

PI LAUNCHPAD

VIRTUAL SUMMIT

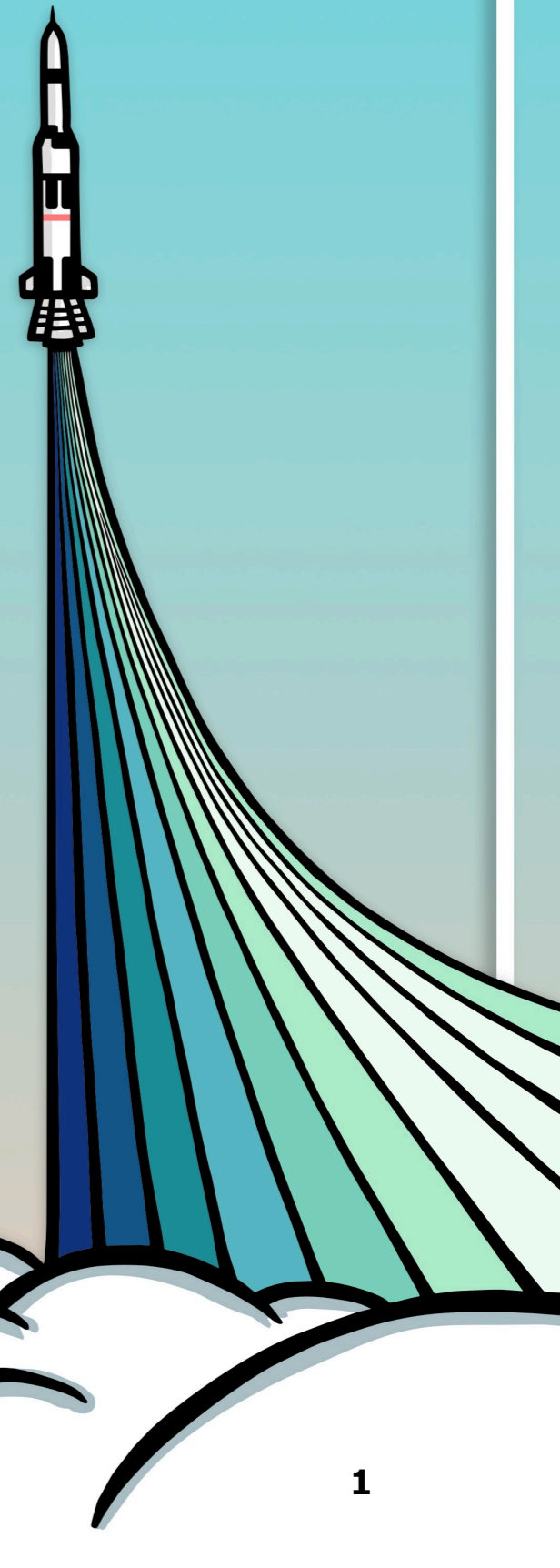
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Architecture & Formulation

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You are interested in developing your first flight mission proposal but have no idea where to start

Pre-Phase A Concept Studies - so you get *approved* for formulation

Start Here! ↩

NASA/JPL Project Lifecycle (7120.5E)

Lifecycle Phases	Approval for Formulation		Approval for Implementation		IMPLEMENTATION			
	Pre-Phase A: Concept Studies	Phase A: Concept & Technology Development	Phase B: Preliminary Design & Technology Completion	Phase C: Final Design & Fabrication	Phase D: System Assembly, Integration & Test, Launch & Checkout	Phase E: Operations & Sustainment	Phase F: Closeout	
ASSIGNED MISSIONS	NASA Decision Points	KDP A	KDP B	KDP C	KDP D	KDP E	KDP F	
	NASA Project Reviews	MCR ¹	SRR ² MDR ^{1,2}	PDR ¹	CDR ^{1,6} SIR ^{1,3}	ORR MRR ¹ PLAR	CERR ^{1,4} DR ¹ DRR	
COMPETED MISSIONS	NASA Decision Points	Down Select	Project Selection	KDP C	KDP D	KDP E	KDP F	
	NASA Project Reviews			PDR ¹	CDR ^{1,6} SIR ^{1,3}	ORR MRR ¹ PLAR	CERR ^{1,4} DR ¹ DRR	
	JPL Project Reviews	Step 17 Proposal Reviews	Step 2 PIR Proposal Reviews	PMSR ¹				
Other Reviews and Events		ASM			SMSR, FRR (LV), LRR (LV)	MRB Launch	EOPM ⁵ Final Archival of Data	
Notes	(1) Review is followed by a JPL CMC. If the review immediately precedes a KDP, a Mission Directorate and/or Agency PMC/GPMC, as appropriate, are required prior to/with the KDP. (2) The SRR and MDR may be combined (3) SIR is a "soft gate", project may initiate Phase D work immediately upon completion of Phase C work products, absent a notice of discontinuance from the Program Manager (4) CERRs are established at the discretion of Program Offices.				(5) When missions are extended beyond their prime mission, JPL conducts an EMR, NASA conducts an SR; the extended mission remains in Phase E. (6) When there are multiple (>3) copies of a system, a Production Readiness Review is held. (7) Projects selected with a one-step proposal process start in Phase A and conduct the reviews identified for Assigned Missions beginning with the SRR			
Legend	ASM – Acquisition Strategy Meeting CDR – Critical Design Review CERR – Critical Events Readiness Review CMC – Center Management Council DR – Decommissioning Review DRR – Disposal Readiness Review EMR – Extended Mission Review EOPM – End of Prime Mission FRR (LV) – Flight Readiness Review Launch Vehicle		GPMC – Governing Program Management Council KDP – Key Decision Point LRR (LV) – Launch Readiness Review Launch Vehicle MCR – Mission Concept Review MDR – Mission Definition Review MRB – Mission Readiness Briefing MRR – Mission Readiness Review ORR – Operations Readiness Review PDR – Preliminary Design Review		PIR – Proposal Implementation Review PLAR – Post Launch Assessment Review PMC – Program Management Council PMSR – Project Mission System Review SIR – System Integration Review SMSR – Safety and Mission Success Review SR – Senior Review SRR – System Requirements Review 08.05.2013 ▲ = Reviews conducted with NASA-appointed Standing Review Board			



The Purpose of Pre-Phase A Concept Studies

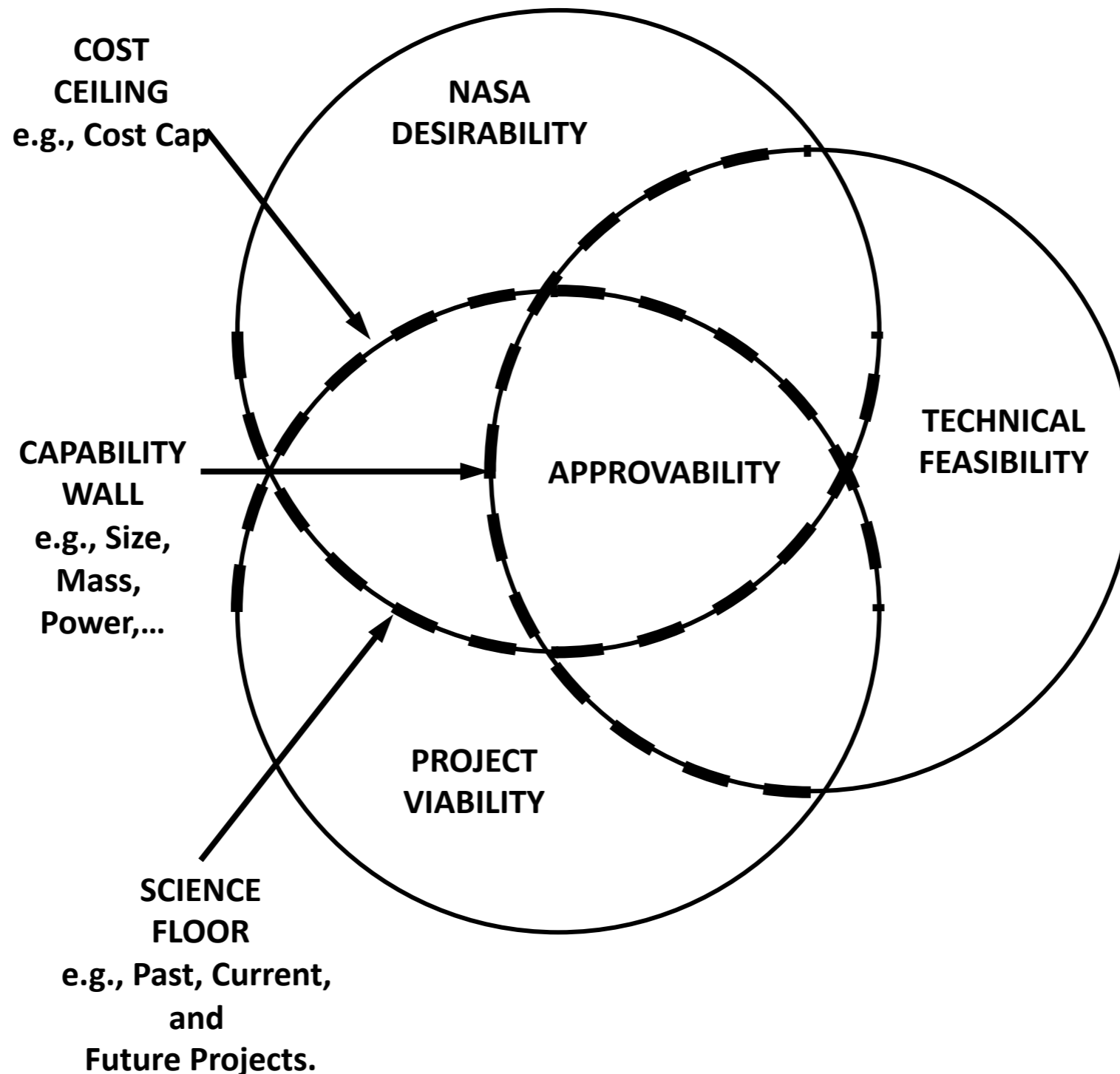
to conduct trades

- NASA SP-2016-6105 Rev2 “NASA Systems Engineering Handbook”
 - The purpose of Pre-Phase A Concept Studies is to produce a broad spectrum of ideas and alternatives for missions from which new programs/projects can be selected. Determine feasibility of desired system, develop mission concepts, draft system-level requirements, assess performance, cost, and schedule feasibility; identify potential technology needs, and scope.
- Trade: to exchange something for something else, an alternative



...from which new programs/projects can be selected (approved)

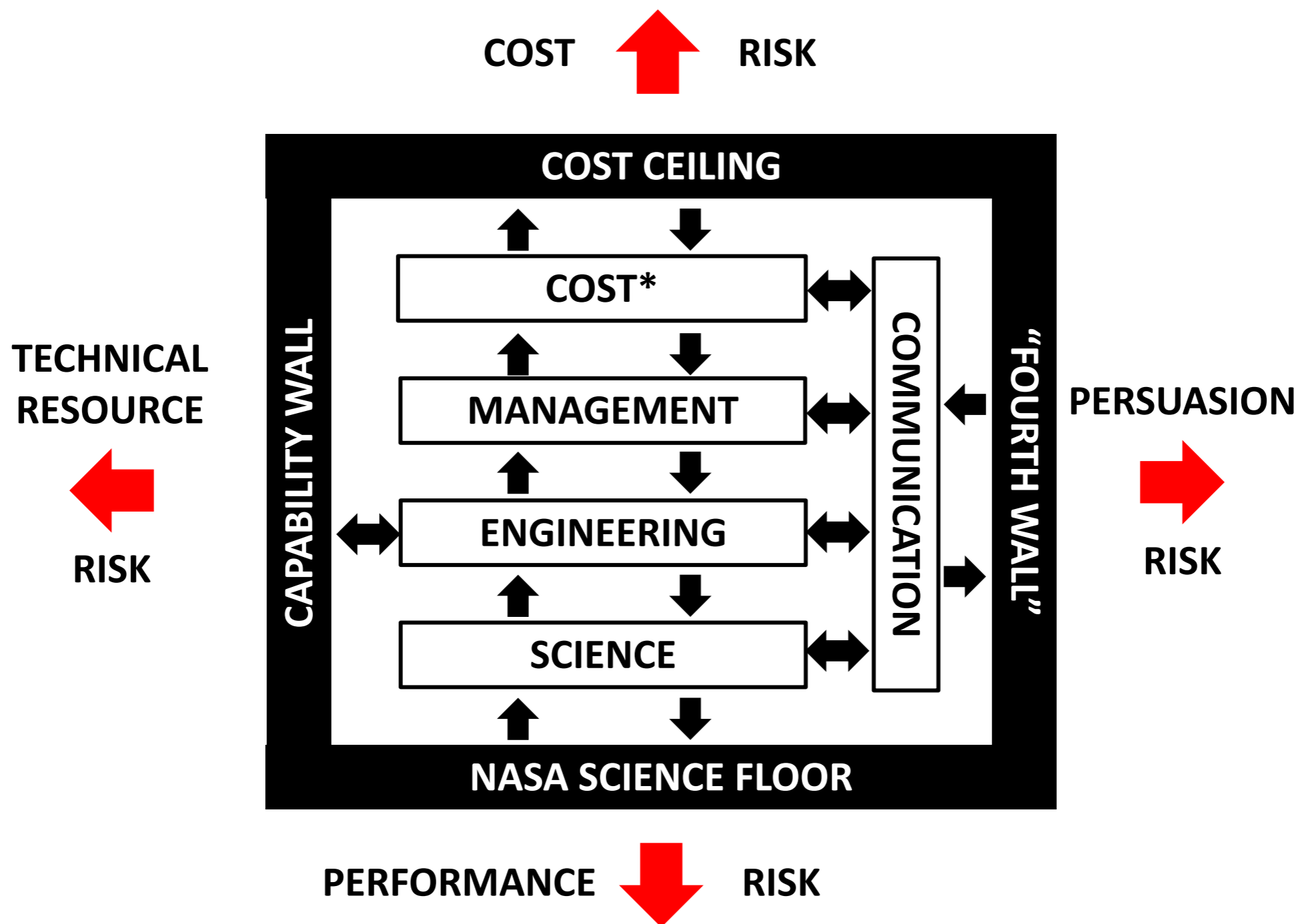
The three principal boundary conditions





Principal Trade Space Dimensions for Approvability

Science, Engineering, Management, & Communications



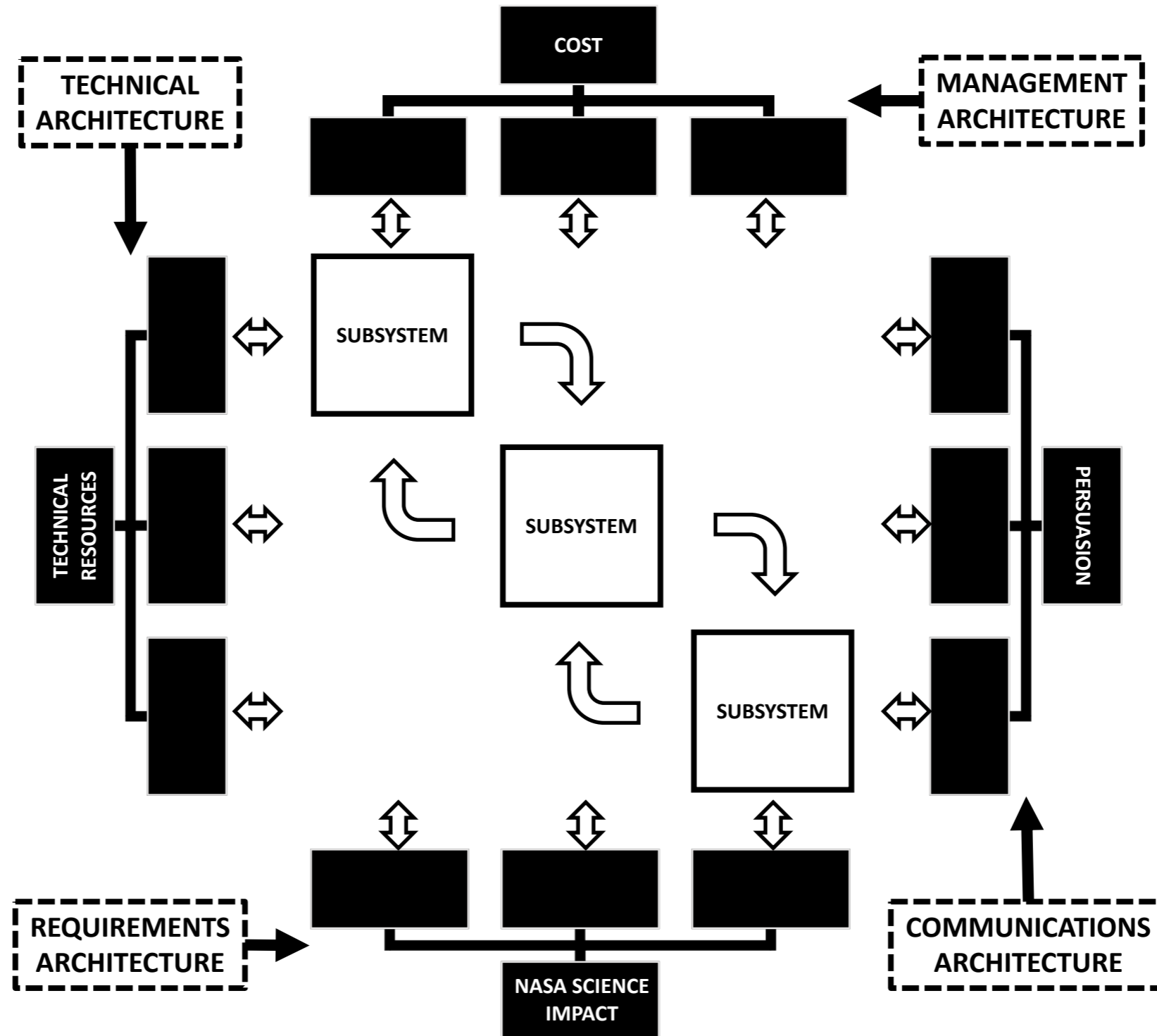


Principal Architecture & Design Trades

to redistribute risk & reward (margins)

When your approach breaks (hollow arrows), look at the choices you are making (boxes - design), and at the choices that brought you there (branches - architecture)

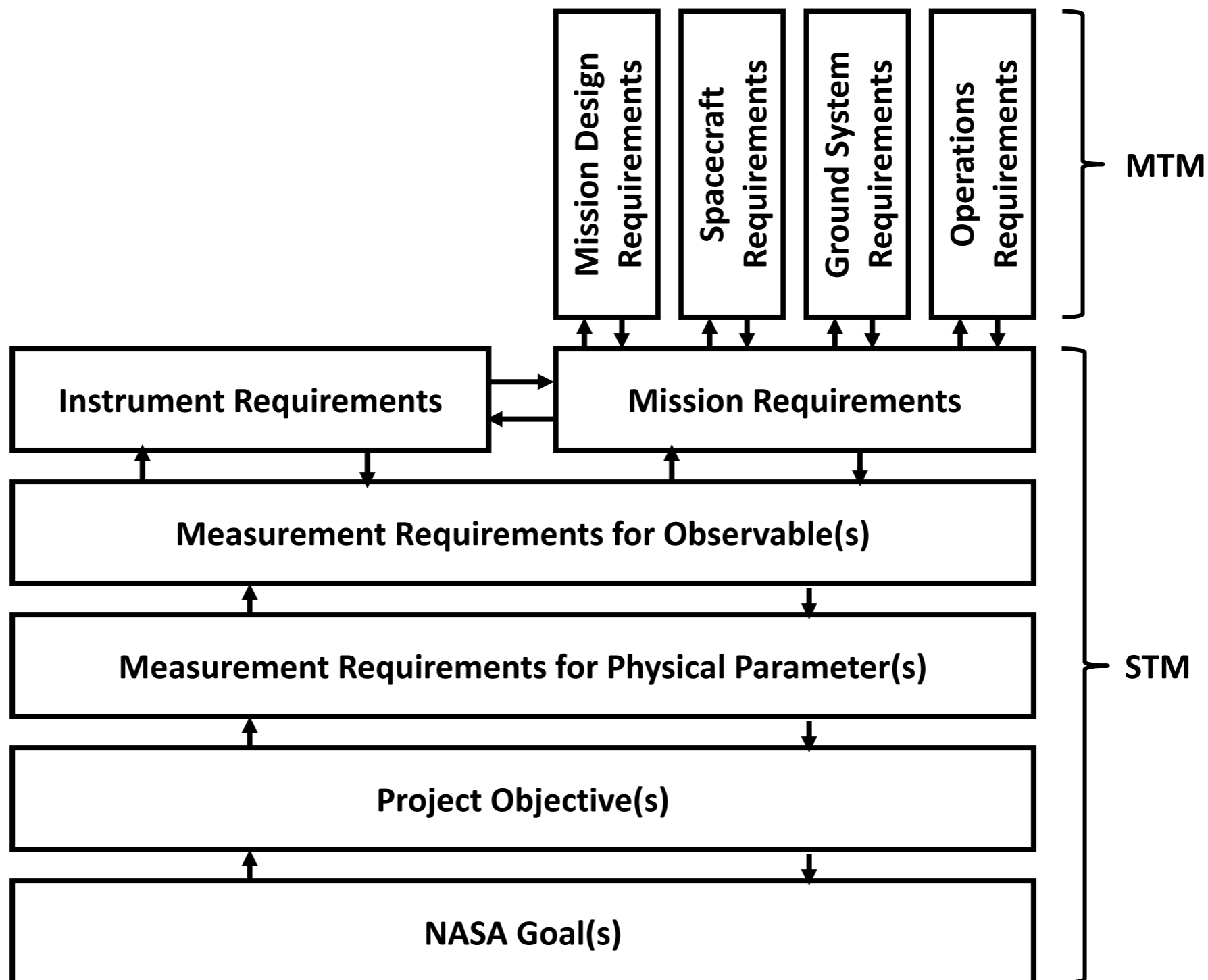
*EXAMPLE:
Your system cannot downlink all the data collected over the course of a day.
You could upgrade the radio, add in-instrument data compression, and/or revisit your sampling requirements*





Science Trades: Requirements Architecture

You will always run out of money before you run out of science

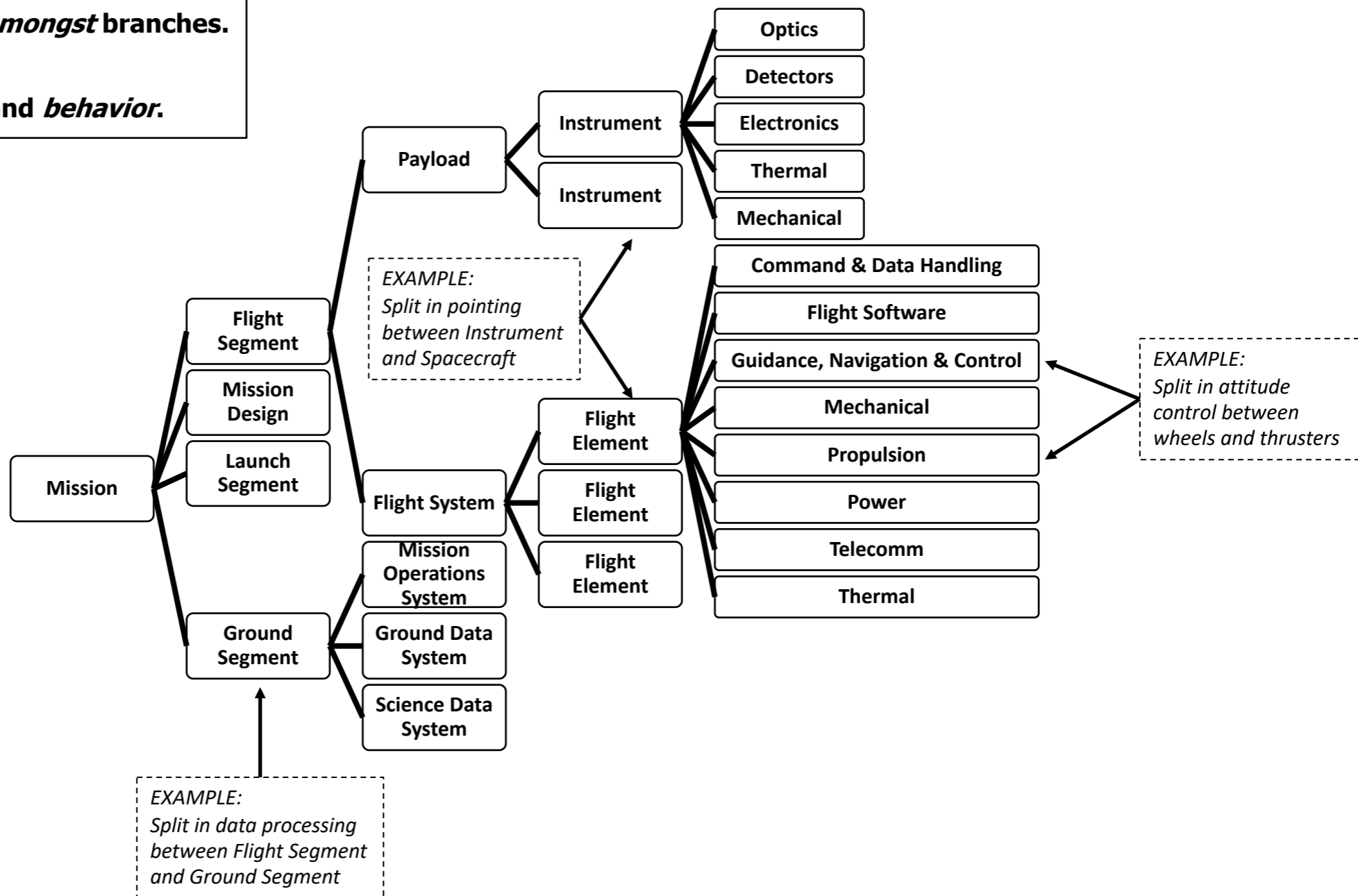




Engineering Trades: Technical Architecture

Big changes come from changing branches, not leaves

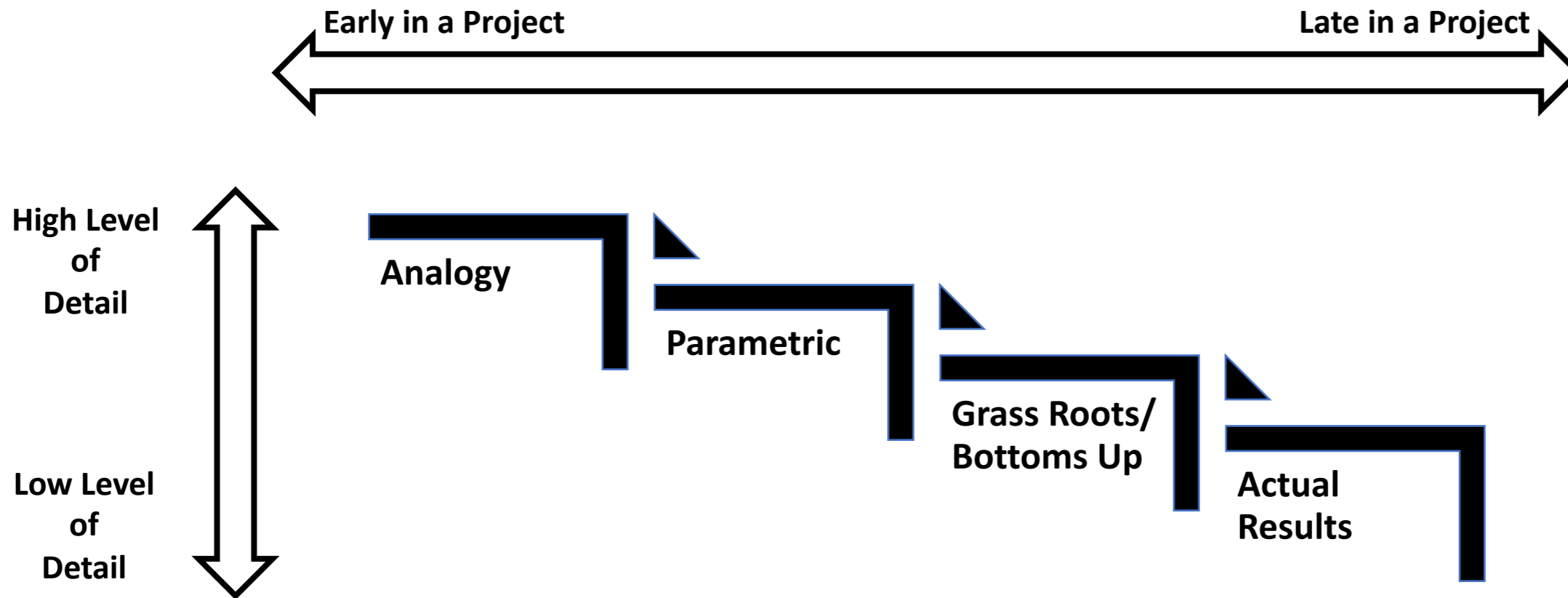
Architecting is changing the allocation of functions *amongst* branches. Designing is finding the solution *at* a node. Designs includes *structure* and *behavior*.





Trade Space Methods

Use phase and detail appropriate estimation methods – not only bottoms up



- Alfred Nash
Jet Propulsion Laboratory,
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