Decision Strategies

Confidence Through Clarity

VALUECREATIONDECISIONFOCUSEDCLIENTCOLLABORATIONMANAGINGUNCERTAINTYCHALLENGEASSUMPTIONSTRUSTEDADVISORQUALITYDECISIONSKEYINSIGHTSMANAGINGRISKCOMPETENTANALYTICSPROVENMETHODSCLARIFYINGAMBIGUITYVALUECREATIONDECISIONFOCUSEDCLIENTCOLLABORATIONMANAGINGUNCERTAINTYCHALLENGEASSUMPTIONSTRUSTEDADVISORQUALITYDECISIONSKEYINSIGHTSMANAGINGRISKCOMPETENTANALYTICSPROVENMETHODSCLARIFYINGAMBIGUITYVALUECREATIO

Introduction to Decision Analysis

O. J. Sanchez
Principal – Decision Strategies, Inc

Decision Strategies

About Decision Strategies, Inc. (DSI)

An international leader in decision and execution management since 1993

Serving clients in Oil and Gas, Chemicals, Plastics, Transportation and Technology Industries

Consultants and technical resources with unique skills built on industry experience

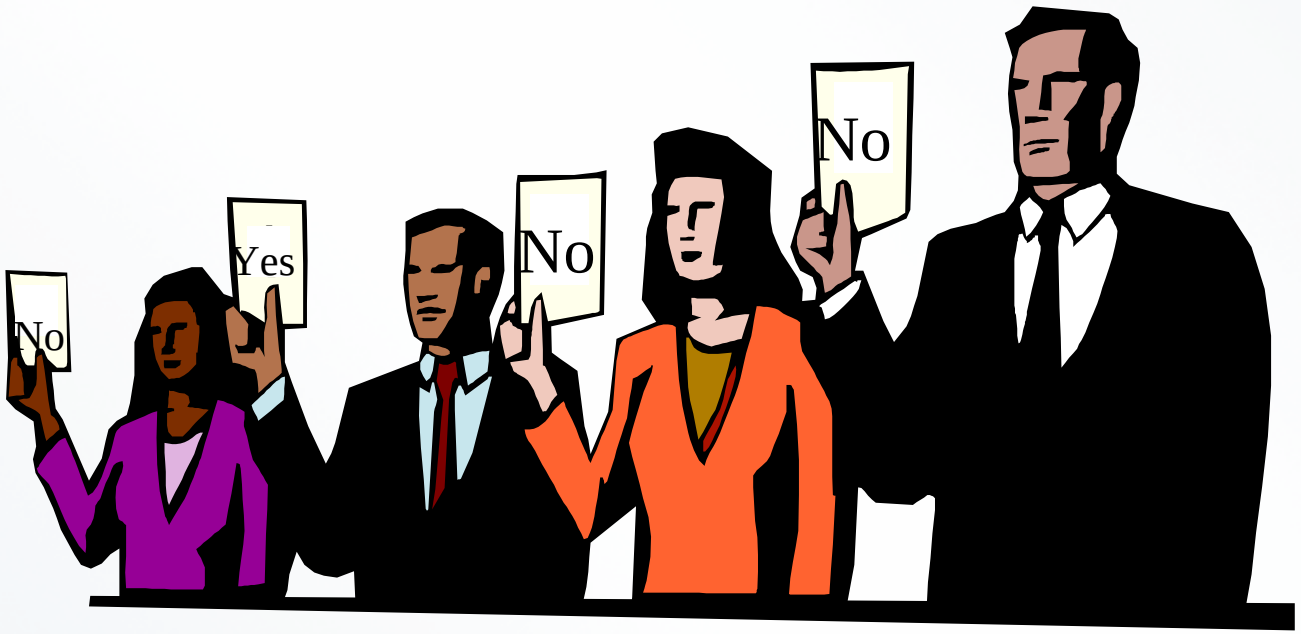
The objectives for this course are:

- Learn the basic skills needed to understand and participate in the application of Decision Analysis to projects
  - the terminology of decision management
  - how to effectively engage in a project or strategy
  - how to appraise the decision situation
  - how to frame decision problems and scenarios
  - an understanding and competence in decision analysis and interpretation to gain insight and agreement
  - how to judge decision quality and gain real value

So…what is Decision Analysis?

- Decision Analysis is a systematic methodology for facilitating high quality, logical discussion; bringing clarity to difficult decisions and leading to clear and compelling action by the decision maker.
  - Probabilistic framework
  - Incorporates consideration of risk and uncertainty
  - Focused on actions

What makes decision-making difficult?



Definition: Decision

A conscious controllable allocation of resources; the act of making a choice between alternatives

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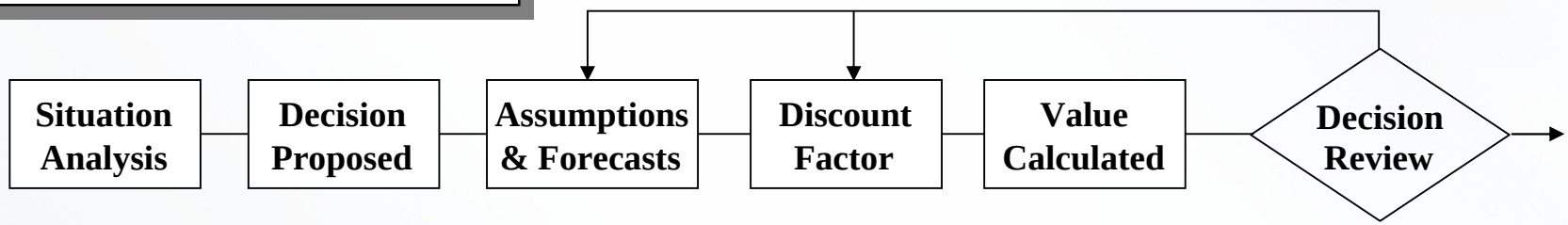
The traditional approach to decision making is to advocate and sell a desired decision.

"Here is the problem, now justify a solution."



What can go wrong with this approach?

Why does it so often lead to a lack of buy-in, unresolved ambiguities, lingering uncertainties and analysis paralysis?

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How do we recognize and differentiate between ambiguity and uncertainty?

- Ambiguity
  - Typically, something we don't know, or are unsure about, but can find out
  - Can be resolved before the decision has to be made
  - Examples
    - Unclear or conflicting goals
    - Availability of resources
    - Stakeholder preference
- Uncertainty
  - An unknown event that impacts the outcome of our decision
  - we may be able to impact the event, but we cannot control
  - Will not be resolved before the decision is made
  - Examples
    - Oil price
    - Reserve size
    - Competitor actions

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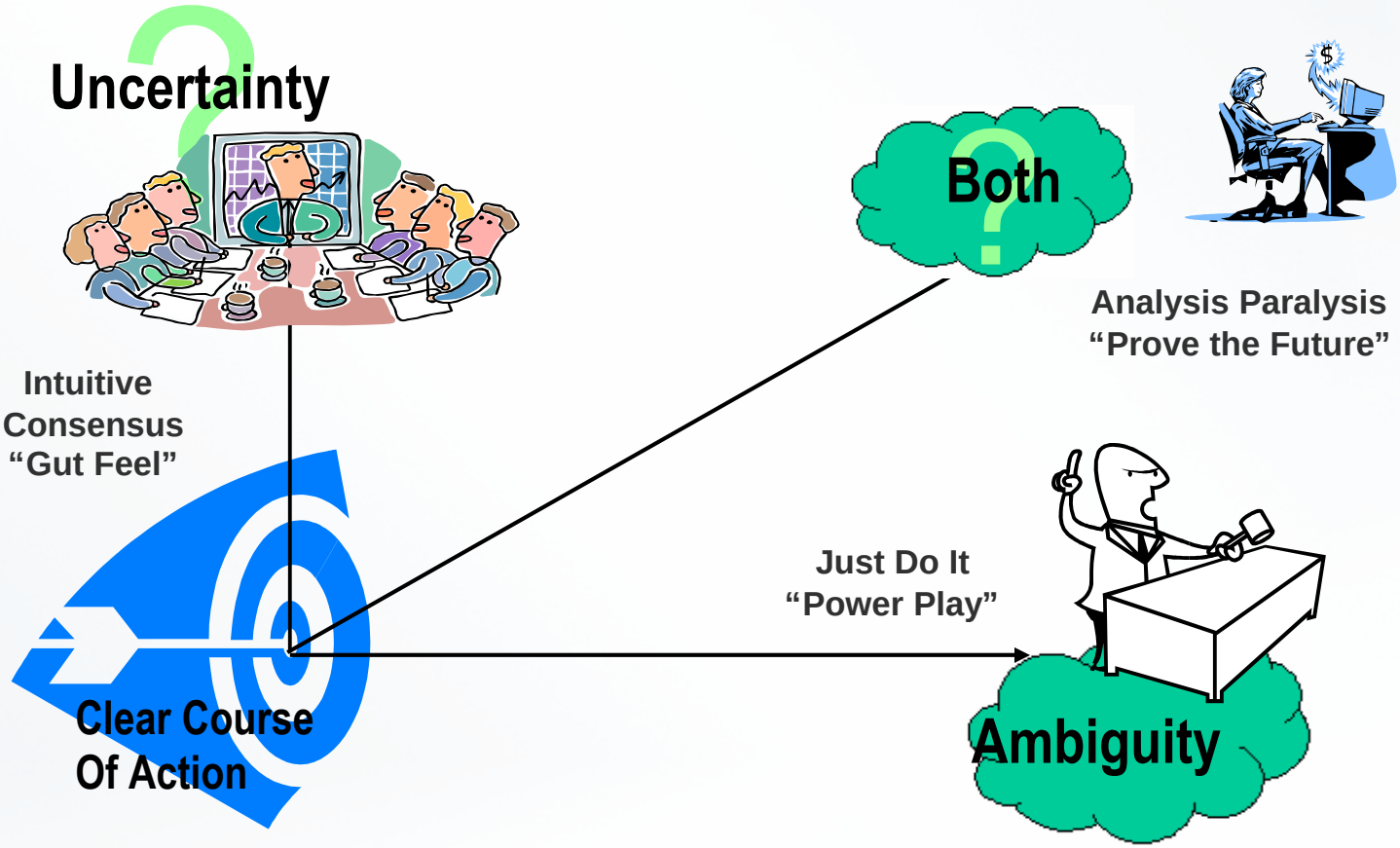
Most decision making processes are not equipped to adequately deal with ambiguity and uncertainty



The complexity of a decision is directly proportional to the combined level of ambiguity and uncertainty inherent in it!

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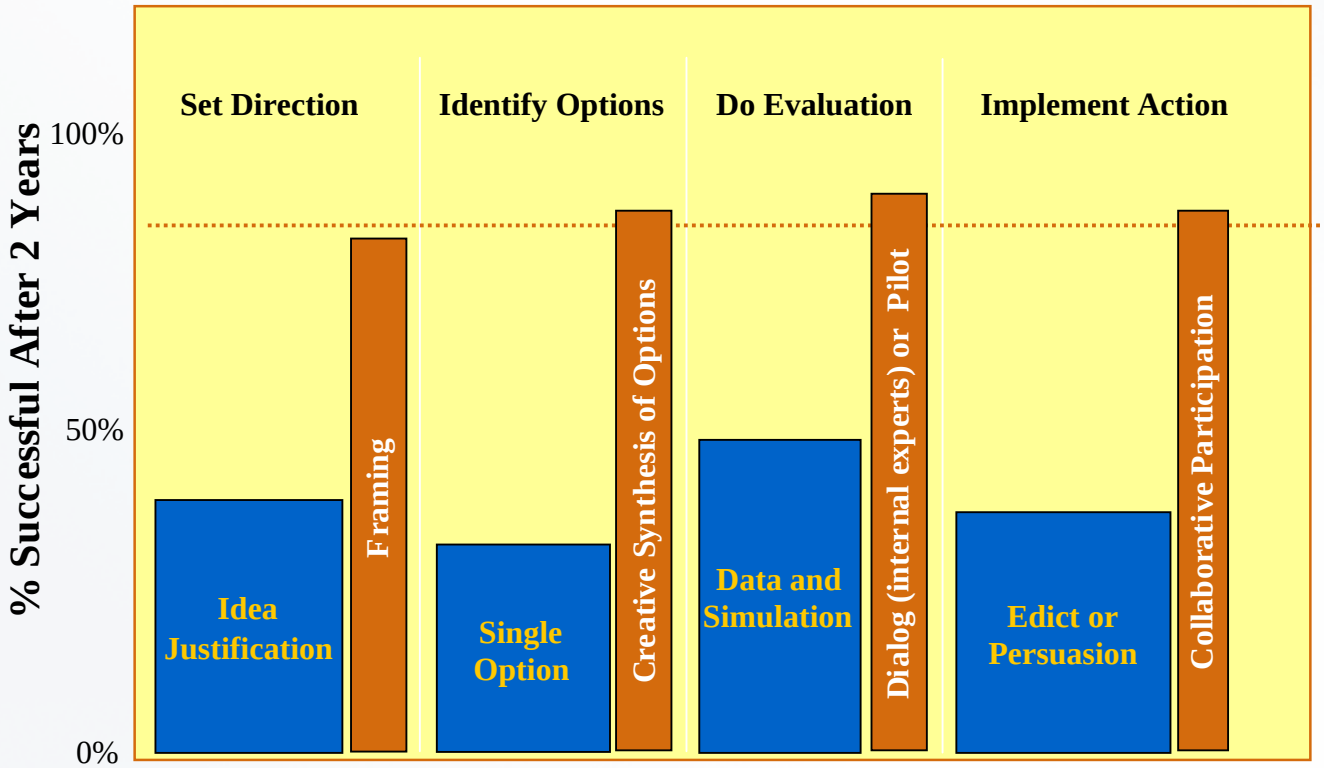
A London Business School study found a dramatic difference in effectiveness based on decision methods.



Frequency of Use (bar width) of each Method

Out of the 127 cases studied in North America
Dr. Paul Nutt - London Business Review

Key findings:
Improvement in understanding, participant buy-in, use of creative ideas and achievement of business results.

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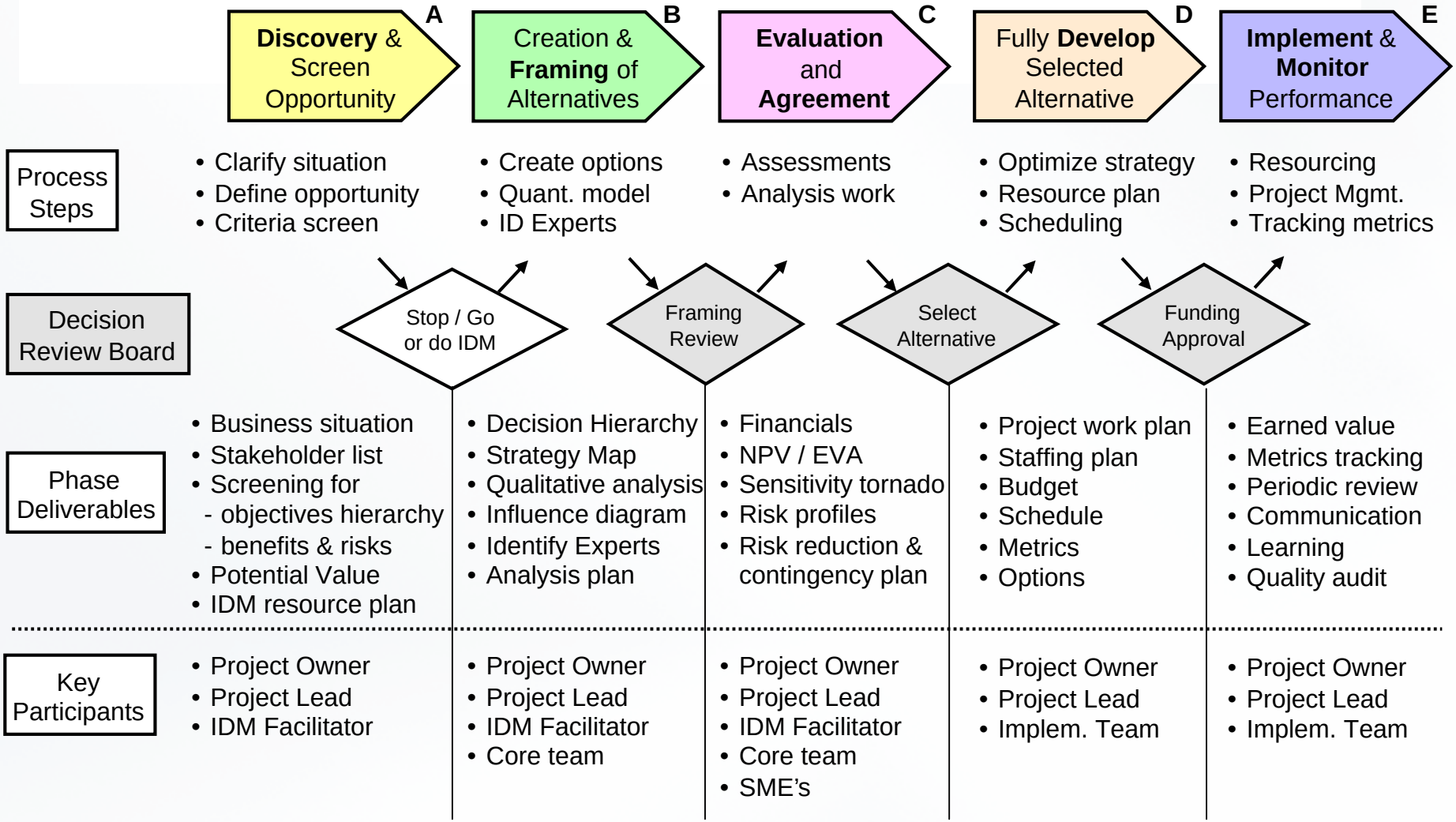
Decision Analysis is a phased process



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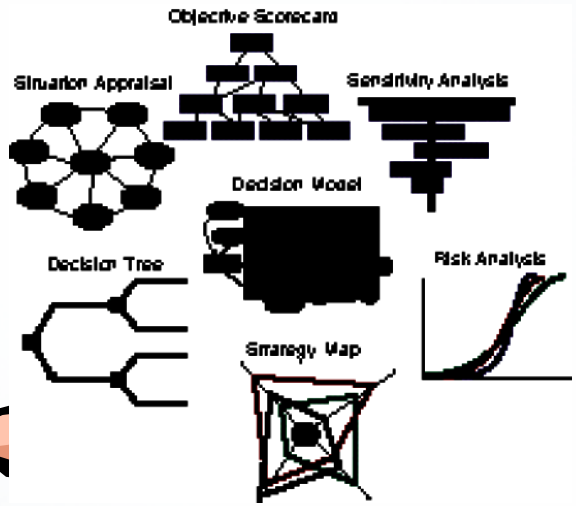
Each phase of the DA process has a set of robust tools and techniques with a logical sequence that encourages open, creative dialog.



We have a large DA tool box and formal processes to address the needs of major decisions.

But, we can customize the toolbox or just choose a couple of key tools to help with the critical elements of smaller decisions.

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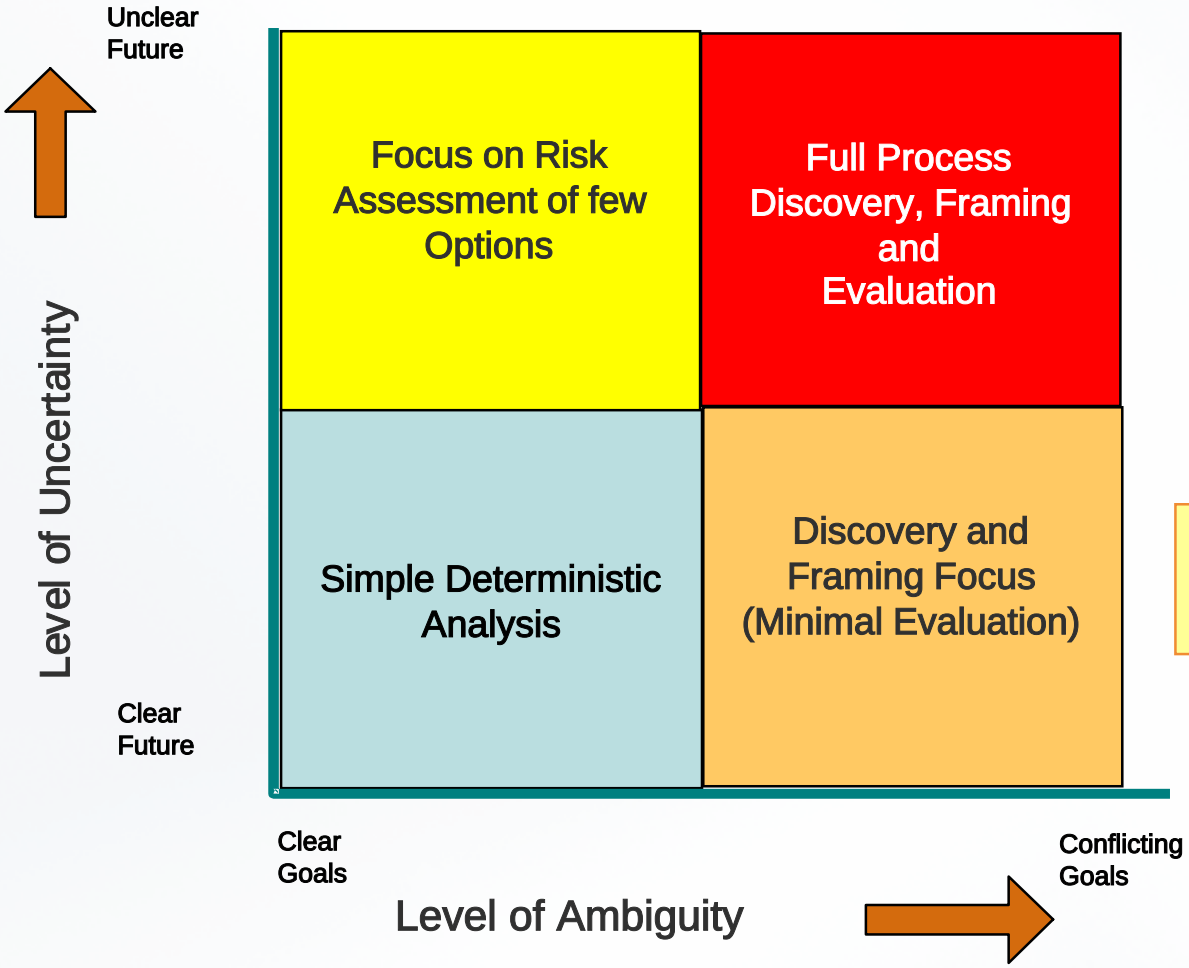
This process is scalable to apply the appropriate level of dialogue and analysis consistent with decision complexity



Another dimension to consider is the financial impact of the decision

- Always framing is done
- 1/3 of the time, simple analysis will do
- 1/3 of the time, some risk assessment is required
- 1/3 of the time, full process deployment is needed

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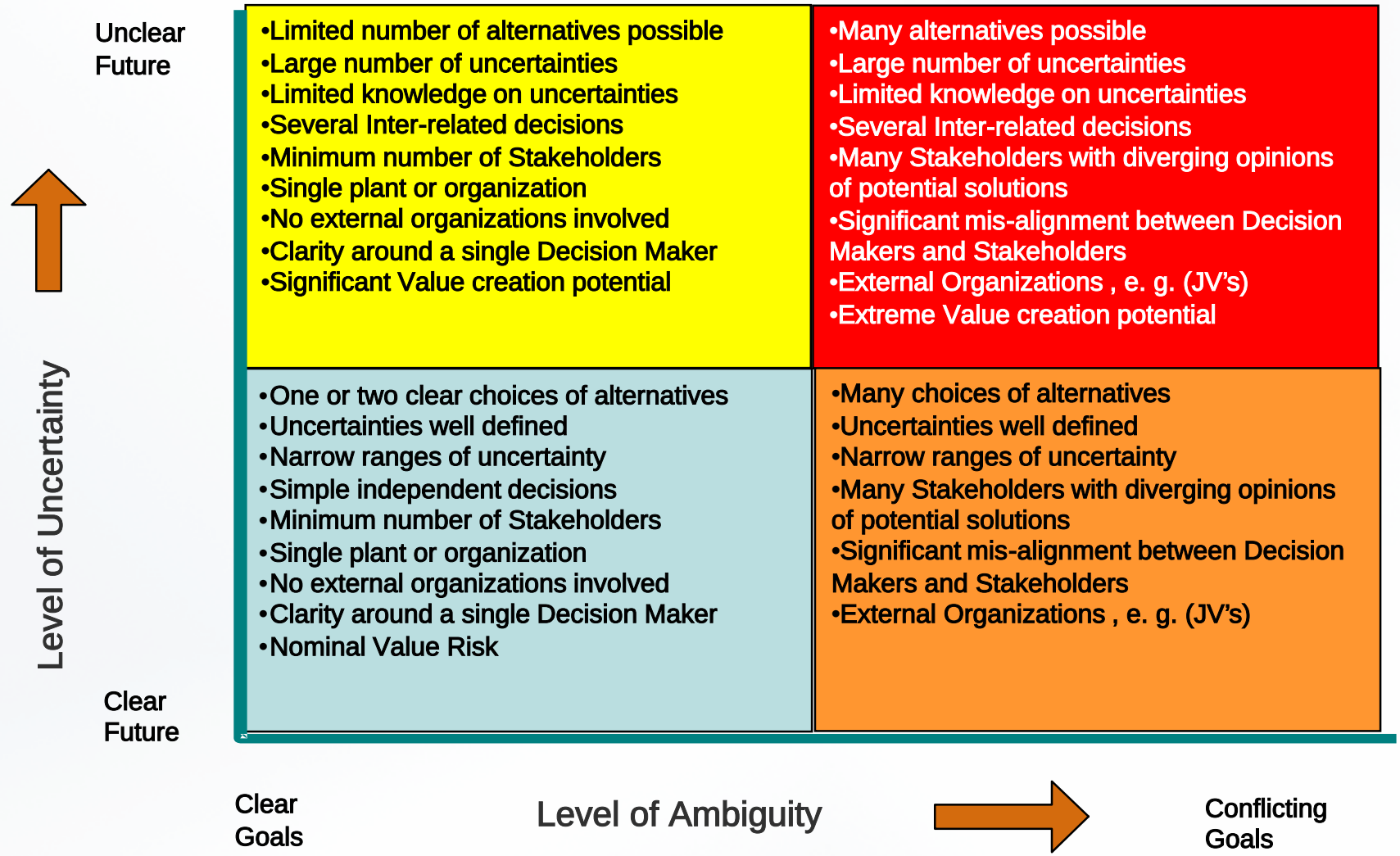
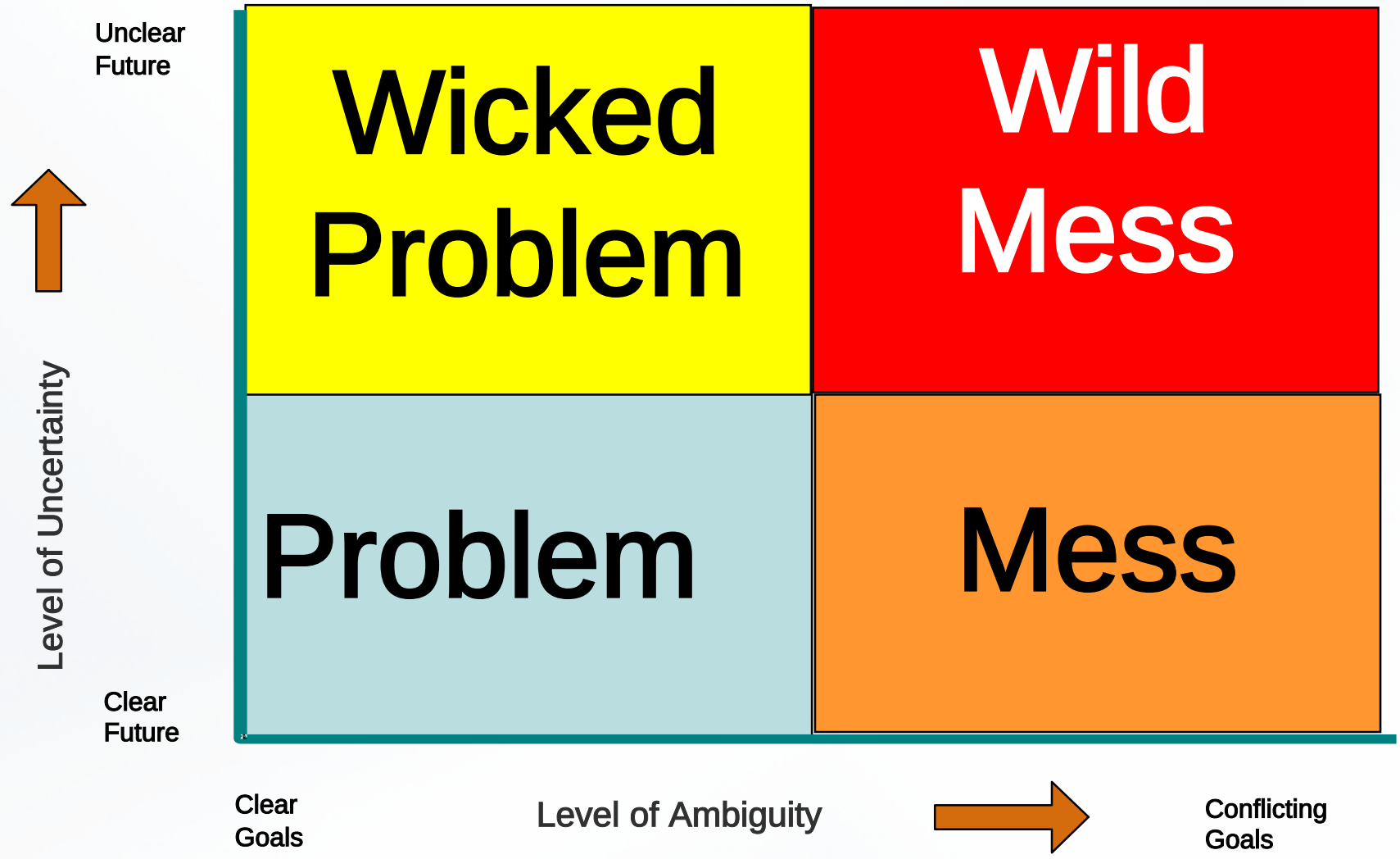
Decision Complexity Characteristics



Another way to look at it



IDM™ Deployment Guidelines

High Level on Uncertainty and Low Level of Ambiguity

IDM Deployment guidelines

- Significant analytical resources required
- Simple Framing
- Get Decision Maker endorsement for frame
- Probabilistic evaluation model
- Potential use of Value Options development

Typical Decision situation

- R&D Strategies
- Negotiation Strategies
- Major Capital Projects
- Maintenance Interval Optimization

High Level on Uncertainty and High Level of Ambiguity

IDM Deployment guidelines

- Highest level of resources required
- Maximum amount of Framing to achieve alignment
- Probabilistic evaluation model
- Value Options development

Typical Decision situation

- Major Business Strategy efforts
- JV Negotiations
- New Product Development Strategies
- Mega Capital Projects

Low Level on Uncertainty and Low Level of Ambiguity

IDM Deployment guidelines

- Nominal resources required
- Minimum Framing to confirm alternatives
- Get Decision Maker endorsement for frame
- Simple deterministic Excel evaluation model
- Minimum emphasis on probabilistic analysis

Typical Decision situation

- Small Capital Projects (<1 M$)

Low Level on Uncertainty and High Level of Ambiguity

IDM Deployment guidelines

- Significant Alignment resources required
- Maximum amount of Framing to achieve alignment
- Lot's of Stakeholder interaction
- Potential Probabilistic evaluation
- Potential use of Value Options development

Typical Decision situation

- Organization Strategies
- Positioning for JV discussions

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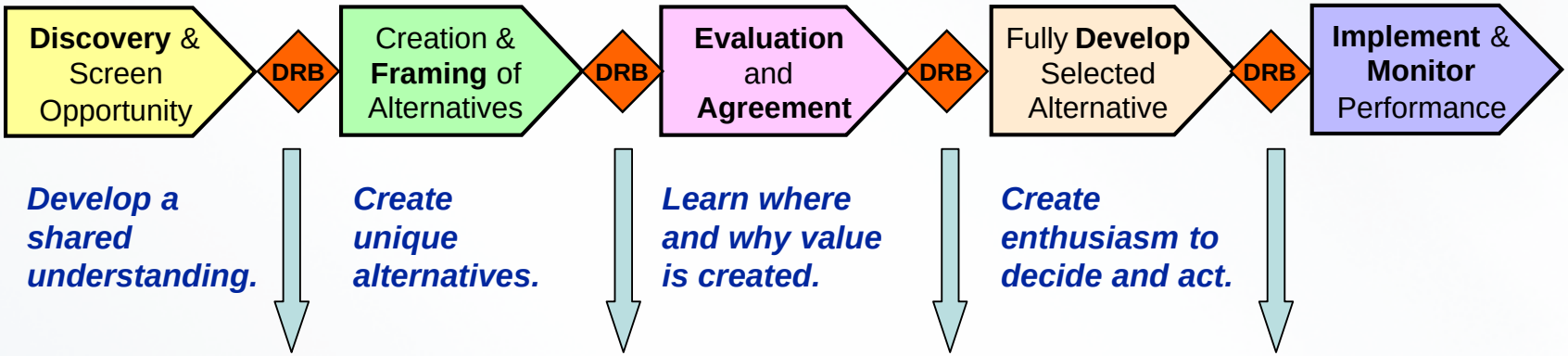
Critical to ensuring decision quality, the decision-maker's input is incorporated throughout the process at the key dialog points



Develop a shared understanding.

Charter the team and provide input into the scope of the project.

Provide input on preferences and decision criteria.

Validate business situation and provide high level insights.

Create unique alternatives.

Validate project objectives and strategic alternatives.

Review influences to be evaluated and identity of experts

Provide team the support needed to access experts

Learn where and why value is created.

Validate expert inputs for reality and relevance to decision

Probe evaluation results for insight and understanding

Look for hybrid ideas or related business synergy or impact

Create enthusiasm to decide and act.

Review conclusions from the analysis.

Select optimal alternative to pursue.

Allocate resources to implement decision.

Communicate decision across organization.

So…we have available good process and tools, but…

Are we guaranteed a good outcome?

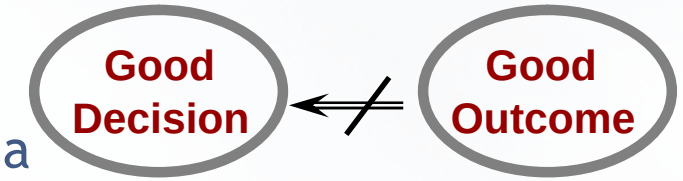
Why not?

What can we do about this?

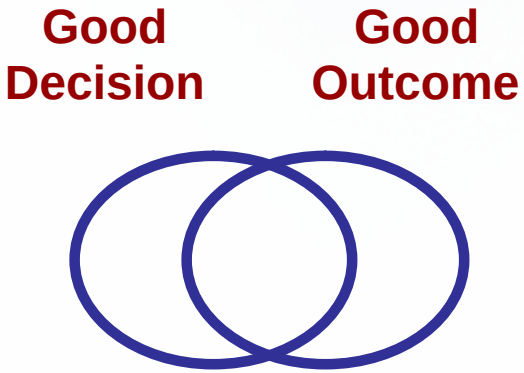
Decision Strategies

In a world of uncertainty, decision quality cannot be judged by a single outcome.

- When risk or uncertainty are present, making a good decision does not guarantee a good outcome will always result.
- Conversely, a good outcome does not mean a good decision was made!



- But… when many, or a portfolio of decisions, are considered, there is a strong relationship between the number of good decisions and good outcomes.



Recognize the signs of a low quality decision in advance, so we can avoid making a bad decision.

Things that cause poor Decisions:

- Improper Frame
  - Asking the wrong question
  - Looking at only a subset of the real problem or opportunity
- Failure to consider alternatives
- Lack of meaningful information
- Competing value measures
- Poor logic
- Ignoring risk or taking on too much risk
- Lack of commitment, no buy-in
- Wrong people involved

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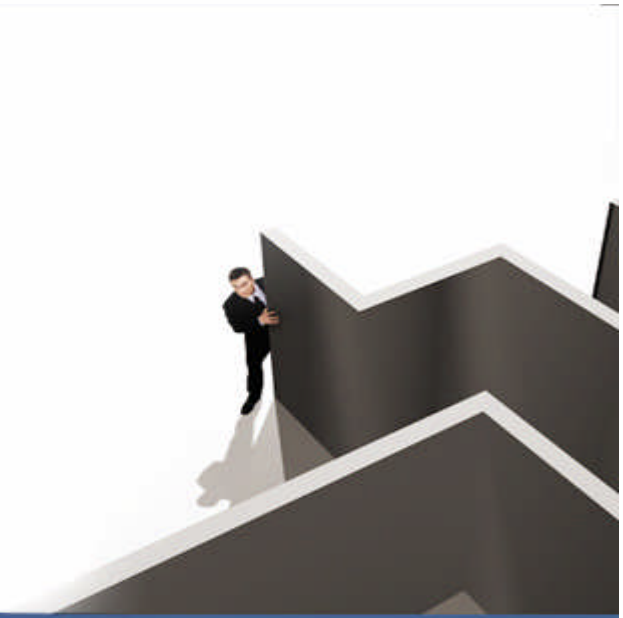
for navigating the maze of issues impacting today's businesses



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National Energy Case Study Description

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National Energy Case Study Description

- National Energy is an operating entity of a major oil company with a presence on the coastline of a developing country.
- The country has huge oil reserves and derives the majority of its income from tax on oil exports.
- The government of the country manages the export quotas for National Oil and the other oil companies operating within its territory fairly closely.
- For low cost producers with good community, safety and environmental records, they often allow export of up to 90-98% of their production capacity.
- For less efficient producers or producers with poor community records, they have often restricted export to 75-80% of their production capacity.
- National Energy has typically been allowed to export 90% of its capacity.
- National Energy's oil fields lie 15 km offshore in shallow water, with a gathering pipeline that transports the crude oil to their onshore processing facility.
- The processing plant is located 5 km inland, approximately 20 km from the offshore central facilities.

National Energy Case Study Description, Continued

- The plant has a single train of processing equipment with a capacity for 300 thousand barrels per day of oil and some condensate from the natural gas.
- The plant has been in operation for 25 years and uses a fairly old processing technology, including a number of large tanks for chemical treatment of emulsions.
- Additional tanks in the plant are used for storage of the processed oil before it is transferred to a shipping facility for export.
- The use of the storage tanks allows the plant to continue to process oil and store it onshore even when the weather prevents transfer for loading of tankers from its offshore shipping facility.
- National Energy has an oil transfer line and a condensate transfer line from the plant to the offshore shipping facility.
- The capacity of the oil transfer line is 300 thousand barrels per day of oil and is used every day.
- The gas condensate transfer line has excess capacity, as it is only used one day per week to transfer the volume of liquids that are processed by the plant

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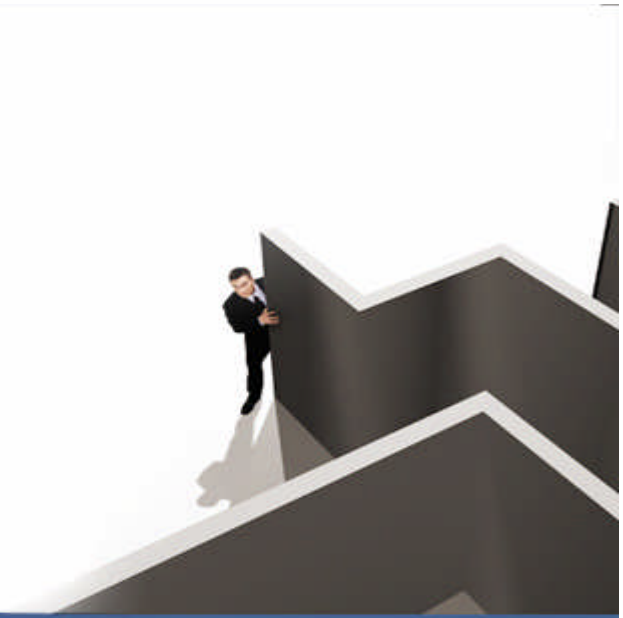

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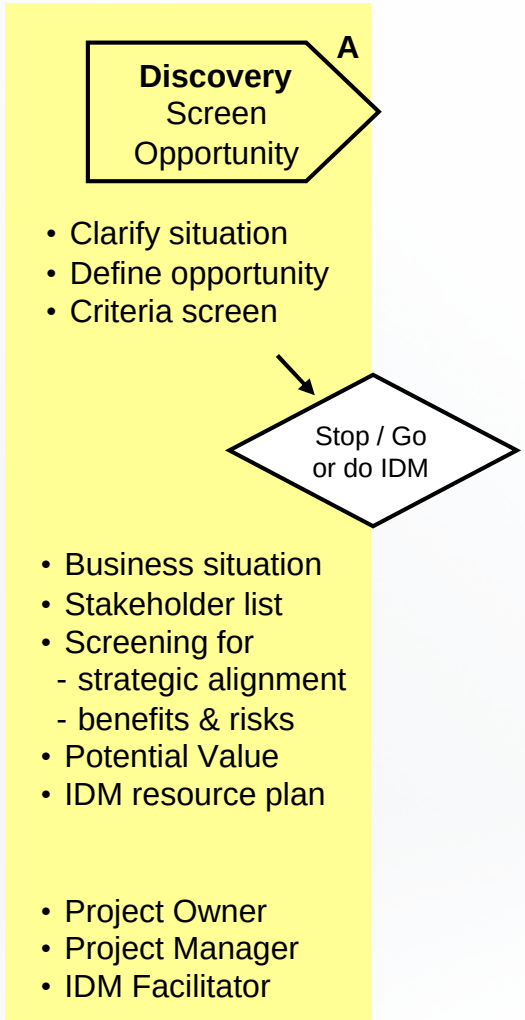
National Energy Facility Expansion Decision Discovery

Decision Strategies

The discovery phase is designed to reveal initial insights and develop a shared understanding of the situation.



- This is your opportunity to step back, look at the situation and determine what is happening.
- Who are the stakeholders & decision-makers?
- What are the ambiguities in this situation?
- What is driving the need for a decision?
- What criteria, goals or objectives will be the basis for making a decision?
- What Discovery steps would help us clarify the ambiguities and move forward to a decision?

Decision Strategies

A clearly defined problem will include:

What is the strategic question?	The strategic question is a concise statement of what needs to be solved.
Who is the decision maker?	This is the person(s) responsible for allocating the resources and making the solution happen.
What are the decision criteria?	The decision criteria can be anything that allows the decision maker to quantitatively differentiate one alternative from another.
What are the issues relevant to this decision?	What are the decisions, uncertainties, facts and values that will affect the decision to be made.

Decision Strategies

National Oil Technology Team Memberships

Core Team

- Capital Projects Manager (Team Leader)
- Planning - Business Analysis
- Process Engineering Advisor
- Operations Engineering Advisor
- Cost Engineer
- DA Facilitator

All relevant functions need to participate in the decision process

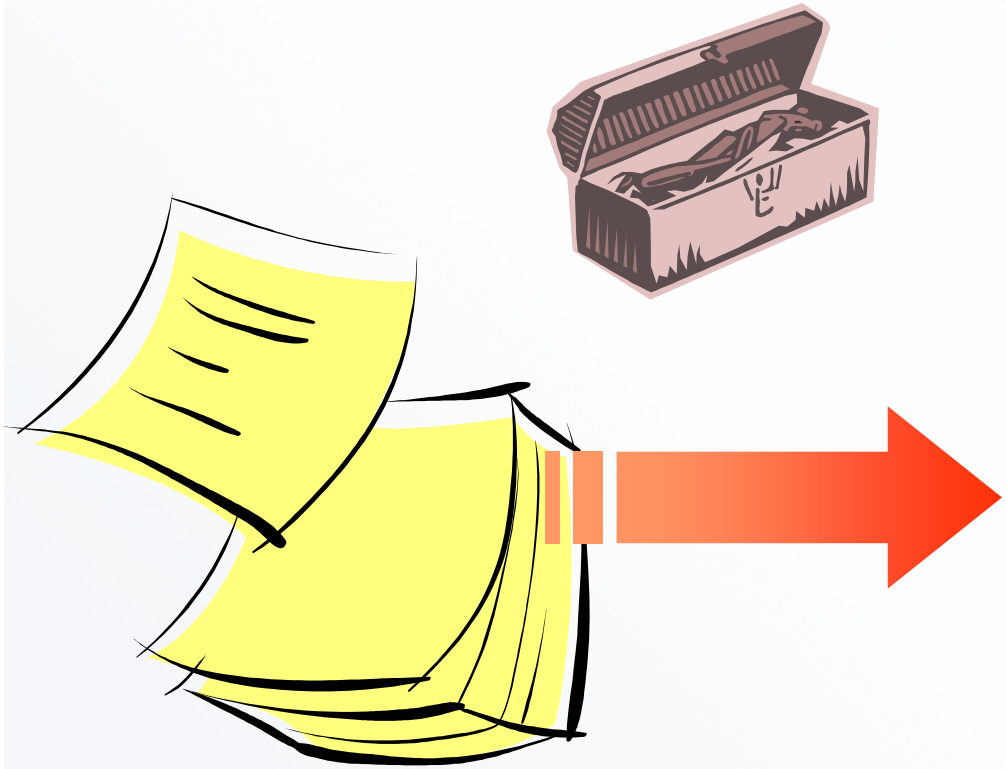
Decision Board

- General Manager
- Exploration and Production Manager
- Planning Manager
- Operations Manager
- Joint Venture Manager

Decision Maker and other stakeholders are critical

Decision Strategies

Issues are categorized with the Discovery focus on Objectives



Objectives

decision maker's goals and criteria to compare options

Decisions

Choices we can control, which sets a direction or course of action

Uncertainties

issues we don't know, cannot control, and will not be resolved until the decision is made and outcomes begin to occur

Facts

known laws of nature, policies, or resolved ambiguities

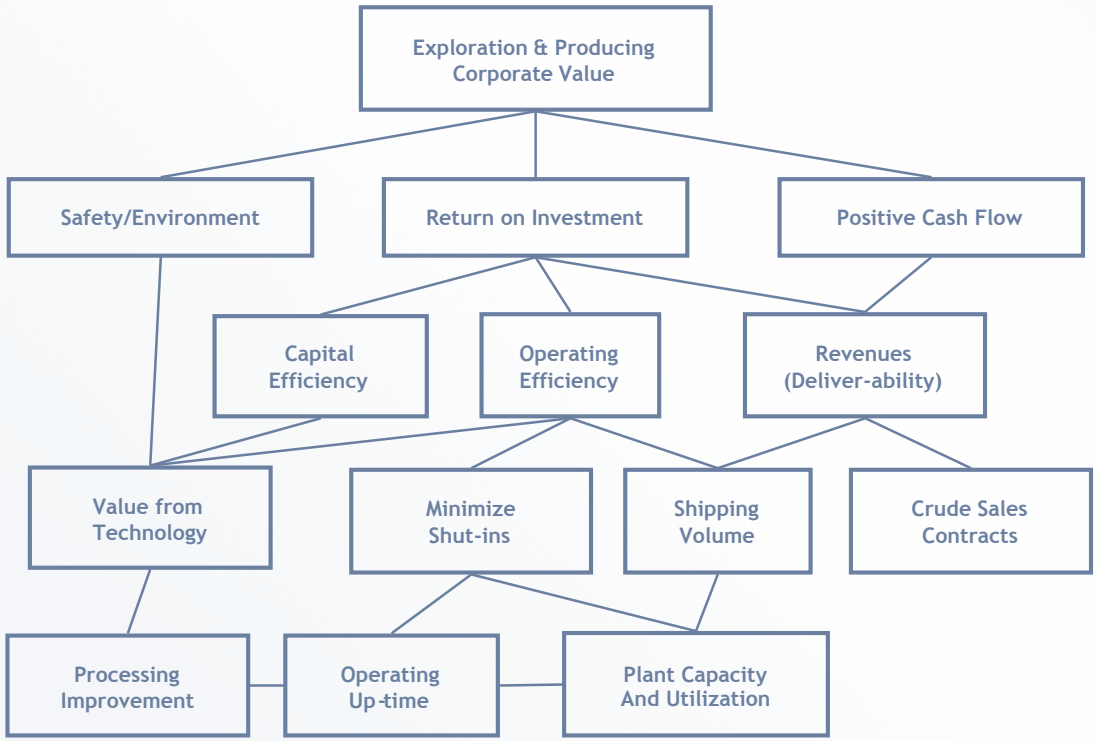
Decision Strategies

Objectives Hierarchy for Decision Criteria

- Individual decision makers may have different objectives, with potential conflicts and tradeoff issues that need to be surfaced.
- Fundamental objectives are above contributing objectives,
  - - e.g. profit may be fundamental while cost control is a contributor
- A hierarchy can be constructed with the key objectives to show the "general" to "specific" relationship and nature of each.
- The dialog on objectives creates a sound basis for making a decision and establishes a clear direction for the entire decision project.

Decision Strategies

National Oil's Objectives Hierarchy



Uses of the Objectives Hierarchy

- Clarify ambiguous or conflicting goals
- Serve as a foundation for clarifying the scope of the decision
- Define an objective basis for making a decision
- Provide a tool for qualitative evaluation of alternatives
- Provide a starting point for the quantitative model development
- Communicate the purpose and aims of the decision

↑ Why is this important? To what goal does it contribute?

↓ What are the contributing elements? How can we measure it?

Completing the Discovery Phase

- The team is ready to begin the process of framing alternatives once the problem and the factors influencing it are well understood by the team and decision makers.
  - There is a shared understanding of the problem
  - The decision maker(s) have clarified the strategic question to be answered and the objectives of making a decision
  - The core working team includes participants representing the major areas impacted or contributing to the decision
  - A project scope and commitment of resources have been made to achieve a confident decision within the necessary timeframe

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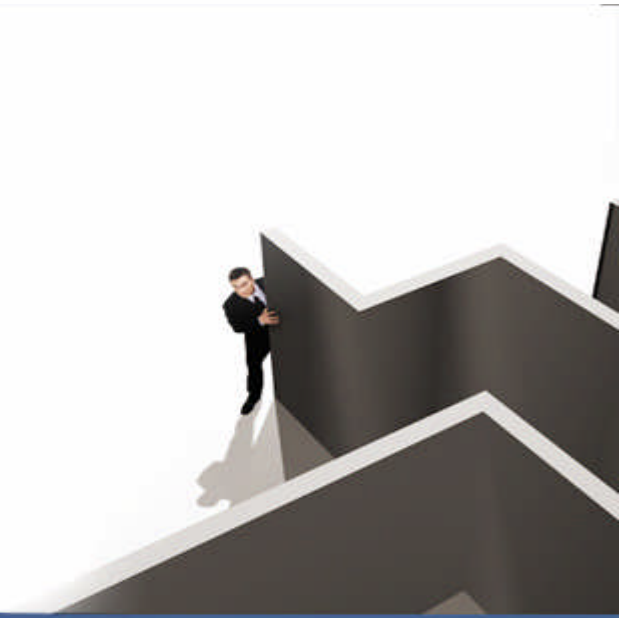

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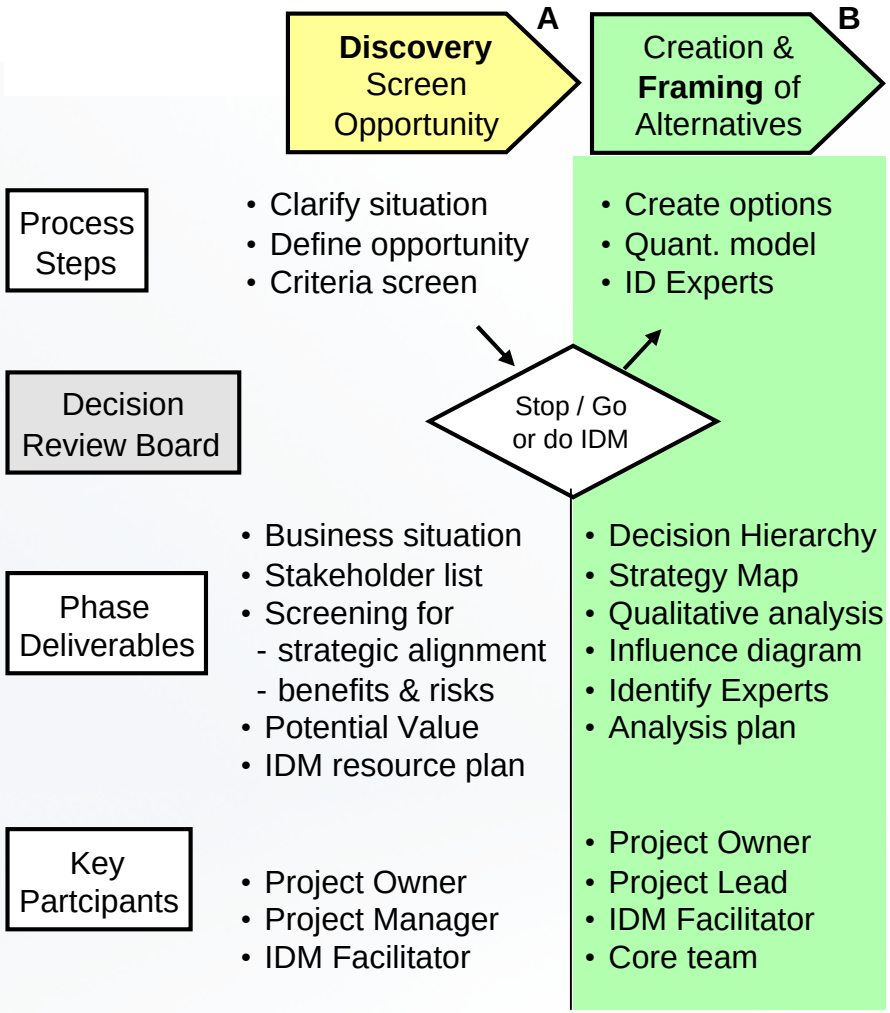
National Energy Facility Expansion Decision Framing

Developing an Appropriate Frame



Learning Objectives

- Learn how to develop a decision frame that enables creativity and clarity
- Understand how and when to use the most effective framing tools
- Create alternatives with proven strategy development techniques
- Develop a strategy table
- Create an influence diagram of the problem and identify experts
- Know when framing is complete

Decision Strategies

Issues raised in the Discovery phase are also used in Framing - focusing on Decisions, Uncertainties, and Facts.

Objectives

decision maker's goals and criteria to compare options

Decisions

Choices we can control, which sets a direction or course of action

Uncertainties

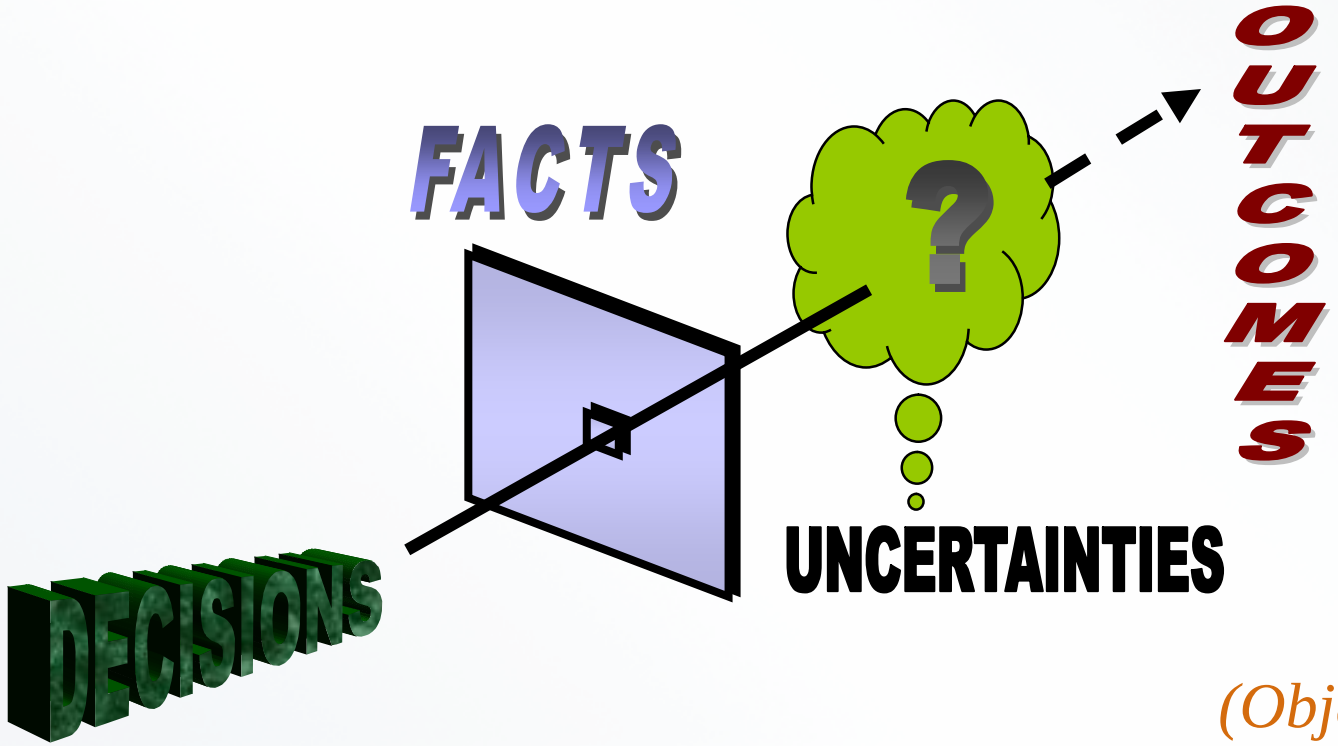
issues we don't know, cannot control, and will not be resolved until the decision is made and outcomes begin to occur

Facts

known laws of nature, policies, or resolved ambiguities

Decision Strategies

We have created the Objectives Hierarchy - now we need to frame the Decisions and Uncertainties



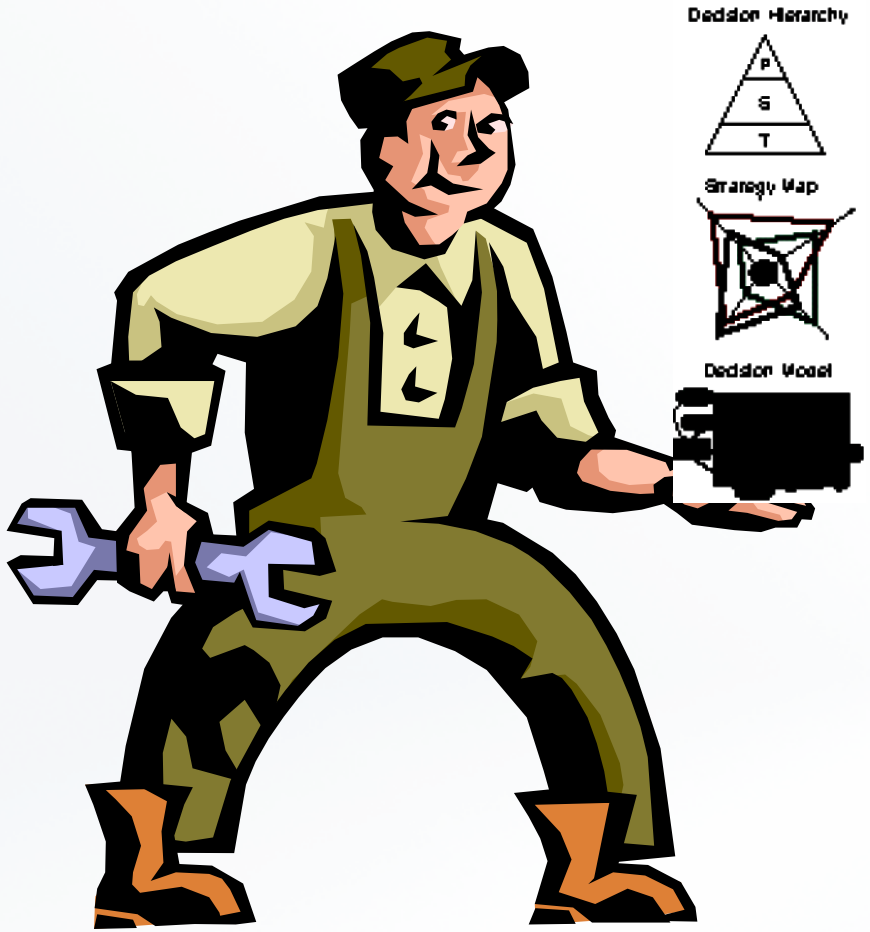
(Decision Hierarchy)

(Influence Diagram)

(Objectives Hierarchy)

Decision Strategies

Framing uses the insights developed in the Discovery stage to build unique alternatives.



- The Decision Hierarchy will clarify the scope of the decision options.
- Sets of decisions will need to be pulled together into clear strategic alternatives for analysis.
- A qualitative analysis can be done to determine which are viable.
- A relevance model for quantitative analysis can then be diagrammed.

Decision Strategies

Decision Hierarchy is the tool that enables framing of the decision options and ideas that are on the table

The decision hierarchy helps to identify the scope of the problem and to separate constraint and implementation decisions from the focus of the analysis.

Objectives

decision maker's goals and criteria to compare options

Decisions

Choices we can control, which sets a direction or course of action

Uncertainties

issues we don't know, cannot control, and will not be resolved until the decision is made and outcomes begin to occur

Facts

known laws of nature, policies, or resolved ambiguities

Decision Strategies

There are three levels of decisions relevant for framing

Identify **policy** decisions - boundaries to be taken as givens

Identify **strategic** decisions - open decisions to be made by team

Identify **tactical** decisions - open decisions to be made later

Use a Decision Hierarchy to show
Policy, Strategy and Tactical decisions.

Decision Strategies

National Energy - Decision Hierarchy

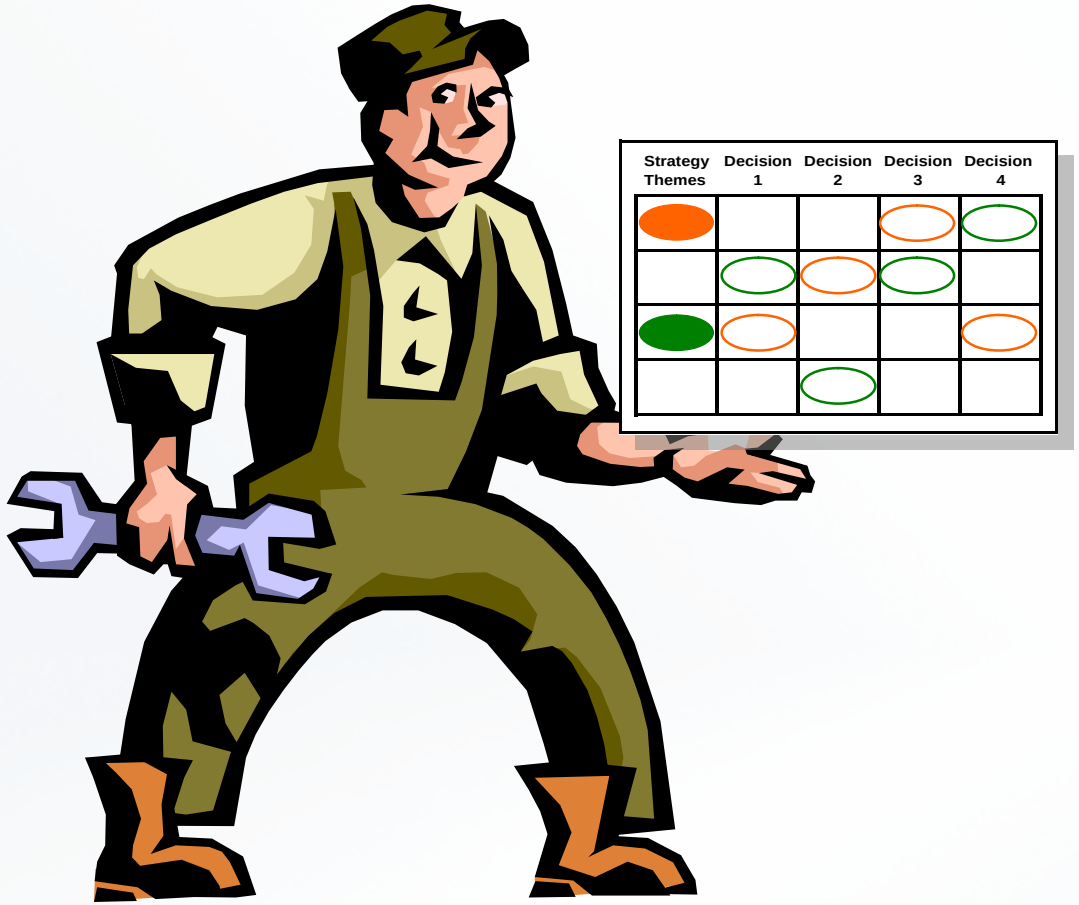
Policy Decisions
- already made

Strategy Decisions
- team focus

Tactical Decisions
- to be made later

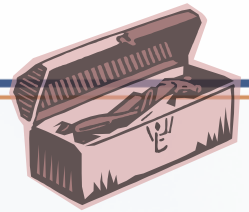
Decision Strategies

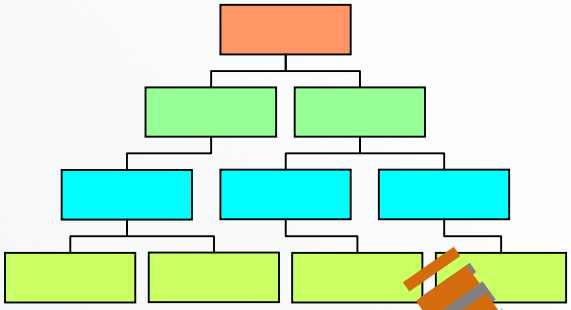
What alternative strategies exist for maximizing value?



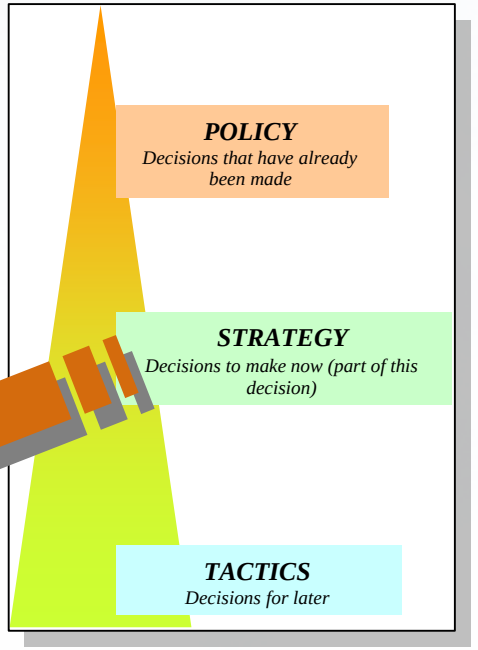
Developing Creative Strategies from Multiple Decisions

Strategy Table Tool



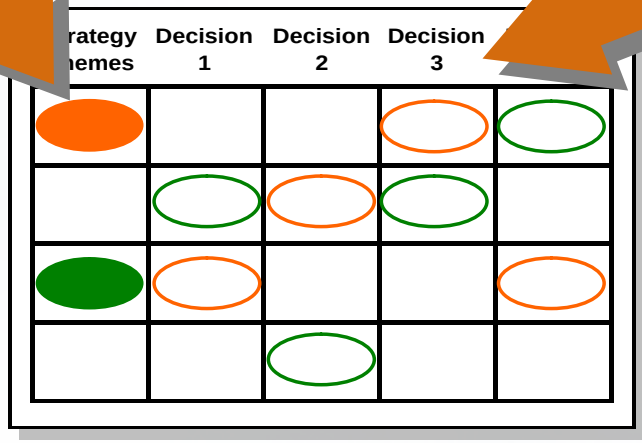


The decisions and choices from the Decision Hierarchy are used to populate the alternatives



The Objective Hierarchy generates Strategy Themes.

The Team selects a fundamental theme and builds a strategy with a coherent set of actions, usually one option from each decision category.



The goal is to have choices that represent the range of options, not a matrix of all possible permutations.

Decision Strategies

The completed Strategy Table is a good format for communicating and comparing alternatives

Strategy Themes	Incr. Plant Capacity	Process Selection	Loading Line	Facility Tankage	Safety and Operability
Momentum	Zero	Modern	New Line	Current	Best (4%)
Into the Future	100 (staged)	Modified	Dual Svc. plus Pumps	Add 1	Better (2%)
Clone the Plant	200	As is	Repair Current	Add 2	Current Compliance
Staged Development	300				
	400				

Each Alternative Must Have A Qualitative Assessment

Objective

- key business outcomes that each alternative aims to achieve

Rationale

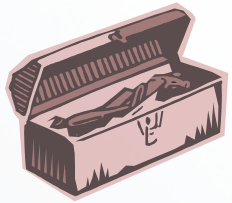
- Positives: aspects which favor success of each alternative
- Negatives: risks of failure or major resistance points for alternative
- Response: what will be the response from other key players
- Hunches: intuitive feelings about the potential of each alternative

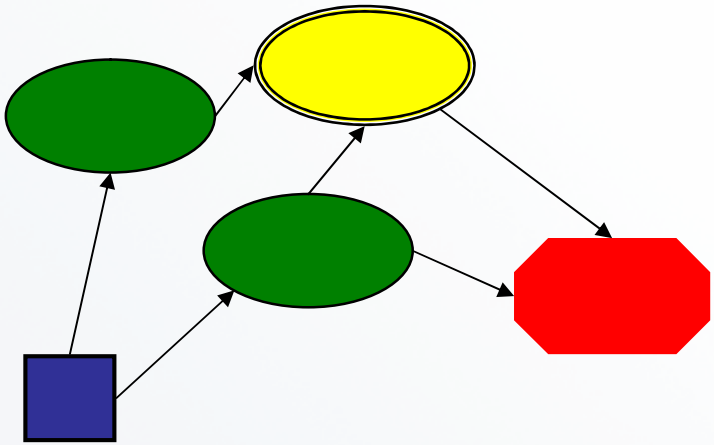
Qualitative Assessments
(abbreviated)

	Objective	Rationale
Momentum Strategy	Save capital Maintain business	Limited capital risk Does not meet expansion needs Risk revenue loss with failure to monetize resources
Into the Future	Add capacity and optimize operations	Handles increased capacity and process improvement needs, while enhancing safety and operating efficiency. HP pumping may add safety risk. Market risk exists for increased volumes. Significant capital required
Clone the Plant	Add capacity with known operation	Handles increased capacity requirements. Can be done quickly with little technical risk. Does not improve safety or efficiency. Market risk exists for increased volumes. Significant capital required
Staged Development	Add capacity as driven by production and market needs.	Handles increased capacity and process improvement needs, while enhancing safety and operating efficiency. Minimizes market risk and lost revenue possibilities. Reasonable capital risk. HP pumping may add safety risk.

Decision Strategies

The last part of the Framing phase is to develop a logic map or influence diagram on the opportunity.





- They initially capture the essence of the problem and facilitate the dialog between the team members.
- As the analysis progresses, they become a well defined model of the situation, and contain all the necessary and relevant information needed to assess the situation.
- They can be evaluated to provide insights into the appropriate course of action, and later used as a means to communicate the shared knowledge of the team to the organization.

Decision Strategies

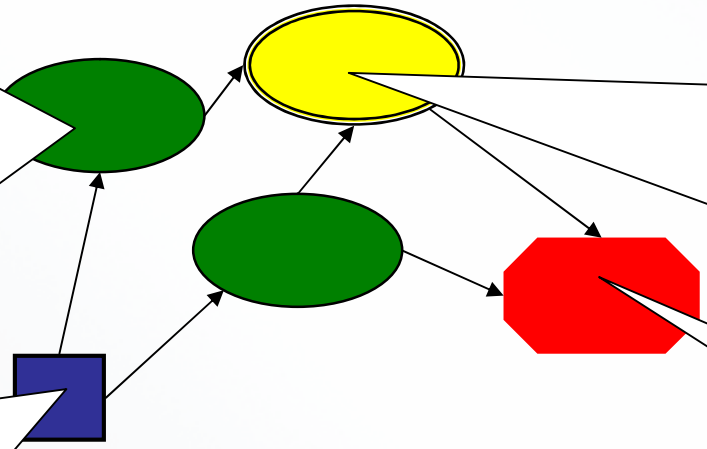
A simple influence diagram can accurately and concisely convey the essence of the problem or opportunity.

Uncertainties are shown as ovals in the influence diagram

- Can be defined by a probability distribution
- Are not controllable by the decision maker
- Can have arcs entering and leaving them denoting either conditional dependence or deterministic information

Influence diagrams also use a special set of nodes called deterministic nodes. These can be value or uncertain nodes and are represented by double octagons or ovals.

- These nodes hold formulas or functions.
- They represent uncertainties or values which are determined by their predecessors.



Decision nodes are represented by rectangles or squares

- Can be defined by a doable set of possible alternatives
- Are controllable by the decision maker
- Can have arcs coming into them which denote information

Value nodes are represented by diamonds, hexagons, or octagons

- Usually appear only once in a diagram
- Often represent a deterministic relationship

Building the Influence Diagram