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Earned Value Management – Part 2 of 2

White Paper

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Earned Value Accuracy through Estimating

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Preface

My first big vacation as a young adult was to Los Angeles, California (from Milwaukee, Wisconsin). My sister lived in Flagstaff, Arizona (near the Grand Canyon) at the time and suggested that I come to visit since it was "only a four-hour drive from L.A." Four hours didn't sound too bad, so I jumped in the car and headed for Arizona – armed with nothing more than my sister's estimate and some vague directions. Approximately nine hours later I arrived at her house, crossing a desert and driving up a mountain to get there. When I questioned my sister about her estimate, she replied, "It looks a lot closer on the weather map on TV."

As funny as this may seem, this approach is probably not much different from the approach used for estimating many projects. All too often, estimates are based on "gut feel" or (worse yet) available time or budget. Those estimates are often very inaccurate.

There are many techniques for estimating, such as expert judgement, analogous estimation, and parametric estimation. It is a *skill* that is developed over time and refined with experience. However, even though estimating is part Art and part Science, there are ways to enhance the accuracy of estimates. Doing so leads to better Earned Value Management (EVM), which in turn translates to project success

This white paper is part two of a two part series on Earned Value Accuracy. The first paper, [Accuracy through Scope Management](#), describes an approach to scope definition used successfully by the author for numerous projects. Combined, they provide suggestions and examples of how to improve in both of these key areas.

The "Best" Approach

Is there a best approach to estimating? I don't believe so, having seen good and bad examples of each method. The most common approach seems to be expert judgment – essentially, drawing on the experience of a subject matter expert. This estimating approach works very well when you have people who have a great deal of expertise in a specific area, and who have worked together as a cohesive team in the past (because estimates will be based on those experiences). This approach does not work well when your team has little or no knowledge of the environment, or the work being estimated is radically different from any previous work (e.g., using a new technology).

Analogous estimating is ideal when you have historical data for similar projects. As consultants, my team and I have been involved with a significant number of similar projects. Because of this we have a large pool of historic reference data to draw from. The larger the pool of data, the better this approach works.

Historical reference data also helps with parametric estimating accuracy. Parametric estimating uses "Cost Estimating Relationships" (CERs) to relate past efforts to new projects. This type of technique is very popular in the construction industry, where a rough estimate for a new house might be "$80 per square foot."

In lieu of any better data we will perform a simple one-dimensional sensitivity analysis to create (or validate) an estimate. The technique for this is simple – first, ask yourself (or a Subject Matter Expert) what the low-end estimate would be where they felt that there would be a ten percent chance of completing the work package in that time (call this F10). That value, while unlikely, is still possible. Then ask the same question for the high-end estimate, again with a 10% chance of this happening (call this F90). You then determine the midpoint between those two values and use it for your final estimate (see example below). Although this should be viewed as an approach of last resort, but we have found it to be *reasonably* reliable.

Task: SOW2-002	F10= 5	F90= 28	Estimate in Days = 16.5
Note: Estimate using Expert Judgment was 15 days.			

In the end it comes down to the people on your team – what approach do they have the most experience, expertise, and success with? Even though there is no single best way to estimate, there are many ways to achieve accurate estimates.

Our Approach

We use a weighted PERT method for estimating. This method considers the optimistic, most likely, and pessimistic estimates for a given task. The formula is shown below:

$$\frac{Optimistic + (4\, x\, MostLikely) + Pessimistic}{6}$$

Our approach also relies on thorough involvement for our team. When we begin work on a project we have three senior people involved in the process to review the Statement of Work (SOW) and create estimates.

The first person will effectively start the Work Breakdown Structure (WBS) for the project. This includes documenting what they feel to be the scope of the work package, including task notes, included and excluded components, and a rough map of task and requirement dependencies. If site visits are required this information is included as well, including detail on the number of required resources and the estimated duration of the visits. This becomes the template for the other two people creating estimates.

The other team members will validate this basic information, looking for gaps relative to the SOW, and identifying issues or concerns that they may have. All issues are distributed and discussed as soon as they are identified. This can minimize rework in the estimating process. Then, each person creates their estimates and sends it to a fourth person to review and merge into a final draft document for review. This draft document is then reviewed in a status meeting, finalized, and distributed to the client in the form of a final SOW.

Below is an example of the form used:

Task ID#	SOW2-002
Task Details	Migrate production Ingres Installations and Databases, production applications, DIGI terminals, and external feeds. Test same.
Deliverables	Migrated Ingres Databases, DIGI devices, and working upstream & downstream feeds. System operational and meeting all SLAs.
Inclusions	Ingres production applications, Ingres production installations and databases, DIGI terminals, and external feeds.
Exclusions	Any systems or equipment not specifically defined as being "in-scope" for this effort.
Level of Effort	15 Days 1 Trip
Notes	Testing of migrated systems will be performed by both Comprehensive Solutions and Client QA Staff.
External Dependencies	Client will provide final sign off. Identify primary and secondary contacts having authority to do so. Schedule must include at least one of these people.

The PERT estimates for each identified task are entered in our estimating worksheet. It is very important that an accurate estimate is used. If there is any concern or identified risk for a task, it is recognized in the "Up Charge" column. For example, was the estimate too low or too high, or was a risk understated or overstated? By having this information accurately noted in this manner we can gather better metrics and continually improve our estimating skills.

Comprehensive Solutions: Project Pricing Worksheet - Company Confidential

Client:	Acme Manufacturing				Prepared By:	John Smith
Project:	OpenSource Ingres Migration				Approved By:	Chip Nickolett
Date:	01/05/07				Status:	Pending

Task ID	Rate	UOM	Quantity	Upcharge	Reason	Total
SOW2-001	$1,000.00	Day	5.00	1.00		$5,000.00
SOW2-002	$1,200.00	Day	15.00	1.00		$18,000.00
SOW2-003	$1,200.00	Day	5.00	1.10	Risk - Client Dependency	$6,600.00
SOW2-004	$150.00	Hour	36.00	1.25	Weekend w/Nights	$6,750.00
SOW2-005	$3,500.00	Month	1.00	1.00		$3,500.00
Analysis / SOW Prep.	$500.00	Total	1.00	1.00		$500.00

Grand Total						**$40.350.00**

Est. Capitalized Costs (Customer):			**$23,850**		(Used for NPV/IRR Calculations)	

Additional Benefits

There are several benefits to this approach. First and foremost, the estimates are very accurate. This provides a high level of confidence that leads to more competitive bids. There may be some variance at the task level, but in our experience variance at the project level has been very low.

The process of clearly defining the scope helps us work with the Client to understand what the project will accomplish, and what it will take to complete. It helps them determine if this is their best investment choice. It also creates the shared vision of "what success looks like." Changes identified now, up to and including cancellation of the project if the situation warrants it, are preferable to unpleasant surprises encountered later.

Throughout the project we continually identify the cost and benefit for the client. This provides the necessary data to determine the preliminary Return on Investment (ROI) for the project. Again, this helps the Client determine whether this is their best investment choice. A good project will sell itself, and this approach helps to demonstrate the tangible value of the project.

Below is an example of potential project ROI scenario that is presented to the client:

ROI Estimates

Acme Manufacturing				Project: OpenSource Ingres Migration
Item	**Year 1**	**Year 2**	**Year 3**	**Cumulative Impact**
Depreciation (the 35% tax value of the full depreciation amount)	$7,490	$6,673	$6,673	$20,836
Savings - Software Support	$15,000	$15,000	$15,000	$45,000
Savings - Software Licenses	$10,000	$0	$0	$10,000
Savings - Hardware Support / Maint	$6,500	$6,500	$6,500	$19,500
				$0
				$0
				$0
				$0
				$0
Expected Net Cash Flows	$38,990	$28,173	$28,173	$95,336
Initial Investment:	-$64,200	**Internal Rate of Return:**		24%
Cost of Capital:	10%	**Net Present Value:**		$15,696

In Summary

This two paper series has hopefully demonstrated the importance and value of up-front analysis and planning –before the project officially begins. These efforts provide the foundation for future project success, and lead to the creation of an accurate project baseline plan. That accuracy enables the Project Manager to fully utilize Earned Value Management techniques to optimize project performance.

About the Author

Chip Nickolett, MBA, PMP, is the President of Comprehensive Solutions. He has been successfully managing Information Technology projects for nearly 20 years, including a large global ERP consolidation program. Chip holds an MBA degree with concentrations in Project Management from Keller Graduate School of Management. He firmly believes in the importance of Project Management in Business. For more information please see http://www.Comp-Soln.com/chipn.html.

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Comprehensive Solutions
4040 N. Calhoun Road
Suite 105
Brookfield, WI 53005
U.S.A.

Phone: (262) 544-9954
Fax: (262) 544-1236