These changes then could also affect the outcome of other decisions where the affected requirements were driving constraints.

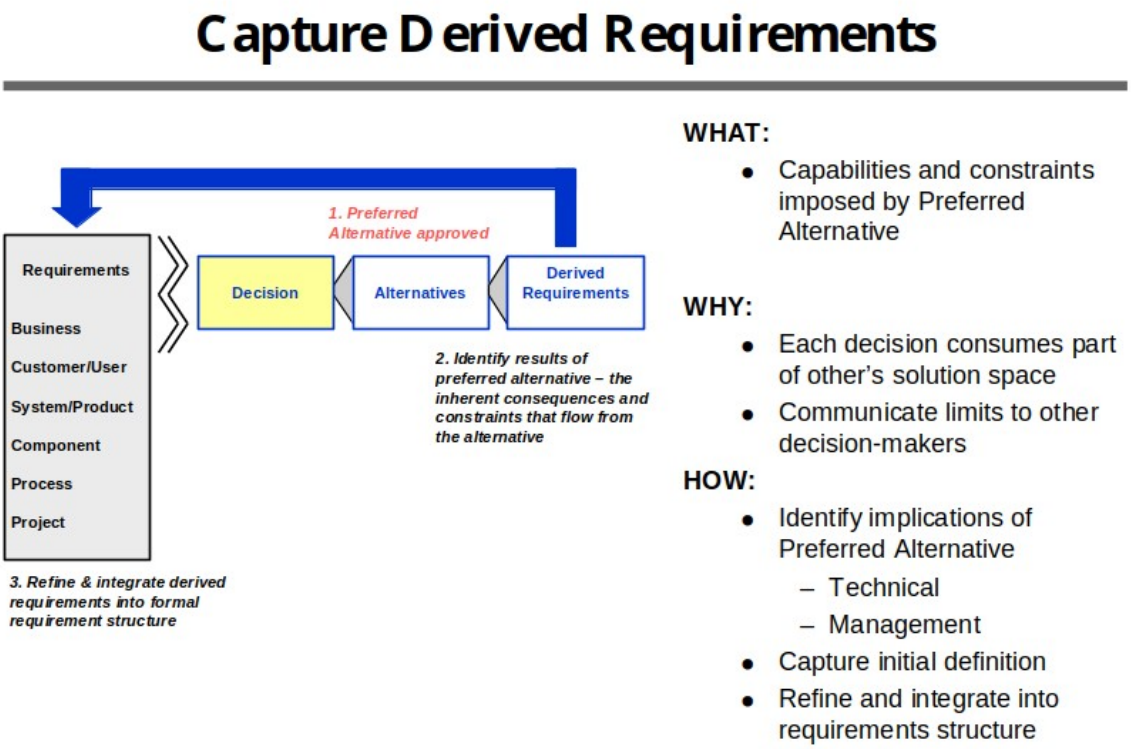



Cite an example of a decision in which you had to trade requirements to achieve a viable solution.

## 4.2 Capture Derived Requirements

The selection of a preferred alternative consumes a portion of the solution space that was previously available to the owners of related decisions. Inherent in one decision-maker's solution are constraints that limit the freedom of others. These constraints are commonly known as derived requirements.

Systems Engineering and Requirements Management have historically viewed any requirement as the direct product of upstream requirements, a process of requirements to requirements flow-down and traceability. In actuality, decisions are the primary creators and consumers of requirements. Multiple requirements are factored together as the drivers of a decision, a preferred alternative is selected that balances these requirements, and this preferred alternative creates multiple derived requirements. In the view of the Decision Driven® Approach, requirements-to-decision and decision-to-requirements traceability are considered paramount.



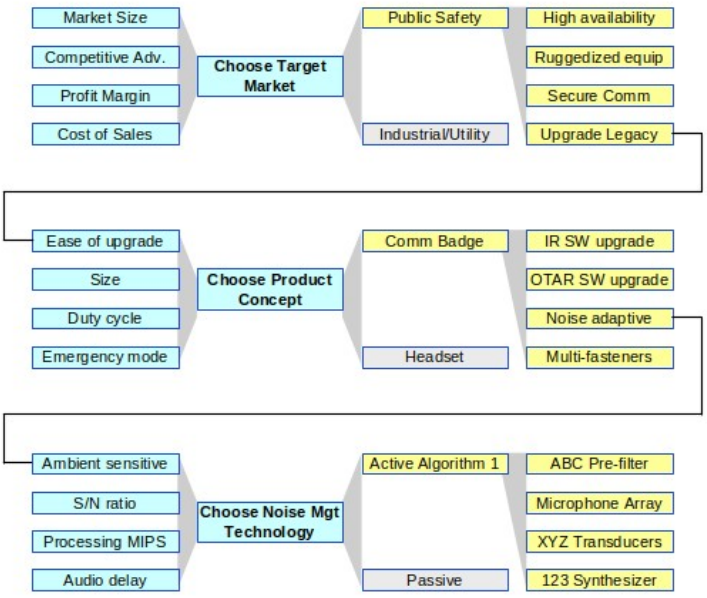
Derived requirements include product technical capabilities and constraints and project task requirements. Engineers who are capturing derived requirements from a technical decision must be careful not to overlook the impact of their decision on the project WBS, plans, and schedule. Project managers who are recording derived requirements from business or project planning decisions must be similarly vigilant to avoid overlooking technical constraints. In addition, derived requirements may be levied on the organizational structure, research plans, or process capabilities.

At a minimum, the derived requirements inherent in the preferred alternative should be listed at the point of the decision and communicated to affected parties. Ideally, all requirements should be directly traceable to the decision that created them, so that effective impact analysis may be performed.

Derived requirements are typically identified in raw form at the point of the decision. However, additional refinement and decomposition of these raw requirements may occur through later analysis. Ultimately all derived requirements and additional requirements derived from them must be integrated into the requirements structure for the product/project. Traceability should always be maintained back to the parent decisions from which they were created.

The following graphic provides a simple example that illustrates the “Decisions Create Requirements” principle.

# Decisions Create Requirements!




**The Solution Space for one decision sets the Problem Domain for another!**

**Problem Domain:**

- Essential question to be answered
- Stakeholders' criteria for success

**Solution Space:**

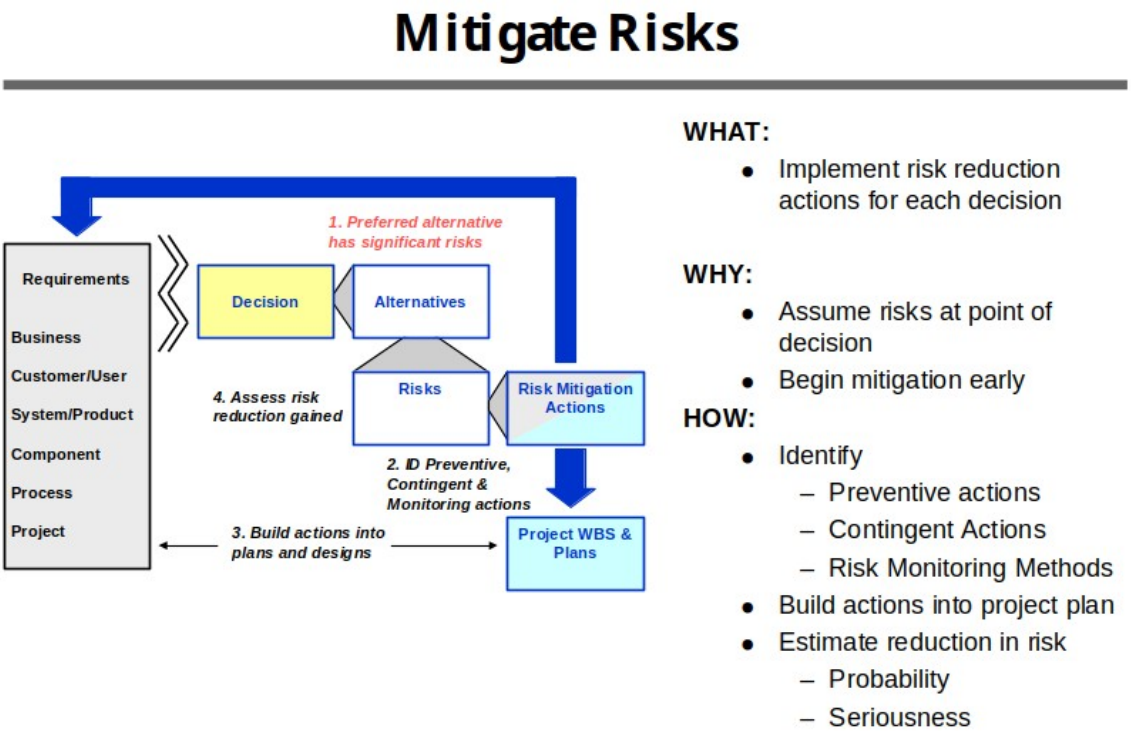
- Alternatives and their consequences:
  - Performance against criteria
  - Derived requirements
  - Risk & opportunity actions

Problem Domain | Solution Space

Trace a similar requirements derivation thread from your experience.

### 4.3 Mitigate Risks

All decisions should factor the consideration of risk into the selection of a preferred alternative. The ideal (earliest possible, therefore most effective) time to begin mitigating these risks is at the point of decision, when these risks are inherited as part of the preferred alternative.

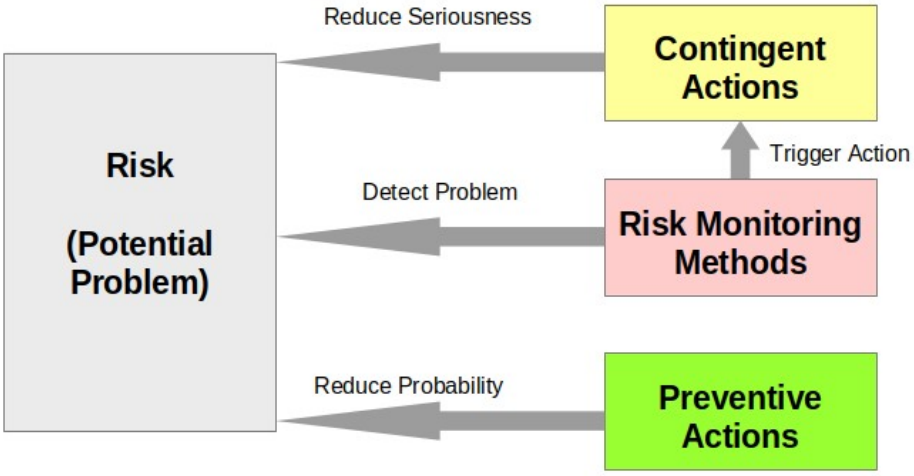



Three types of actions may be taken to mitigate risk.

- Preventive actions taken to reduce the likelihood of the risk by disabling or eliminating its cause(s).
- Contingent actions planned in advance to reduce the damage or negative consequences of the risk if and when it occurs.
- Risk monitoring methods set up to detect the emergence of the risk and to initiate the contingent actions.

An effective risk mitigation strategy will combine these actions, with an emphasis on prevention wherever possible.

# Risk Mitigation - A Simple View




Risk mitigation may be viewed as an investment to protect the successful implementation of a good decision. For risk mitigation to be effective, it must be built back into the project plan or product design. Risk mitigation actions without a defined budget, assigned staff, and schedule milestones are of no value.

Once risk mitigation actions have been built into the plan, the risk priorities associated with the preferred alternative should be updated to reflect the risk reduction that has been achieved.

How does managing risks in the context of each decision differ from your experience with risk management processes?

### 4.3.1 Technical Performance Measurement

Technical Performance Measurement (TPM) is a closed-loop process for monitoring known technical risk areas. It provides an early warning system for a product's technical health. TPM is used to trigger contingent actions (as referred to in the decision-making process; more commonly known as corrective actions in the context of TPM).

The success of TPM hinges on the selection of good Technical Parameters (TPs). Technical Parameters are typically a small subset of the total set of performance requirements for a system. They serve as the diagnostic tools for product technical health, just as pulse rate and blood pressure are effective indicators of human health.

Criteria for Technical Parameter selection include:

- Cover known risks, system architecture
- Technical criticality to user
- Effective technical health indicator
- Early/frequent data points
- Low data collection cost

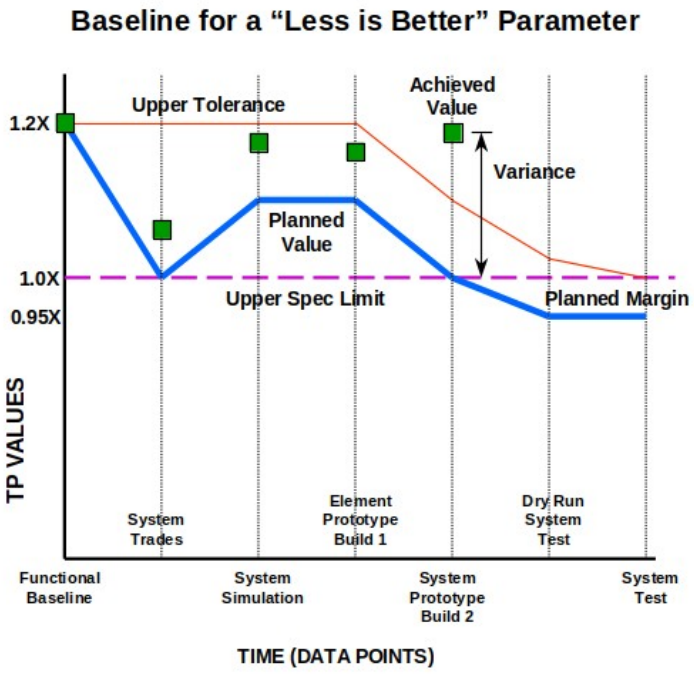
A Technical Performance Baseline must be established for each Technical Parameter. This baseline is documented in the form of a Planned Value Profile (PVP). The PVP identifies the following:

- Specification limits (acceptance criteria) for the TP.
- A set of specific data points at which the TP will be measured.
- The method to be used to measure and compute the TP at each data point.
- An estimate of the planned value and tolerances for each data point.

The Planned Value Profile (PVP) serves as a data gathering and analysis tool for the Technical Parameter. At each data point, the actual (achieved) value of the parameter is recorded or computed and compared with the tolerance limits. An out-of-tolerance situation (Variance) occurs whenever the achieved value falls outside the tolerance band.

The tolerance values serve as a preplanned trigger for formal corrective action (the contingent actions that have been defined as part of the risk mitigation strategy). TPM is an investment in an early warning system; tolerances provide a fixed limit at which the project team agrees that hoping for a miracle is inadequate.

# Technical Performance Measurement




**Data Points**

| ID | Measurement Method | PV / TOL | AV / VAR |
|---|---|---|---|
| 1 | Estimate from legacy systems | 1.2 | |
| | | 1.2 | |
| 2 | Rollup from system trade study results | 1.0 | |
| | | 1.2 | |
| 3 | System simulation using AAA method | 1.1 | |
| | | 1.2 | |
| 4 | Measure Element A prototype; compute using BBB method | 1.1 | |
| | | 1.2 | |
| 5 | Directly measure System prototype using CCC method | 1.0 | |
| | | 1.1 | |
| 6 | Directly measure System using DDD method | 0.9 | |
| | | 1.05 | |
| 7 | Directly measure System using DDD method | 0.9 | |
| | | 1.0 | |

What is your organization's experience in using the TPM process?

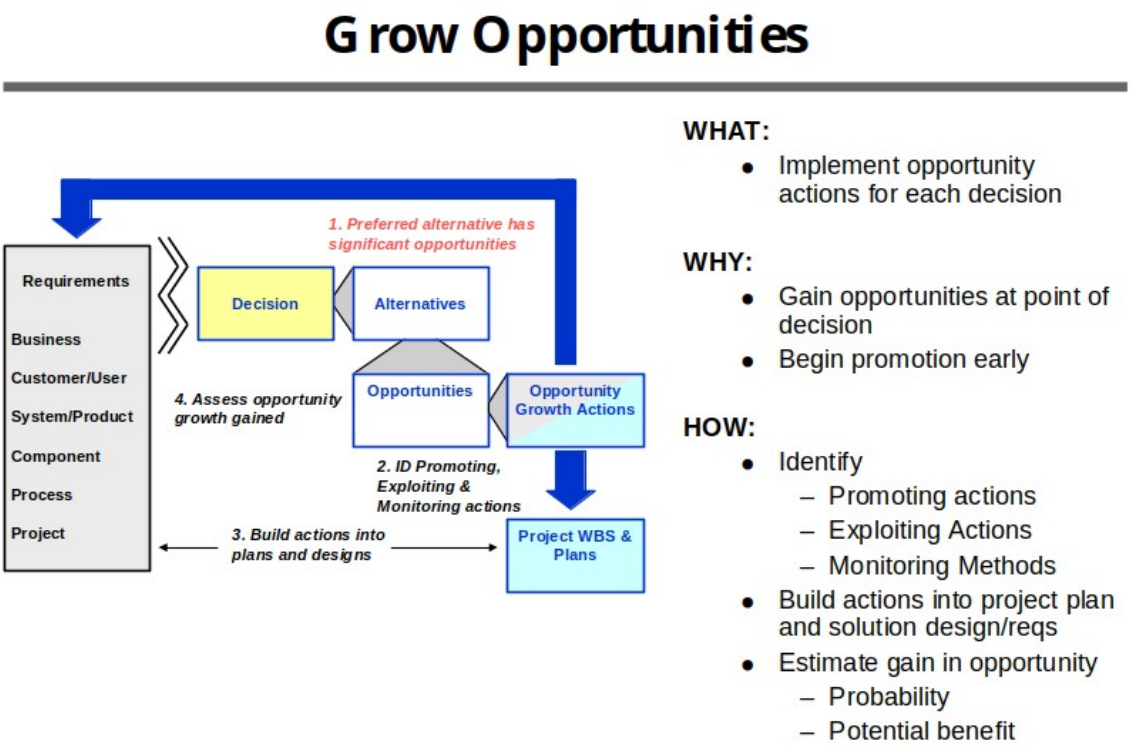
### 4.4 Grow Opportunities

Actions should be initiated at the point of decision to begin growing opportunities associated with the preferred alternative.

Three types of actions may be taken to grow an opportunity.

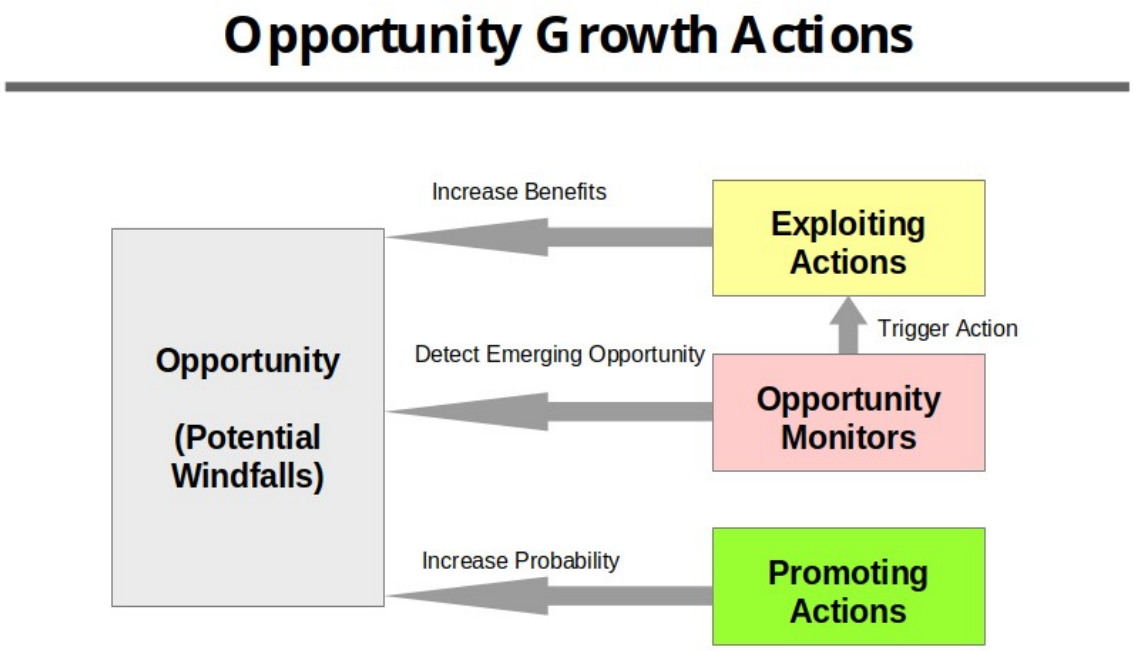
- Promoting actions increase the likelihood of the opportunity by stimulating its cause(s).
- Exploiting actions multiply the positive consequences of the opportunity if and when it occurs (snowball effect).
- Opportunity monitoring methods detect the emergence of the opportunity and initiate the exploiting actions.

An effective opportunity growth strategy will combine these actions, with an emphasis on promoting actions wherever possible.




Similar to risk mitigation, opportunity growth requires specific actions to be built back into the project plan or product design. Once these actions have been built into the

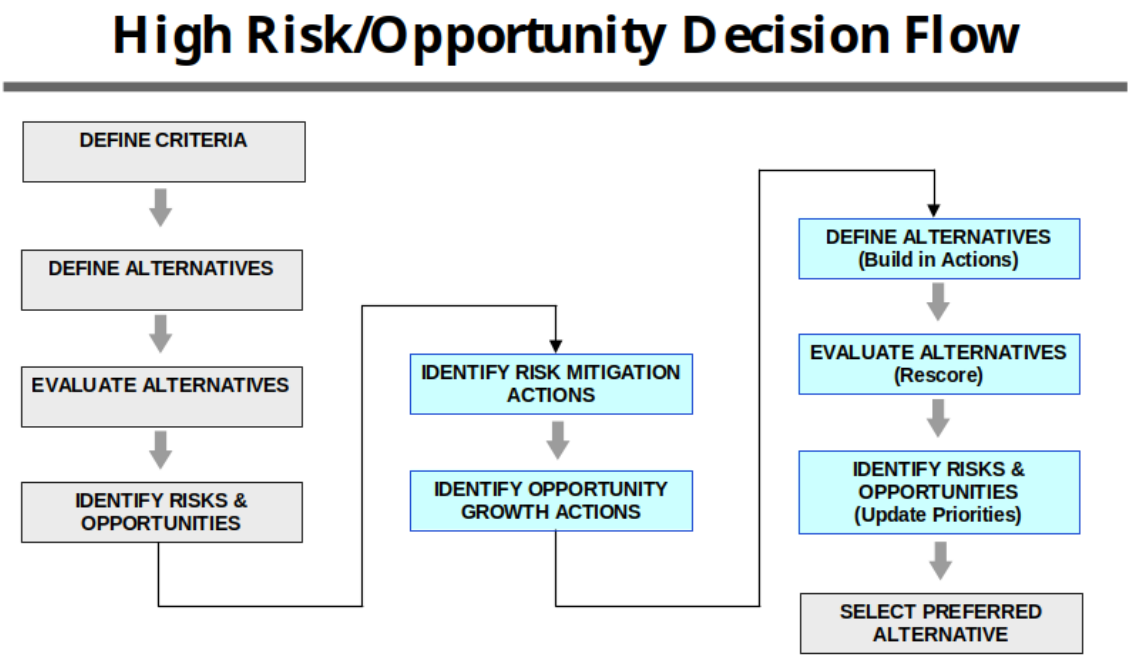
plan, the Probability and Potential Benefit associated with the preferred alternative should be updated to reflect the opportunity growth that has been achieved.




How does managing follow-on opportunities in the context of each decision differ from your current process?

### 4.4.1 High Risk/Opportunity Decision Flow

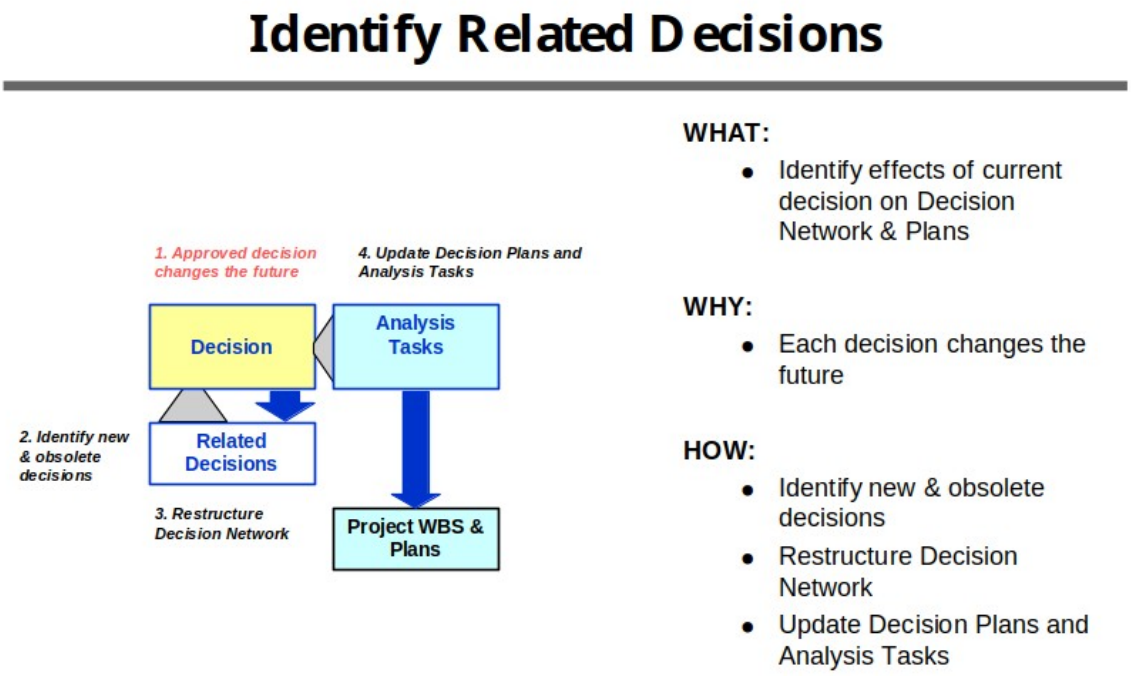
Decisions that contain significant risks and opportunities often trigger a full round of risk mitigation and opportunity growth planning prior to the selection of a preferred alternative. This may include multiple iterations of defining a variety of armor-plating" or play-the-lottery actions and adding these to the viable alternatives. The new, risk/opportunity-optimized alternatives are then re-evaluated to account for the performance costs of building in the selected actions.




Identify a current decision that you face that should be addressed using the High Risk/Opportunity process.

## 4.5 Identify Related Decisions

Decision-making is a conditional process that creates a new future at every decision (branch) point. The Decision Driven® Approach may be represented by a closed loop feedback system, in which each decision point should be followed by an update to the Decision Network. These updates may identify new decisions, eliminate decisions, or refine the decision plan for any existing choice.

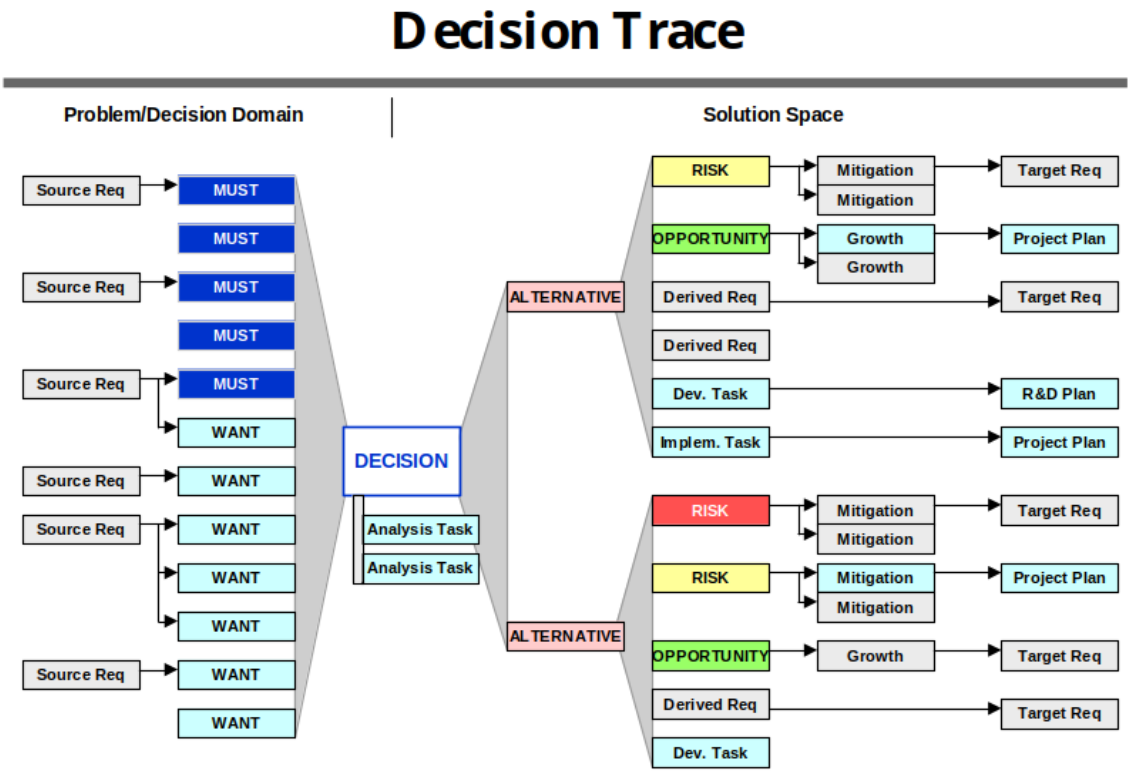



Cite an example of a recent decision that created some new downstream choices.

## 4.6 Decision Trace

It should be evident that the results of one decision create a variety of constraints on other downstream choices. A Decision Trace is a useful visualization to illustrate this process of requirements creation and flow-down.

A Decision Trace is an explosion of the data associated with a specific decision. Its primary purpose is to show the derivation of requirements, i.e. to look inside the decision black box and clarify traceability from the Problem Domain (source requirements) to the Solution Space (derived requirements and risk/opportunity actions associated with the preferred alternative).



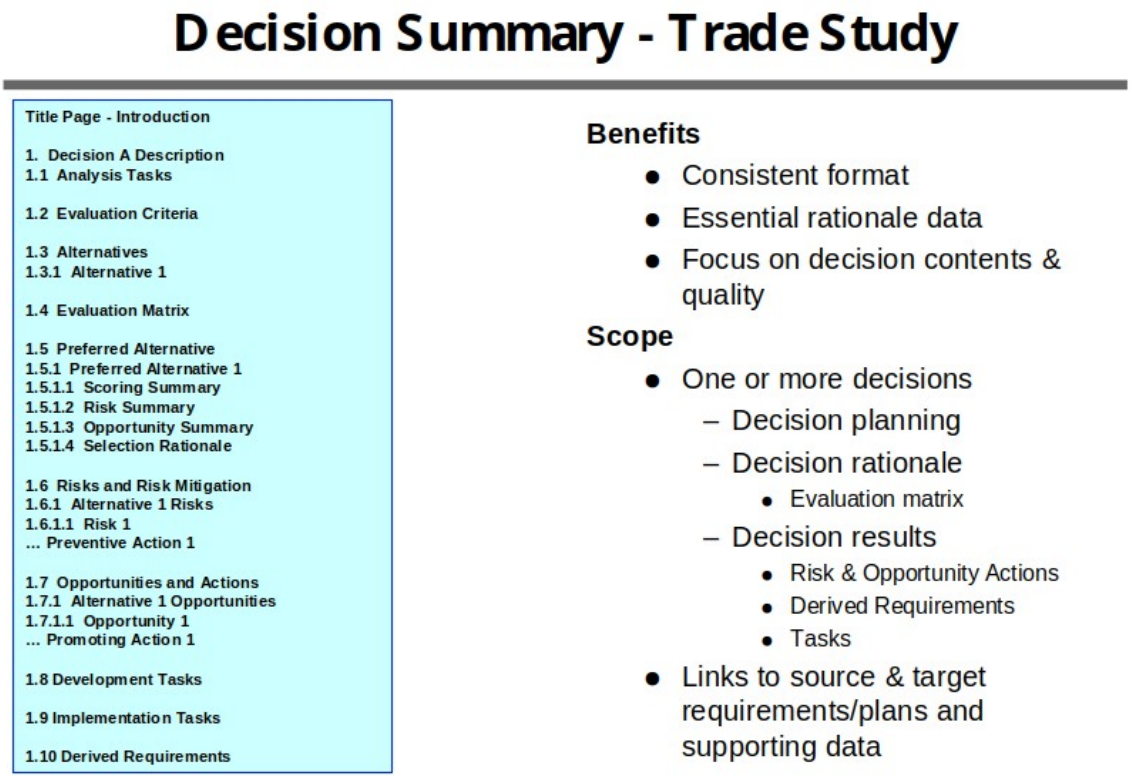

The Decision Trace may be used to walk the relationships and communicate an Impact Analysis or What-if scenario. It may be used to explain how a change in a source requirement could overturn the preferred alternative and create a downstream ripple effect (e.g. invalidate existing derived requirements and create new requirements associated with the new winner).

At what points would a Decision Trace be most valuable to your project?

## 4.7 Decision Summary – Trade Study

The Decision Summary (also known as a Trade Study Report) is the most comprehensive document output from the Decision Driven® Approach process. It presents the detailed analysis plan and decision rationale for one or more decisions, with varying levels of detail based on the decision priority.

A Decision Summary outline is presented in the following graphic. The report typically includes the full Evaluation Matrix to contain the scoring rationale. It may include any of the other graphical formats (Decision Network, Spider Chart, Scoreboard, etc.).




How does this Decision Summary outline compare with your organization's typical decision analysis white paper?

## 4.8 E6: Manage Consequences

Capture the full range of decision consequences by brainstorming risk mitigation actions, opportunity growth actions and derived requirements for the preferred alternative (or leading contender) in your prior decision.

# E6: Manage Consequences

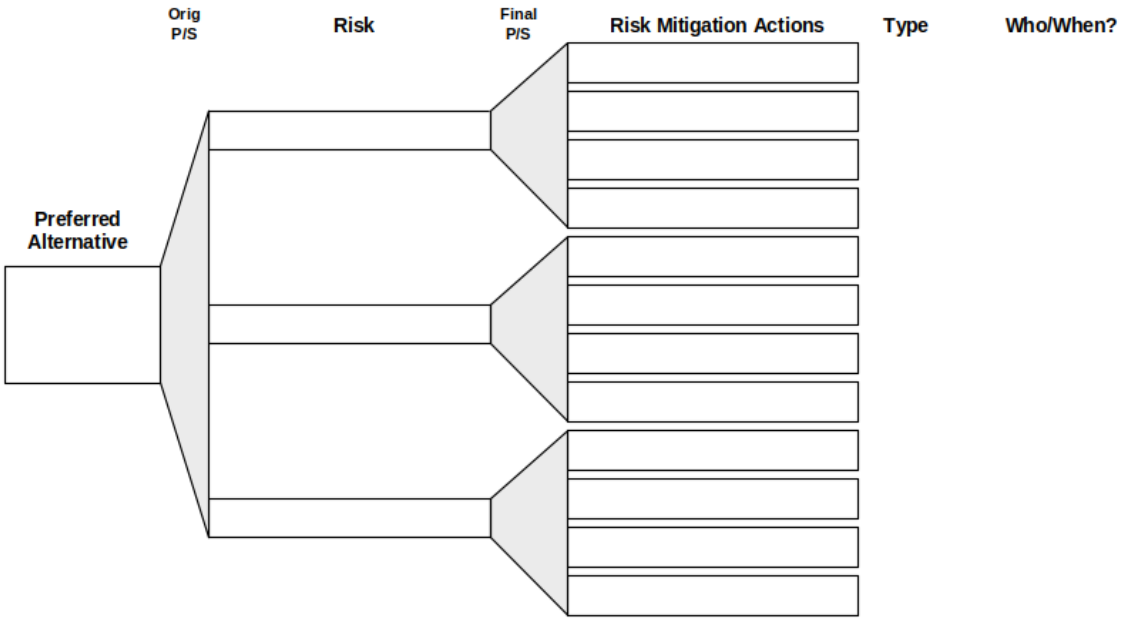
**Populate the "Solution Space" side of a Decision Trace diagram with:**

- 2-3 risks associated with a preferred alternative:
  - Identify Preventive, Contingent, Monitoring actions
- 2-3 opportunities associated with a preferred alternative:
  - Identify Promoting, Exploiting, Monitoring actions
- Highlight the actions that you will implement:
  - Assign owners and target dates for each action (who/when?)
  - Assess risk reduction and opportunity growth gained - re-estimate Probability and Seriousness/Benefit
- 4-8 Derived Requirements associated with (inherent in) the preferred alternative
  - Categorize each derived requirement (business, user, system, process, project, …)
  - Identify the requirement's owner (who cares?)
  - Identify the requirement's repository (where maintained, controlled?)

Exercise Notes:

# E6: Decision Trace – Risk Mitigation

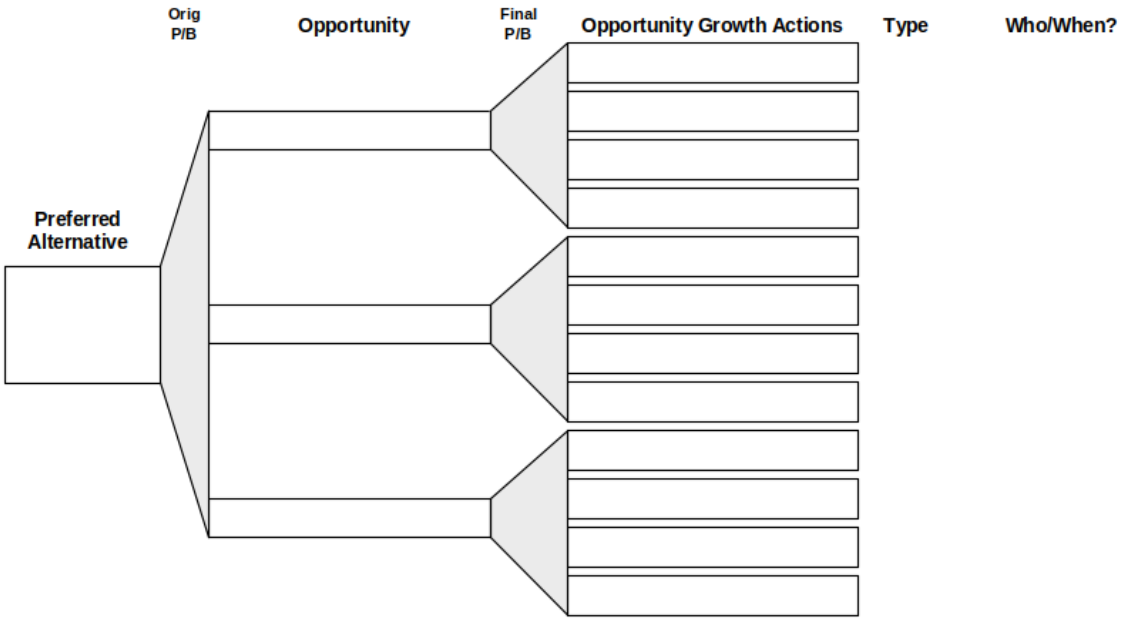
**DECISION:**




Exercise Notes:

# E6: Decision Trace – Opportunity Growth

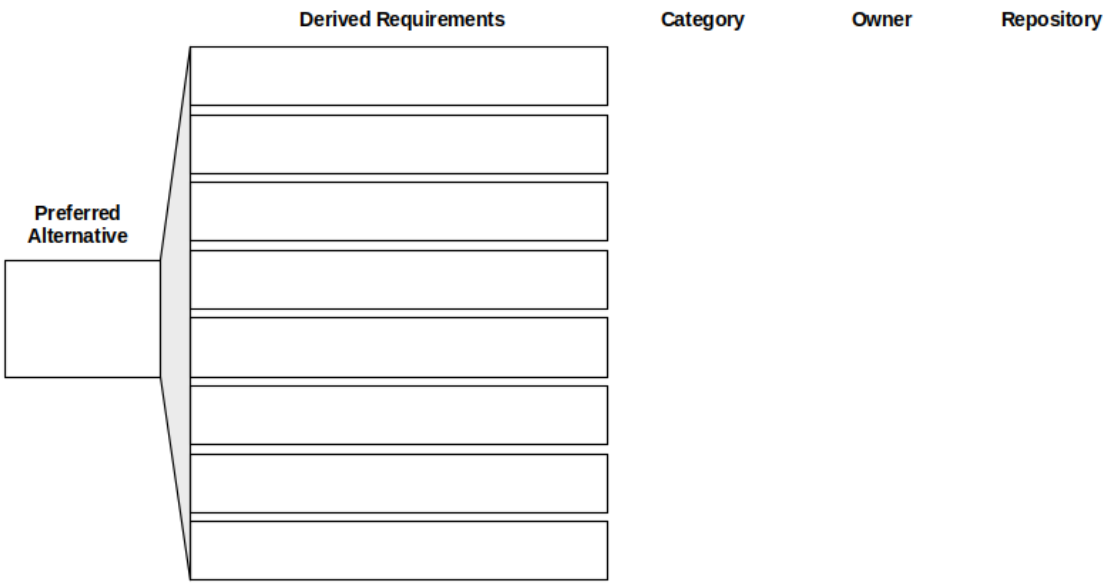
**DECISION:**




Exercise Notes:

# E6: Decision Trace – Derived Requirements

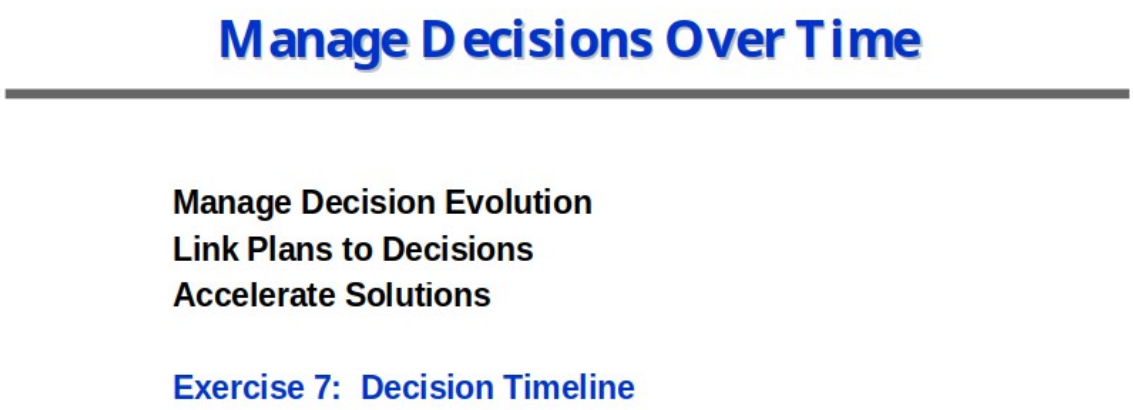
**DECISION:**




Exercise Notes:

# 5 Manage Decisions Over Time

This section of the Decision Driven® Approach example extends the core elements of the method and its Decision Network model as a decision engine for strategy, market & product planning, platform/architecture definition and system/product design.



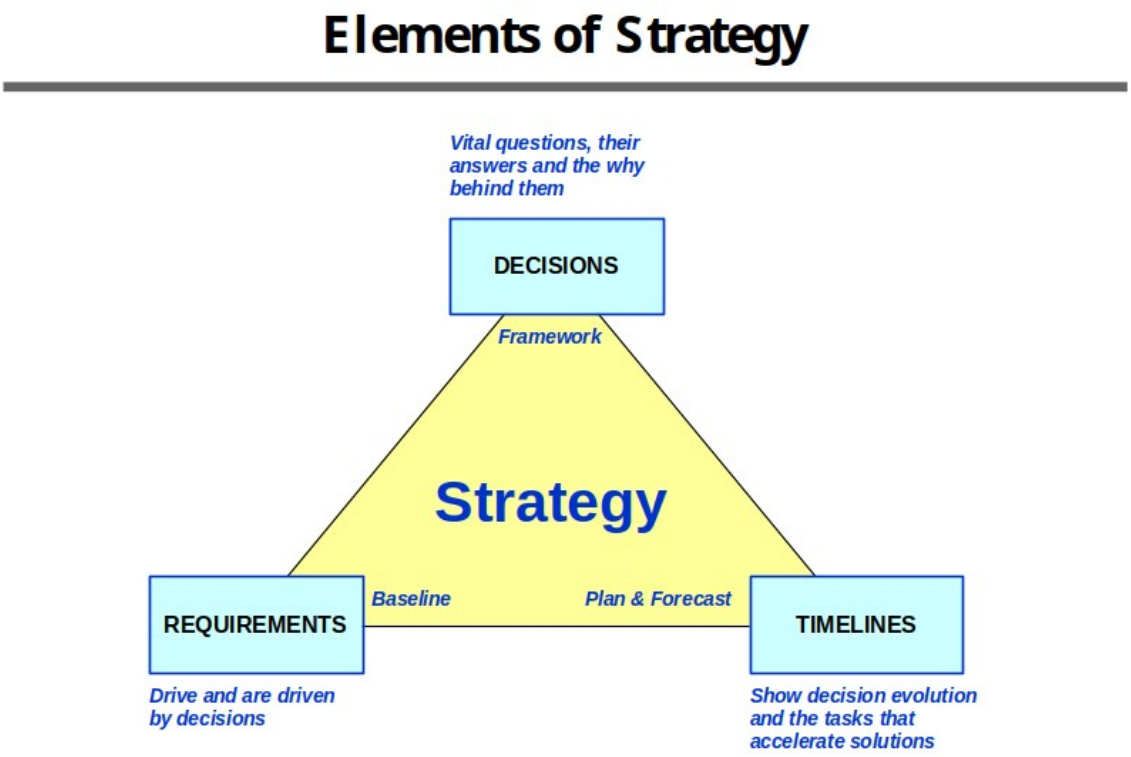

A time-conscious Decision Network supports a **continuous** strategy, product planning, process improvement or product design process.

## 5.1 Elements of Strategy

Strategy is a high-value application of human thinking, with decision-making at its core. As seen earlier, a comprehensive business strategy may be modeled as a Decision Network, in which each decision sets policy for and constrains lower level choices.

The primary knowledge components of a strategy are decisions and requirements, each of which may evolve independently through a series of states. Decisions provide a framework of vital business questions, their answers and the rationale behind them. Requirements provide a method to baseline and control the hand-off of strategic objectives to various members of the organization. They define success and communicate the boundaries for achieving it.

The following graphic represents a simplified information model for a strategy using a Decision Driven® Approach. Timelines explicitly capture the evolving states of decisions and requirements and the tasks/events that accelerate solutions (decision alternatives) and trigger changes (usually step-function improvements) to these states.



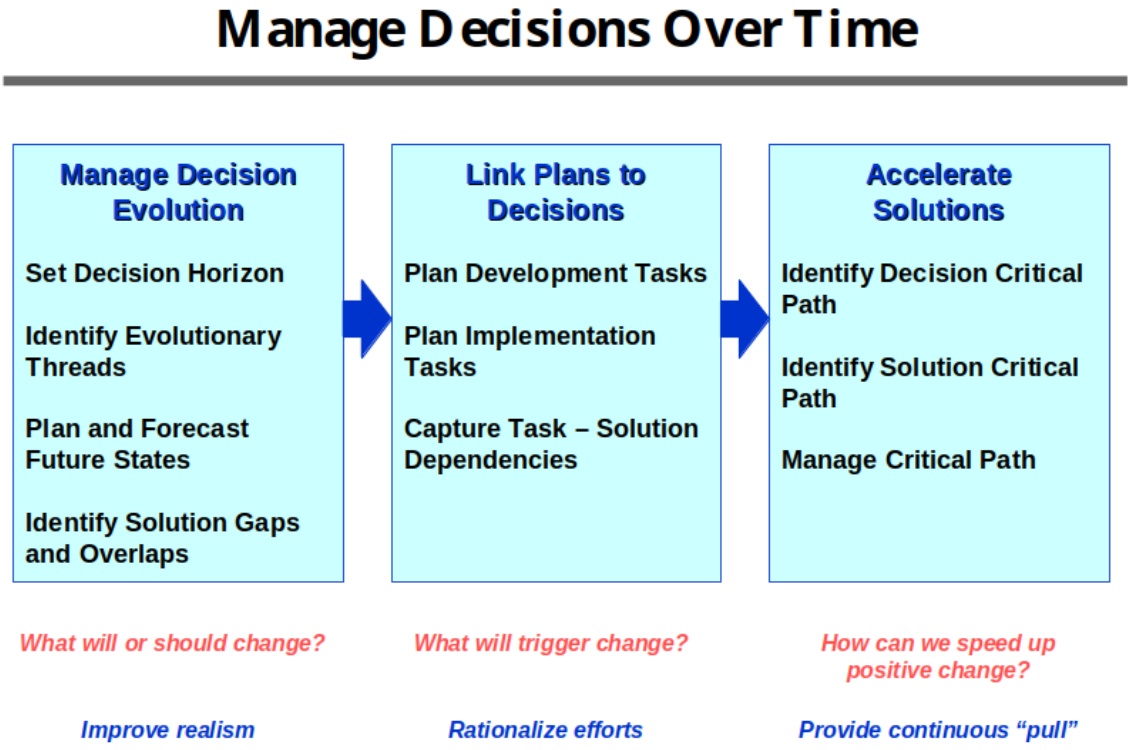

How does your current process synchronize and align decisions, requirements and timelines?

## 5.2 Manage Decisions over Time

The “Manage Decisions Over Time” process is the response to the need to create a time-conscious Decision Network. This Decision Network provides the framework from which to manage the evolution of decisions and the requirements they create/consume and to rationalize and align all the tasks (e.g. R&D projects, analysis, design, implementation) that accelerate the solutions/opportunities of the future.

The “Manage Decisions Over Time” process has been designed to:

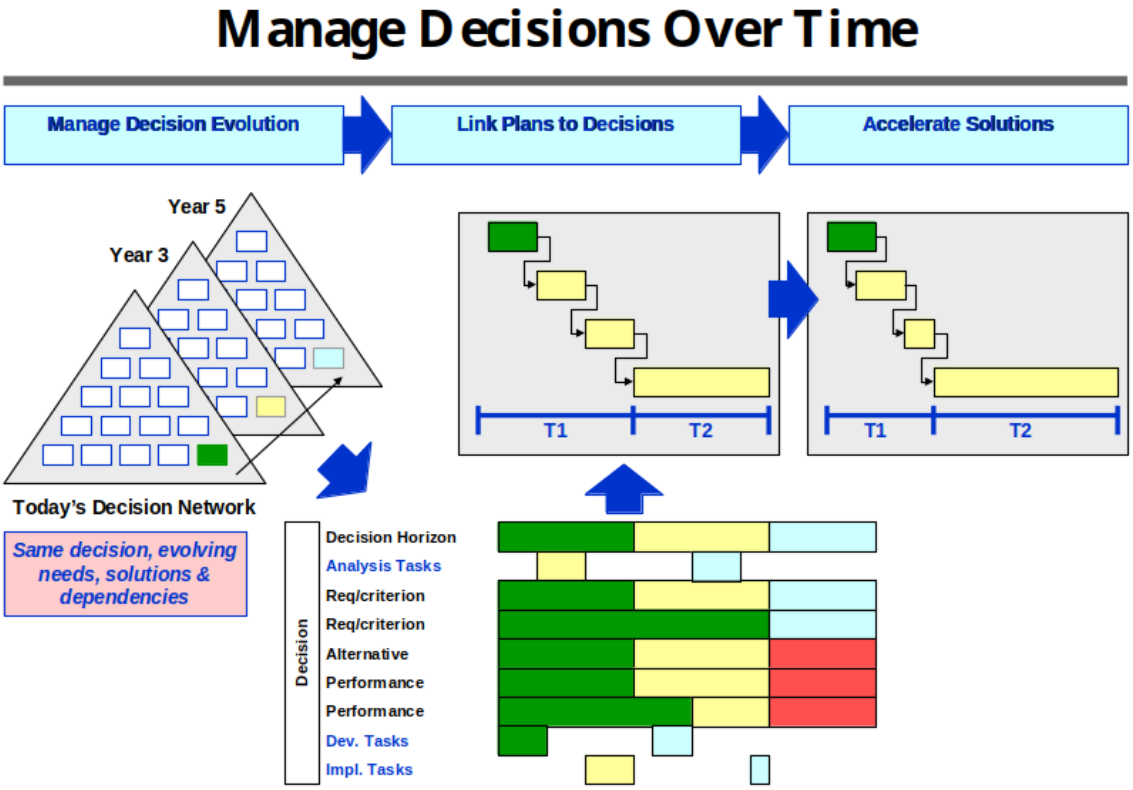
- Improve the realism of a strategy Decision Network by making explicit the “good for” horizon associated with each decision
- Amplify both knowledge and solution pull by identifying the futures states of high priority decisions
- Rationalize all development, analysis and implementation tasks against the decisions they inform and solutions (alternatives) they accelerate and deliver
- Maximize the continuous acceleration provided to solutions and the opportunities they enable by management of the idea-to-opportunity critical path




The "Manage Decisions Over Time" process includes three sub-processes or dimensions:

- Manage Decision Evolution
- Link Plans to Decisions
- Accelerate Solutions

A time-conscious Decision Network can be used to focus multiple groups (teams, departments, organizations) on the idea-to-solution critical path. This critical path typically spans multiple projects and business processes; it is often managed in fits and starts rather than as an integral solution pipeline from disruptive technology ideas to realized business opportunities. Benefits of integrated management include reduced time to market/capability and increased efficiencies through rationalization of technology and capability portfolios.




No single decision produces the success of any business; the alignment of a set of decisions is required to realize and exploit a business opportunity. The choice of which target markets and segments to pursue demands the selection of value proposition that will win the hearts of potential customers and best the competition. This value proposition demands a portfolio of products and solutions with unique capabilities. The capabilities of successful products/solutions result from effective decisions concerning key technologies and platforms. Winning technologies and scalable platforms are produced by investments in core competencies that provide the basis for differentiation.

Stated simply, a Decision Network can produce a powerful knowledge and solution pull that can accelerate solutions (and related business opportunities) into reality. Each decision exerts its own pull; it demands a solution and the knowledge required to evaluate the solution's effectiveness against stakeholders' needs. The pull is amplified when multiple decisions are aligned. The pull increases further when the entire Decision Network is fast-forwarded into the future to anticipate the competitive and market landscape that will determine tomorrow's winners and losers.

In order to fast-forward a Decision Network, one must be able to frame today the decisions of tomorrow. One of our discoveries (distilled from many engagements) was that every decision and Decision Network has an implied time context or

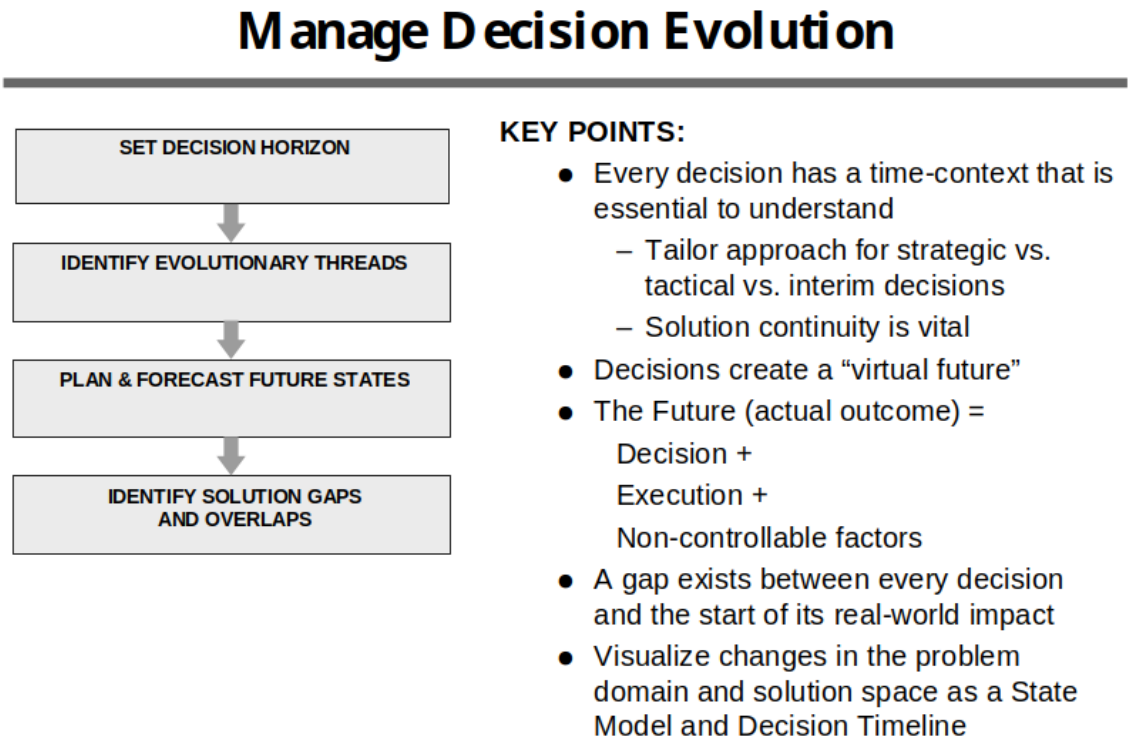
decision horizon. The decision horizon represents the “good for” period during which the outcomes that flow from a decision will affect the real world. The decision horizon may also be thought of as the decision’s period of relevance or real world effectiveness.

The sections that follow describe each Manage Decisions over Time sub-process.

## 5.3 Manage Decision Evolution

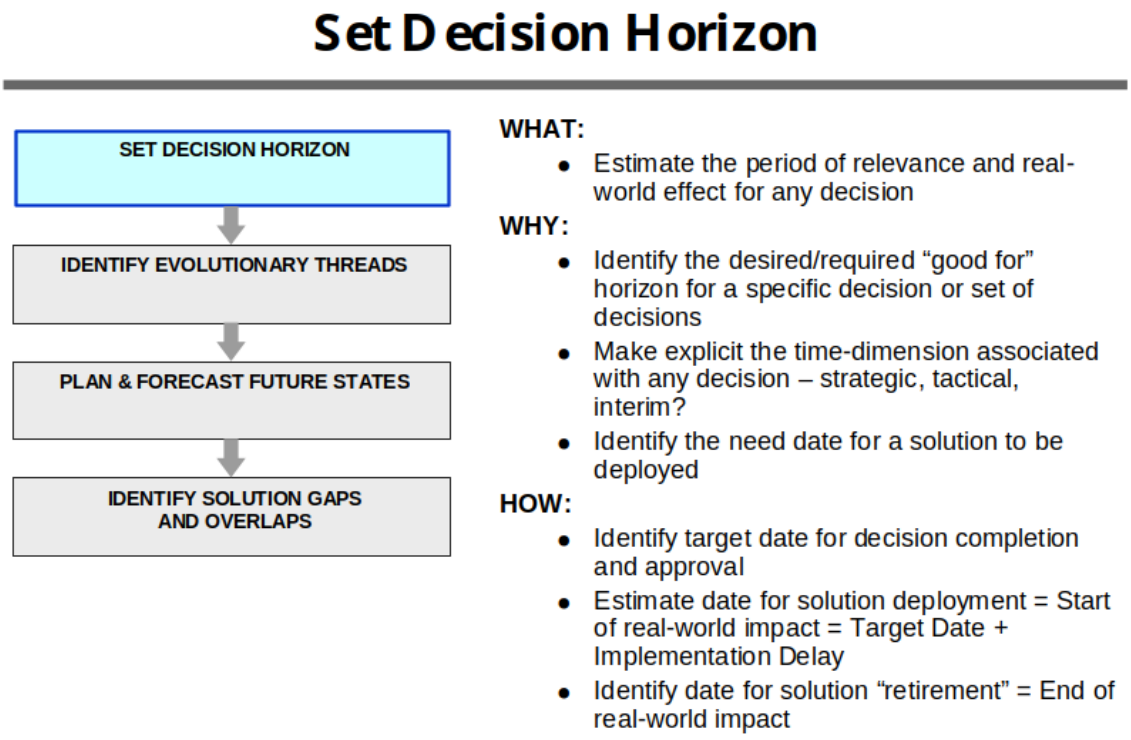
Stability and longevity are two of the most significant characteristics of a Decision Network. The decisions captured in the network represent the fundamental business or technical questions associated with a given domain. As a result, the structure and contents of a Decision Network (the problem domain) change very slowly. The decision "Choose Target Markets" has been made by every business enterprise and will be revisited often as long as these companies seek to grow and prosper.

Even though a Decision Network is a very stable framework, decisions do evolve. This decision evolution can be modeled as a series of decision states. The "Manage Decision Evolution" sub-process builds a state model that captures and forecasts the evolution of each decision and its analysis data. This evolution can be visualized as a Decision Timeline.



### 5.3.1 Set Decision Horizon

Every decision has a "good for" horizon that can be estimated in advance. This Decision Horizon represents the decision's period of relevance and real-world effectiveness. The choice of a critical technology upon which a product family will be based may endure for 10+ years. The choice of a project leader for a specific product design will be good for the project duration – perhaps 6-12 months. The choice of what to eat for lunch has a horizon of hours – until its effects fade from the body and are overwhelmed by the next meal.




The Decision Horizon makes explicit the time-dimension associated with any decision – whether it is strategic, tactical, interim/temporary or recurring/periodic.

The Decision Horizon is typically first estimated in answer to the questions:

- "When must the solution called for by this decision be deployed (put into operation)?"
- "How long will the solution called for by this decision be in operation (in-service or in-use)? How long must it last – when will it need to be retired or replaced?"

The start of the Decision Horizon is typically not the same as the "Target Date" for decision completion and approval. There is almost always an implementation delay from the point of decision to the start of its real-world impact through solution deployment.

A business enterprise desires most of its decisions to have very long horizons, i.e. to make few decisions and have each decision result in solutions that lead to stable and long-term benefits (market share, profits, competitive advantage, customer loyalty, etc.). There is natural tension between the forward-looking estimates of Decision Horizon (what a business wants) and the real-world longevity of the solutions that they can conceive and deliver. Disruptive technologies, competitor moves and counter-moves, business cycles, geo-political events and environmental trends all conspire to shorten the realistic and achievable horizon for any decision.

The Decision Horizon should be captured by estimating a Start Date and End Date rather than Start Date + Duration. This makes the horizon elastic and compressible which better matches the real-world consequences of a delay in the decision or in the solution's implementation. Such delays push out the date at which the solution is deployed and its benefits begin to be enjoyed; they do not typically extend the solution retirement date or period of competitive viability. In business terms, this is commonly called "missing the window of opportunity".

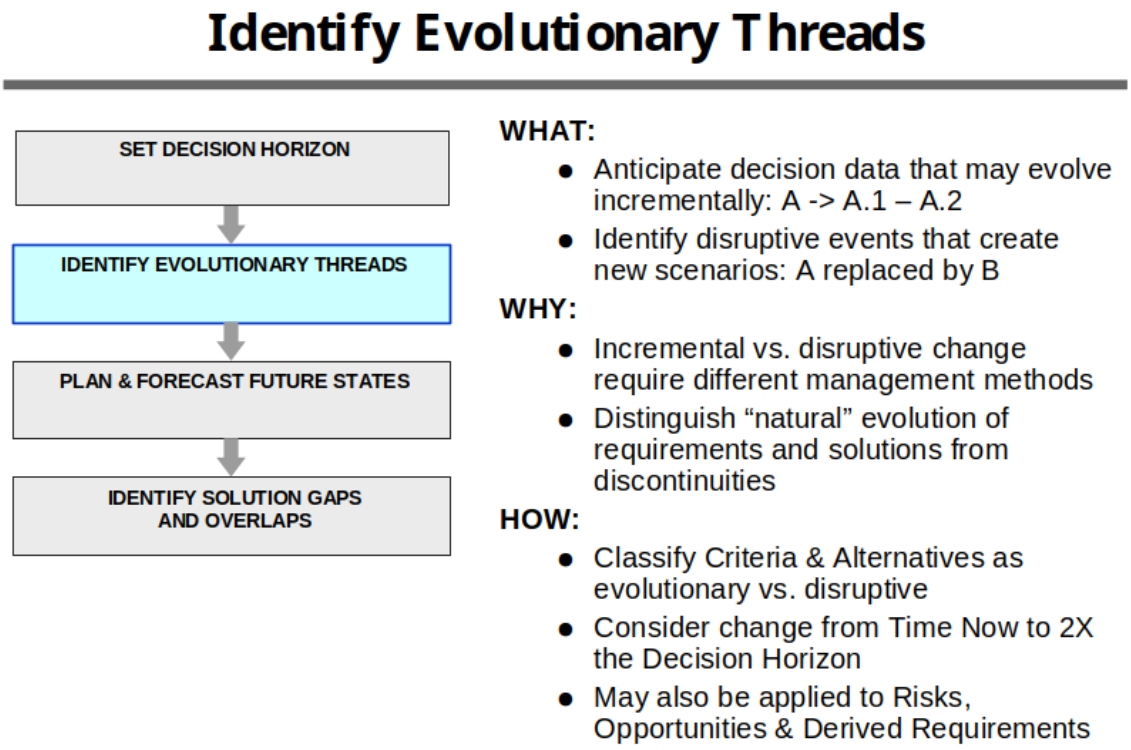
### 5.3.2 Identify Evolutionary Threads

The following types of decision data may evolve through a series of states:

- Stakeholder requirements
- Evaluation criteria (stakeholder requirements in the context of a decision)
- Alternatives (solutions)
- Performance of alternatives against the criteria
- Risks
- Opportunities
- Derived Requirements

In addition, some Risk Mitigation and Opportunity Growth actions behave as optional Derived Requirements and therefore may also evolve. Other such actions are effectively Tasks, which are treated as one-shot activities that do not pass through a series of states.

Stakeholder requirements and evaluation criteria represent the problem domain and change slowly relative to the other types of information (the solution space).




Alternatives and their performance are typically the most interesting information to model as a series of states. This process is analogous to product release planning which asks:

- "How many releases of Product X are planned?"
- "What features will be included in each release?"

Although the evolution of any solution could be modeled as a continuous process or one comprised of many baby steps, it is more practical to aggregate these into a few significant step-function improvements (releases or versions). Each of these steps becomes a next state in the life of the solution at which its performance significantly improves against various criteria. This series of related states associated with an alternative forms an evolutionary thread or solution scenario.

To identify and capture evolutionary threads:

- Anticipate solutions that may evolve incrementally: A -> A.1 –> A.2
- Identify disruptive events that create new (independent, competing) solution threads: A replaced by B, starting a new B thread/scenario.
- Classify solutions (alternatives) as evolutionary, competing or disruptive

Alternative/performance states may be illustrated on a Decision Timeline as a series (common row) of time-constrained bars that describe the step function differences in design or capabilities that occur within each state.

The evolution of solutions doesn't occur only as a single thread or series of states. A network of states better represents hybrid solutions and the convergence and divergence of technology families. Although most would agree that the Windows operating system family is an independent and competing solution to the Unix breed, there might be debate concerning the relationship between Unix and Linux.

### 5.3.3 Plan and Forecast Future States

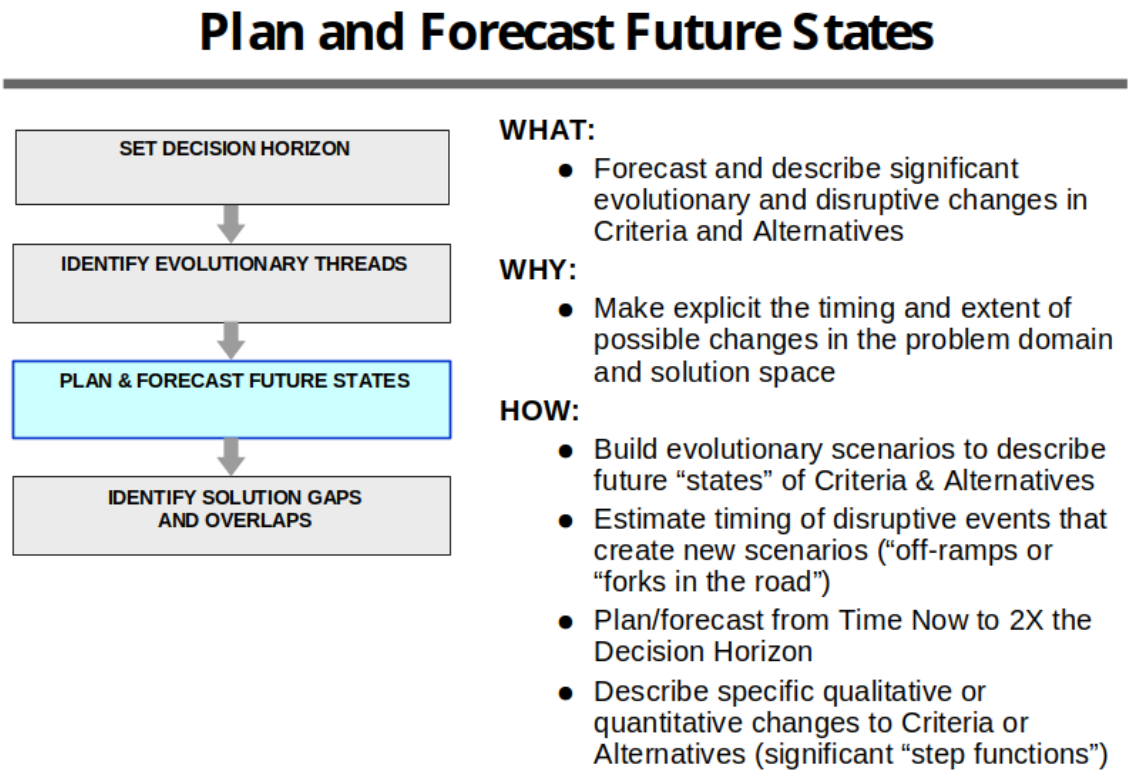
After solutions have been grouped into threads or families, the timing and extent of significant evolutionary and disruptive changes should be captured explicitly. For products lines or solution families under a company's control, this effort may represent the solution plan of record. For competing solution families, this may represent a forecast or best guess scenario, filled with significant uncertainty. In both cases, the plans or forecasts should capture the best thinking of the present concerning the future state of the decision. This is the start of "knowing what you don't know" which begins to create a knowledge pull to reduce major uncertainties.

To plan and forecast future states:

- Estimate the timing of disruptive events that create new scenarios (off-ramps or forks in the road)
- Plan/forecast from Time Now to 2X the desired Decision Horizon

- Describe specific qualitative or quantitative changes to criteria, alternatives or alternative performance (significant step functions)

It is important to look beyond the horizon of the current decision so that disruptive events and other forks in the road are not overlooked. The recommendation to look out 2X the Decision Horizon is a rule of thumb to stretch your thinking to avoid overlooking significant long-term surprises.

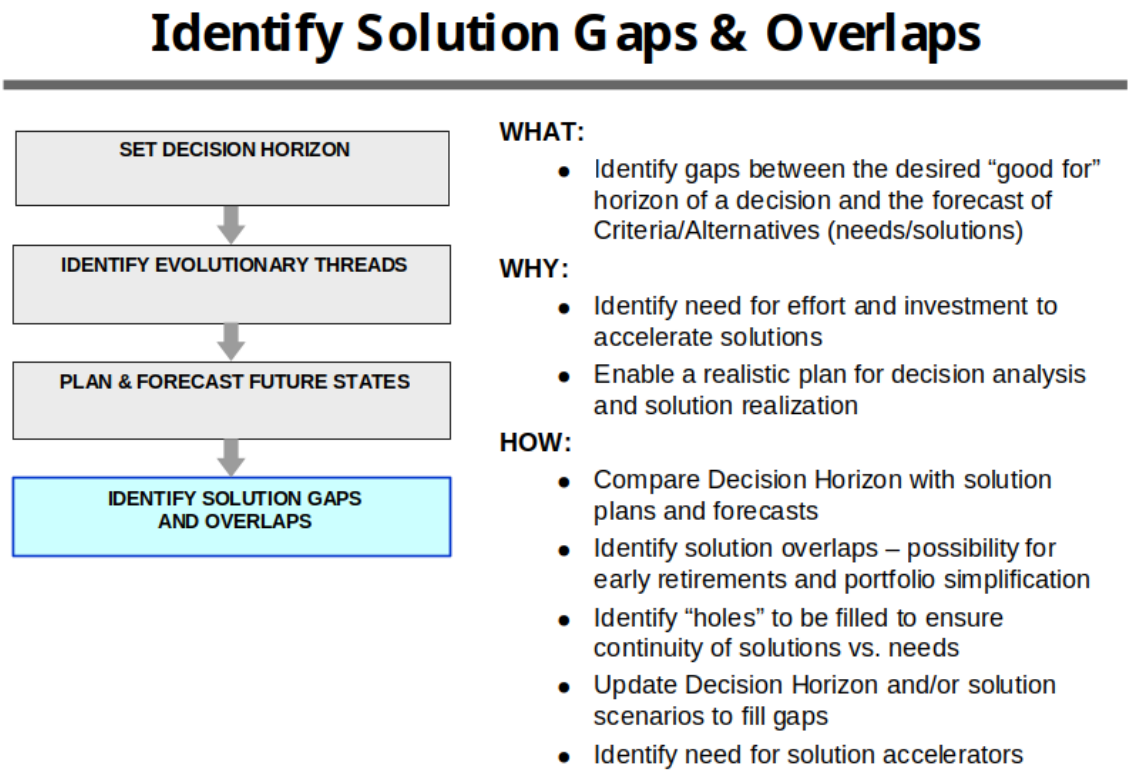



Experience has shown that summarizing the essence of a forecasted change in qualitative performance is a challenging task. Complex and fuzzy Wants compound the difficulty of this task. Learning cycles that refine and validate criteria to highlight the essence of your stakeholders' objectives are the primary antidote to fuzzy and ambiguous performance forecasts.

### 5.3.4 Identify Solution Gaps and Overlaps

The previous steps create Decision Timelines that represent evolving solutions and their performance against evolving requirements. These can be expected to highlight numerous solution gaps and overlaps. There may be discontinuities

between stakeholder needs and solution timing and capabilities. There may be competitor solutions that deliver unique value to customers sooner than our products. We may offer multiple solutions with capability overlaps, essentially competing with ourselves and perhaps confusing the marketplace while driving up our cost of engineering and sales.




These discoveries should trigger a Gap/Overlap Analysis to accomplish the following:

- Identify gaps between the desired horizon of a decision and the forecast of criteria/alternatives (needs/solutions)
- Identify the need for effort and investment to accelerate solutions
- Enable a realistic plan for decision analysis and solution realization

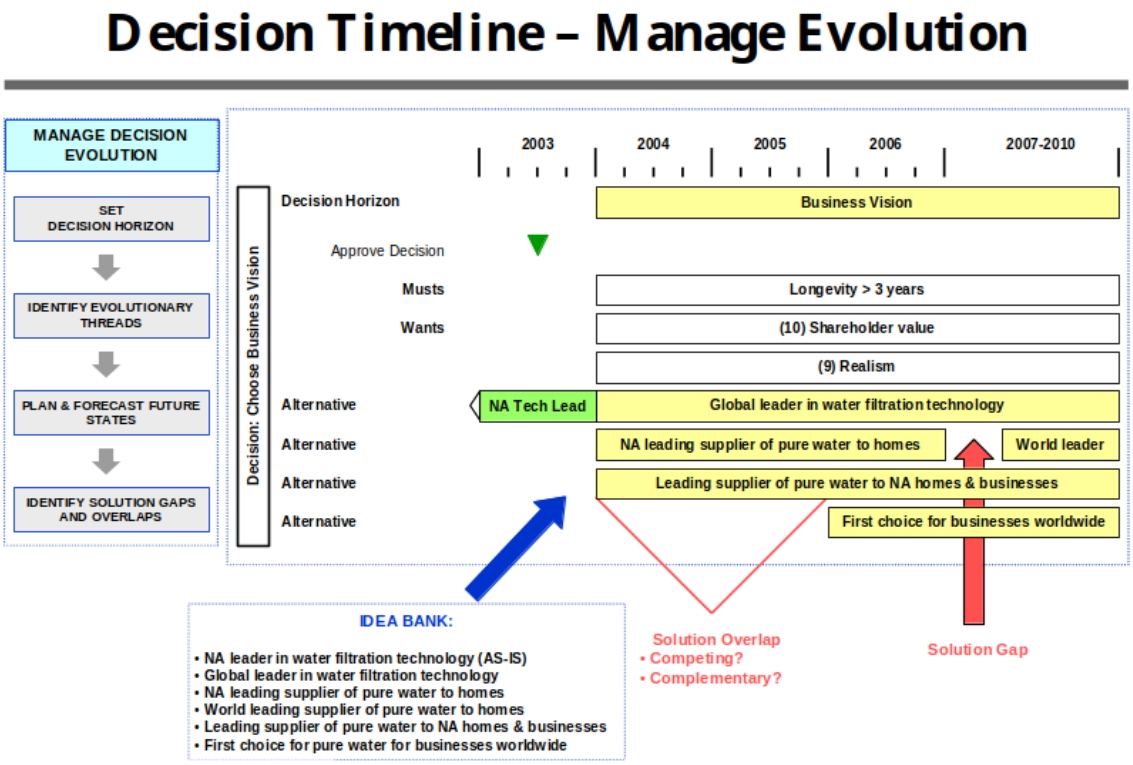
Don't forget to look for solution gaps in time and performance gaps compared to either competitor offerings or the continually rising expectations of the market. Such expectations may reflect incremental demand for more and better performance or

sudden discontinuities triggered by the emergence of a disruptive technology that raises the bar for all existing solutions.

What techniques does your organization currently use to perform gap analysis?

### 5.3.5 Decision Timeline – Manage Evolution

The following graphic illustrates the use of a Decision Timeline to manage decision evolution. The example is built around the "Choose Business Vision" decision for the company whose home water filter has been the subject of previous examples.




As we work through this example, consider how your organization's Vision Statement might also evolve over the next 10 years.

Current Vision Statement:

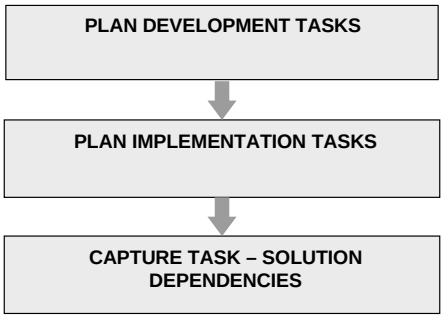
Logical Next State:

Disruptive or competitive Vision alternative (new thread):

## 5.4 Link Plans to Decisions

Useful changes to solutions and their performance don't just happen. They require conscious and persistent investment of talent and treasure to push solutions to their next state performance levels. Along the way, there may be numerous estimation and measurement points to inform decisions by assessing the effectiveness of solution concepts.

# Link Plans to Decisions




**KEY POINTS:**

- Leverage Decision Network as Decision Breakdown Structure
  - Spans multiple projects, processes & organizations
  - Enterprise Project Management
- Rationalize:
  - R&D project portfolio
  - Process improvement initiatives
- Explicitly trace every task to the decision that it informs and/or the solution that it matures
- Tasks defined to highlight value:
  - Creation of knowledge to fill gaps
  - Advancement of solution maturity
- Basis for a value-creation critical path model

Three types of tasks may be used to represent the work/investments required to evaluate and deliver the solutions of the future:

- Analysis tasks – Inform decisions by validating stakeholder needs or estimating/verifying the performance of alternatives
- Development tasks – Mature alternatives to make them capable, available and ready-for-use

- Implementation tasks – Translate ready-for-use alternatives into reality in a particular context or for a specific mission. Solution deployment.

The “Manage Decisions Over Time” process creates an explicit linkage between these tasks, the decisions they inform and the alternatives (solutions) they mature.

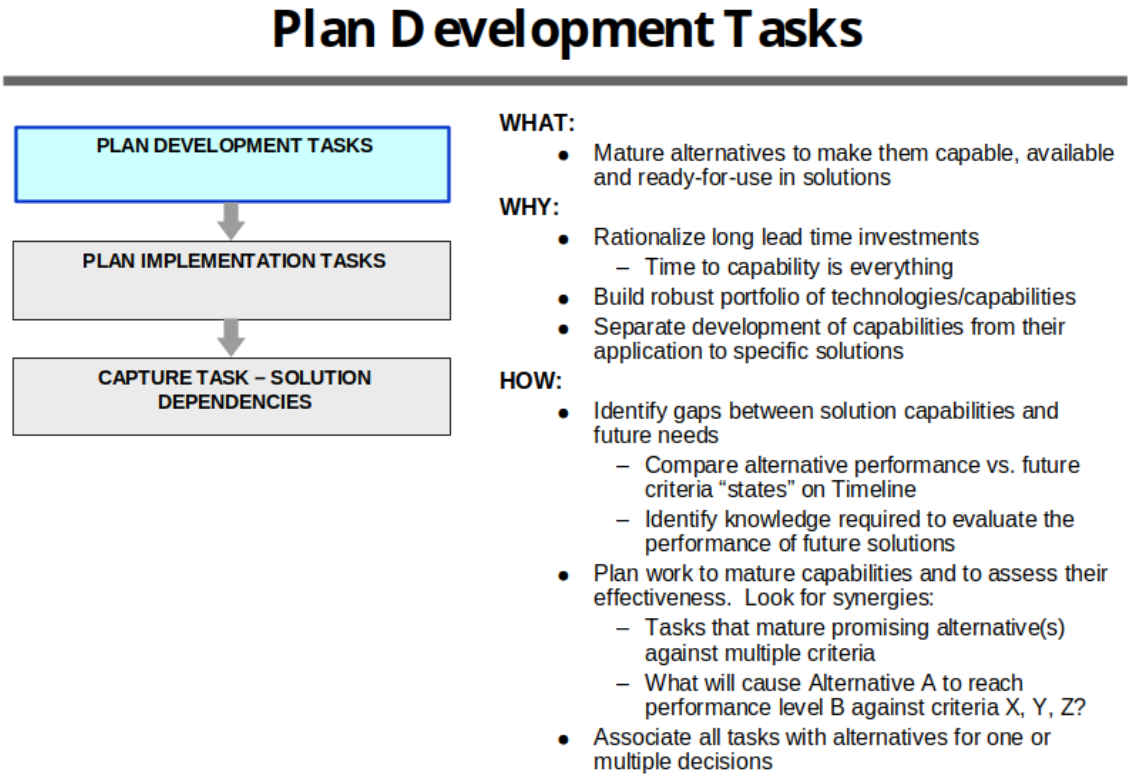
At first glance, this may sound like Project Management 101. However, because a strategy Decision Network spans the entire enterprise, this linkage spans multiple projects and business processes. R&D projects that advance specific technologies may be linked to future product designs that may drive new market opportunities and even business models. Ensuring that every task is explicitly traceable to the decision that it informs and/or the solution that it matures is a powerful tool for aligning and rationalizing the various portfolios that comprise a business enterprise:

- Core competencies
- Technology R&D projects
- Process improvement initiatives
- Products/solutions/services
- Business opportunities
- Target markets/customers

### 5.4.1 Plan Development Tasks

In the context of managing decisions over time, Development Tasks are activities (work, effort, investments or events) that mature alternatives (e.g. technologies) to bring them to a level of maturity that enables them to be designed into real world solutions. The most recognizable type of Development Task are technology R&D projects that take a promising technology through a series of characterization and scalability improvement iterations until the technology is deemed to be ready for its first use in a real world product or solution.

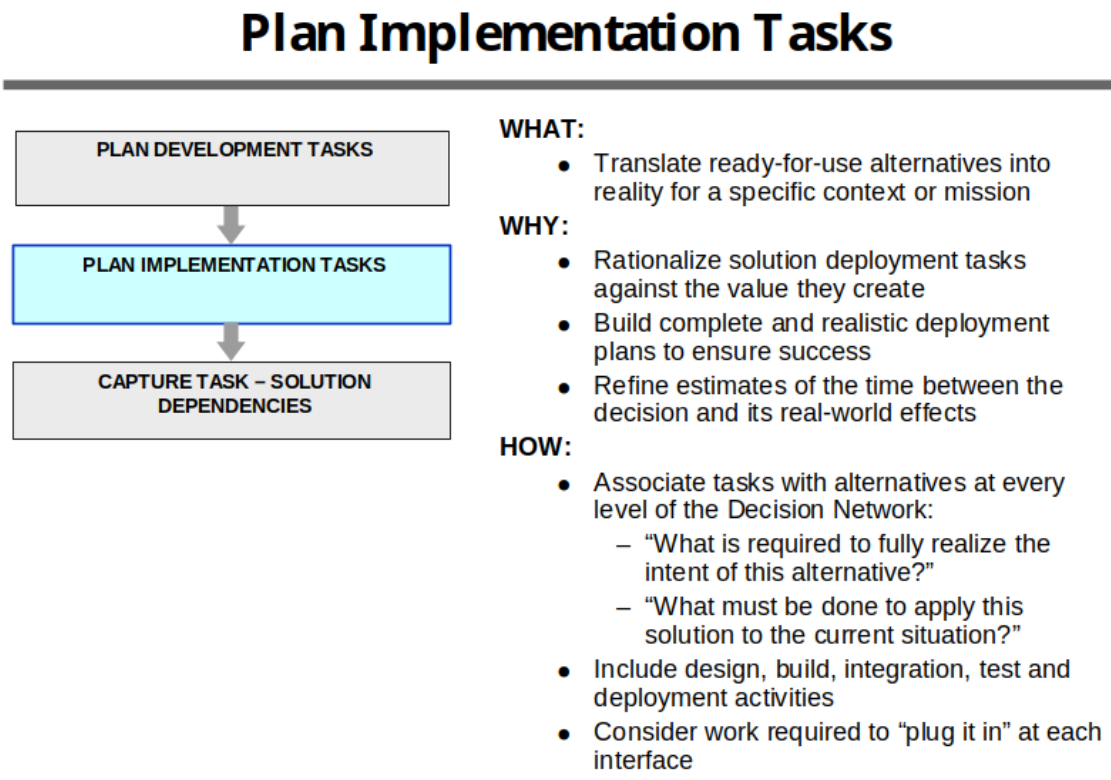
All Development Tasks should be associated with alternatives in one or more decisions. Development Tasks may be further decomposed to identify activities that improve alternative performance against specific criteria.




How does your organization assess the "readiness for use" of a technology or process capability?

### 5.4.2 Plan Implementation Tasks

In the context of managing decisions over time, Implementation Tasks take mature and ready-for-use alternatives as building blocks and translate them into reality as solutions to meet a specific mission or need. Product design, build, integration, test and deployment activities are typical implementation tasks.



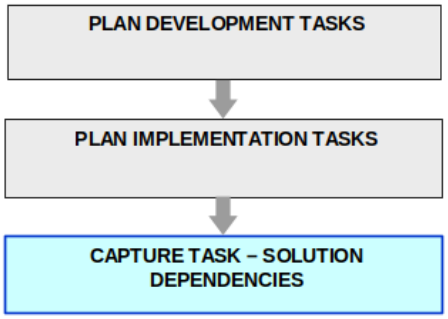

Implementation Tasks may be thought of as the effort required to plug a candidate solution into a larger system after this solution has been chosen as the Preferred Alternative. As such, these tasks often work out the details of the solution's interfaces to existing components within a larger system of systems. Such interfaces include the obvious hardware and software connections, but also the softer links to existing processes, people and the operating environment.

### 5.4.3 Capture Task – Solution Dependencies

After analysis, development and implementation tasks have been identified for each decision/solution, they may then be networked together using standard critical path logic. This may include a mixture of the following types of dependencies:

- Decision-to-Decision
- Solution-to-Solution
- Task-to-Decision
- Task-to-Solution
- Task-to-Task

# Capture Task – Solution Dependencies




**WHAT:**

- Create a dependency-based plan to deploy solutions that achieve their expected performance (deliver on-time on-target value)

**WHY:**

- Make explicit the value-creation chain that delivers new capability "states"
- Reinforce commitments between organizations
- Enable multi-organization, multi-process, multi-project critical path management

**HOW:**

- Link together the full solution design, build, integration, test and deployment plan
- Task-to-Task Dependencies
- Task-to-Solution Dependencies
  - Task-to-Performance
  - Task-to-Alternatives
- Solution-to-Solution Dependencies
- Use standard critical path logic

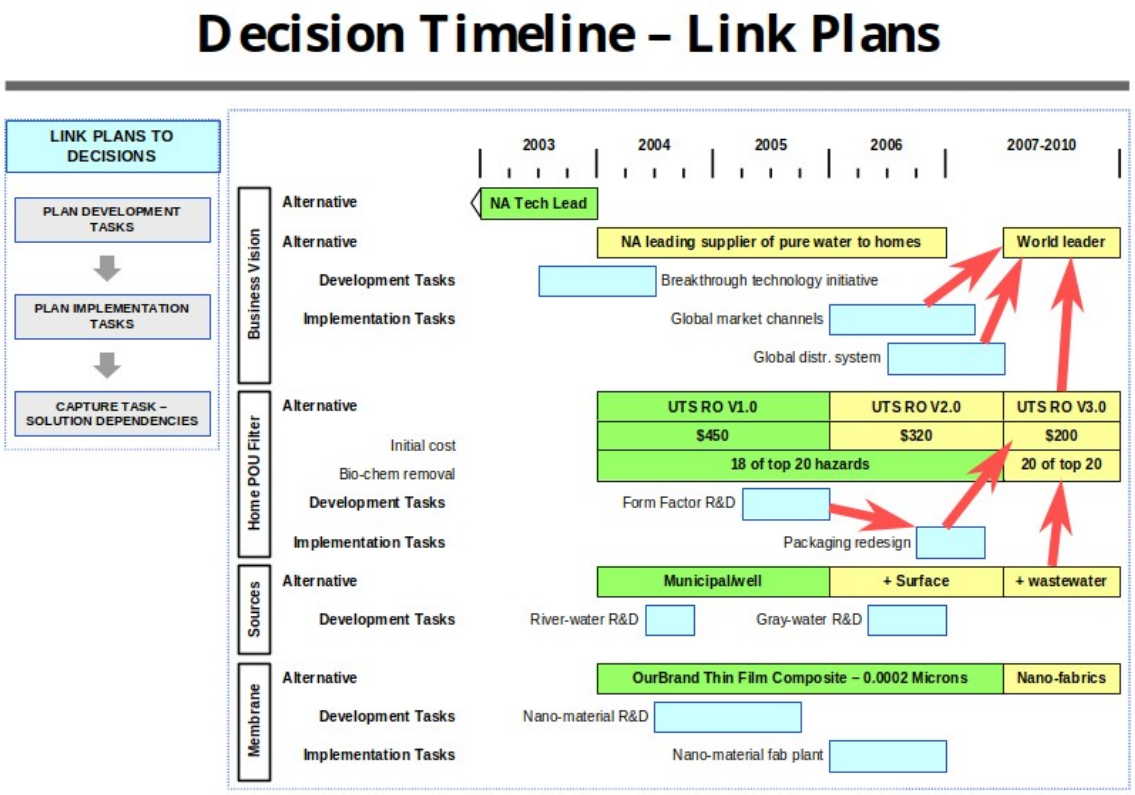
Dependencies between decisions and solutions typically are represented by Start-Start links. These relationships reflect the fact that lower-level decisions and solutions roll up into their higher-level parents. Task-to-anything dependencies are typically Finish-Start.

Linkages between tasks and various solution states create a unique form of dependency model. Typical project management processes only require linkage between tasks (work or milestones). By adding solutions (alternatives and their evolving performance levels) to the model, the value-creation or value-chain critical path may be identified and managed. All tasks may be then be rationalized and prioritized against the value they deliver or accelerate.

Because a strategy Decision Network spans multiple organizations and business process, task-solution dependencies are typically managed at a less detailed level than within a single project environment. The dependency network is more likely a project of projects, rather than a tool for detailed, day-to-day or week-to-week planning and resource management.

### 5.4.4 Decision Timeline – Link Plans to Decisions

The following graphic continues the refinement of the Decision Timeline the "Choose Business Vision" decision and several child decisions.



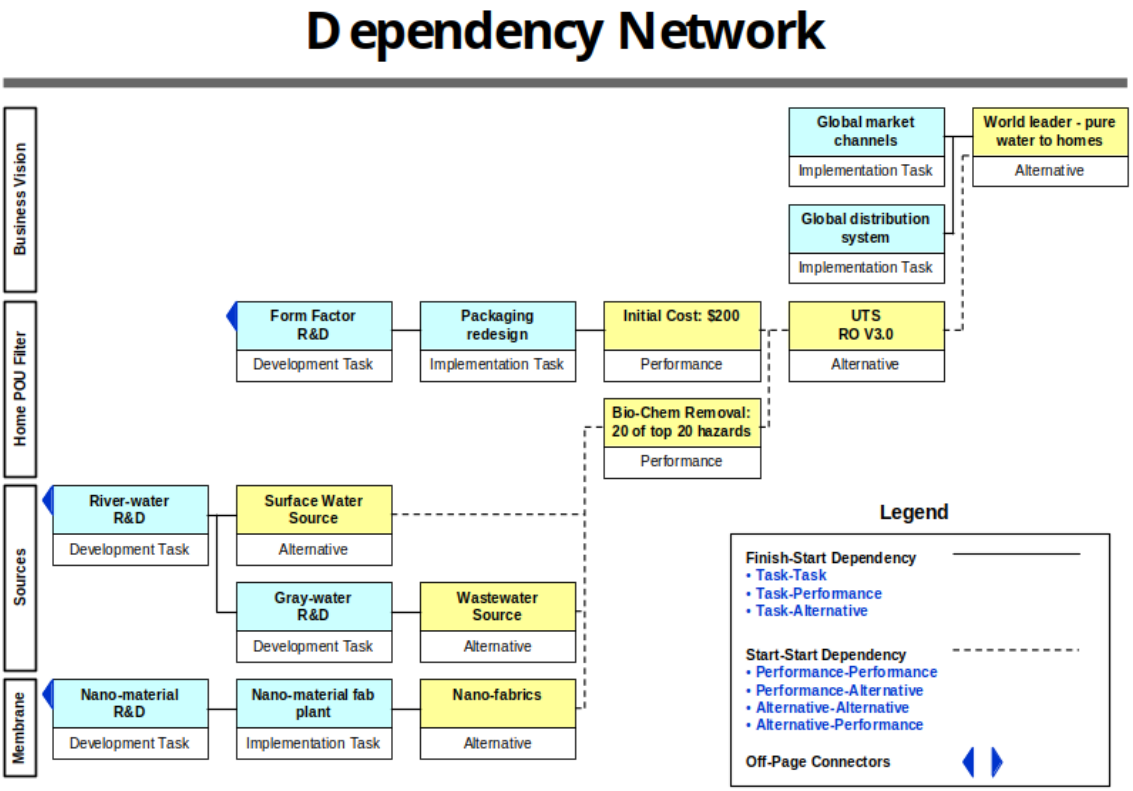

Note how a series of Development and Implementation Tasks support the creation of value at every level in the Decision Network.

Which organizations within your company would own the various decisions and tasks on the Decision Timeline?

How would your current process align these organizations, decisions and tasks?

### 5.4.5 Dependency Network

The following graphic represents the dependency network associated with the water filter company's Decision Timeline. Note the different classes of objects that comprise the value creation critical path.

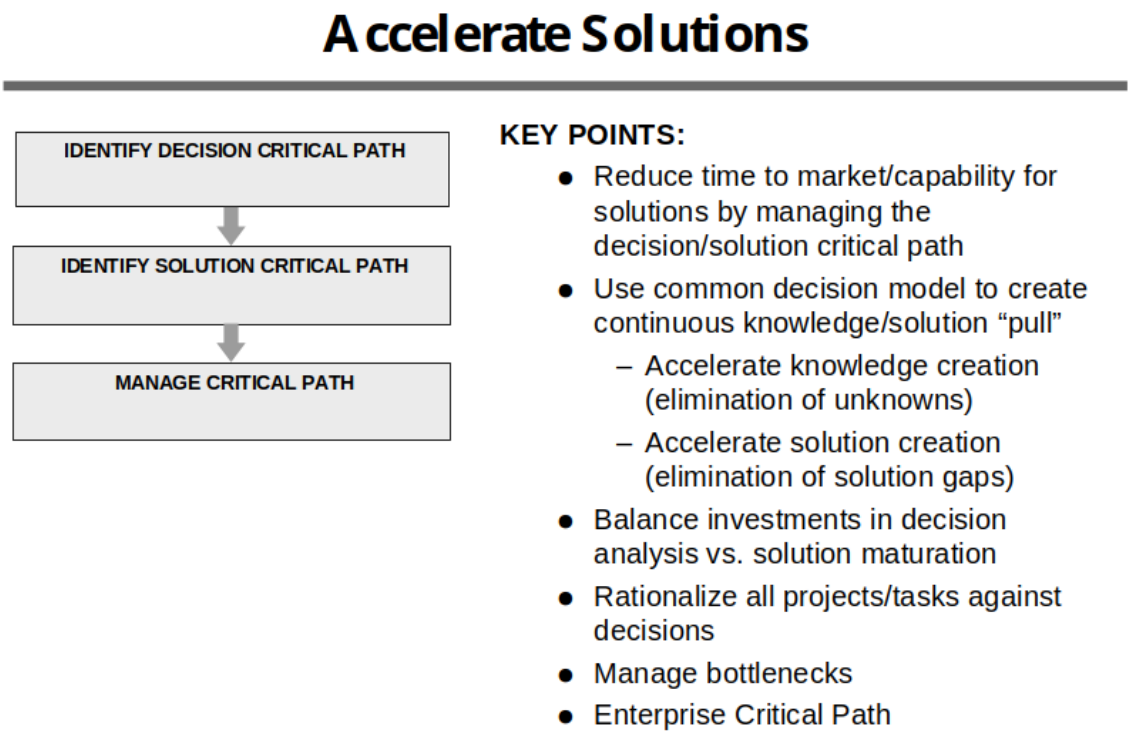



Note the decisions displayed along the left side of the dependency network. We recommend that the decision context of all solutions and tasks are visible in the dependency network. This acts as a safeguard to ensure that all work can be justified against the decisions they inform or solutions they create, mature and deliver.

How would your current management process identify work that doesn't explicitly drive the creation of value?

## 5.5 Accelerate Solutions

The primary benefit of the "Manage Decisions Over Time" process is its ability to accelerate solutions into reality. This is accomplished by managing the idea-to-solution "Enterprise" critical path across multiple decisions, multiple projects and multiple organizations. An enterprise critical path model is used to rationalize all projects and tasks against the decisions they inform or and the solutions they deliver.



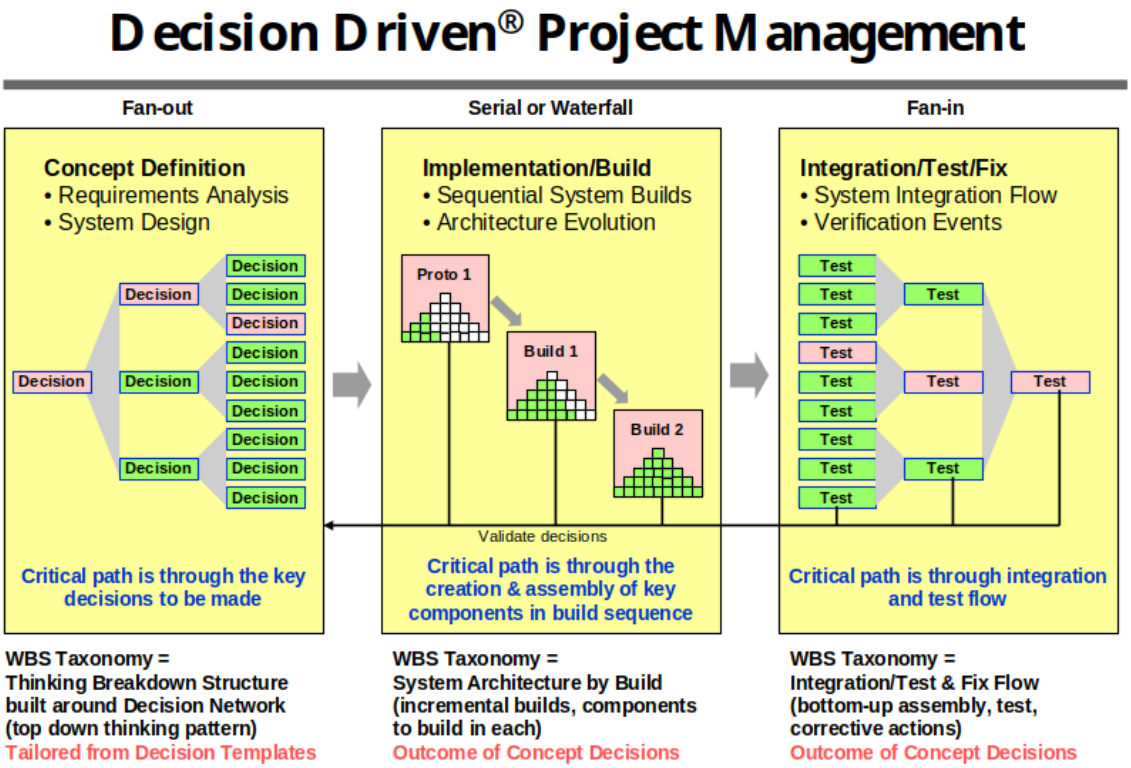

This is accomplished by using a common decision model to create a continuous knowledge/solution pull and to improve thinking efficiencies by:

- Accelerating knowledge creation (elimination of unknowns)
- Accelerating solution creation and maturity
- Balancing investments in decision analysis against solution maturation
- Rationalizing all projects/tasks against decisions – killing off dead-end projects and tasks

### 5.5.1 Decision Driven® Project Management

A basic premise of the Decision Driven® Approach is that ***Decisions Create the Future***. Decisions actually create a vision of the future, a ***Virtual Future***, which requires the concrete tasks of a project to bring that future into reality. Practically speaking, most projects include both of these dimensions: decisions about how the future should look (continually refined and elaborated in more detail) and decisions about how to "make it so" by building up the new product or capability that is at the heart of this future.

Many projects begin their life with the creation of a Work Breakdown Structure (WBS) and the development of a critical path schedule. This is often done without much consideration of the key decisions that affect the project scope and form the execution strategy. This is akin to developing a plan to "GET THERE" without clearly defining where "THERE" is.



It is impossible to understand and manage the critical path associated with a project without isolating and understanding the decisions that create and constrain that critical path. Without managing the critical path, little progress can be made in dramatically reducing **time to market** and **time to capability**.

During the initial Concept Definition phase of a project, decisions ARE the critical path. During the Implementation/Build phase of the project, the critical path typically flows through a series of incremental development activities in which increasingly complete systems are built up and evaluated. During the final Integration/Test/Fix phase, the critical path is a series of bottom-up integration and test events that lead to final system acceptance by the users. However, the critical path during the final two phases is actually set much earlier by concept and project execution decisions (Choose Build Strategy, Choose Test Strategy, etc.).

> Hence, it is accurate to say that the critical path through any project can only be managed by controlling the project decision management process first (and early in the project life cycle).

The first task in a project should be the building of a decision management plan that includes decisions about the future and how to get there. This Decision Breakdown Structure then forms the basis for an effective Work Breakdown Structure and critical path schedule for the project. In addition, whenever a key decision is made, its impact on the project plan should be reconsidered.

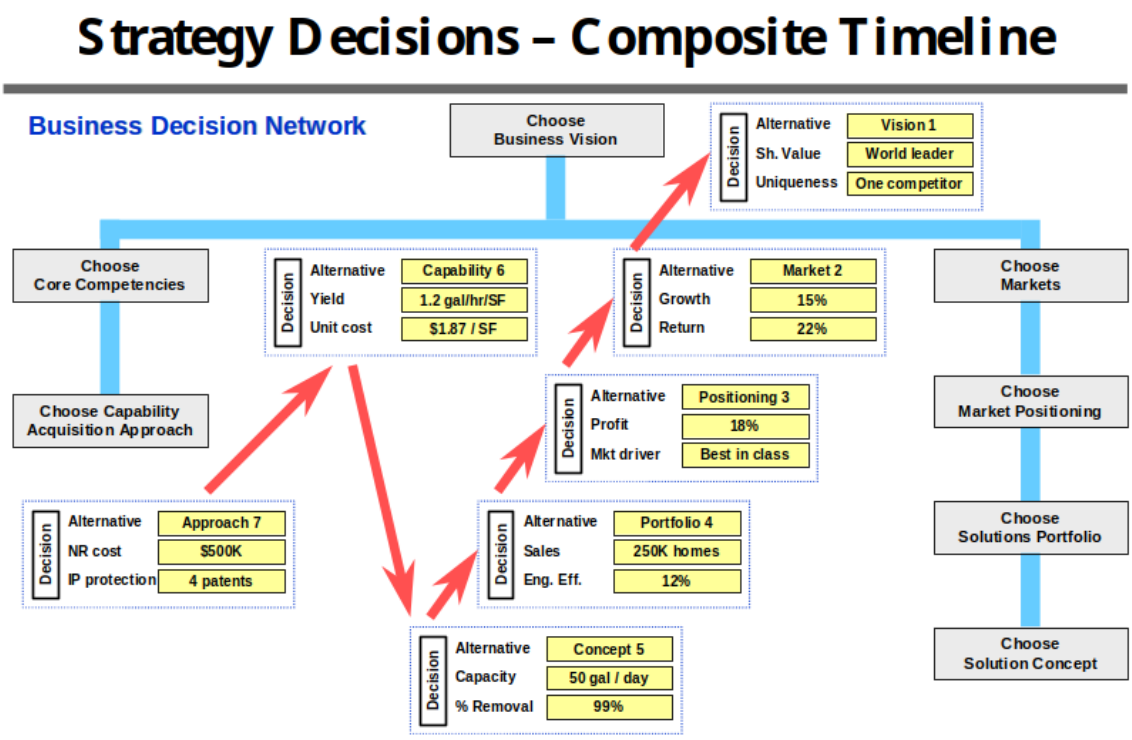
Which phase of a typical project offers the greatest opportunity for reducing time to market?

How does a Decision Driven® Critical Path differ from your current project management method?

How does this view produce a WBS that is different from your standard model of a project?

### 5.5.2 Strategy Decisions – Composite Timeline

The Manage Decisions over Time process extends the single project acceleration benefits of the Decision Driven® Approach to the full Enterprise Idea-to-Opportunity Critical Path. The following graphic shows a subset of a typical business strategy Decision Network mapped to a composite (multi-decision) Timeline. This Decision Network highlights two main branches, a Core Competency branch (decisions about the capabilities and strengths that we will build around) and a Market branch (decisions about the customers we will serve and the products we will offer).

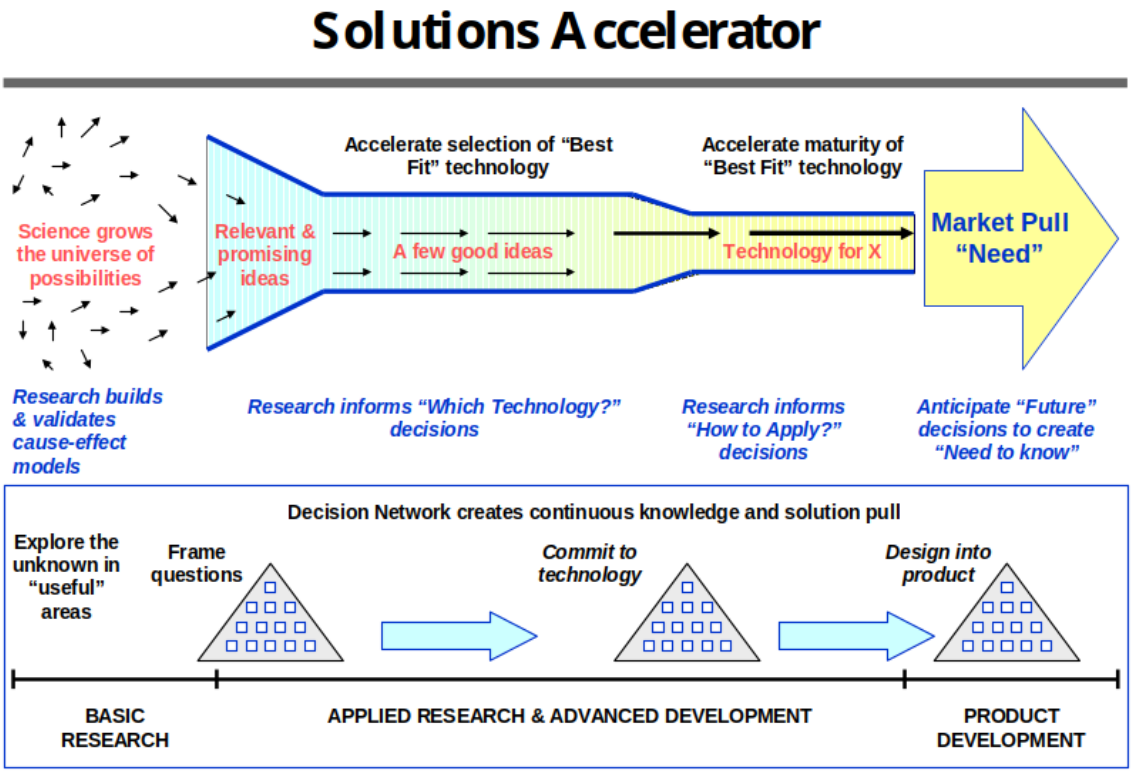



A Composite Decision Timeline may be used to summarize the creative tension between the Technology Push and Market Pull forces within an organization. It visually sews together the value-creation chain from the R&D lab to business opportunities and even corporate vision.

How does your organization visualize and balance Technology Push vs. Market Pull forces?

### 5.5.3 Solutions Accelerator

A Decision Network can serve as a Solutions Accelerator. The accelerator may be thought of as the blend of two metaphors. First, it serves as an "intelligent vacuum cleaner" that pulls in relevant and promising capabilities. The pull is initiated by building a Decision Network that anticipates the need for new solutions and the knowledge to understand, create and deploy them. Second, it serves as a solution pipeline in which the application of a continuous pull (vacuum) accelerates the winners into reality in the marketplace. The same decision model is applied to technology and solution ideas at all points; the decision framework and discipline provides acceleration to the solutions throughout the pipeline. All research and development activities may then be rationalized by linking them to the decisions that they inform and for which they create and mature solutions



The Solutions Accelerator illustrates the typical phases of technology or capability development and delivery. During Basic Research, science grows the universe of possibilities and identifies candidate technologies as ideas worth pursuing. At this stage, the Decision Network frames the vital questions that guide a diverse set of research and academic partnerships. These partnerships provide the breadth of expertise required to perform a first-cut screening of new technology concepts.

Basic Research is followed by a technology maturation phase, which may include both Applied Research and Advanced Development. While the scope of these processes varies among organizations, during each of them the knowledge and solution holes in the Decision Network are progressively filled. Candidate technologies are characterized and the processes required to leverage them for commercial application (e.g. achieve rate production goals and quality targets) are designed and matured. Some technologies may wash out and be abandoned; others may yield exciting new application possibilities that were not recognized when they entered the pipeline.

Advanced Development is responsible for maturation of candidate technologies from a level of unacceptable risk to one of manageable risk. The output of the Advanced Development effort is a Technology Cache (aka Technology Shelf). The Technology Cache represents a portfolio of technologies in-process, each of which represents progress toward a proven, low risk capability that is real and ready for a commitment to deployment.

Technology maturation is most effective if controlled by a distinct organization with a clear charter to transition technologies from feasible ideas to ready-for-use building blocks. Such an independent organization can balance the pressures inherent in the push philosophy of a research organization and the pull realities of the product development teams.

Finally, a technology or capability deployment phase is entered when the Development Engineering organization begins to design the technology into their products and solutions. This first use requires a technology transfer capability that can be greatly simplified if a single Market Pull Decision Network has been maintained throughout technology development. The Solutions Engineering organization receives the Decision Network, populated with the results of research, which they may then tailor and extend for their specific application.

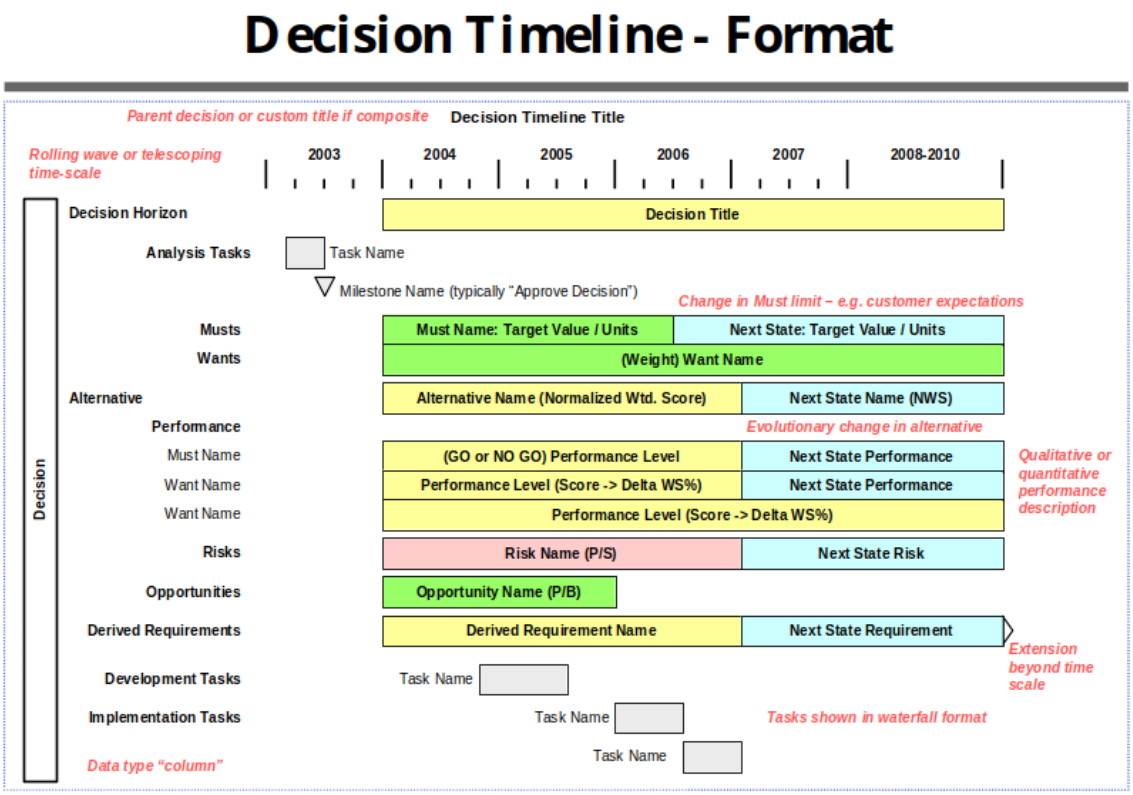
The Solutions Accelerator concept suggests two useful process metrics, Technology/Capability Yield and Technology/Capability Cycle Time. Yield tracks the percentage of promising technologies or capabilities that enter the pipeline and are actually deployed into products and solutions. Cycle Time tracks the time to capability from identification as an idea worth pursuing to its first use or the commitment to first use.

What techniques do you currently use to provide coherence to your R&D projects?

What values for Technology/Capability Yield and Cycle Time are typical your organization? What would be the business impact of 2X improvements in each?

### 5.5.4 Decision Timelines

The following graphic illustrates the typical format and contents of a Decision Timeline.



Timelines use a stacked Gantt format that displays the evolution of decisions as a single thread on a common row. Planned or forecasted changes to criteria, alternatives, performance, risks, opportunities and derived requirements may also be shown in this format.

Timelines typically display all types of tasks in waterfall format of a standard project management Gantt chart.

Timelines include a multi-period time scale. The time scale typically extends to cover the Decision Horizon for the parent decision on the Timeline. This is commonly 5, 10, or 15 years. The time scale is broken into a near term segment (viewed at one year intervals) and a far term or long-range segment shown as a single interval. This approach supports the common Rolling Wave method of planning in which greater detail and precision is applied to near term decisions and tasks.

How does this Timeline format compare with other planning and forecasting tools currently used by your organization?

What is the Decision Horizon associated with your organization's strategy? What would be the benefits of extending this horizon by 2X or 3X?

### 5.5.5 Decision Timeline Applications

The "Manage Decisions Over Time" process can be applied to a variety of business situations.

- Large Scale R&D – Complex system design programs with the need for technology maturation through significant R&D investments
- Portfolio Management - Multi-generational product release plans, including product line convergence and divergence scenarios.
- Solution Optimization - Continuous improvement or periodic releases for internally developed product lines. Technology insertion and upgrades to solution architectures and platforms. Incremental capability growth through process improvement initiatives.

- Parallel Technology / Concept Development – Long duration decisions in which parallel solution paths are kept open while layers of child decisions are investigated.

## Decision Timeline Applications

**Large Scale R&D – System Design Program**

- Manage the Idea – Capability Deployment critical path
- High R&D component – must identify prerequisite investments

**Portfolio Management**

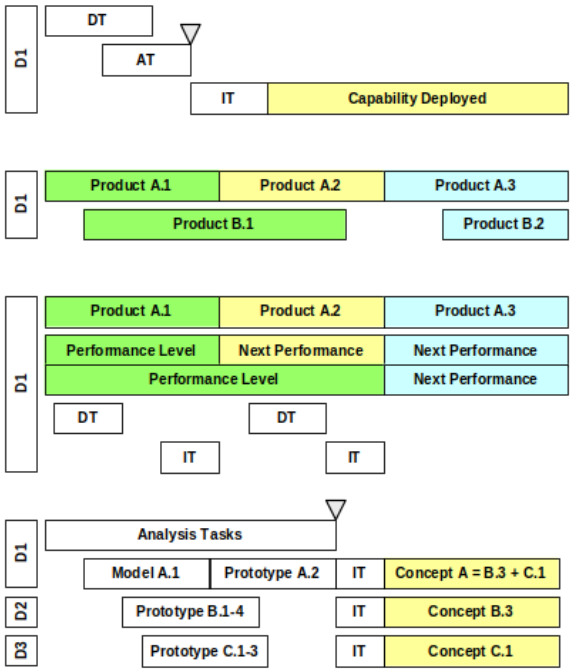
- Product release planning
- Convergence/divergence and retirement scenarios

**Solution Optimization**

- Continuous improvement or periodic releases
- Architecture Upgrades
- Technology Insertion into Platforms
- Process/Capability upgrades

**Parallel Development**

- Roll-up multiple decisions
- Solutions = combinations of competing technologies and designs
- Decision stays "open" - refined by series of prototypes/models




Which usage of Decision Timelines would yield the most value for your organization?

## 5.6 E7: Decision Timeline

Identify 2 high priority and reasonably volatile decisions within your Decision Network and create a Decision Timeline that helps your visualize the evolution of these decisions.

# E7: Decision Timeline

**Prepare a Decision Timeline for 2 high priority decisions**

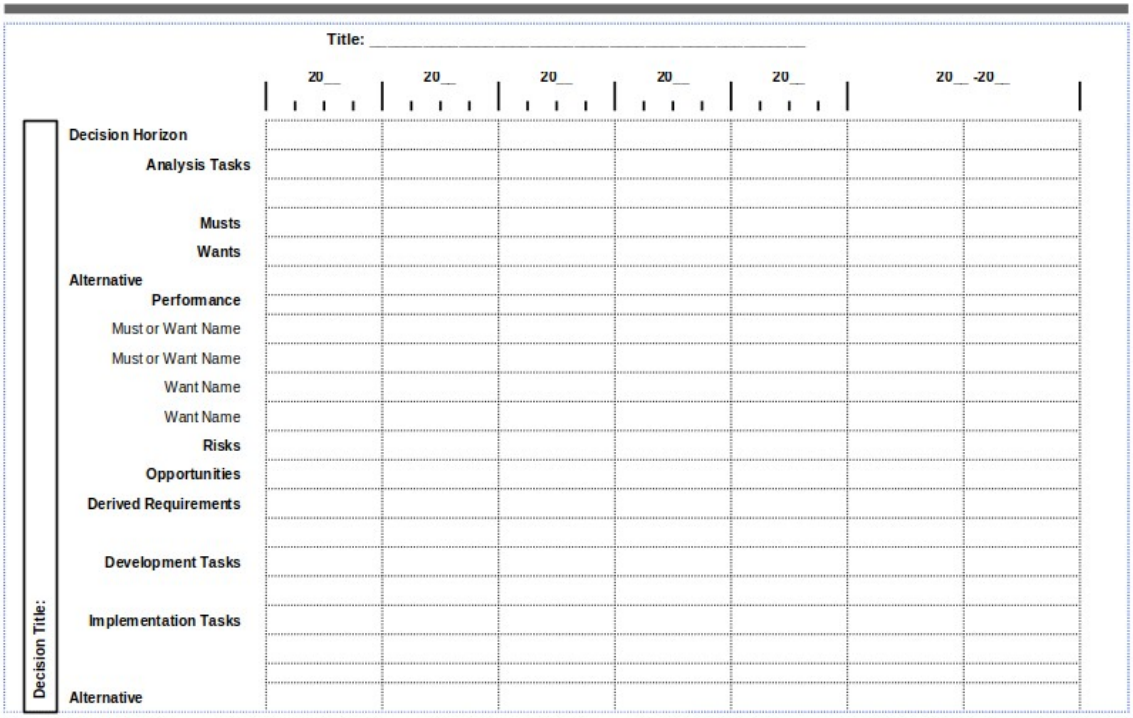
- Identify Decision Horizon, milestones and Analysis Tasks
- Forecast evolution of 1 Must and 1 Want
- Plan evolution of "preferred" alternative as 2 or 3 "states"
  - Plan/forecast performance levels against 4 criteria
  - Forecast evolution of top risk and opportunity
  - Capture horizon / evolution of 1-2 derived requirements
  - Capture 1-2 Development and Implementation Tasks that are prerequisites for achieving each alternative state
- Summarize evolution of a competing alternative
- Identify solution gaps or overlaps (time or performance)
  - Add/modify tasks to resolve gaps/overlaps

**Prepare a Network Diagram that captures dependencies for these decisions**

- Highlight the Critical Path of tasks and solutions (performance/alternatives)
- What is your primary strategy for managing the Critical Path to reduce time to capability/market?

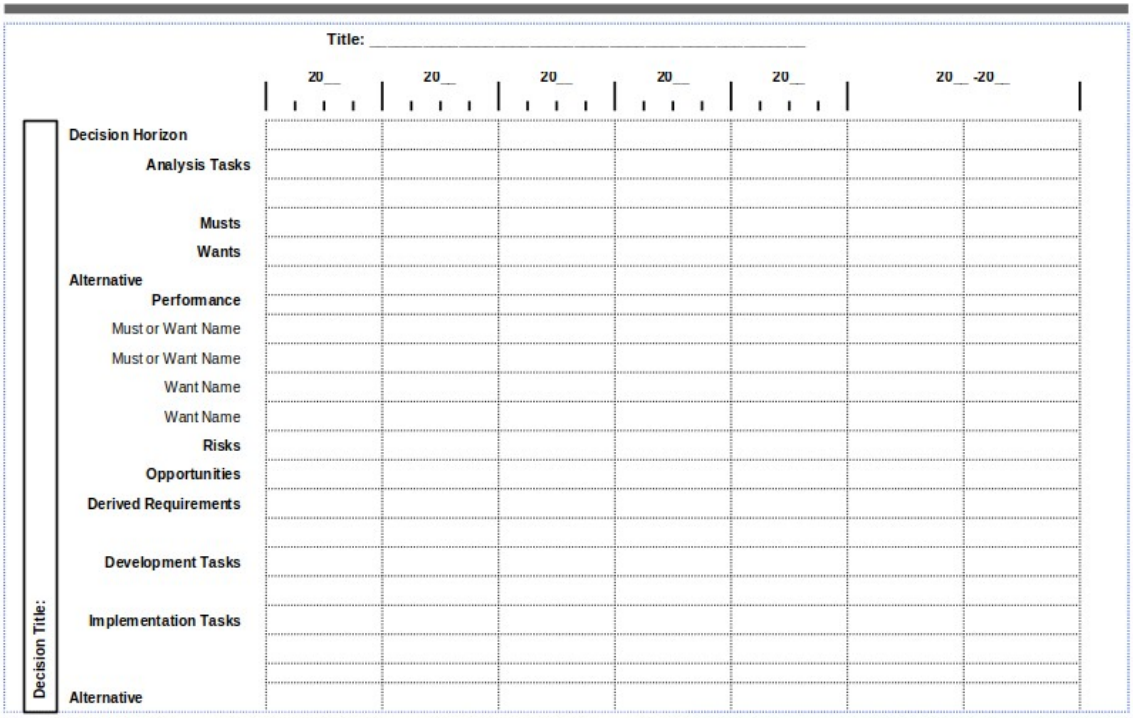
Exercise Notes:

# E7: Decision Timeline




Exercise Notes:

# E7: Decision Timeline




Exercise Notes:

# E7: Network Diagram

Exercise Notes:

# 6 Next Steps

Hopefully, you've found that the Decision Driven® Approach has opened your eyes to a new range of possibilities for dramatic improvements in your decision-making efficiency and effectiveness. Continuing your personal skill growth is the first step toward success. We recommend that you attempt to apply the full method to at least four decisions (diverse in size and subject matter) during the next month. This will solidify your grasp of the concepts while they are still fresh on your mind.

## Next Steps

**Improve personal effectiveness in use of the method**

- Goal: 4 decisions fully executed in the next month
- No substitute for learning cycles - collaborate with others

**Identify a significant project that needs to be Decision Driven®**

- High priority, key decisions are open, leader is an "early adopter"
- Sponsor a Structured Decision Management workshop for the team

**Achieve personal mastery in use of the method**

- Participate in a Structured Decision Management Bootcamp
- Become Decision Black Belt; model the right behavior

**Redesign business processes to be Decision Driven®**

- Build initial Decision Patterns; set up feedback process
- Break the task/document cycle; focus on value-added decisions
- Define Information Architecture; evaluate automated tools
- Implement a small set of decision metrics

Beyond personal growth, we recommend that you begin to identify a significant project that could serve as a vehicle for demonstrating the benefits of the DDA to you and your organization. This would ideally be a project that has significant decisions to be made, i.e. not a project that is so deep in the development life cycle that "it's all over but the shouting". A project leader that is methods-friendly AND a bit adventurous is also desirable, not your organization's chief pessimist or firefighter.

Finally, we recommend that you identify a critical business process and begin to map its tasks and artifacts to the key decisions buried therein. Create a set of Decision Patterns, including standard criteria for each of these decisions. Assign clear ownership responsibility for the Decision Patterns; create a feedback process to start refining the patterns as they are used.