

Incorporation of Program Priorities in Funding-Constrained Environments

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Overview

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- ▶ Overview of Decision Analysis Methodologies
- ▶ Decision Analysis Methodology Pros & Cons
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Introduction to Decision Analysis *

- ▶ Decision analysis (DA) is the discipline comprising the philosophy, theory, methodology, and professional practice necessary to address important decisions in a formal manner.
- ▶ Decision analysis includes many procedures, methods, and tools for:
 - Identifying, clearly representing, and formally assessing important aspects of a decision
 - Prescribing a recommended course of action by applying the maximum expected utility action axiom to a well-formed representation of the decision
 - Translating the formal representation of a decision and its corresponding recommendation into insight for the decision maker and other stakeholders.

* - http://en.wikipedia.org/wiki/Decision_analysis

Overview of Decision Analysis Methodologies

- ▶ Analytical Hierarchy Process (AHP)/Analytic Network Process (ANP) – Multi-criteria decision making pair-wise comparison on the Fundamental Scale that captures and structures preference of one element over the other. Quantifies subjectivity in priorities scales. With ANP the decision structures are networks in which all dependencies in that network are analyzed.
- ▶ Multi-Criteria Decision Analysis (MCDA) weigh criteria importance, trade-offs between criteria, balance decision, and process of reducing human biases in a structured model. Includes various methods to achieve quantitative weighting: AHP, Goal Programming, Evidential Reasoning Approach, ELECTRE (Outranking), Aggregated Indices Randomization Method (AIRM)
- ▶ Multi-Attribute Utility Theory (MAUT) -Aggregation of values by assessing utility functions and tradeoffs among decision objectives. Uses probabilities to manage uncertainty that appears in decision problems. Specifically looks at consequences based on decisions.

Decision Analysis Methodologies – Pros and Cons

Methodology	Pros	Cons	Software Tools
Analytic Hierarchy Protocol/Analytic Network Protocol (AHP/ANP)	<ul style="list-style-type: none"> Effectively structures decision Accepts inconsistency Suitable for choice (Projects, equipment, resources) 	<ul style="list-style-type: none"> Significant time and information required to build models accurately Difficult to add newly identified alternatives late in process Normalization of Utility 	<ul style="list-style-type: none"> Decision Lens® Expert Choice®
Multi-Criteria Decision Analysis (MCDA)	<ul style="list-style-type: none"> Deals well with uncertainty Effectively uses probability methods 	<ul style="list-style-type: none"> Can be complex to fully scope decision 	<ul style="list-style-type: none"> Equity 3®
Multi-Attribute Utility Theory (MAUT)	<ul style="list-style-type: none"> Suitable for Alternative prioritization and Resource Allocation/Portfolio optimization 	<ul style="list-style-type: none"> Must assess accurate weight values to succeed 	<ul style="list-style-type: none"> Dynamic Capability Assessment Model (DCAM) Hiview3® Logical Decisions® (LDW)

For this presentation, we will focus on the Analytic Hierarchy Protocol (AHP) Methodology

AHP Allocation Scheme

- ▶ After a problem is identified, AHP considers a set of evaluation criteria to determine which alternative scenario is the best solution.
- ▶ These criterion are given weights through input from the decision makers. The strength of AHP is taking a complex situation like generating weighting for a set of criteria, and reduces the problem down to a series of simple pairwise decisions.
- ▶ After the criteria weighting is complete, each alternative is compared against one another and a matrix is formed for each criterion. Another benefit of AHP is that the personal bias of the decision makers is minimized by measuring the consistency of the pairwise decisions made.
- ▶ The final priority ranking of the alternatives is generated by taking each criterion comparison matrix and applying that criterion's weighting. Sum over all of the criteria, and a normalized set of priorities for each alternative is the result.

Constructing a Decision Analysis Framework

Framing sets the Purpose, Perspective and the Scope for the decision you are addressing.

- ▶ What Problem are we trying to solve?
 - Clear and agreed upon definitions
 - Construct Influence diagrams
 - Specify the scope

- ▶ What is Focal to the decision?
 - Call out Cost Drivers
 - Determine Criteria Weighting
 - Identify Alternatives
 - Identify Dependencies

- ▶ What uncertainties exist?
 - Analyze process for optimization
 - Clarify Value potential
 - Build Risk Management profile



Decision Analysis Case Studies

Case Study #1: Budget Prioritization in a Transformational Environment

- ▶ **Environment:** Client was interested in prioritizing the non-O&M Program of Record (“tradespace”) to drive Transformation of their organization. The organization’s budget had activities spread across multiple locations in support of multiple non-O&M efforts (e.g. R&D & Program Support).
- ▶ **Problem Statement:** How do we determine where and how to allocate the funding in the tradespace?
- ▶ **Assessment:** Defined main mission of tradespace resources the determined value created. Compared that to quantifying workload
- ▶ **Result:** Provided tradespace priority list of recommended resource allocations that more effectively aligned resources to drive organizational transformation. Successive effort planned to prioritize O&M budget in upcoming budget cycles.

Case Study #2: Sequestration Impacts on Resource Allocation

- ▶ **Environment:** Client's staff were spread across multiple locations. Due to budget pressures, a 10% reduction of resources was required.
- ▶ **Problem Statement:** How do we determine which resources (who and how many), to cut at any given location?
- ▶ **Assessment:** Defined main assignment of resources, specific location requirements and quantified workload value. Contrasted that to existing footprint and forecasted future conditions.
- ▶ **Result:** Provided priority list of recommended resource reductions that more effectively aligned resources to organization operational needs.

Case Study #3: Fantasy Football – Setting a Weekly Lineup

- ▶ **Environment:** Standard League Fantasy Football owners have at least six RBs and WRs, but only five slots on their starting roster each week for those positions.
- ▶ **Problem Statement:** How do we determine the optimal player choices each week, including the difficult flex option?
- ▶ **Assessment:** Defined drivers to assess overall value of players, and their likelihood of a successful fantasy week.
- ▶ **Result:** Rank Ordered List of players based on normalized priority values.

Drivers	Weighting
Average	0.3331
Upside	0.0429
Consistency	0.0618
Status	0.1514
Opponent	0.1831
Projection	0.1364
Previous	0.0913

Alternatives	Priority	Rank
Gore	0.1588	3
Cruz	0.1309	4
Bryant	0.1194	5
Washington	0.1031	6
MJD	0.2390	2
Lynch	0.2488	1

Case Study #3: Fantasy Football – Deeper Dive

- ▶ With the selection criteria set, we perform the pair-wise comparison.
 - This process results in a normalized priority of players for each criterion.
 - We apply the weighting that was determined for the criteria, and then sum up our results to get a normalized priority list of players for that week.
 - The players with the highest priority are who we want to start each week. However, we have to consider the constraints on position slots. Remember there are 2 RB's, 2 WR's, and a FLEX option to fill. So if four of the top 5 priorities are of one position, then the fourth player will remain on the bench and the next ranked player fills the remaining slot if they meet the position requirement.

Case Study #3 - Stepping through the Process

- ▶ Our initial driver weightings have been established. Next we complete the pair-wise comparison against each driver, in this case average.

Normalized Priorities for Average

	Average
Gore	0.215
Cruz	0.180
Bryant	0.082
Washington	0.043
McFadden	0.000
MJD	0.316
Lynch	0.165

X

Average's Defined Weighting

Drivers	Weighting
Average	0.333

=

Driver Priority Results

	Average
Gore	0.072
Cruz	0.060
Bryant	0.027
Washington	0.014
McFadden	0.000
MJD	0.105
Lynch	0.055

- ▶ Complete this for each of the defined drivers, and sum their priority results to obtain the normalized priority for each of the alternatives.

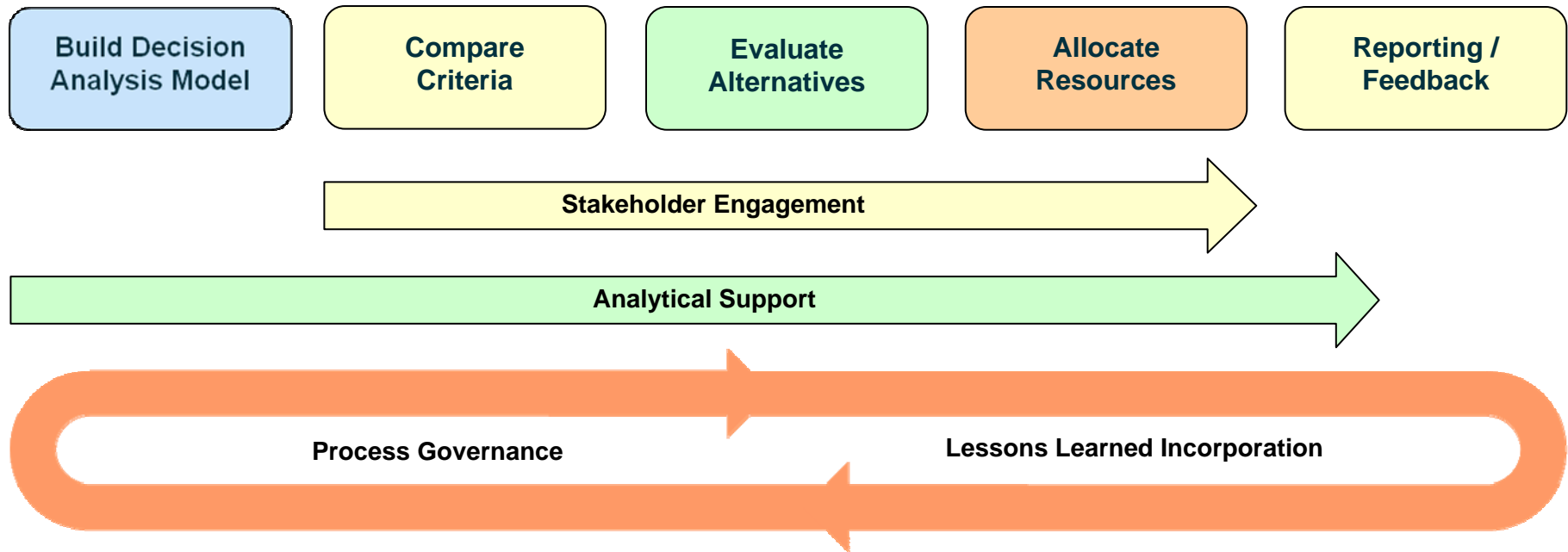
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Decision Analysis Notional Timeline



Time to cross the timeline is dependent on scope and reach of support, i.e. Strategic efforts take longer than operational which take longer than tactical

Decision Analysis Lessons Learned

- ▶ Senior Leadership Support and Buy-In for the effort
 - In-person “kick off” by Senior Leaders can be effective
- ▶ Empowered Session participants that have the ability think corporately while representing their individual interests
 - Decision Analysis is a facilitated negotiation
 - Participants should be consistently available to ensure consistency and promote buy-in
- ▶ Devote a resource to record the basis for decisions and publish/share that basis as soon as possible after the facilitated session(s)

Best source of Lessons Learned is the feedback collected at pre-identified points in the decision analysis cycle

