Lessons Learned
Using Earned Value Management System to Track Effort and Schedule Weekly at the Individual and Team Level and Be Able to Detect a One-Day Schedule Slip

Girish Seshagiri

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Preamble

Don’t think of business as a life without greatness
Unless the distant goals of meaning, greatness, and destiny are addressed, we can’t make an intelligent decision about what to do tomorrow morning – much less set the long-term strategy of the company
First decision must be to commit to an ethical world, a civilized existence, a moral order
Nothing is more practical than for people to deepen themselves

- Peter Koestenbaum (pkipeter@ix.netcom.com)
The EVMS guidelines have been published as an American National Standards Institute/Electronic Industries Alliance standard ANSI/EIA-748, Earned Value Management Systems.

The DoD formally adopted ANSI/EIA-748 in August 1998 for application to major defense acquisition programs.

Compliance with ANSI/EIA-748 is required for DoD cost or incentive contracts and agreements valued at or greater than $20M.
EVM ANSI 748 Objectives - 1

Plan all work scope for the program to completion

Break down the program work scope into finite pieces

Integrate program work scope, schedule, and cost objectives into a performance measurement baseline plan
EVM ANSI 748 Objectives - 2

Control changes to the baseline

Use actual costs incurred and recorded in accomplishing the work performed

Objectively assess accomplishments at the work performance level
EVM ANSI 748 Objectives - 3

Analyze significant variances from the plan

Prepare an estimate at completion based on performance to date and work to be performed

Use EVMS information in the company’s management processes
EVMS Elements

Statement of Work
Work Breakdown Structure
Program Organization
Program Schedule
Budget Allocation and Resource Planning
Accounting Considerations
Earned Value Methodology
Performance Measurement
Estimates at Completion
Revisions and Data Maintenance
The Headlines

GAO: Hundreds of federal IT projects are poorly planned and underperforming
   Nextgov.com, July 31, 2008

$26 billion in projects on IT high-risk list
   Federaltimes.com, October 24, 2008

Lawmakers today expressed frustration and disbelief over the continued shortcomings of information technology projects across the federal government
   Washington Technology, September 21, 2007
How do projects get to be one year late?
One day at a time!!!
How many projects employ tracking systems that can detect a one-day schedule slip?
How many team leads can say weekly

“This job is under control and I don’t need your help right now”
How many team members can say weekly

“This job is under control and I don’t need your help right now”
How many solicitations require that contractors report status weekly?
Agenda

Rational Management and EVMS
Managing the Software Work
Level 5 Individual Process
Level 5 Team Process
Weekly Status Tracking
Lessons Learned
Transformation Principles
Rational Management - Elements

1. Set goals
2. Plan and review
3. Measure and track
4. Anticipate and correct

Source: Watts Humphrey, Winning with Software
Rational Management and EVMS

Set Goals
  Statement of Work

Plan and Review
  Work Breakdown Structure
  Program Organization
  Program Schedule
  Budget Allocation and Resource Planning
  Accounting Considerations

Measure and Track
  Earned Value Methodology
  Performance Measurement

Anticipate and Correct
  Estimates at Completion
  Revisions and Data Maintenance
Managing the Software Work - 1

Software and systems development is knowledge work

The first rule for knowledge work is that managers can’t manage it - the workers must manage themselves
Managing the Software work - 2

The second rule is that developers and their teams
   Must know how to manage themselves
   Negotiate their commitments with management
   Manage with data
   Own their own work

The third rule is that management must trust the development teams to plan and manage their own work.

Source: Acquiring Quality Software, Watts Humphrey
The need is not for lots of process data but for engineers who gather and use that data

What would happen if software professionals used sound engineering practices?
- Made and followed detailed plans
- Gathered and used historical data
- Measured and managed quality
- Analyzed and improved their processes
The need is for a Level 5 process at the individual level

“If our methods do not serve the individual professionals, they will not endure”

Watts Humphrey, *Managing the Software Process*
Level 5 Personal Process

1. Produce Conceptual Design
2. Estimate Objects
3. Estimate LOC
4. Estimate Effort
5. Develop Schedule
6. Develop Product
7. Collect Process Data
8. Analyze Process Data
9. Design
   - Personal Design Review
   - Team Design Inspection
10. Code
    - Personal Code Review
    - Compile
11. Unit Test

Data:
- Planned & Actual Object Size Data
- Planned & Actual Productivity Data
- Planned & Actual Effort Data
- Planned Value & Earned Value
- Planned & Actual Time Spent in Each Phase
- Planned & Actual Defect Data
Building Teamwork Capability - 1

Provide a management environment where the engineers are encouraged and rewarded for doing quality work

Create a mechanism to guide teams through defining their processes and making complete, precise, and detailed plans
Building Teamwork Capability - 2

Build an environment where everybody planned and tracked their work and measured and managed the quality of their products

Provide a trained coach

Create an organization environment where Level 5 behavior is the norm
Level 5 Team Process

**Weeky Status**

- Project Commitment Process → Current Phase
- Project Phase → Phase Review
- Phase Review → Next Phase
- Customer Feedback → Data Collection Analysis
- Customer Feedback → Risk Mitigation Strategies
- Development Tracking & Risk Management
- Track and Control
- Software Configuration Management
- Software Quality Assurance
- Requirements Management
- Quarterly Status Review
- Project Replan (When Required)
## Weekly Status – Team Goals (1)

<table>
<thead>
<tr>
<th>Goal</th>
<th>Measure</th>
<th>Target</th>
<th>Tracking responsibility</th>
<th>Tracking timing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Schedule</strong></td>
<td>WP Actual Earned Value - WP Baseline Planned Value</td>
<td>$\geq 0$</td>
<td>Team Leader</td>
<td>Weekly</td>
</tr>
<tr>
<td>Deliver all milestones that AIS commits to in its project plan on or ahead of schedule</td>
<td>Committed end date - Projected completion date (Days)</td>
<td>$\leq 1$</td>
<td>Team Leader</td>
<td>Weekly</td>
</tr>
<tr>
<td>% of milestones completed (delivered for customer for acceptance) on time</td>
<td></td>
<td>100%</td>
<td>Team Leader</td>
<td>By milestone</td>
</tr>
<tr>
<td><strong>Quality</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substantially defect free deliverables</td>
<td>On or ahead of Quality Plan</td>
<td></td>
<td>Quality Manager</td>
<td>Weekly</td>
</tr>
<tr>
<td>Accurate &amp; complete data (size, effort and defect) collection on a weekly basis</td>
<td>Track data by 9:00 AM CT on First working day: Number of team members who did not enter data on time</td>
<td>0</td>
<td>Planning Manager</td>
<td>Weekly</td>
</tr>
</tbody>
</table>
## Weekly Status – Team Goals (2)

<table>
<thead>
<tr>
<th>Goal</th>
<th>Measure</th>
<th>Target</th>
<th>Tracking responsibility</th>
<th>Tracking timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team Morale</td>
<td>Positive (1), Neutral (0), Negative (-1): If not what can we change?</td>
<td>Team average &gt;= 0</td>
<td>Team Leader</td>
<td>Weekly</td>
</tr>
<tr>
<td>AIS Team members have a positive experience on the project</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effective communication within the team</td>
<td>Positive (1), Neutral (0), Negative (-1): If not what can we change?</td>
<td>Team average &gt;= 0</td>
<td>Team Leader</td>
<td>Weekly</td>
</tr>
<tr>
<td>Process Maturity</td>
<td>Red, Green, Yellow indicator for each PA (based on PA review with SQA Monthly Meeting)</td>
<td></td>
<td>Process Manager</td>
<td>Monthly</td>
</tr>
<tr>
<td>Achieve/maintain CMMI Maturity Level 5 practices on the project level</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profitability</td>
<td>Plan/Act hrs for rework tasks complete</td>
<td>&gt;= 1.0</td>
<td>Team Leader</td>
<td>Weekly</td>
</tr>
<tr>
<td>Rework less than or equal to planned</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meet commitments with less effort or equal to plan</td>
<td>Plan/Act hrs for tasks complete</td>
<td>&gt;= 1.0</td>
<td>Team Leader</td>
<td>Weekly</td>
</tr>
</tbody>
</table>
Weekly Status - Team Hours

Cumulative Planned Effort vs Cumulative Actual Effort from 16-Feb-09 to 16-Aug-09.
Weekly Status – Team
Earned Value
### Weekly Status – Team Estimate At Completion

#### Task Status Summary

<table>
<thead>
<tr>
<th>Status Summary</th>
<th>Plan</th>
<th>Actual</th>
<th>Pln/Act</th>
<th>Act/Pln</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Hours</td>
<td>450.3</td>
<td>468.3</td>
<td>0.96</td>
<td>1.04</td>
</tr>
<tr>
<td>Project Hours To-date</td>
<td>3175.0</td>
<td>3255.3</td>
<td>0.97</td>
<td>1.03</td>
</tr>
<tr>
<td>Earned Value</td>
<td>4.3</td>
<td>1.7</td>
<td>2.51</td>
<td>0.40</td>
</tr>
<tr>
<td>EV To-date</td>
<td>28.5</td>
<td>26.9</td>
<td>1.06</td>
<td>0.94</td>
</tr>
<tr>
<td>To-date Hours for EV Tasks Closed</td>
<td>2482.0</td>
<td>1977.1</td>
<td>1.26</td>
<td>0.80</td>
</tr>
<tr>
<td>To-date Hours for Non-EV Tasks</td>
<td>429.6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Current Week 7 of 29

<table>
<thead>
<tr>
<th></th>
<th>7 of 29</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Status Based On EV</td>
<td>Week(s)</td>
</tr>
<tr>
<td>Projected Completion Based On</td>
<td></td>
</tr>
<tr>
<td>Earned Value Earn Rate</td>
<td>3.0</td>
</tr>
<tr>
<td>Remaining Plan Hours and EV</td>
<td></td>
</tr>
<tr>
<td>Project Hours and Estimate Accuracy</td>
<td>4.9</td>
</tr>
</tbody>
</table>

#### Other Metrics

- Blocked EV Effort: 848.6
- Avg EV Hours Per Week: 465.0
- Avg EV Per Week: 3.8
- EV Hours reqd for 100% EV: 5219.9
- For ontime completion Per Week:
  - Required EV: 3.3
  - Required EV Hours: 237.3
Weekly Status - Individual A

Hours

Cumulative Planned Effort
Cumulative Actual Effort

16-Feb-09 16-Mar-09 16-Apr-09 16-May-09 16-Jun-09 16-Jul-09 16-Aug-09
Weekly Status – Individual A

Earned Value

- Cumulative Planned Value
- Cumulative Earned Value

Dates: 16-Feb-09 to 16-Jul-09
# Weekly Status – Individual A

## Estimate At Completion

### Task Status Summary

<table>
<thead>
<tr>
<th>Status Summary</th>
<th>Plan</th>
<th>Actual</th>
<th>Pln/Act</th>
<th>Act/Pln</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Hours</td>
<td>38.0</td>
<td>41.1</td>
<td>0.92</td>
<td>1.08</td>
</tr>
<tr>
<td>Project Hours To-date</td>
<td>269.7</td>
<td>268.3</td>
<td>0.99</td>
<td>1.11</td>
</tr>
<tr>
<td>Earned Value</td>
<td>8.1</td>
<td>6.7</td>
<td>1.22</td>
<td>0.82</td>
</tr>
<tr>
<td>EV To-date</td>
<td>62.6</td>
<td>35.3</td>
<td>1.79</td>
<td>0.59</td>
</tr>
<tr>
<td>To-date Hours for EV Tasks Closed</td>
<td>141.9</td>
<td>269.4</td>
<td>0.53</td>
<td>1.90</td>
</tr>
<tr>
<td>To-date Hours for Non-EV Tasks</td>
<td></td>
<td>20.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Current Week

<table>
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<tr>
<th></th>
<th>7 of 29</th>
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<tbody>
<tr>
<td>Current Status Based On EV</td>
<td>Week(s)</td>
</tr>
<tr>
<td>Projected Completion Based On</td>
<td></td>
</tr>
<tr>
<td>Earned Value Earn Rate</td>
<td>10.0</td>
</tr>
<tr>
<td>Remaining Plan Hours and EV</td>
<td></td>
</tr>
<tr>
<td>Project Hours and Estimate Accuracy</td>
<td>15.7</td>
</tr>
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</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Blocked EV Effort</td>
<td>8.7</td>
</tr>
<tr>
<td>Avg EV Hours Per Week</td>
<td>42.7</td>
</tr>
<tr>
<td>Avg EV Per Week</td>
<td>5.3</td>
</tr>
<tr>
<td>EV Hours reported for 100% EV</td>
<td>460.4</td>
</tr>
<tr>
<td>For on-time completion</td>
<td>Per Week</td>
</tr>
<tr>
<td>Required EV</td>
<td>2.9</td>
</tr>
<tr>
<td>Required EV Hours</td>
<td>20.9</td>
</tr>
</tbody>
</table>

*Advanced Information Services Inc.*
# Weekly Status – Individual B

## Estimate At Completion

<table>
<thead>
<tr>
<th>Task Status Summary</th>
<th>Plan</th>
<th>Actual</th>
<th>Pn/Act</th>
<th>Act/Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Hours</td>
<td>38.0</td>
<td>60.5</td>
<td>0.63</td>
<td>1.56</td>
</tr>
<tr>
<td>Project Hours To-date</td>
<td>261.7</td>
<td>234.7</td>
<td>1.12</td>
<td>0.90</td>
</tr>
<tr>
<td>Earned Value</td>
<td>4.9</td>
<td>0.0</td>
<td>0.0</td>
<td>0.00</td>
</tr>
<tr>
<td>EV To-date</td>
<td>58.4</td>
<td>23.8</td>
<td>2.45</td>
<td>0.41</td>
</tr>
<tr>
<td>To-date Hours for EV Tasks Closed</td>
<td>80.7</td>
<td>79.5</td>
<td>1.11</td>
<td>0.90</td>
</tr>
<tr>
<td>To-date Hours for Non-EV Tasks</td>
<td>11.2</td>
<td>11.2</td>
<td>1.00</td>
<td>1.00</td>
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</table>

<table>
<thead>
<tr>
<th>Current Week</th>
<th>7 of 29</th>
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<tbody>
<tr>
<td>Current Status Based On EV</td>
<td>10.2</td>
<td>Behind</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Projected Completion Based On</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Earned Value Earn Rate</td>
<td>0.4</td>
</tr>
<tr>
<td>Remaining Plan Hours and EV</td>
<td></td>
</tr>
<tr>
<td>Project Hours and Estimate Accuracy</td>
<td>0.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Blocked EV Effort</th>
<th>1143.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg EV Hours Per Week</td>
<td>33.5</td>
</tr>
<tr>
<td>Avg EV Per Week</td>
<td>3.4</td>
</tr>
<tr>
<td>EV Hours read for 100% EV</td>
<td>255.6</td>
</tr>
<tr>
<td>For ontime completion</td>
<td>Per Week</td>
</tr>
<tr>
<td>Required EV</td>
<td>3.5</td>
</tr>
<tr>
<td>Required EV Hours</td>
<td>11.6</td>
</tr>
</tbody>
</table>
## Weekly Status – Individual C

### Estimate At Completion

#### Task Status Summary

<table>
<thead>
<tr>
<th>Status Summary</th>
<th>Plan</th>
<th>Actual</th>
<th>Pln/Act</th>
<th>Act/Pln</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Hours</td>
<td>39.5</td>
<td>40.5</td>
<td>0.98</td>
<td>1.03</td>
</tr>
<tr>
<td>Project Hours To-date</td>
<td>291.6</td>
<td>282.6</td>
<td><strong>1.03</strong></td>
<td>0.97</td>
</tr>
<tr>
<td>Earned Value</td>
<td>3.8</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>EV To-date</td>
<td>26.6</td>
<td>24.1</td>
<td><strong>1.10</strong></td>
<td>0.91</td>
</tr>
<tr>
<td>To-date Hours for EV Tasks Closed</td>
<td>223.9</td>
<td>176.1</td>
<td><strong>1.24</strong></td>
<td>0.79</td>
</tr>
<tr>
<td>To-date Hours for Non-EV Tasks</td>
<td>60.3</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

#### Current Week

<table>
<thead>
<tr>
<th></th>
<th>7 of 29</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Status Based On EV</td>
<td>0.7</td>
<td>Behind</td>
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<tr>
<td>Projected Completion Based On</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earned Value Earn Rate</td>
<td>0.0</td>
<td>Behind</td>
</tr>
<tr>
<td>Remaining Plan hours and EV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Hours and Estimate Accuracy</td>
<td>4.1</td>
<td>Ahead</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Blocked EV Effort</td>
<td>46.2</td>
</tr>
<tr>
<td>Avg EV Hours Per Week</td>
<td>40.4</td>
</tr>
<tr>
<td>Avg EV Per Week</td>
<td>3.4</td>
</tr>
<tr>
<td>EV Hours reqd for 100% EV</td>
<td>554.0</td>
</tr>
<tr>
<td>For ontime completion</td>
<td>Per /Week</td>
</tr>
<tr>
<td>Required EV</td>
<td>3.4</td>
</tr>
<tr>
<td>Required EV Hours</td>
<td>25.2</td>
</tr>
</tbody>
</table>
Lessons Learned - 1

If schedules are unrealistic, tracking methods are of little value.

Team members must be trained in estimating, planning, tracking and measuring/managing quality.

When team members participate in preparing the baseline plan, they believe in the plan and do their utmost to meet their commitments.
Lessons Learned - 2

Plans are not accurate beyond 18 to 24 weeks

Plans need to be adjusted periodically to keep them relevant and for EV to accurately reflect status of the project

Plan for at least two task completions per week for each team member

Keep the amount and type of data to be collected to a minimum – size, time, defects, and task completion
Lessons Learned - 3

Initially focus on helping individuals to provide precise and accurate data timely

Team lead should set the example

Team lead should press for daily results

Weekly EV tracking helps individuals appreciate the importance of completing each day’s planned tasks on that day
Lessons Learned - 4

Weekly EV tracking helps individuals and teams maintain product focus, meet intermediate milestones consistently and thereby complete project on schedule.

Schedule problems are normal.

Trust the individuals and teams to identify and solve the problems in time and meet their commitments.
Transformation Principles - 1

Quality Is More Important Than Schedule

“In today’s software marketplace, the principal focus is on cost, schedule, and function; quality is lost in the noise. This is unfortunate since poor quality performance is the root cause of most software cost and schedule problems.”

Watts Humphrey
Transformation Principles - 2

If it doesn’t have to work any body can deliver on time

If you want the product in the worst way, that’s how you will get it

If the situation looks truly impossible, it probably is

Schedule is what must happen; quality determines what will happen
Transformation Principles – 3

Insanity - Doing the same thing over and over and expecting a different result

Malpractice - An organization which does not have a top-management-sponsored continuous improvement initiative in place
Why do competent software professionals agree to delivery dates when they have no idea how to meet them?

Why do rational managers accept schedule commitments when engineers offer no evidence that they can meet the commitments?
Transformation Principles - 5

When pressed for early deliveries, the responsible team members say

“I understand your requirements, I will do my utmost to meet it, but until I make a plan, I cannot responsibly commit to a date”
Transformation Principles - 6

When pressed for early deliveries, the responsible managers say

“I trust you to create an aggressive and realistic plan, I will review the plan, but I will not commit you to a date that you can not meet”
Managing The Software Work

“Software work is entirely manageable, but only if you know how to manage it.”

Watts Humphrey, *Winning with Software – An Executive Strategy*
What does “FUN ON THE JOB” Mean to you?
Contact Information

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girish.seshagiri@advinfo.net
www.advinfo.net