estimate

estimate • analyze • plan • control

Dan Galorath On Estimating For ISPA/SCEA 2009 From BLOGsphere to Conference

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SEER by GALORATH

Dan on Estimating BLOG

- www.galorath.com/wp

- Provides insights, thoughts, and rants on estimating, process, IT, software, and other topics
- One popular BLOG is the history and content of cost overruns throughout the world
- Many tips on estimating with SEER and generally

Dan on estimating BLOG www.galorath.com/wp Hot Topics

- 10 Step Estimating Process
- Project Failures Cost Billions
- How Galorath Quantified Sales Force Costs
- SaaS Costs
- IT Estimating

Eight Causes of Project Failure

Source: POST Report on UK Government IT Projects

1. Lack of a clear link between the project and the organisation's key strategic priorities, including agreed measures of success.
2. Lack of clear senior management and ministerial ownership and leadership
3. Lack of effective engagement with Stakeholders
4. Lack of skills and proven approach to project management and risk management.
5. Lack of understanding of and contact with the supply industry at senior levels within the organisation.
6. Evaluation of proposals driven by initial price rather than long-term value for money (especially securing the delivery of business benefits).
7. Too little attention to breaking development and implementation into manageable steps.
8. Inadequate resources and skill to deliver the total delivery portfolio.

Source: POST Report on UK Government IT Projects

Project Failures: Standish Project Failure Studies

	1994	1996	1998	2000	2002	2004
Succeeded	16%	27%	26%	28%	34%	29%
Failed	31%	40%	28%	23%	15%	18%
Challenged	53%	33%	46%	49%	51%	53%

More Project Failure Information

- **Most projects cost more than they return, Mercer Consulting:** "When the true costs are added up, as many as 80% of technology projects actually cost more than they return. It is not done intentionally but the costs are always underestimated and the benefits are always overestimated." Dosani, 2001
- **Oxford University Regarding IT Project Success** (Saur & Cuthbertson, 2003)
  - Successful: 16%
  - Challenged: 74%
  - Abandoned: 10%
- **British Computer Society:** The UK public sector spent an estimated £12.4 bn. on software overall spend on IT about 22.6 Billion British Pounds (Jaques, 2004)
- Successful: 16%
- Failure Costs Tens of Billions of British Pounds in the European Union

10 Step Software Estimation Process:

Consistent Processes = Reliable Estimates

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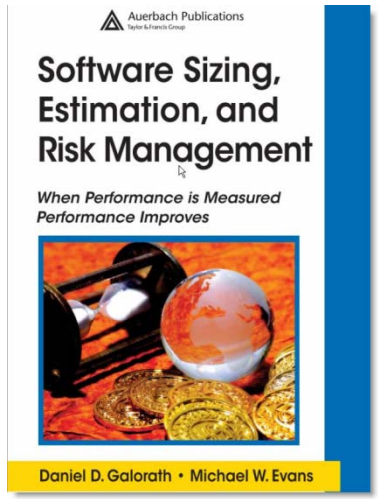
1. Establish Estimate Scope
2. Establish Technical Baseline, Ground Rules, Assumptions
3. Collect Data
4. Estimate and Validate Software Size
5. Prepare Baseline Estimates
6. Review, Verify and Validate Estimate
7. Quantify Risks and Risk Analysis
8. Generate a Project Plan
9. Document Estimate and Lessons Learned
10. Track Project Throughout Development



Software as a Service

- **Don't Assume SaaS Is Cheaper**: February 19, 2009
- SaaS is cheaper for the first two years
- Five year total cost of ownership is cheaper for on-site software due to accounting rules allowing depreciation of capital assets for on-site software
- SaaS is not necessarily quicker to implement
- There is another factor consideration that Gartner may not have considered….
  - The monthly or annual cost of software delivered as a service may have a much lower fee due to paying by the month versus paying for the entire system up front.

Standard WBS For Space System Cost Estimating

- The NRO cost group provided a Work Breakdown Structure (WBS) for costing their projects. As quoted from the introduction:
- ”The standard WBS was developed to capture the costs of any NRO program, whether it is an operational space program, technology demonstration program, ground station upgrade, or a system of systems. It is structured to accommodate varying levels of detail in available data

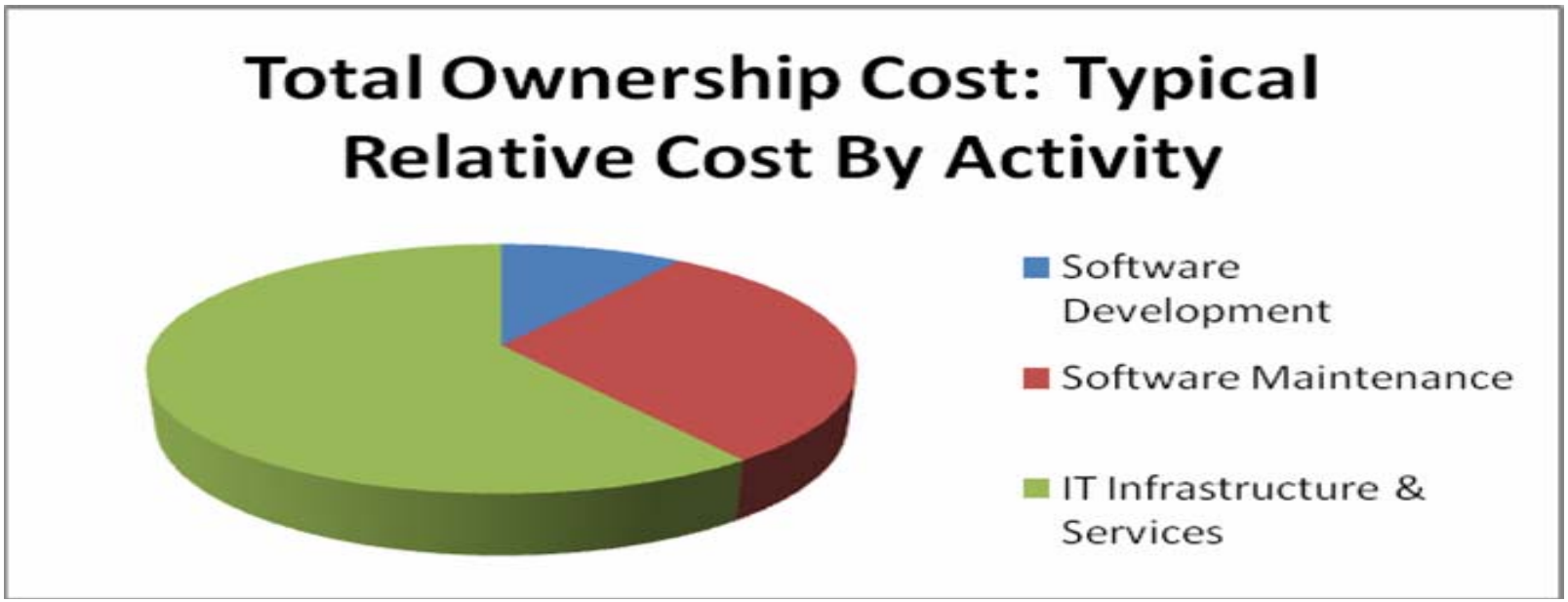
Software as a Service vs. Service Oriented Architecture vs. Cloud Computing

- **Software as a Service:** Software provides an application on-demand. There is no implied language, development methodology, or tool specifically attributed to SaaS. Some development methods may be more appropriate (such as Java and C#) since SaaS applications often provide the user interface a browser .
- **Service Oriented Architecture:** (SOA) provides methods for systems development and integration where systems group functionality around business processes and package these as interoperable services. A SOA infrastructure allows different applications to exchange data with one another as they participate in business processes. Some organizations offer software as a service running on the organization's private infrastructure as well.
- **Cloud Computing**: Cloud computing is Internet (cloud) based use of computer technology where dynamically scalable resources are provided as a service over the Internet. Users need not have knowledge of, expertise in, or control over the technology infrastructure (the Infrastructure as a Service cloud) that supports them…virtualized. Some call this **"IT Infrastructure as a Service.** " Some venders refer to the "**private cloud,**" which is essentially virtualized local servers.
- SaaS applications may use the cloud but they are not the cloud.
- SOA architectures may or may not be delivered via SaaS but they are not generically SaaS.
- Cloud applications may or may not be delivered as SaaS

COSMIC Function Points In SEER

- SEER for Software supports the COSMIC function point counting rules as well as traditional IFPUG and others and has done so for some time. While this BLOG does not cover religious issues it is good to see how every sizing method is supported. When reviewing an estimating process I see that we added a second COSMIC sizing method for COSMIC Function Point "Data Movements" And using the data movements provided estimates just about spot on to actuals. It is so important to be able to deal with any sizing method that users might come up with. That is just one more reasons why SEER for Software lead in project estimation, planning and control. Continuous product improvement by a development and analyst staff who understand the domain. Thanks to Galorath's Ton Dekkers for his involvement in COSMIC and in making the alternate approach work so well with SEER.
- Supporting the numerous methods of software sizing is critical to providing a full service solution.

IT Systems Total Ownership Costs
60+% Can Be Infrastructure & Services



- Software Development
- Software Maintenance
- IT Infrastructure
- IT Services

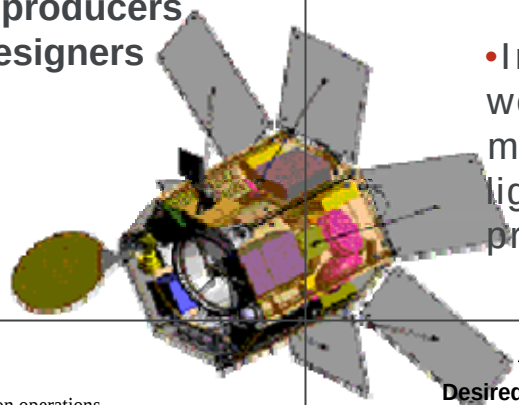
"Far Out" Higher TRL Level Estimation

Goal: Better Cost For highly Advanced Space Missions (15-20 Years in the Future)

Proposed Hyperspectral Imaging Satellite predicted fielding: 2016

This capability would be of interest to:

- **Military space asset planners**
- **Government agencies**
- **Commercial satellite producers**
- **Advanced concept designers**



Critical items at less than TRL 4…

- Like asking Edison in 1876 "How much longer for the light bulb?"
  - "Hard to say"
- In 1879, once he had found a workable carbon filament, "How much will a production version of the light bulb cost to develop and produce Tom?"
  - Then a TRL 4 question

TRL 9 TRL 8 TRL 7 TRL 6 TRL 5 TRL 4 TRL 3 TRL 2 TRL 1

TRL9: Actual system "flight proven" thorough successful mission operations

TRL8: Actual system completed and "flight qualified" through test and demonstration

TRL7: System prototype demonstration in a space environment

TRL6: System/subsystem model or prototype demonstration in a relevant environment

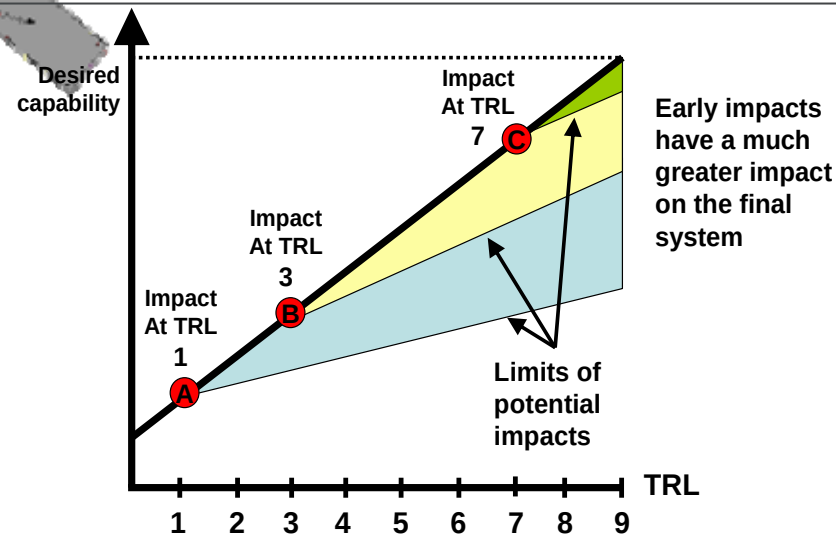
TRL5: Component and/or breadboard validation in relevant environment

TRL4: Component and/or breadboard validation in laboratory environment

TRL3: Analytical and experimental critical function and/or characteristic proof-of-concept

TRL2: Technology concept and/or application formulated

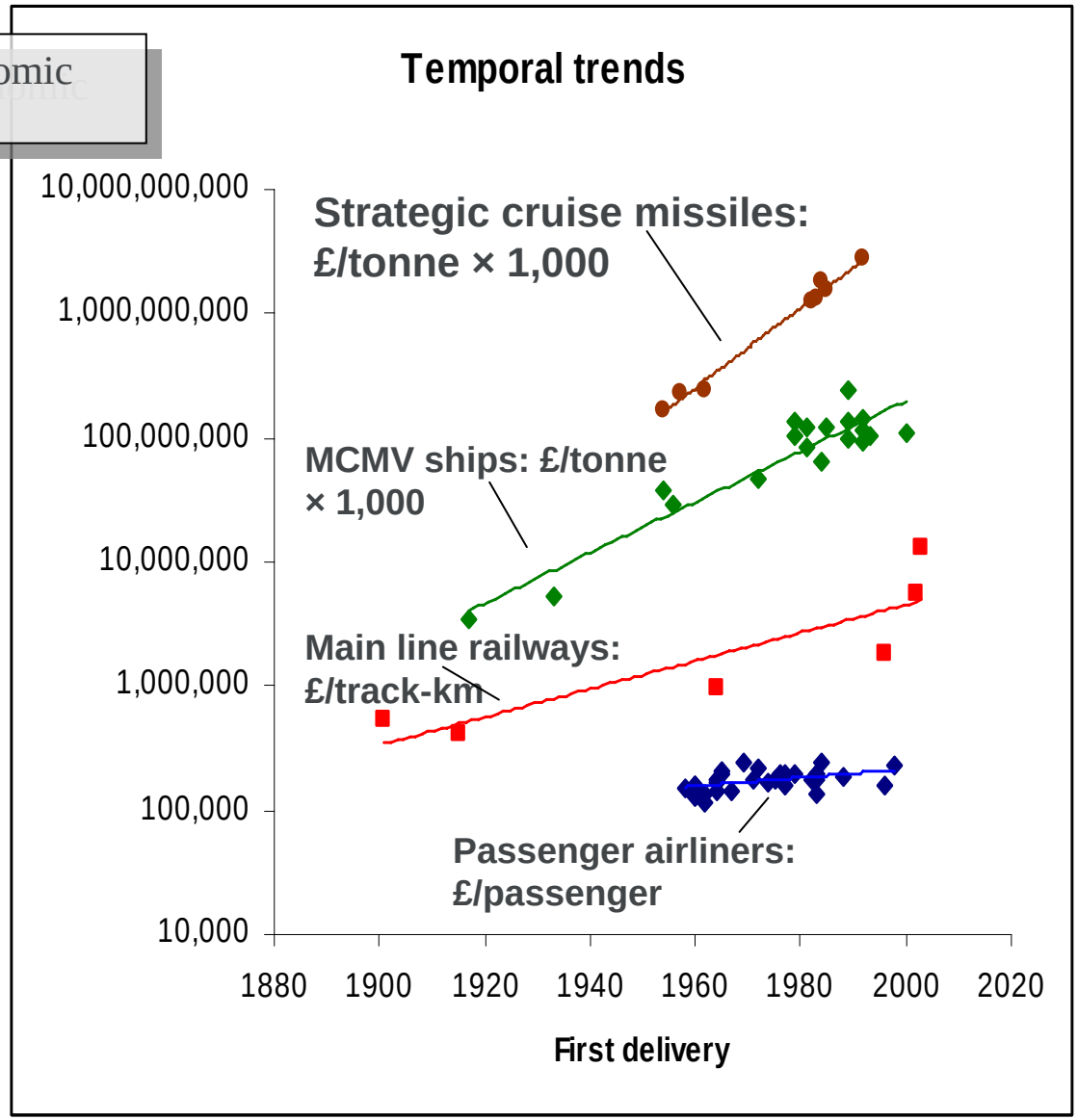
TRL1: Basic principles observed and reported



Early impacts have a much greater impact on the final system

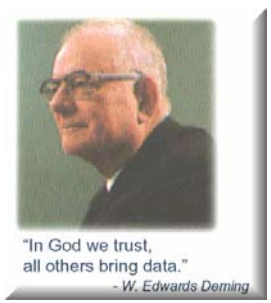
Trends in Cost (Source P. Pugh)

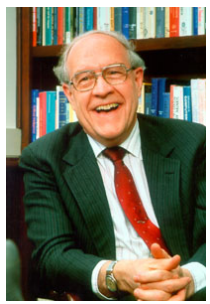
All costs are at 2004 economic conditions



Some Measurement Heroes

- **Frederick Taylor**: The Principals of Scientific Management 1901 “Let data and facts do the talking”
- **W. Edwards Demming**: “In God We Trust… All Others Bring Data”
- **Frederick Brooks**: “There is an incremental person when added to a software project that makes it take longer”
- **Ed Yourdon**: “Avoiding Death Marches in Software Projects”
- **Steven Covey**: “Sharpen the Saw” Focus on improvement
- **Eli Goldratt**: Improvements should increase profit: Effectiveness





SEER Advanced Risk Analysis With Crystal Ball Integration

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Results

Import New SEER-H Inputs

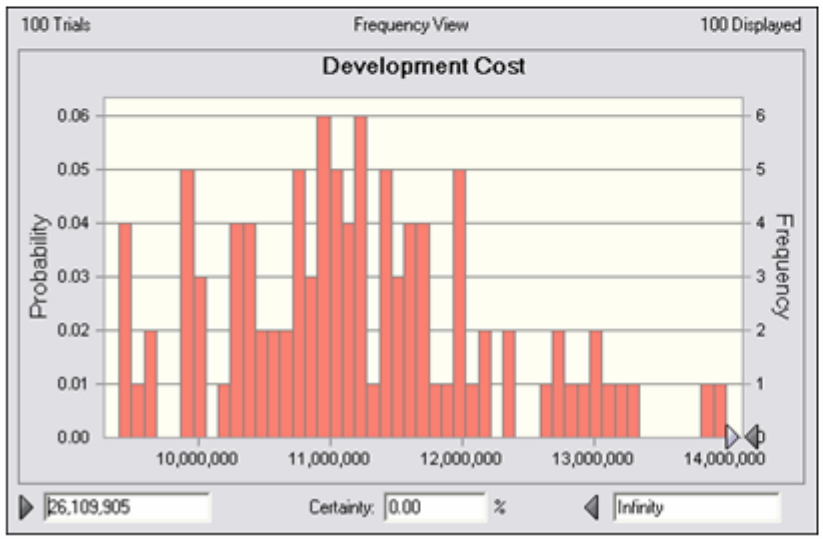
Define New Assumptions and Rerun Risk Analysis on currently imported SEER-H data:

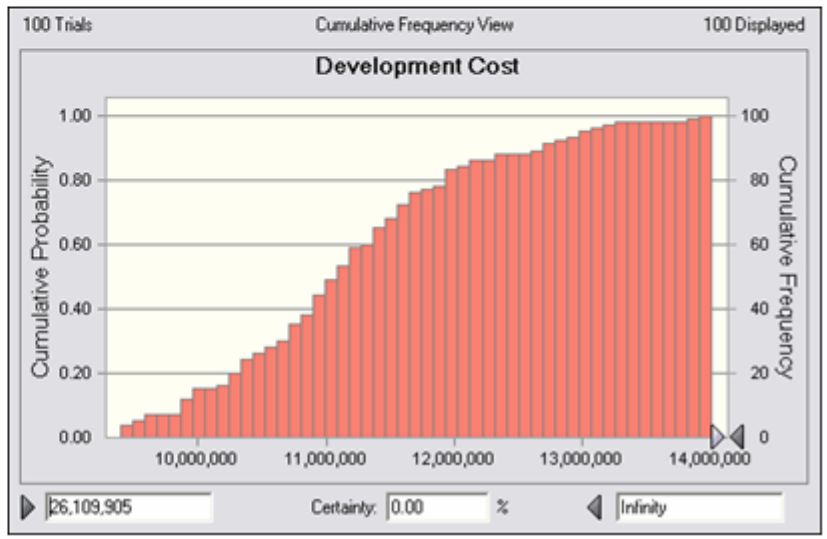
Redefine Assumptions

SEER-H Output Values	
Development Cost	11,350,971
Production Cost	53,472,374
Total Equipment Support Cost	944,395
Total System Level Cost	-
APUC	891,206
Total Cost	65,767,740

Initial SEER-H Output Values	
Development Cost	26,109,905
Production Cost	74,121,394
Total Equipment Support Cost	2,973,757
Total System Level Cost	
APUC	1,235,357
Total Cost	103,205,056

Expected Values	
Development Cost	11,200,796
Production Cost	53,680,265
Total Equipment Support Cost	1,032,284
Total System Level Cost	-
APUC	894,671
Total Cost	65,913,344





Cost and Schedule Growth Summary Source:Bitten, SSCAG

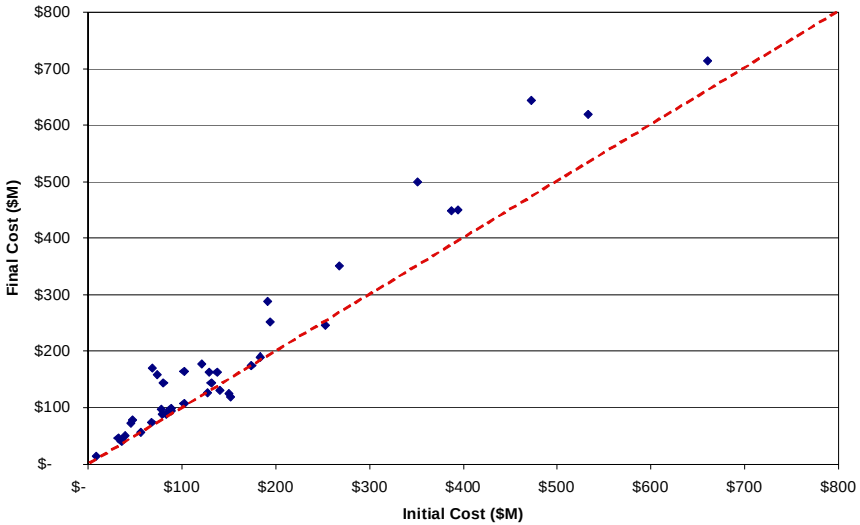


Figure 6: Summary of Initial versus Final Development Cost

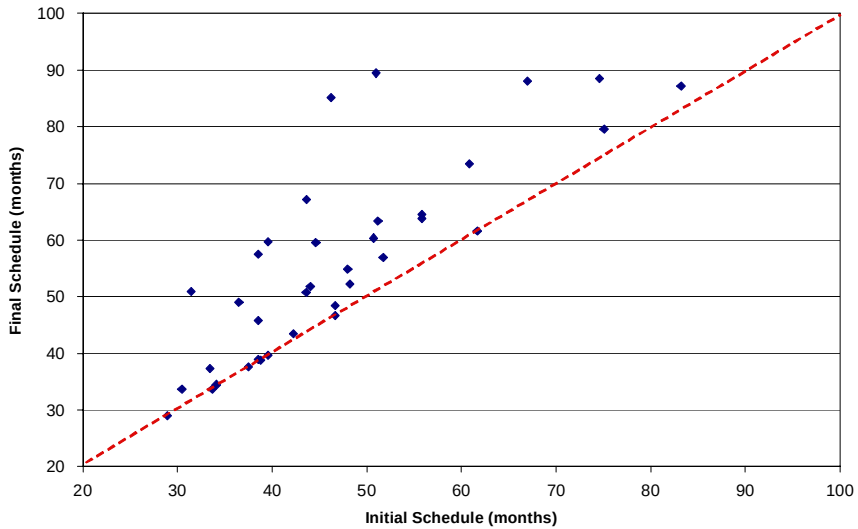
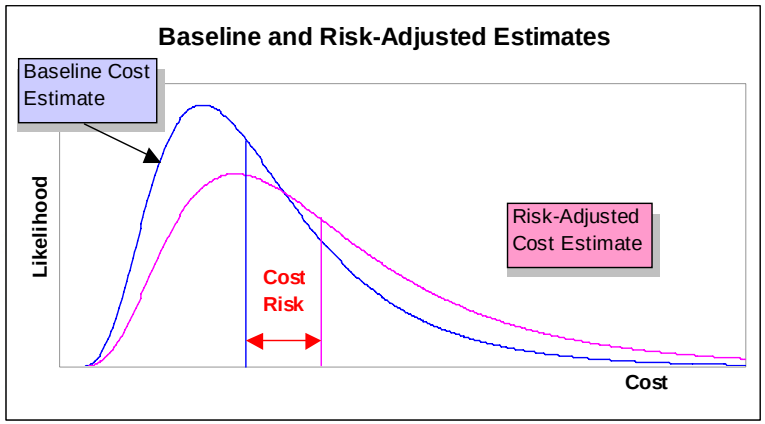


Figure 7: Summary of Initial versus Final Development Schedule

- For the mission data set, the average cost growth is 26.9%, with the median cost growth being 16.1%. The maximum cost growth for the data set was 150%, and the minimum cost growth for the data set was –21.4%.

- For the mission data set, the average schedule growth is 21.5%, and the median schedule growth is 16.1%. The maximum schedule growth for the data set was 84.2%, and the minimum schedule growth was 0%.

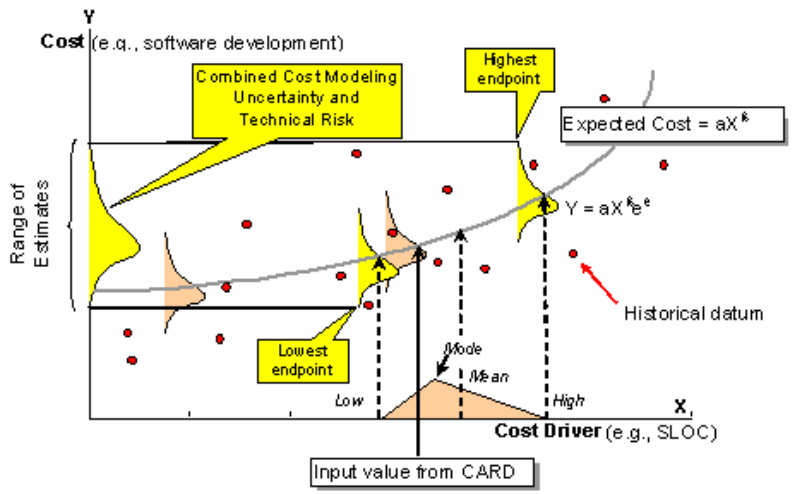
Observations – Cost Risk Analysis (Source A Griffiths, HVR, SCAF)

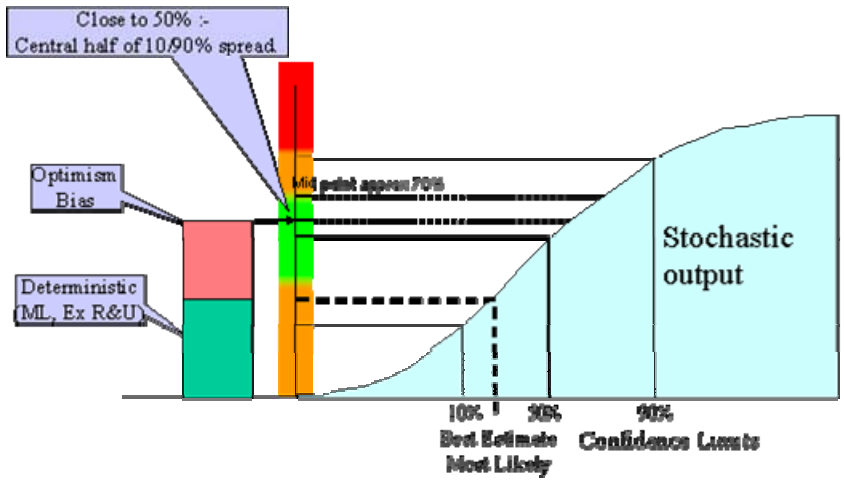


Only a few nations use tools to quantify uncertainty and risk.

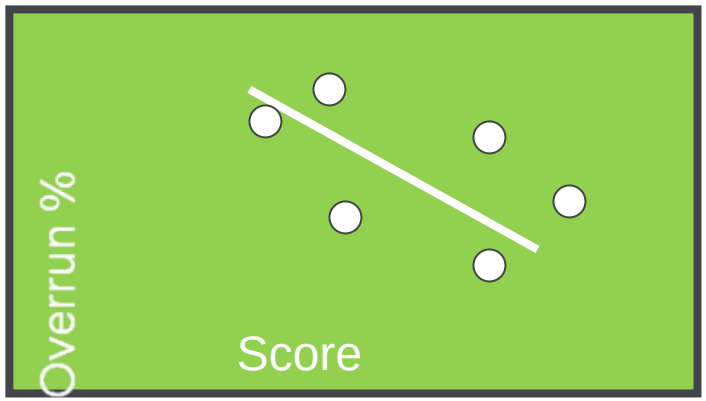
Nearly all the ones that do use commercial models and Monte Carlo simulation.

The figure below shows an application of Optimism Bias adopted by the UK MoD

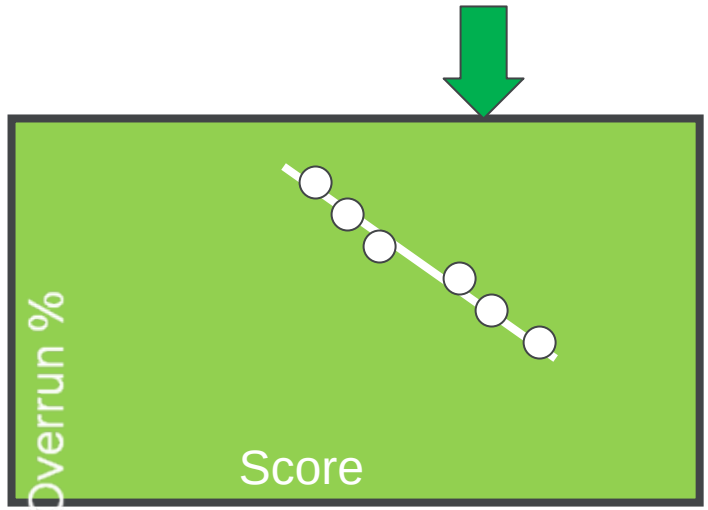




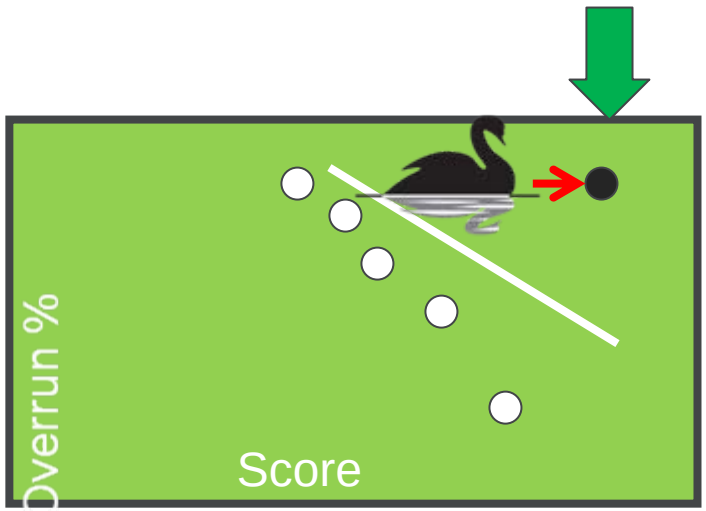
More About Black Swans



This is a manageable historical database. Dynamic Calibration can adjust the relevance weights to get a result something like this.



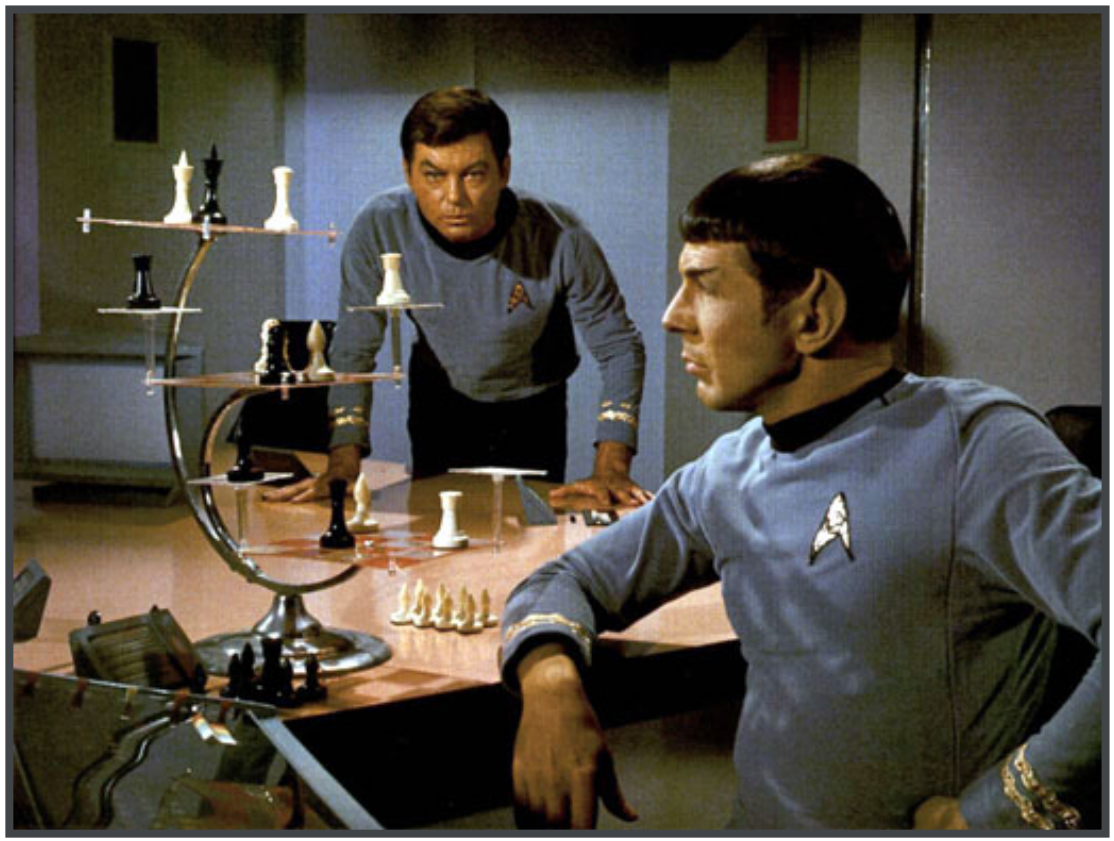
The plot below contains a Black Swan. This outlier will make it impossible to get a good calibration.



XIPRR gives notice of the probable presence of a Black Swan. It can then be removed by the user.

XIPRR The Challenge

- Most “risk” analysis in project management today is actually attempted uncertainty analysis
- The proper goal of our risk analysis should be to make project outcomes more certain, or at least insurable



Insurable risks require data about historical outcomes. We propose to meet the challenge **parametrically**.

XIPPR Measurable Risks of Interest

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- Money (project cost) – best proxy for risks of excessive physical resource requirements
- Time (project duration) – best proxy for risks related to scheduling
- Not directly measurable: "technical" risk, except by its effect on money and time

Difficult but doable – given enough time and money, this puzzle has zero technical risk. Issue: How much time & money is enough?

The BLOG and Webinars: A Few Recent Examples

- How Northrop Estimated Within 2% over 15 years With SEER
- 10 Truths you must know about IT Estimation
- Estimating and Controlling Agile Systems Development

- Available Live or On-Demand

Phillips Saves 1.5Million Euros

Philips Healthcare's First Year of SEER Use Saves 1.5 Million Euros

PHILIPS
sense and simplicity

Philips Healthcare, headquartered in Eindhoven, The Netherlands, is the world's leading supplier of cardiovascular X-ray systems and second in general X-ray systems. The company's long history in medical imaging dates to 1895 when it purchased the company that manufactured the first commercial X-ray tube. Today, with 32,500 employees in more than 63 countries and nearly $9 billion in sales, Philips Healthcare accounts for nearly a quarter of its parent company's total revenues.

Philips Healthcare manufactures X-ray machines and peripheral equipment and supplies at its facility in Eindhoven. These include analogue and digital units as well as cutting edge cardiovascular X-ray systems for advanced interventional procedures. In mid-2007, G. Pruijsen MSC, manager of value engineering, wanted to gain tighter control of costs by better understanding supplier pricing and design options. With an experienced cost engineer already on staff, he sought a software application that could help them plan, manage and control all areas of parts design and manufacturing.

Having previously worked in purchasing, Pruijsen had developed a cost management methodology that involved benchmarking, acquiring data from supply markets and looking deeply into processes to determine how much material and labour would be involved. This method used conventional spreadsheets to perform complex calculations and "just finding the right data was labour-intensive and time consuming."

"Cost estimation is a very important topic for me," said Pruijsen. "Cost engineers may differ on their estimates so we needed a tool that could calibrate those differences. A colleague at Boeing recommended Galorath Incorporated. They explained how they successfully used Galorath cost estimation applications and offered their positive opinion. Galorath was invited to give us a demonstration of SEER for Manufacturing (SEER-MFG), a project estimation and management solution. The most convincing part of the demonstration was, after we showed Galorath a

"They eventually settled on a final price of 350-euros – about one-third of the original quotation."

Lockheed Saves 6 Person Months Per Proposal

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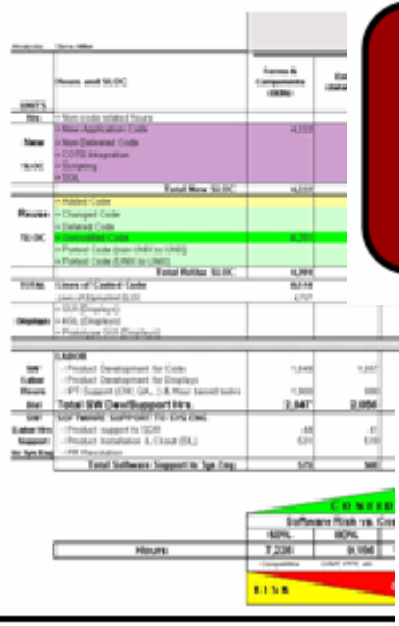
Save Six Man-Months per Proposal with Estimation Process

Lockheed Martin Mission Systems

LOCKHEED MARTIN

Two primary launch ranges support U.S. Government (DoD and NASA/JPL [Jet Propulsion Laboratory]) and other government-sponsored launches and missions in the continental United States. Vandenberg Air Force Base (30th Space Wing), located in southern California, north of Santa Barbara, is responsible for all Department of Defense space and missile launch activities on the West Coast. The Eastern Launch Range at Cape Canaveral, Florida (45th Space Wing), supports similar missions, and is also responsible for launching the world-renown Space Shuttle. Both ranges launch a myriad of expendable vehicles including the Athena, Atlas, Delta, Pegasus, and the Titan, as well as support Air Force development and evaluation of all intercontinental ballistic missiles.



"This new approach has dramatically improved the efficiency of the cost estimation process."

"...we nearly always come to an agreement in the initial meeting, saving something on the order of six man-months..."

Northrop Estimates Within 2% of Actuals

SEER by GALORATH

Improve Commercial-off-the-Shelf (COTS) Integration Estimates

Northrop Grumman, Mission Systems
Kathy Bradford, Systems Engineer and Lori Vaughan, Cost Engineer

Achieve remarkable results with new modeling methods Northrop Grumman Mission Systems is a leading global integrator of complex, mission-enabling systems and services for federal agencies engaged in defense and intelligence activities, as well as federal civilian organizations, state and local governments and commercial clients.

A Northrop Grumman Mission Systems project involved building the software system for a ground station. The purpose was to improve launch and control services of military satellites by increasing automation and simplifying launch operation. The system supported the Air Force's day-to-day mission of providing command and telemetry data via the Air Force Control Network.

Northrop Grumman Mission System's original proposal was based largely on internal research and development efforts undertaken at the company's own expense. The cost of the project was estimated using Galorath Incorporated's SEER-SEM™ (Software Estimation Model), a parametric tool that is a standard for software cost prediction and modeling at Northrop Grumman Mission Systems. SEER-SEM came with a database of thousands of completed projects from client-server, embedded, distributed, and stand-alone systems, as well as varied MIS applications, graphics, and signal processing environments.

The project was completed on schedule, met the customer's expectations, and declared a success. Upon completion, the work analysis was put through SEER-SEM and the results fell within seven percent of the actuals.

The overall effort and schedule predicted were within two percent of the program actuals.

The job stood out because of its high COTS content. The COTS integration costs were not separately identified or estimated on the project so analysts wanted to see if they could get closer by dissecting the COTS elements. They decided to revisit the estimate to determine whether it could have been improved by a new method of estimating COTS integration costs

Booz Allen Hamilton Solves Systems Problems

Moving Satellite Communications Program to Next Level

Booz Allen Hamilton

Booz | Allen | Hamilton

Parametric cost estimating tools, used in an integrated team, are playing a major role in pushing the Navy's Advanced Extremely High Frequency (AEHF) satellite communications terminal program through the DoD acquisition process. Due to the lack of early technical and programmatic data and nt-cycle cost estimates are difficult to determine and validate.

on to develop a business case analysis (BCA) of several Terminal Program. To mitigate uncertainty, Booz Allen ating tool that compels technical staff to think specifically s technical definition. Upon completing the BCA, the Naval known as the Naval Center for Cost Analysis (NCCA), oves Booz Allen's initial cost estimates with minor changes.

ork for arly in the program formulation stage," says David Bracamonte, a Booz Allen senior associate. "Another major advantage is we are able to update the analytical framework created during the initial estimate as the program advances. This framework provides a consistent reference to understand how the cost estimates change with the program's evolution."

"The SEER tools are equally strong at estimating both software and hardware costs. They do a thorough job of enabling the analyst to deconstruct the system into smaller elements."

"A major advantage of parametric cost estimating is that it provides a framework for all parties involved to consider costs early in the program formulation stage."

Lessons learned

- We don't just estimate to get a most probable cost
- We estimate to make projects more successful
- More projects fail due to lack of planning (and estimation) than any other reasons

- What SCEA/ISPA does is important…. It can make a difference in the economy and in the world.