

The GAO reports that most DoD business system modernization projects fail to establish a baseline within 2 years. These are not unprecedented systems – viable solutions exist, but choosing a solution involves stakeholders agreeing about the architecture approach and delivery sequence. We've found that in many cases, only a few decisions affect the solution cost and benefit, and we have developed a method and tool to help find those decisions that matter.

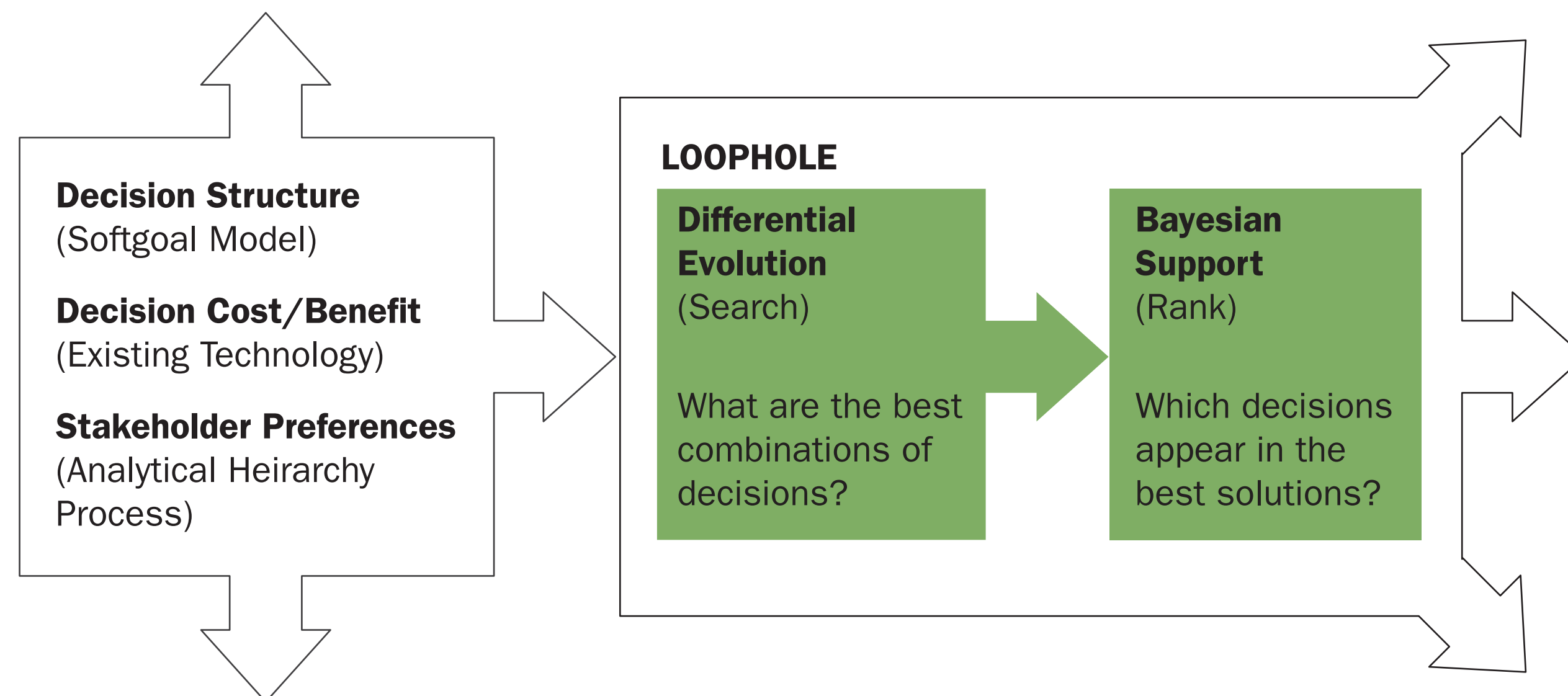
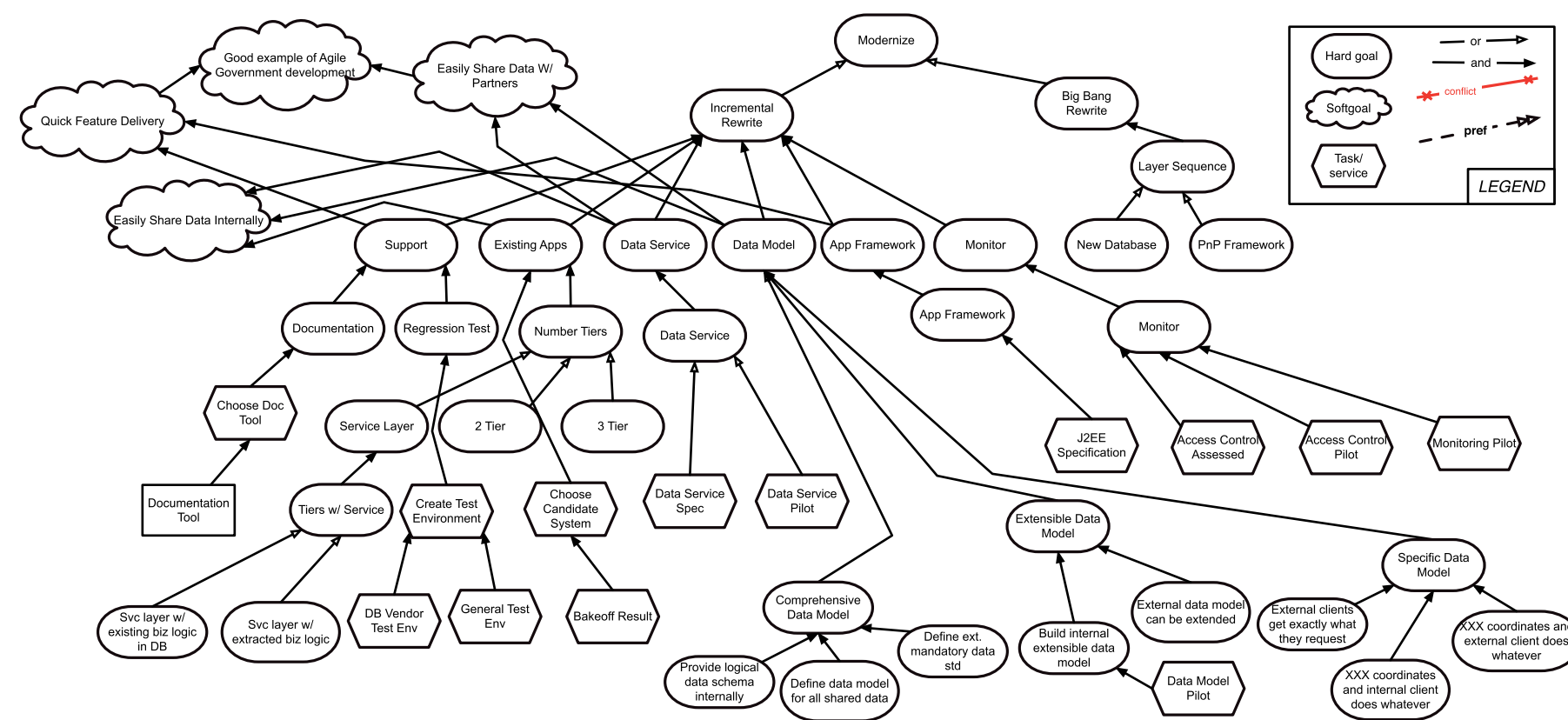
Softgoal Modeling is a lightweight approach to capture the structure of the decisions to be made as a network. Softgoals allow representation of subjective, qualitative desires about the system.

Analytic Hierarchy Process (AHP) collects stakeholder preferences about the softgoal decisions. AHP is time-efficient for stakeholders, using pairwise comparisons to rank alternatives.

LOOPHOLE is a search-based tool that uses differential evolution to efficiently find optimal solutions—the combinations of decisions that best satisfy preferences and other constraints. LOOPHOLE then uses Bayesian inference to identify the decisions that contribute to the best solutions—the **Key Decisions** that have the most influence over the quality of the solution.

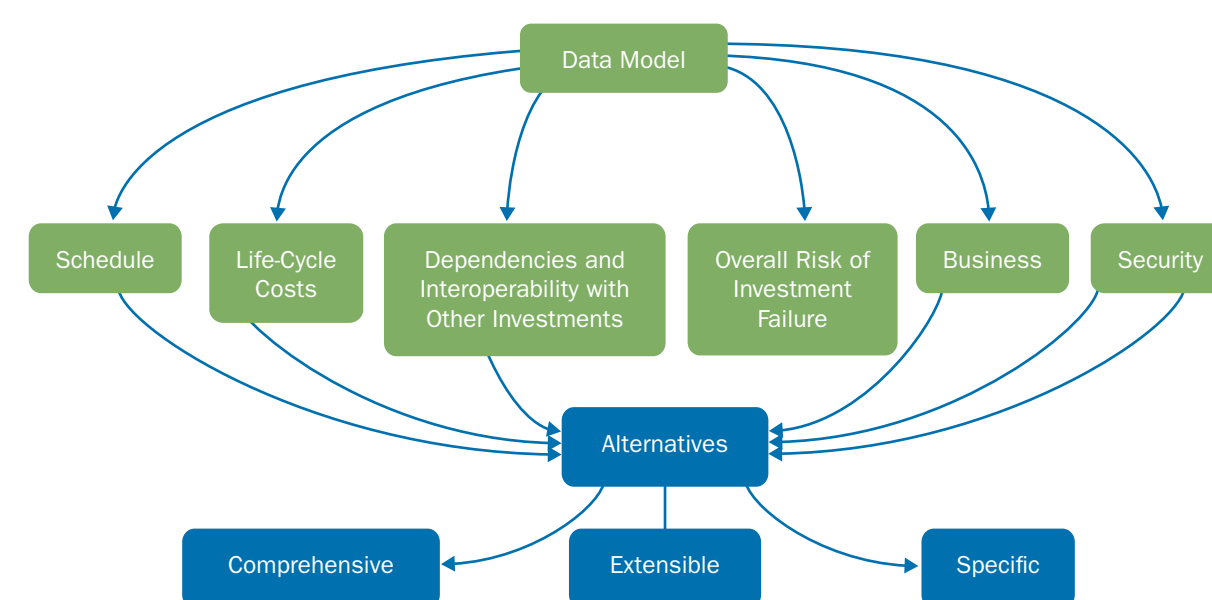
This approach scales to large decision models, and is fast enough to provide real time collaboration support. By focusing on the decisions that matter, programs can focus attention, establish baselines, and make faster progress.

Softgoal Model



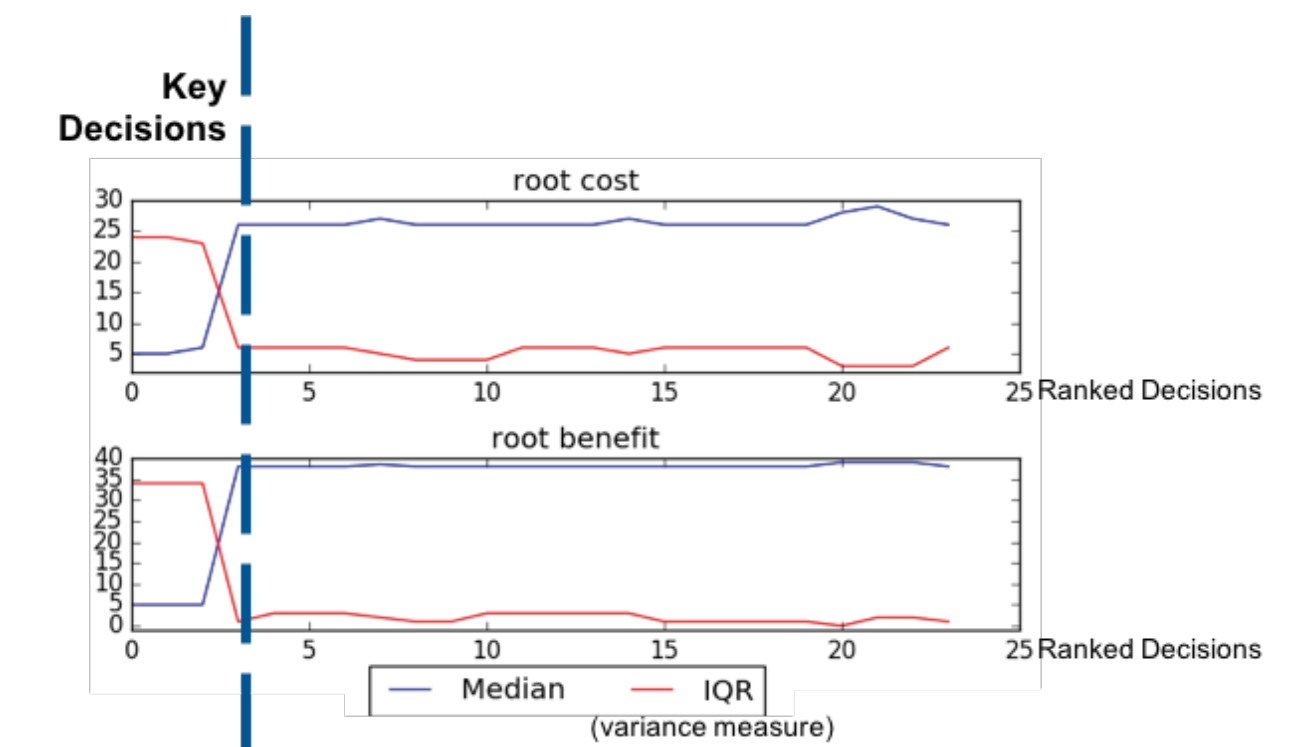
Analytic Hierarchy Process (AHP)

Ranking by pairwise comparisons



Decision Name:	Data Model?	
Description: Comprehensive	What type of data model should we develop?	
Alternatives: Extensible	Extensible	
	Specific	
Criterion: Schedule		
Comprehensive	is significantly worse than (-7)	Extensible
Comprehensive	is significantly worse than (-7)	Specific
Extensible	is a little worse than (-3)	Specific
Criterion: Life-Cycle Costs		
Comprehensive	is significantly worse than (-7)	Extensible
Comprehensive	is significantly worse than (-7)	Specific
Extensible	is somewhat worse than (-5)	Specific
Criterion: Dependencies and Interoperability with Other Investments		
Comprehensive	is significantly worse than (-7)	Extensible
Comprehensive	is significantly worse than (-7)	Specific
Extensible	is the same as (1)	Specific
Criterion: Overall Risk of Investment Failure		
Comprehensive	is somewhat worse than (-5)	Extensible
Comprehensive	is somewhat worse than (-5)	Specific
Extensible	is the same as (1)	Specific

LOOPHOLE Results



Key Decisions (the ones that matter)

Rank	Node	Status	Support
1	J2EE Specification	ON	0.129
2	Pnp Framework	OFF	0.124
3	New Database	OFF	0.115
4	Documentation Tool	ON	0.114
5	Access Control Assessed	ON	0.113
6	Monitoring Pilot	ON	0.112
7	General Test Env	ON	0.110
8	Bakeoff Result	ON	0.110
9	Access Control Pilot	ON	0.108
10	DB Vendor Test Env	ON	0.105
11	Data Service Spec	ON	0.099
12	External clients get their request	ON	0.098
13	XXX coordinates & internal client	ON	0.098
14	XXX coordinates & external client	ON	0.097
15	Data Model Pilot	ON	0.095
16	Data Service Pilot	ON	0.095
17	2 Tier	ON	0.094
18	3 Tier	ON	0.090
19	Define data model for shared data	ON	0.085
20	Svc layer w/ extracted biz logic	OFF	0.080
21	Define ext mandatory data std	ON	0.079
22	Svc layer w/ extracted biz logic in DB	ON	0.066
23	External data model can be extended	ON	0.062
24	Provide logical data scheme internally	ON	0.052

LOOPHOLE Performance and Scalability

Model	Nodes	Edges	Runtime(s)
CSServices	351	510	320
CSDPand Marketing	326	422	252
CSCounseling	350	470	240
CounselingMgmt	206	239	62
CSITDepartment	126	162	28
CSSAProgram	114	168	27
KidsAndYouth	81	81	11
AOWS	53	57	10

Other larger models

Softgoal model example

Able to support real-time collaborative decision-making