estimate

estimate • analyze • plan • control

Affordability Analysis: The Role of Process, Cost and ROI Modeling In Improved Program Performance ICEAA 2013

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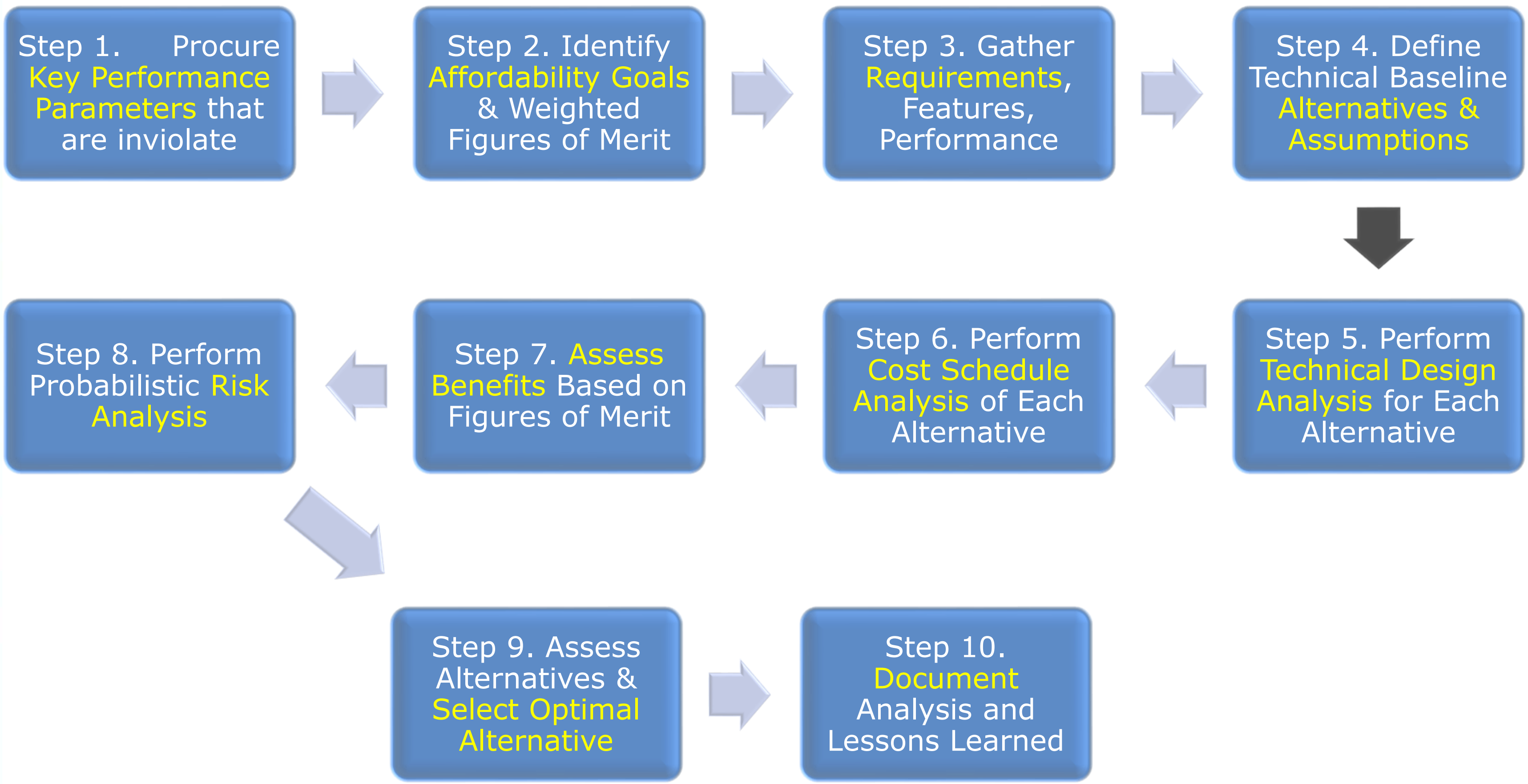
Key Points

Viable affordability decisions yield project achievements

Repeatable affordability process is a key method of analyzing affordability

We can make best value decisions, driving down cost & increasing value

Galorath Affordability Process 1.3: Use An Affordability Process To Determine Best Value



Pricing strategies assumed in step 7. Since price is a figure of merit

Step 1 Key Performance Parameters (KPPs)

Step 1. Procure Key Performance Parameters that are inviolate

- **Key Performance Parameters Defined**: Critical subset of performance parameters, capabilities and characteristics **so significant that failure to meet them can cause concept or system selected to be reevaluated or the project reassessed or terminated**. (Adapted from Glossary of Defense Acquisition)

KPP Example Criteria

- Essential for defining the required capabilities?
- Contributes to significant improvement in the operational capabilities of the enterprise?
- Achievable and affordable?
- Measurable and testable/verifiable?
- Can KPP attribute be analyzed throughout the life cycle?
- If not met, will the sponsor of the project be willing to cancel or significantly restructure the project?

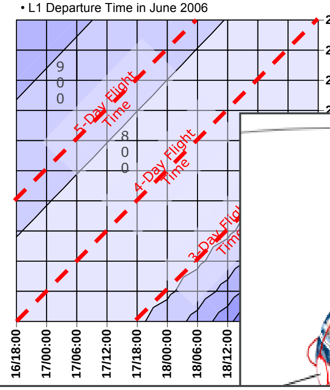
Step 2. Identify Weighted Affordability Goals & Figures of Merit

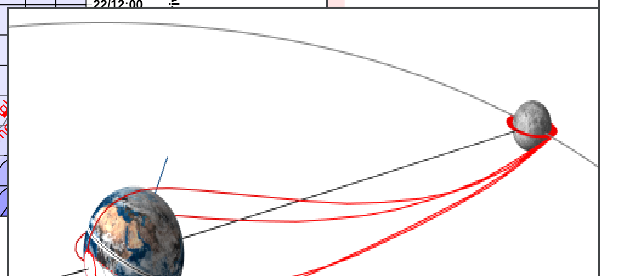
- **Figure of merit:** A quantity used to characterize the performance of a device, system or method, relative to its alternatives e.g.
  - Cost
  - Response time of a computing action
  - Survivability
  - Calories in a serving
  - Resolution of a digital camera
  - Battery life
  - Coverage

Used to compare alternatives
For example more cheaper UAVs may provide better coverage for the same $ than fewer more powerful UAVs

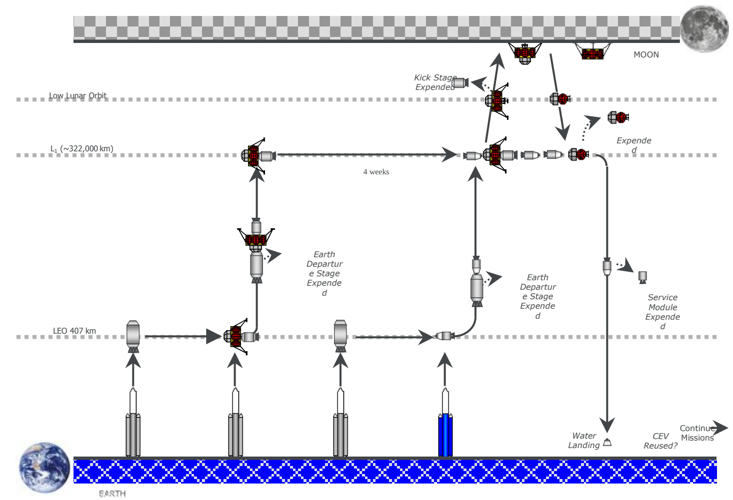
Key Figures of Merit (Source NASA Space Systems Engineering)

Mission Design

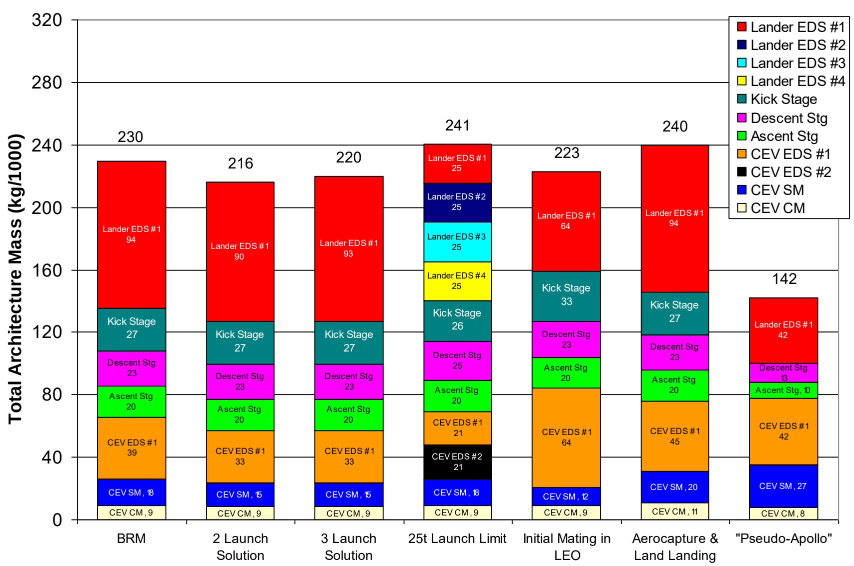




Reference Operations Concept



Initial Mass in LEO



Key Figures of Merit

Safety
- # of Critical Events
- Mission Complexity
- Abort Options
- Crew Time
- Technology Risk
- Probability of launch success
- Etc.

Effectiveness
- Total Mass
- Dry Mass
- Surface Time
- Etc.

Extensibility
- Long-Stays
- Mars
- Other destinations
- Etc.

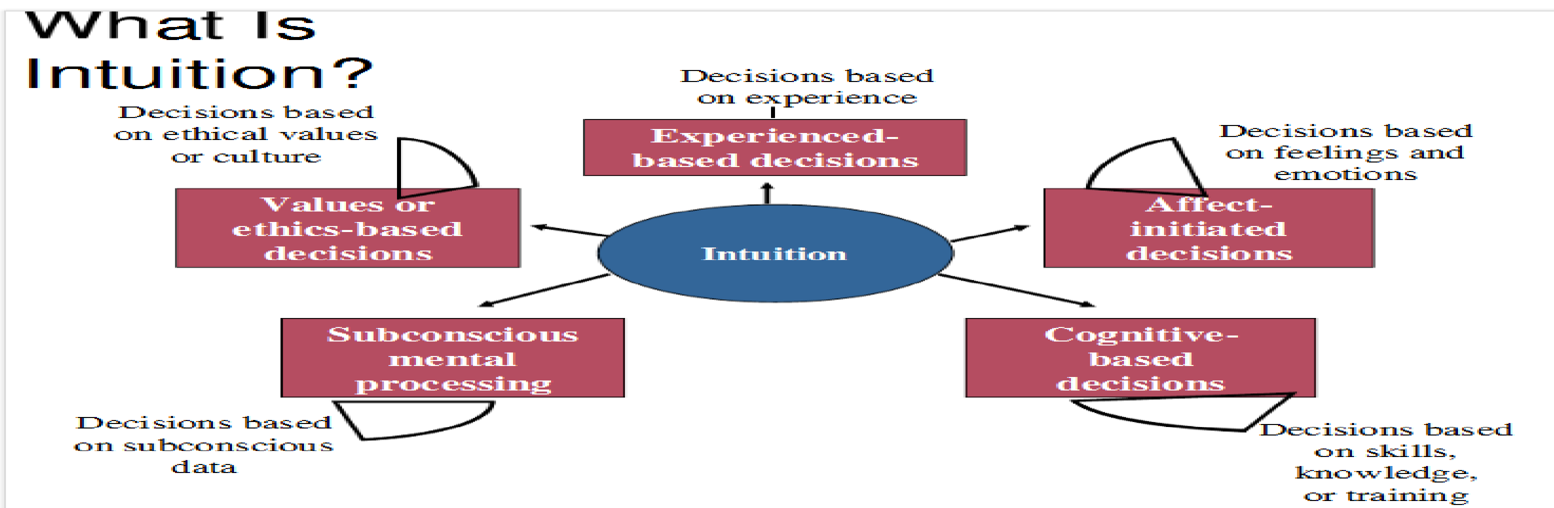
Cloud Example: But When We Look at Figures of Merit

- Is the cloud secure enough?
- Is the cloud fast enough?
- Is cloud vender reliable enough?
- Other figures of merit for this system?

Every case is different
We can’t say cloud or on-premises is always better

Building Weightings

- Allocate weights to each figure of merit IN advance
  - KPPs should be ok'ed to get here
- Gives appropriate priority to each
- Consider using expected value when decisions are financial
- Intuition can be valuable but is not repeatable



What is intuition: Source Unknown

Step 3 Gather Requirements, Features, Performance

Step 3. Gather Requirements, Features, Performance

- Functional requirements: Describe interactions between the system environment independent of implementation
  - Watch system must display time based on location
- Nonfunctional requirements: User visible aspects of the system not directly related to functional behavior
  - Response time must be less than 1 second
  - Accuracy must be within a second
  - Watch must be available 24 hours a day except from 2:00am-2:01am and 3:00am-3:01am
- Groundrules: Imposed by the client or the environment in which the system will operate
  - The implementation language must be COBOL.
  - Must interface to the dispatcher system written in 1956

Data-Gathering Techniques[1]

Technique	Good for	Kind of data	Plus	Minus
Questionnaires	Answering specific questions	Quantitative and qualitative data	Can reach many people with low resource	The design is crucial. Response rate may be low. Responses may not be what you want
Interviews	Exploring issues	Some quantitative but mostly qualitative data	Interviewer can guide interviewee. Encourages contact between developers and users	Time consuming. Artificial environment may intimidate interviewee
Focus groups and workshops	Collecting multiple viewpoints	Some quantitative but mostly qualitative data	Highlights areas of consensus and conflict. Encourages contact between developers and users	Possibility of dominant characters
Naturalistic observation	Understanding context of user activity	Qualitative	Observing actual work gives insight that other techniques cannot give	Very time consuming. Huge amounts of data
Studying documentation	Learning about procedures, regulations, and standards	Quantitative	No time commitment from users required	Day-to-day work will differ from documented procedures

[1] Preece, Rogers, and Sharp "Interaction Design: Beyond human-computer interaction", p214

Step 4. Define Technical Baseline Alternatives & Assumptions

Step 4. Define Technical Baseline Alternatives & Assumptions

- Functionality included in the estimate or range must be established
  - Defines technical goals, objectives, and scope and provides the basis for estimating project cost and schedule. is managed and communicated in a structured and planned way DAU
    - A living, revised document, set of documents, database, etc.
  - When detailed functionality is not known, groundrules and assumptions state what is and isn't included in the estimate
  - Issues of COTS, reuse, and other assumptions should be documented as well

Ground Rules & Assumptions

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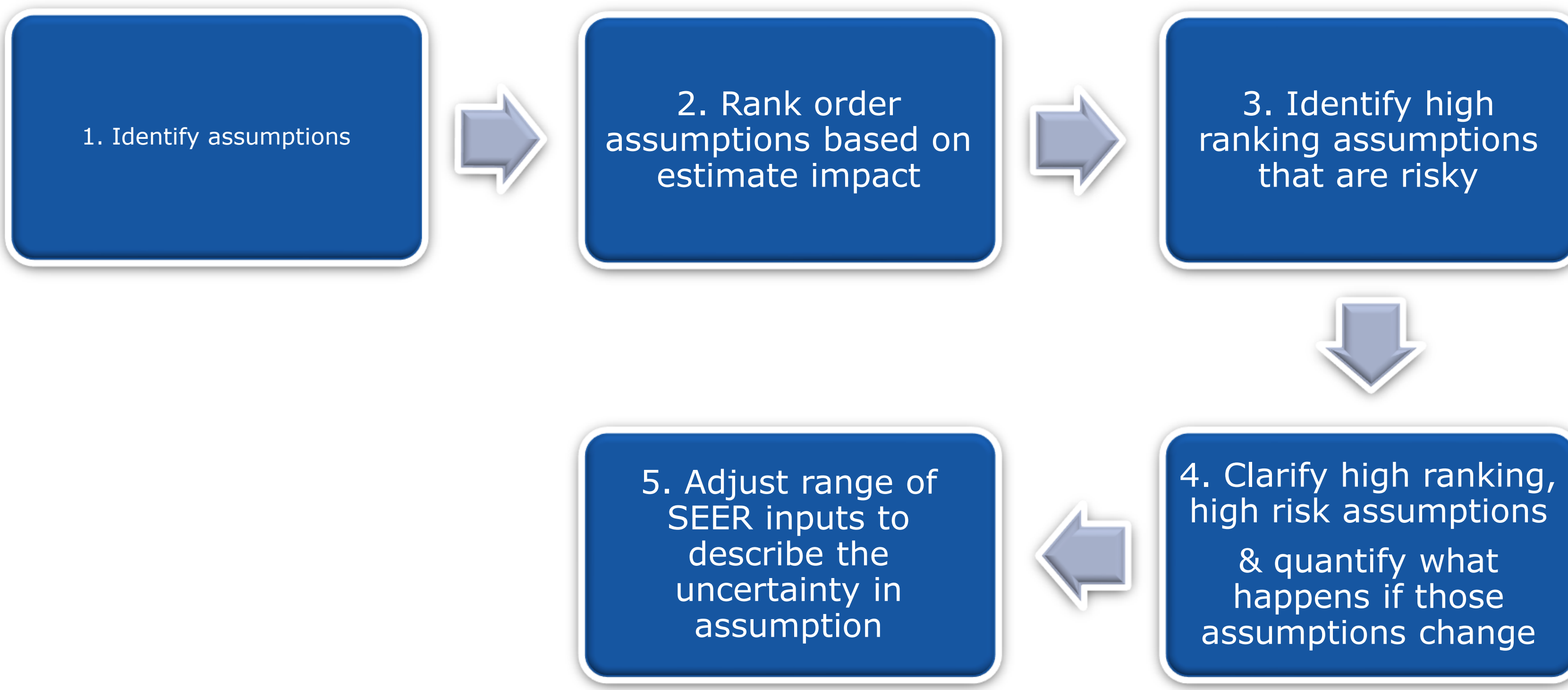
- Groundrule: given requirement of the estimate (e.g. software must support windows and Linux
- Assumption: assumed to scope estimate
- Groundrules and assumptions form the foundation of the estimate
  - Early they are preliminary & rife with uncertainty
  - they must be credible and documented
  - Review and redefine these assumptions regularly as the estimate moves forward
- What's known, what's unknown
- Anything relating to scope
  - What's included, what's excluded
- Anything relating to modeling inputs
  - Who you interviewed and when
  - What you learned

Dealing With the "Problem of Assumptions"

- Assumptions are essential but… Incorrect assumptions can drive an estimate to uselessness
- Use an assumption verification process



Step 5 Perform Technical Design Analysis For Each Alternative

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- Functions needed to satisfy requirements
- For example, to perform any science measurement you will need
  - Sensor (detector system)
  - Power the sensor (power system)
  - Read data from the sensor (data acquisition system)
  - Store data (data archive system)
  - Control sensor, readout, storage (control system)
  - Analyze data (ground data system)
- COTS, Reused, GOTS, New Development, etc.
- These functions will also need to have a set of requirements specified
  - Power system shall supply volts & milliamps to the sensor, data acquisition, archive and control systems

Step 6. Perform Cost Schedule Analysis of Each Alternative

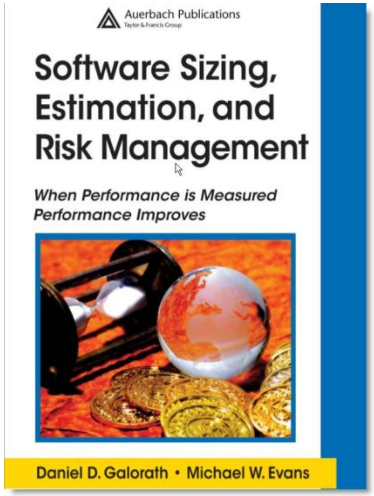
Step 6. Perform Cost Schedule Analysis of Each Alternative

- Estimating is critical for all kinds of systems
  - Yet many treat is as a second rate process
- Everyone estimates…. Just most get it wrong and don't have a process
- Having a repeatable estimation process is critical to both estimating AND to successful projects
- Estimation and measurement go hand in hand

Use An Estimating Process (Generalized 10 Step System Estimation Process 2011)

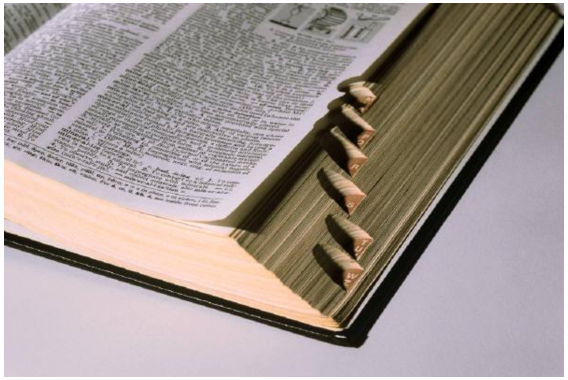
BID & PROPOSAL CON

- 1. Establish Estimate Scope
- 2. Establish Technical Baseline, Ground Rules, Assumptions
- 4. Refine Technical Baseline Into Estimable Components
- 4. Collect data / estimation inputs
- 5. Estimate Baseline Cost, Schedule, Affordability Value
- 6. Quantify Risks and Risk Analysis
- 6. Validate Business Case Costs & Benefits (go / no go)
- 8. Generate a Project Plan
- 9. Document Estimates and Lessons Learned
- 10. Track Project Throughout Development

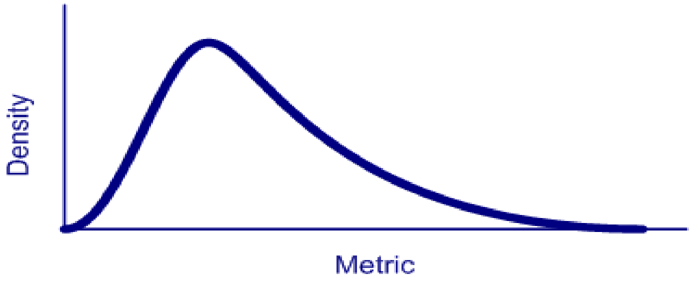


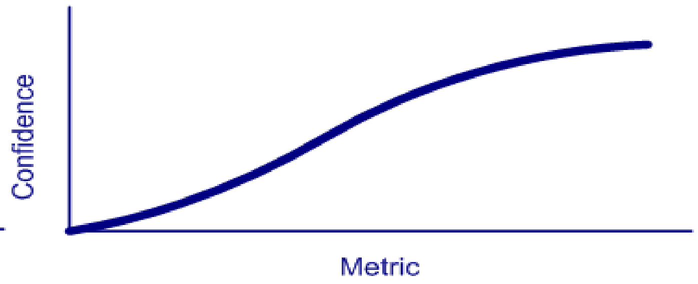
Bad Estimates Are A Root Cause of Project Failure

- An ***estimate*** is the most knowledgeable statement you can make ***at a particular point in time*** regarding:
  - Effort / Cost
  - Schedule
  - Staffing
  - Risk
  - Reliability



- Estimates more precise with progress
- ***A WELL FORMED ESTIMATE IS A DISTRIBUTION***



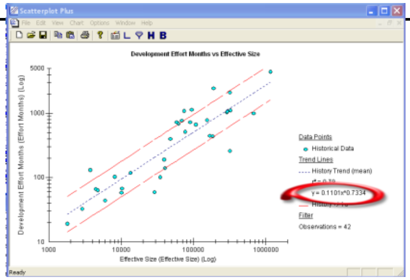


Estimation Methods - 1 of 2

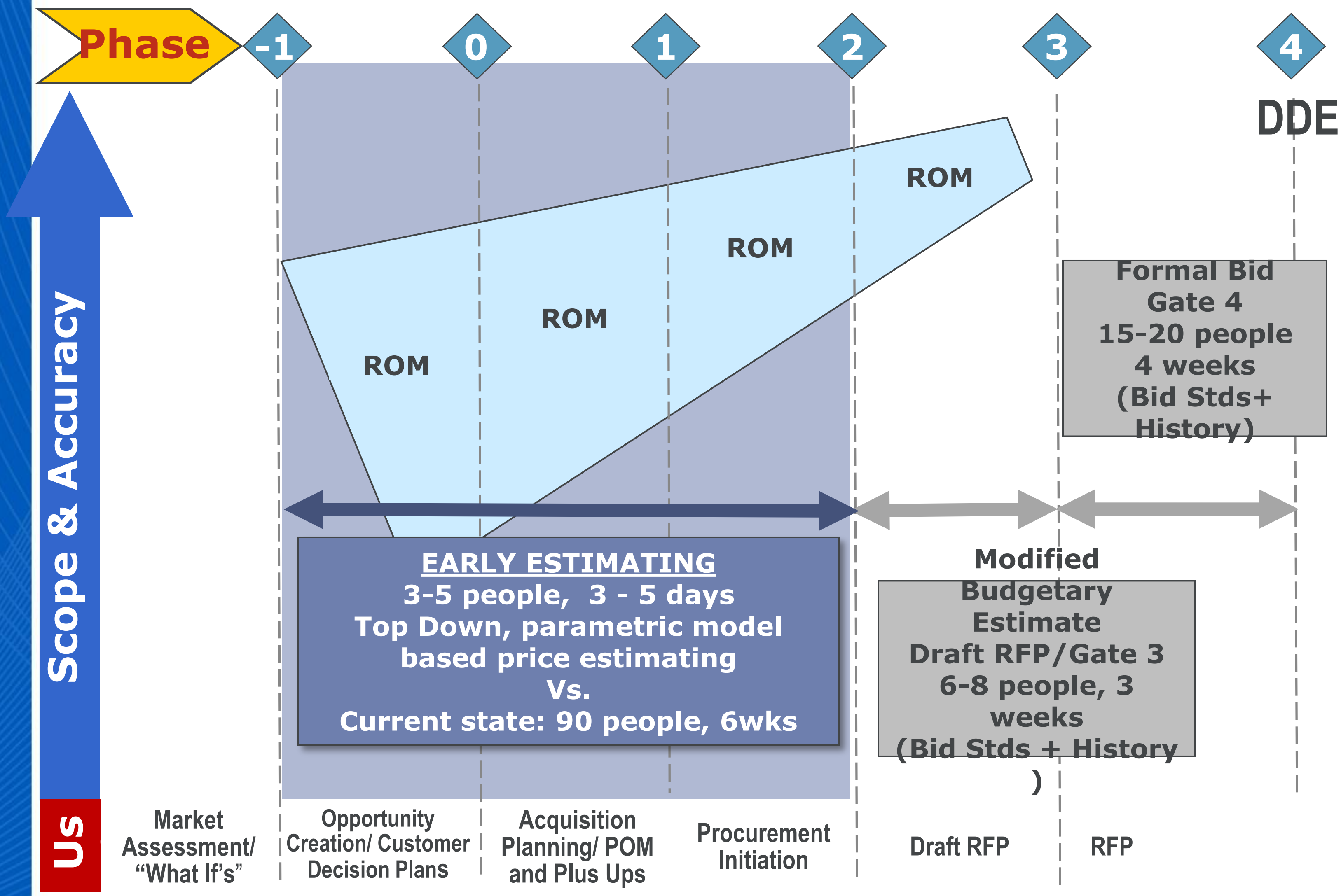
Model Category	Description	Advantages	Limitations
Guessing	Off the cuff estimates	Quick Can obtain any answer desired	No Basis or substantiation No Process Usually Wrong
Analogy	Compare project with past similar projects.	Estimates are based on actual experience.	Truly similar projects must exist
Expert Judgment	Consult with one or more experts.	Little or no historical data is needed; good for new or unique projects.	Experts tend to be biased; knowledge level is sometimes questionable; may not be consistent.
Top Down Estimation	A hierarchical decomposition of the system into progressively smaller components is used to estimate the size of a software component.	Provides an estimate linked to requirements and allows common libraries to size lower level components.	Need valid requirements. Difficult to track architecture; engineering bias may lead to underestimation.

Estimation Methods - 2 of 2

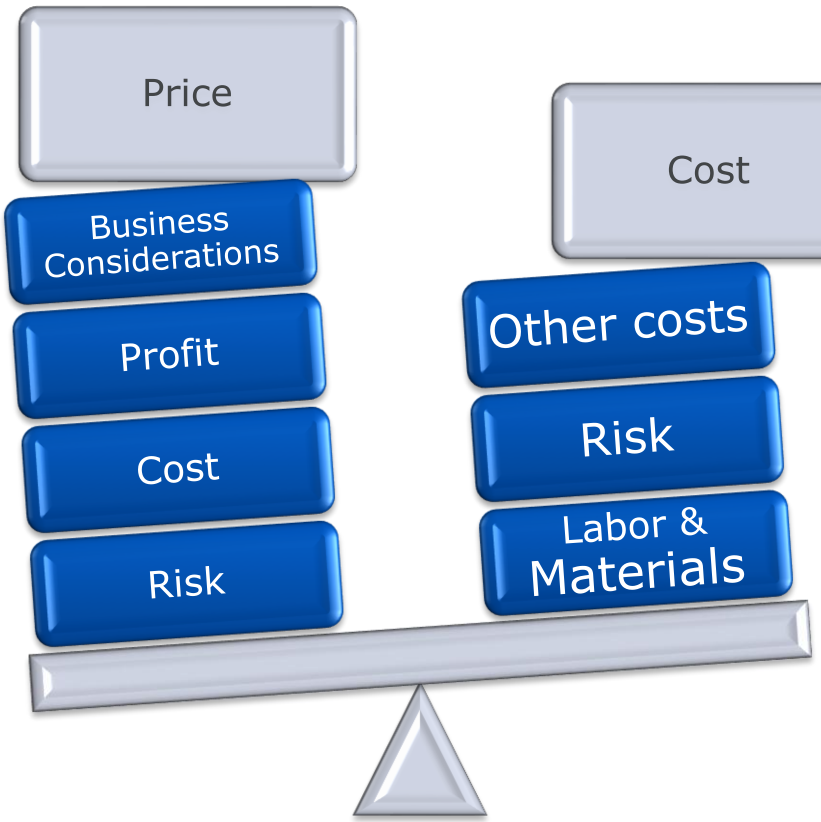
Model Category	Description	Advantages	Limitations
Bottoms Up Estimation	Divide the problem into the lowest items. Estimate each item… sum the parts.	Complete WBS can be verified.	The whole is generally bigger than the sum of the parts. Costs occur in items that are not considered in the WBS.
Design To Cost	Uses expert judgment to determine how much functionality can be provided for given budget.	Easy to get under stakeholder number.	Little or no engineering basis.
Simple CER's	Equation with one or more unknowns that provides cost / schedule estimate.	Some basis in data.	Simple relationships may not tell the whole story. Historical data may not tell the whole story.
Comprehensive Parametric Models	Perform overall estimate using design parameters and mathematical algorithms.	Models are usually fast and easy to use, and useful early in a program; they are also objective and repeatable.	Models can be inaccurate if not properly calibrated and validated; historical data may not be relevant to new programs; optimism in parameters may lead to underestimation.



Affordability Alternatives Generally Provide ROM Estimates (Source APMP: Just Say No)

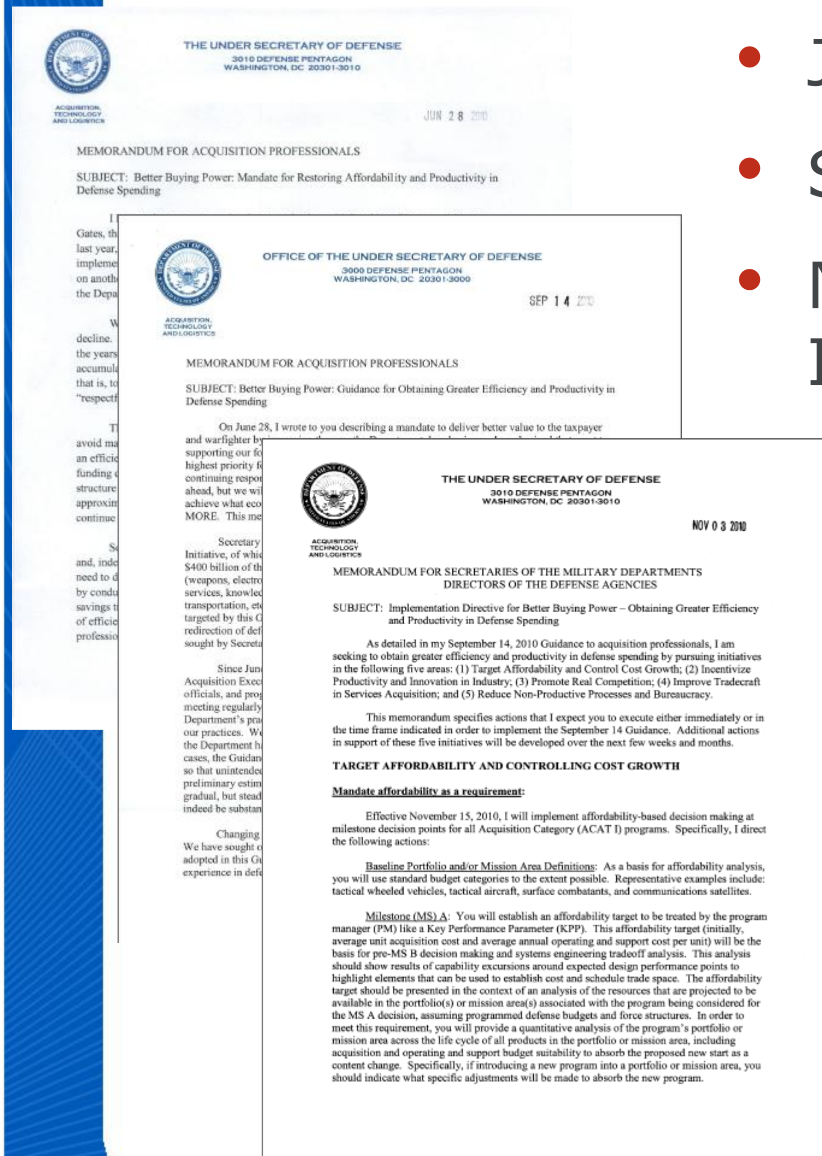


Remember Cost and Price Are Different (Adapted from Morton)



- **Price**: Amount Charged to Customer (considering cost, profit, risk, Price to win, business considerations, etc.)
  - e.g. New Car - Discounts
  - e.g. Machinists - Idle
  - e.g. Golden Gate Bridge - Cables
  - e.g. NASA – Photos

US Better Buying Power Initiatives


THE UNDER SECRETARY OF DEFENSE
3010 DEFENSE PENTAGON
WASHINGTON, DC 20301-3010

ACQUISITION, TECHNOLOGY AND LOGISTICS

MEMORANDUM FOR ACQUISITION PROFESSIONALS

SUBJECT: Better Buying Power: Mandate for Restoring Affordability and Productivity in Defense Spending

OFFICE OF THE UNDER SECRETARY OF DEFENSE
3000 DEFENSE PENTAGON
WASHINGTON, DC 20301-3000

ACQUISITION, TECHNOLOGY AND LOGISTICS

MEMORANDUM FOR ACQUISITION PROFESSIONALS

SUBJECT: Better Buying Power: Guidance for Obtaining Greater Efficiency and Productivity in Defense Spending

On June 28, I wrote to you describing a mandate to deliver better value to the taxpayer

THE UNDER SECRETARY OF DEFENSE
3010 DEFENSE PENTAGON
WASHINGTON, DC 20301-3010

NOV 0 3 2010

ACQUISITION, TECHNOLOGY AND LOGISTICS

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
DIRECTORS OF THE DEFENSE AGENCIES

SUBJECT: Implementation Directive for Better Buying Power – Obtaining Greater Efficiency and Productivity in Defense Spending

As detailed in my September 14, 2010 Guidance to acquisition professionals, I am seeking to obtain greater efficiency and productivity in defense spending by pursuing initiatives in the following five areas: (1) Target Affordability and Control Cost Growth; (2) Incentivize Productivity and Innovation in Industry; (3) Promote Real Competition; (4) Improve Tradecraft in Services Acquisition; and (5) Reduce Non-Productive Processes and Bureaucracy.

This memorandum specifies actions that I expect you to execute either immediately or in the time frame indicated in order to implement the September 14 Guidance. Additional actions in support of these five initiatives will be developed over the next few weeks and months.

TARGET AFFORDABILITY AND CONTROLLING COST GROWTH

Mandate affordability as a requirement:

Effective November 15, 2010, I will implement affordability-based decision making at milestone decision points for all Acquisition Category (ACAT I) programs. Specifically, I direct the following actions:

Baseline Portfolio and/or Mission Area Definitions: As a basis for affordability analysis, you will use standard budget categories to the extent possible. Representative examples include: tactical wheeled vehicles, tactical aircraft, surface combatants, and communications satellites.

Milestone (MS) A: You will establish an affordability target to be treated by the program manager (PM) like a Key Performance Parameter (KPP). This affordability target (initially, average unit acquisition cost and average annual operating and support cost per unit) will be the basis for pre-MS B decision making and systems engineering tradeoff analysis. This analysis should show results of capability excursions around expected design performance points to highlight elements that can be used to establish cost and schedule trade space. The affordability target should be presented in the context of an analysis of the resources that are projected to be available in the portfolio(s) or mission area(s) associated with the program being considered for the MS A decision, assuming programmed defense budgets and force structures. In order to meet this requirement, you will provide a quantitative analysis of the program's portfolio or mission area across the life cycle of all products in the portfolio or mission area, including acquisition and operating and support budget suitability to absorb the proposed new start as a content change. Specifically, if introducing a new program into a portfolio or mission area, you should indicate what specific adjustments will be made to absorb the new program.

- June 28, 2010 Mandate
- September 14, 2010 Guidance
- November 3, 2010 Implementation
  - Five Specific Areas of Concern:
    - **Target Affordability and Control Cost Growth**
    - **Reduce Non-Productive Processes and Bureaucracy**
    - Incentivize Productivity and Innovation in Industry
    - Promote Real Competition
    - Improve Tradecraft in Services Acquisition

Affordability Initiatives With "Should Cost" and "Will Cost"

Will Cost Performance − Cost Initiatives (Applied practices & improvements) = Should Cost Performance

Many View Bottoms up estimates as the requirement for Should Cost / Will Cost Analysis

But parametrics can do analysis faster as well as provide more tradeoffs

Example: Project Cost Alone Is not The Cost of IT Failure (Source: HBR)

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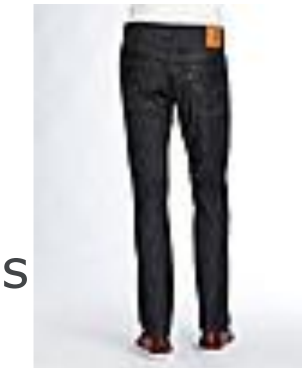
- Case Study: Levi Strauss
  - $5M ERP deployment contracted
  - Risks seemed small
  - Difficulty interfacing with customer's systems
  - Had to shut down production
  - Unable to fill orders for 3 weeks
  - **$192.5M charge against earnings on a $5M IT project failure**



"IT projects touch so many aspects of organization they pose a new singular risk"

http://hbr.org/2011/09/why-your-it-project-may-be-riskier-than-you-think/ar/1

Step 7. Assess Benefits Based on Figures of Merit

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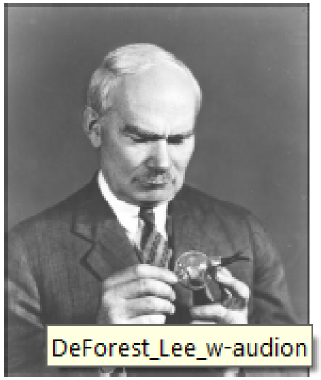
- Return on Investment often main criterion in IT systems

While Optimism Needs Tempering, So Does Short Sightedness (Source Northrop)

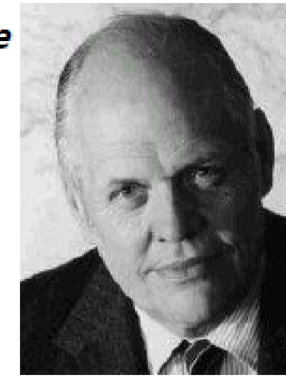


"Man will never reach the moon regardless of all future scientific advances."

- Dr. Lee DeForest, Inventor of Television

"There is no reason anyone would want a computer in their home."

- Ken Olson, president and founder of Digital, 1977



"Airplanes are interesting toys but of no military value."

- Marechal Ferdinand Foch, Professor of Strategy, Ecole Superieure de Guerre

"640K ought to be enough for anybody."

- Bill Gates, 1981

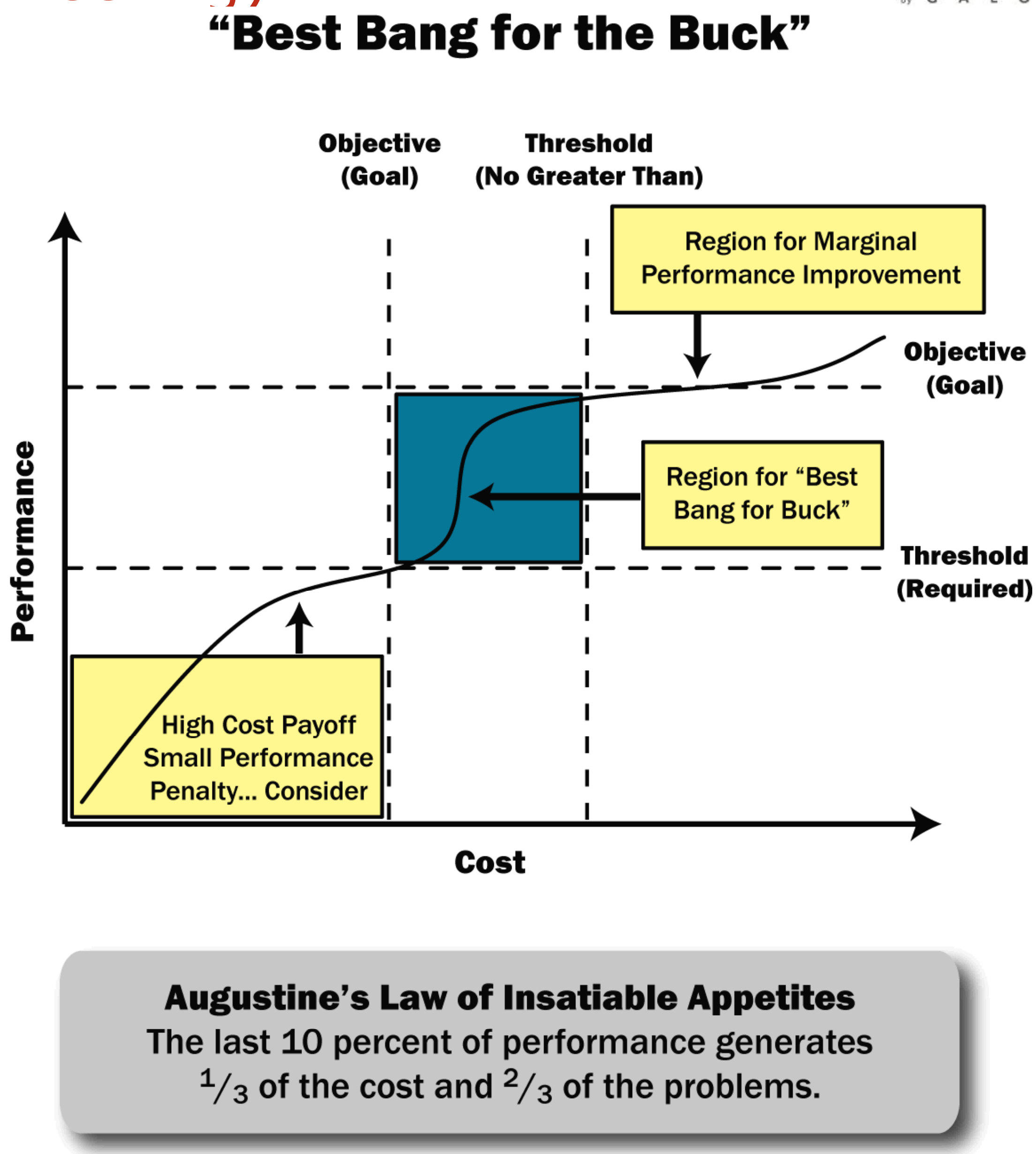
"Any general who's worth his salt knows that war is not a Nintendo game, war is not something that's fought by robots."

- Norman Schwarzkoph, 1991

"To throw bombs from an airplane will do as much damage as throwing bags of flour. It will be my pleasure to stand on the bridge of any ship while it is attacked by airplanes."

- Newton Baker, Sec. of War, 1921

Affordability Trades (Source NASA Space Systems Engineering)



Example: Cloud Economics Fall Apart When Application Needs Rewrite for Cloud

- Rewriting applications to make them work in the cloud
- Dave Linthicum, who also participated in Dana's latest analyst roundtable, points out that there's a lot more to enterprise IT than simply accessing and running applications.
- "Cloud computing typically is going to be a better, more strategic, more agile architecture, but it's also typically going to be more expensive, at least on the outcome,“ Can be lots of costly infrastructure changes Dave Linthicum

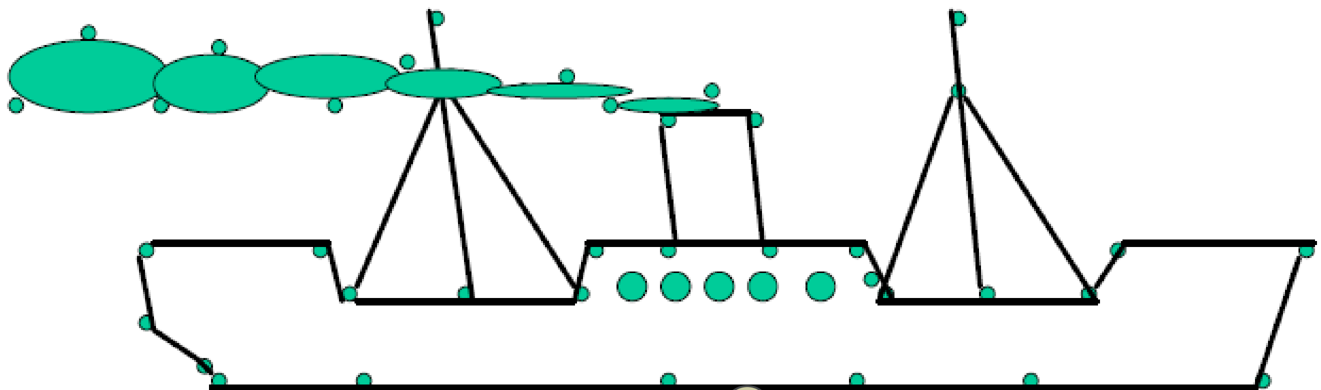
Step 8 Perform Risk Analysis

- A viable risk analysis may point out different decisions than simple analysis

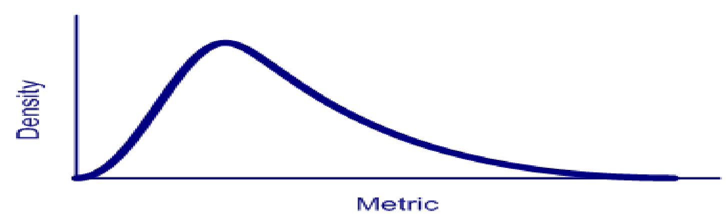
Step 8. Perform Probabilistic Risk Analysis

System Description (Parametrics Can Estimate More, Earlier) Adapted from CEBOK

"If you can't tell me what it is,
I can't tell you what it costs."
-Mike Jeffers

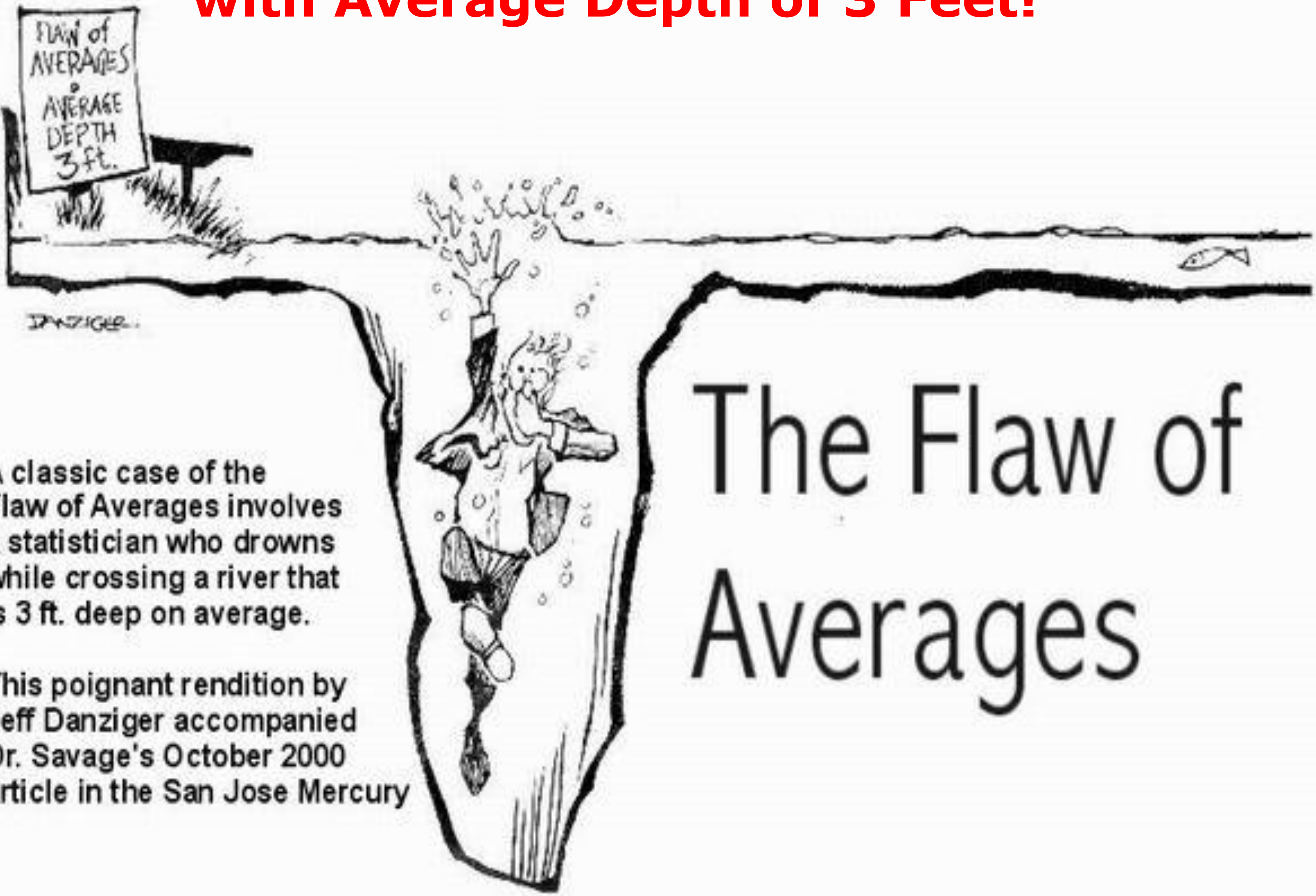


"If you can tell me the range of what it might be, I can tell you the range of cost, schedule & probability."
-Dan Galorath



Statistician Drowns in River with Average Depth of 3 Feet!

SEER

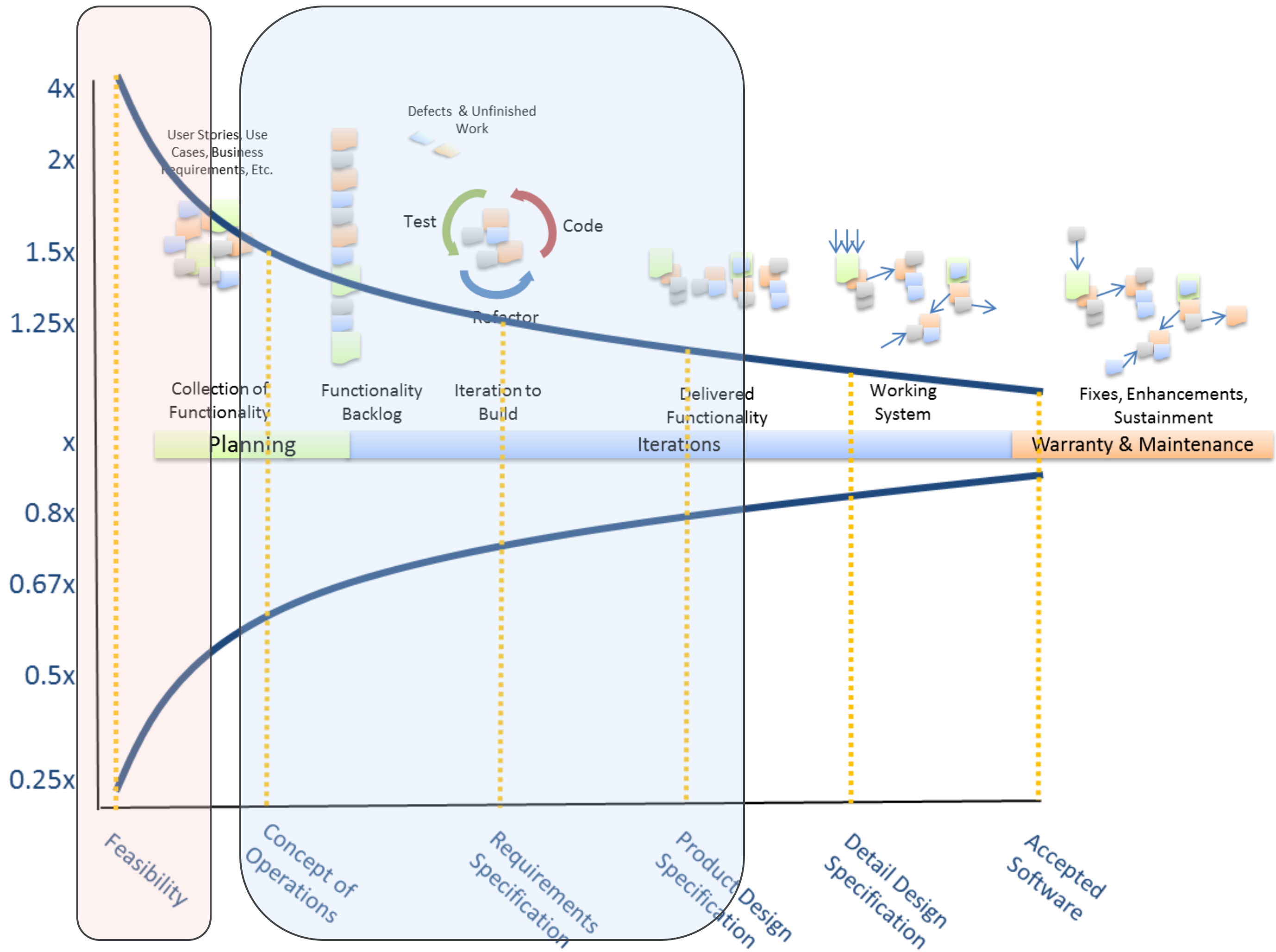


A classic case of the Flaw of Averages involves a statistician who drowns while crossing a river that is 3 ft. deep on average.

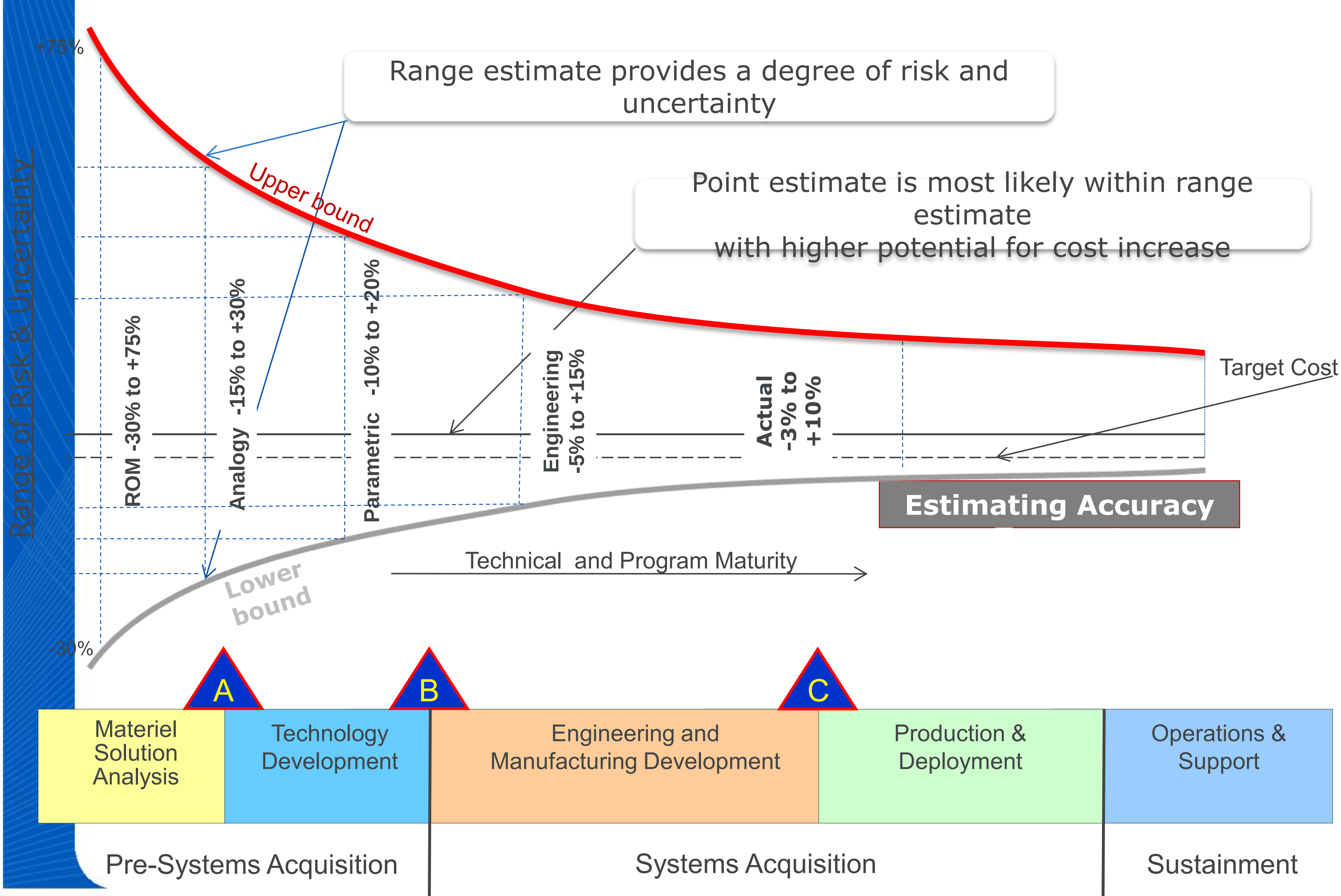
This poignant rendition by Jeff Danziger accompanied Dr. Savage's October 2000 article in the San Jose Mercury

Agile Uncertainty May Be The Same or Worse With Agile

- Precision comes over time! And what that it is unclear



Range vs. Point Estimates (Source US Army)



Managing Risk Improves Results

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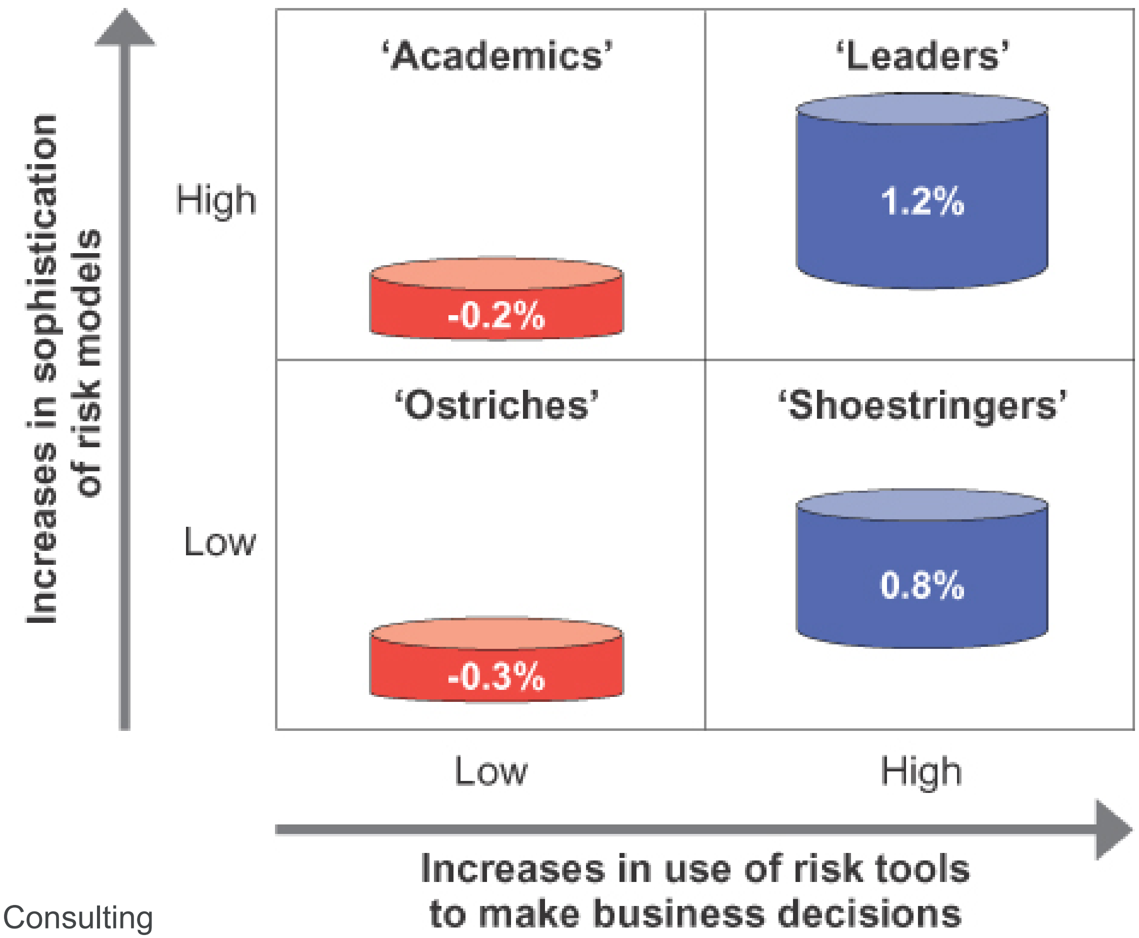
- Annualized total shareholder returns (1998-2003) for differing degrees of risk model sophistication and risk tool usage



Source: PA Consulting Survey of Global Banks

Step 9 Assess Alternatives & Select

Step 9. Assess Alternatives & Select Optimal Alternative

- Use the figures of merit to determine which is the best
  - Lowest risk
  - Highest value
  - Scored Weighted importance

Weighted Rating evaluation Example (Source: Acedemia.edu)

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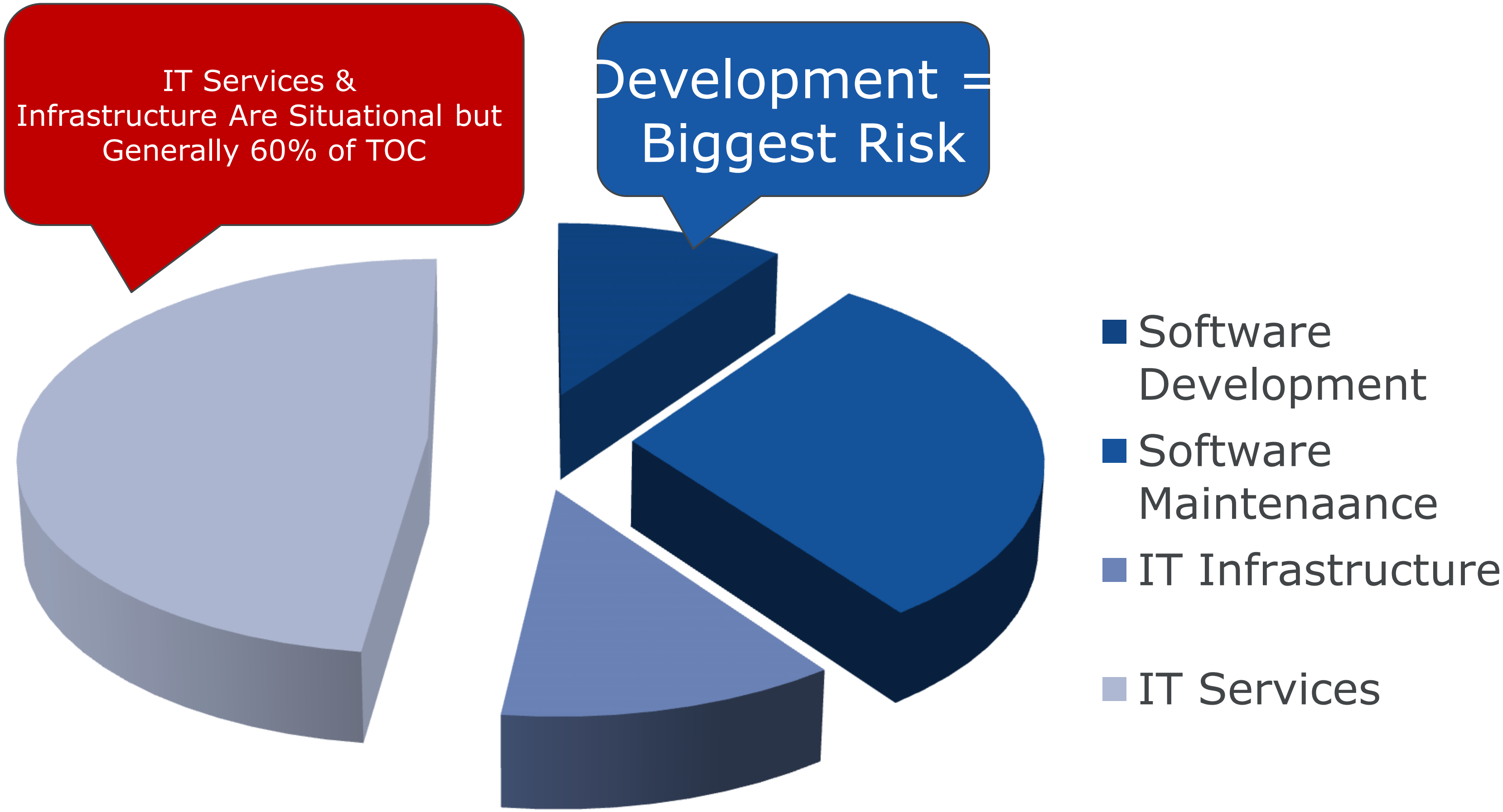
		Concept Alternatives					
		gears		v-belts		chain	
Criteria	Importance Weight (%)	Rating	Weighted Rating	Rating	Weighted Rating	Rating	Weighted Rating
high efficiency	30	4	1.20	2	0.60	3	0.90
high reliability	25	4	1.00	3	0.75	3	0.75
low maintenance	20	4	0.80	3	0.60	2	0.40
low cost	15	2	0.30	4	0.60	3	0.45
light weight	10	2	0.20	4	0.40	3	0.30
	100	NA	3.50	NA	2.95	NA	2.80

Rating	Value
Unsatisfactory	0
Just tolerable	1
Adequate	2
Good	3
Very Good	4

Example: Traditional On Premises Software Total Ownership Cost Allocation



For Cloud Some Costs reduced or eliminated.. Other new Costs occur

Cloud Example: Labor & Hardware Change From Iaas To PaaS To SaaS

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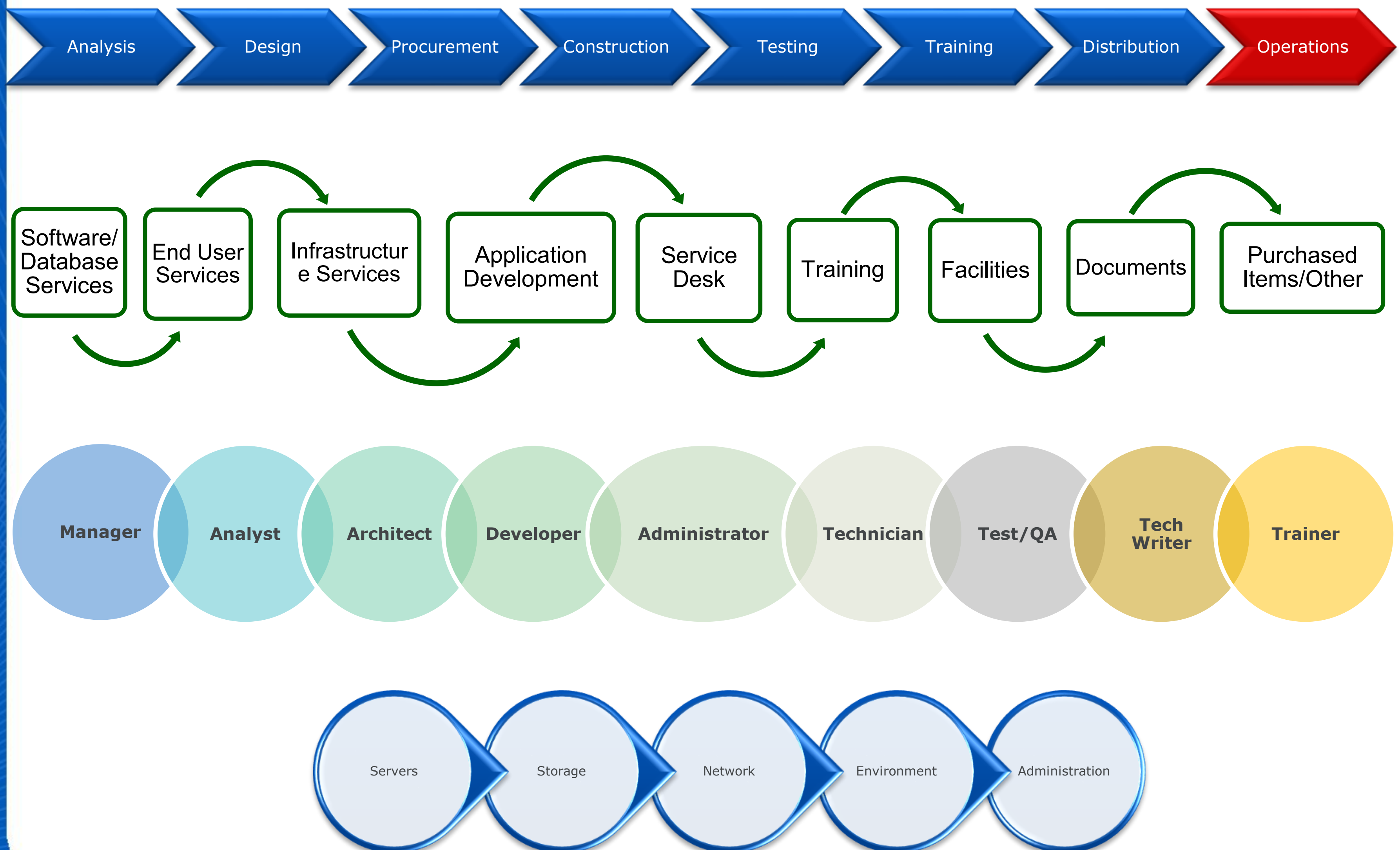

Cloud Example: Current Costs of IaaS Are Readily Available

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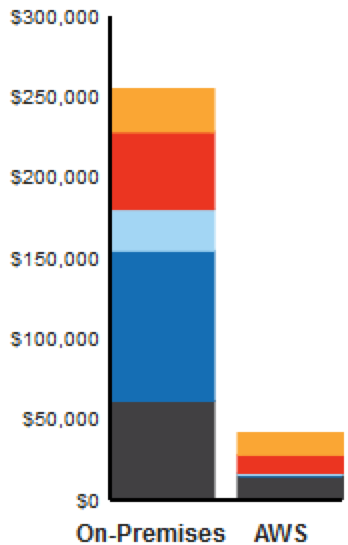
TCO Comparison Calculator for Web Applications*(Beta)

<< Adjust Calculator Settings

You could save **$213,244 per year** running on AWS.



	On-Premises	AWS	Difference
Servers	$26,579	$13,547	$13,031
Storage	$47,919	$11,192	$36,728
Network	$25,767	$972	$24,795
Environment	$93,150	$0	$93,150
Administration	$60,720	$15,180	$45,540
Total / year	**$254,135**	**$40,891**	**$213,244**

Region: US East (Northern Virginia)

Usage Pattern: Spikey Predictable

Powered By:

http://tco.2ndwatch.com/#compare

Step 10 Document Analysis and Lessons learned

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Step 10. Document Analysis and Lessons Learned

- Document estimate complete AND project complete
- Lessons learned ASAP while memories are still fresh
  - Provides evidence that your process was valid
  - Can substantiate or calibrate your estimation models
  - Provides opportunity to improve estimating process
- Missing or incomplete information & risks, issues, and problems the process addressed & any complications that arose
- Key decisions made during the estimate & results
- Dynamics that occurred during the process e.g.
  - Interactions of your estimation team
  - Interfaces with clients
  - Trade-offs made to address issues during the process

Key Points

Viable affordability decisions yield project achievements

Repeatable affordability process is a key method of analyzing affordability

We can make best value decisions, driving down cost & increasing value

estimate

estimate • analyze • plan • control

Backup Slides

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Cloud Costs Study Concusions

http://www.forbes.com/sites/kevinjackson/2011/09/17/the-economic-benefit-of-cloud-computing/

- **Startups Easier**: Cloud computing makes web startups easier
- **50=67% lifecycle cost savings:** 1,000 server deployment (BAH)
- **Greater ROI & Shorter payback:** Cloud delivered greater investment returns with a shorter payback compared to traditional on-premise (Deloitte)
- **GSA IaaS Should save about 7 to 1:** Transitioning IT services from agency-owned IT infrastructure to GSA IaaS platform (Assumed From BAH study)
- **PaaS can increase costs:** Application portability, particularly in a PaaS scenario, and associated costs can be significant. Microsoft
- **Cloud 30% More Cost:** One analysis of moving to cloud http://www.uptimesoftware.com/uptimeblog/cloud-virtualization/cost-of-cloud-computing-expensive/

Example Costing Alternatives On-premises Vs Cloud

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- Σ 1 Web Application Infrastructure
  - Σ 1.1 Multi-Tier Web Application
    - Σ 1.1.1 Web Tier
      - 1.1.1.1 Web Server
      - 1.1.1.2 Web Service
    - Σ 1.1.2 Application Tier
      - 1.1.2.1 Core Application
      - 1.1.2.2 Application
    - Σ 1.1.3 Data Tier
      - 1.1.3.1 Database and Storage
      - 1.1.3.2 Database Configuration
    - Σ 1.1.4 Procurement of Hardware and Software
      - 1.1.4.1 Production Servers Purchase
      - 1.1.4.2 Purchase QA and Dev Server
      - 1.1.4.3 SQL Server
      - 1.1.4.4 Windows Server OS
  - 1.2 Cloud Hosted Multi-Tier
    - Σ 1.2.1 Web Tier
      - 1.2.1.1 Web Service
    - Σ 1.2.2 Application Tier
      - 1.2.2.1 Application
    - Σ 1.2.3 Data Tier
      - 1.2.3.1 Database Configuration
    - 1.2.4 AWS EC2 Hosting (annual cost)
  - Σ 1.3 QA and Dev Environment
    - 1.3.1 Test Server
    - 1.3.2 Test applications and database
    - 1.3.3 Mobile Client Test Rollout
  - Σ 1.4 Training and Documentation
    - 1.4.1 User Documentation
    - 1.4.2 Training
  - 1.5 Support
    - 1.5.1 First line service desk support

Example Showing Lower Cost Cloud Implementation

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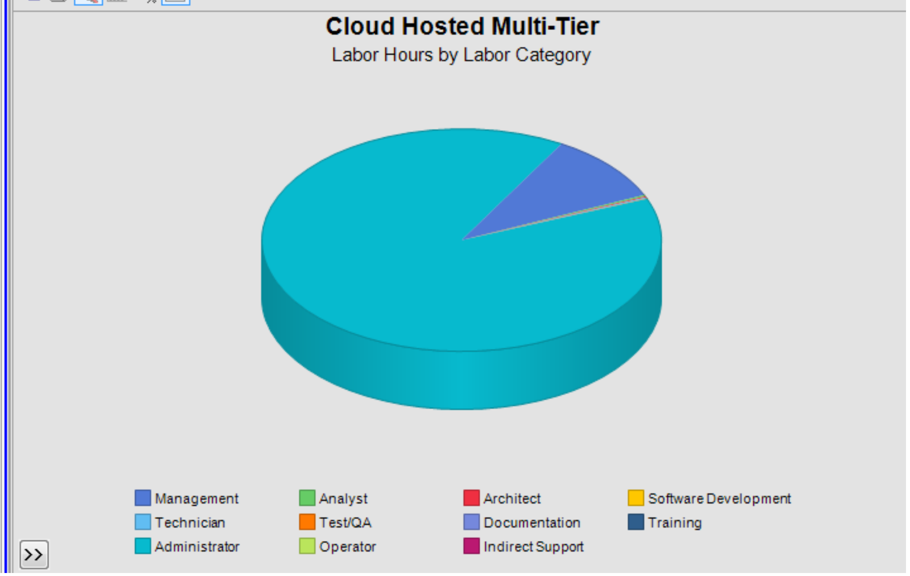
Quick Estimate | Phased Activity | Labor Category Cost By Activity | Cost By Fiscal Year

ITEM	ESTIMATE	REFERENCE	DIFFERENCE
TOTAL			
Total Cost	1,071,256	1,968,705	-45%
Total Labor Cost	950,964	1,807,331	-46%
Total Material Cost	120,291	161,374	-24%
Total Labor Hours	9,861	19,885	-49%
Total Schedule Months	66.32	64.10	3%
PROJECT			
Project Cost	10,346	350,611	-96%
Project Labor Cost	7,546	241,976	-96%
Project Material Cost	2,800	108,635	-96%
Project Labor Hours	80	2,597	-96%
Project Schedule Months	6.29	4.27	47%
Project Start Date	3/25/2013	6/1/2013	
Project End Date	9/30/2013	10/6/2013	
ONGOING SUPPORT			
Ongoing Support Cost	1,060,910	1,618,094	-33%
Ongoing Support Labor Cost	943,418	1,565,355	-39%
Ongoing Support Material Cost	117,491	52,739	123%
Ongoing Support Labor Hours	9,781	17,287	-42%
Ongoing Support Schedule Mon...	66.32	60.03	10%
Ongoing Support Start Date	3/25/2013	10/1/2013	
Ongoing Support End Date	10/1/2018	10/1/2018	

Activity Allocation | Labor Category Allocation | Risk | Gantt | Activity Staff by Month



Note: Cloud is not always cheaper
In this analysis of alternatives cloud was less expensive

We Know How To Estimate Cloud Costs and ROI

- Cloud isn't so different that alternate approaches to cost, ROI or business case are needed
- Important to identify costs that will increase as well as decrease.. E.g. bandwidth
- Risk must be factored in
  - E.g. data inaccessibility
- Potential issues in requirements for SaaS are the same as packages hosted in house
- Measurement, estimation and ROI processes are essential to make the most viable decisions

**Remember History Shows MANY software project never show a positive ROI….
The cloud doesn't solve uninformed decisions**

Some Potential Cloud Black Swan Costs

http://www.datacenterknowledge.com/archives/2012/12/05/the-cloudy-side-of-cloud-computing/

- **Security & Breaches:** Anticipate growing Malicious attacks and accidental data loss
- **Outages:** 2007- late 2012 **568 hours downtime** between 13 major cloud carriers. Cost the customer base about **$72 million** (International working group on cloud computing resiliency)
- **Learning curve: S**uccessful cloud model takes knowledge around multiple technological disciplines. Once in place, however, managing can also be issue
- **Vendor lock-in:** Migrating cloud environment to anther provider difficult… Not often considered
- **Data portability and porting costs**
- **Software modification Costs (PaaS)**
- **Software Setup (Saas)**

Uncertainty in the Cost Depends On Uncertainty of the Project Itself

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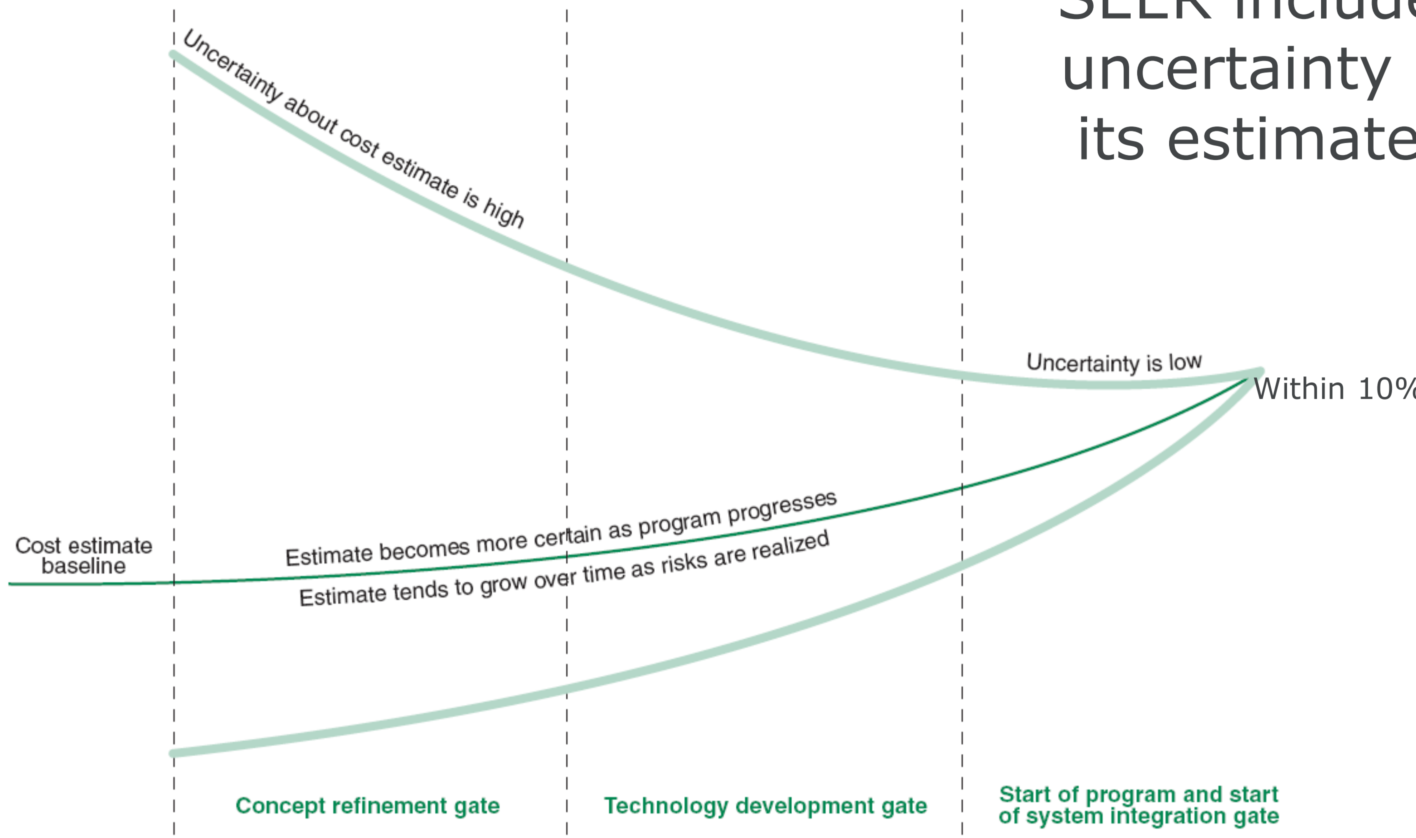
Figure 4: Cone of Uncertainty



Source: GAO.

SEER includes uncertainty in its estimates

Even though the entire project may be highly uncertain, tasks to the next gate should be estimable within 10%.