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

ICEAA 2013

Galorath Incorporated

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

Step 1. Procure Key Performance Parameters that are inviolate
Step 2. Identify Affordability Goals & Weighted Figures of Merit
Step 3. Gather Requirements, Features, Performance
Step 4. Define Technical Baseline Alternatives & Assumptions
Step 5. Perform Technical Design Analysis for Each Alternative
Step 6. Perform Cost Schedule Analysis of Each Alternative
Step 7. Assess Benefits Based on Figures of Merit
Step 8. Perform Probabilistic Risk Analysis
Step 9. Assess Alternatives & Select Optimal Alternative
Step 10. Document Analysis and Lessons Learned

Pricing strategies assumed in step 7. Since price is a figure of merit
Step 1 Key Performance Parameters (KPPs)

• **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

- L1-Earth Co-Planar Inbound Delta V Requirement (m/s)
- Moon: Inclination near maximum, Distance near perigee
- L1 Departure Time in June 2006

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 vendor 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
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

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## Data-Gathering Techniques

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

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

• 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

1. Identify assumptions
2. Rank order assumptions based on estimate impact
3. Identify high ranking assumptions that are risky
4. Clarify high ranking, high risk assumptions & quantify what happens if those assumptions change
5. Adjust range of SEER inputs to describe the uncertainty in assumption
Step 5 Perform Technical Design Analysis For Each Alternative

- 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

• Estimating is critical for all kinds of systems
  • Yet many treat it 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

1. Establish Estimate Scope

2. Establish Technical Baseline, Ground Rules, Assumptions

4. Collect data / estimation inputs

4. Refine Technical Baseline Into Estimable Components

5. Estimate Baseline Cost, Schedule, Affordability Value

6. Validate Business Case Costs & Benefits (go / no go)

6. Quantify Risks and Risk Analysis

8. Generate a Project Plan


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

<table>
<thead>
<tr>
<th>Model Category</th>
<th>Description</th>
<th>Advantages</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guessing</td>
<td>Off the cuff estimates</td>
<td>Quick</td>
<td>No Basis or substantiation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Can obtain any answer desired</td>
<td>No Process</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Usually Wrong</td>
</tr>
<tr>
<td>Analogy</td>
<td>Compare project with past similar projects.</td>
<td>Estimates are based on actual experience.</td>
<td>Truly similar projects must exist</td>
</tr>
<tr>
<td>Expert Judgment</td>
<td>Consult with one or more experts.</td>
<td>Little or no historical data is needed; good for new or unique projects.</td>
<td>Experts tend to be biased; knowledge level is sometimes questionable; may not be consistent.</td>
</tr>
<tr>
<td>Top Down Estimation</td>
<td>A hierarchical decomposition of the system into progressively smaller</td>
<td>Provides an estimate linked to requirements and allows common libraries to</td>
<td>Need valid requirements. Difficult to track architecture; engineering bias may lead to underestimation.</td>
</tr>
<tr>
<td></td>
<td>components is used to estimate the size of a software component.</td>
<td>size lower level components.</td>
<td></td>
</tr>
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</table>
## Estimation Methods - 2 of 2

<table>
<thead>
<tr>
<th>Model Category</th>
<th>Description</th>
<th>Advantages</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottoms Up Estimation</td>
<td>Divide the problem into the lowest items. Estimate each item... sum the parts.</td>
<td>Complete WBS can be verified.</td>
<td>The whole is generally bigger than the sum of the parts. Costs occur in items that are not considered in the WBS.</td>
</tr>
<tr>
<td>Design To Cost</td>
<td>Uses expert judgment to determine how much functionality can be provided for given budget.</td>
<td>Easy to get under stakeholder number.</td>
<td>Little or no engineering basis.</td>
</tr>
<tr>
<td>Simple CER’s</td>
<td>Equation with one or more unknowns that provides cost / schedule estimate.</td>
<td>Some basis in data.</td>
<td>Simple relationships may not tell the whole story. Historical data may not tell the whole story.</td>
</tr>
<tr>
<td>Comprehensive Parametric Models</td>
<td>Perform overall estimate using design parameters and mathematical algorithms.</td>
<td>Models are usually fast and easy to use, and useful early in a program; they are also objective and repeatable.</td>
<td>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.</td>
</tr>
</tbody>
</table>
Affordability Alternatives Generally Provide ROM Estimates (Source APMP: Just Say No)

EARLY ESTIMATING
3-5 people, 3 - 5 days
Top Down, parametric model based price estimating Vs. Current state: 90 people, 6wks

Modified Budgetary Estimate Draft RFP/Gate 3 6-8 people, 3 weeks (Bid Stds + History)

Formal Bid Gate 4 15-20 people 4 weeks (Bid Stds + History)

Market Assessment/ "What If’s"
Opportunity Creation/ Customer Decision Plans Acquisition Planning/ POM and Plus Ups Procurement Initiation

Draft RFP RFP

Presented at the 2013 ICEAA Professional Development & Training Workshop - www.iceaonline.com
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

- June 28, 2010 Mandate
- September 14, 2010 Guidance
- November 3, 2010 Implementation

- 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”

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)

- 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

• 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)

“Best Bang for the Buck”

Augustine’s Law of Insatiable Appetites
The last 10 percent of performance generates $\frac{1}{3}$ of the cost and $\frac{2}{3}$ of the problems.
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
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!

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)

Range estimate provides a degree of risk and uncertainty

Point estimate is most likely within range estimate with higher potential for cost increase

ROM -30% to +75%
Analogy -15% to +30%
Parametric -10% to +20%
Engineering -5% to +15%
Actual -3% to +10%
Target Cost

Technical and Program Maturity

Estimating Accuracy

Materiel Solution Analysis  Technology Development  Engineering and Manufacturing Development  Production & Deployment  Operations & Support

Pre-Systems Acquisition  Systems Acquisition  Sustainment
Managing Risk Improves Results

- 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

- 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)

#### Concept Alternatives

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Importance Weight (%)</th>
<th>Rating</th>
<th>Weighted Rating</th>
<th>Rating</th>
<th>Weighted Rating</th>
<th>Rating</th>
<th>Weighted Rating</th>
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<tr>
<td>gears</td>
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<tr>
<td>v-belts</td>
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<tr>
<td>chain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>high efficiency</td>
<td>30</td>
<td>4</td>
<td>1.20</td>
<td>2</td>
<td>0.60</td>
<td>3</td>
<td>0.90</td>
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<tr>
<td>high reliability</td>
<td>25</td>
<td>4</td>
<td>1.00</td>
<td>3</td>
<td>0.75</td>
<td>3</td>
<td>0.75</td>
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<td>low maintenance</td>
<td>20</td>
<td>4</td>
<td>0.80</td>
<td>3</td>
<td>0.60</td>
<td>2</td>
<td>0.40</td>
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<tr>
<td>low cost</td>
<td>15</td>
<td>2</td>
<td>0.30</td>
<td>4</td>
<td>0.60</td>
<td>3</td>
<td>0.45</td>
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<td>light weight</td>
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<td>0.20</td>
<td>4</td>
<td>0.40</td>
<td>3</td>
<td>0.30</td>
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<tr>
<td>100</td>
<td>NA</td>
<td>3.50</td>
<td>NA</td>
<td>2.95</td>
<td>NA</td>
<td>2.80</td>
<td></td>
</tr>
</tbody>
</table>

#### Rating Value

- Unsatisfactory: 0
- Just tolerable: 1
- Adequate: 2
- Good: 3
- Very Good: 4
Example: Traditional On Premises Software Total Ownership Cost Allocation

IT Services & Infrastructure Are Situational but Generally 60% of TOC

Development = Biggest Risk

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

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

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Cloud Example: Labor & Hardware
Change From Iaas To PaaS To SaaS
Cloud Example: Current Costs of IaaS Are Readily Available

TCO Comparison Calculator for Web Applications *(Beta)*

<< Adjust Calculator Settings

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

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

Region: US East (Northern Virginia)
Usage Pattern: Spikey Predictable

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

- **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 at

Example: Costing Alternatives On-premises Vs Cloud

1. Web Application Infrastructure
   1.1 Multi-Tier Web Application
      1.1.1 Web Tier
         1.1.1.1 Web Server
         1.1.1.2 Web Service
      1.1.2 Application Tier
         1.1.2.1 Core Application
         1.1.2.2 Application
      1.1.3 Data Tier
         1.1.3.1 Database and Storage
         1.1.3.2 Database Configuration
      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
   1.2.1 Web Tier
      1.2.1.1 Web Service
   1.2.2 Application Tier
      1.2.2.1 Application
   1.2.3 Data Tier
      1.2.3.1 Database Configuration
      1.2.4 AWS EC2 Hosting (annual cost)

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

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

<table>
<thead>
<tr>
<th>ITEM</th>
<th>ESTIMATE</th>
<th>REFERENCE</th>
<th>DIFFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Cost</td>
<td>1,071,256</td>
<td>1,968,705</td>
<td>-45%</td>
</tr>
<tr>
<td>Total Labor Cost</td>
<td>950,964</td>
<td>1,807,331</td>
<td>-46%</td>
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<tr>
<td>Total Material Cost</td>
<td>120,291</td>
<td>161,374</td>
<td>-24%</td>
</tr>
<tr>
<td>Total Labor Hours</td>
<td>9,861</td>
<td>19,885</td>
<td>-49%</td>
</tr>
<tr>
<td>Total Schedule Months</td>
<td>66.32</td>
<td>64.10</td>
<td>3%</td>
</tr>
<tr>
<td>PROJECT</td>
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<tr>
<td>Project Cost</td>
<td>10,346</td>
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<td>Project Labor Cost</td>
<td>7,546</td>
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<tr>
<td>Project Material Cost</td>
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<tr>
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<td>80</td>
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<td>ONGOING SUPPORT</td>
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<tr>
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<td>1,060,910</td>
<td>1,618,094</td>
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<tr>
<td>Ongoing Support Material Cost</td>
<td>117,491</td>
<td>52,789</td>
<td>123%</td>
</tr>
<tr>
<td>Ongoing Support Labor Hours</td>
<td>9,781</td>
<td>17,287</td>
<td>-42%</td>
</tr>
<tr>
<td>Ongoing Support Schedule Mon...</td>
<td>66.32</td>
<td>60.03</td>
<td>10%</td>
</tr>
<tr>
<td>Ongoing Support Start Date</td>
<td>3/25/2013</td>
<td>10/1/2013</td>
<td></td>
</tr>
<tr>
<td>Ongoing Support End Date</td>
<td>10/1/2018</td>
<td>10/1/2018</td>
<td></td>
</tr>
</tbody>
</table>

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

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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:** Successful cloud model takes knowledge around multiple technological disciplines. Once in place, however, managing can also be issue
- **Vendor lock-in:** Migrating cloud environment to another 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

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