Agility, Quality, Innovation, Joy in Work

CMMI Maturity Level 5

Excellence
Methodology Assists, Discipline Delivers

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Excellence

Making success *repeatable*

- Continuously advancing the boundaries of quality
- Customer feedback

- Exceeded Needs
- Met Needs
- Need to Improve for Quality
- Exceeded Needs
- Met Needs
- Need to Improve for Value
- Exceeded Needs
- Met Needs
- Need to Improve for Timeliness
ais Advantage - 1

- Founded In 1986; over 25 years of industry experience
- *Winner* of IEEE Software Process Achievement Award
- The *first* U.S. Small Business assessed at SEI CMMI Maturity Level 5
ais Advantage - 2

- *High velocity* maturity level 5 - organization (CMMI), team (TSP), individual (PSP)

- Bottom up driven - *over 330 customized and home grown* processes developed and continuously enhanced by engineers

- *Over 15 years history* of high quality and predictability
  - Effort deviation: 5.4% average
  - Schedule deviation: 10.5% average
ais Advantage - 3

Effort Deviation Individual Value Control Chart - Development Phases

% Deviation

Date of Project Phase Start

- Individual Data Points
- Mean
- Upper Natural Process Limit
- Lower Natural Process Limit
- One Standard Deviation

CMMI Maturity Level 5
ais Advantage - 4

Schedule Deviation Individual Value Control Chart - Development Phases

% Deviation

Date of Project Phase Start

- Individual Data Points
- Mean
- Upper Natural Process Limit
- Lower Natural Process Limit
- One Standard Deviation

CMMI Maturity Level 5

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Typical Project - 1

- Modernization
  - Streamline for improved efficiency

- Firm fixed deadline
  - Dependencies with other agencies and applications
  - Major cost impact on overrun

- Fixed bid, multi-year project
  - In production by end of year 2
  - Productivity enhancements in year 3

- Multiple customer points of contact
Typical Project - 2

- ~500K undocumented COBOL code
  - Not standardized – evolved over time

- ~800 million records to be migrated
  - With business logic

- ~70 non-standardized external interfaces

- System *performance* is key
Typical Project Concerns

- Largest project undertaken by AIS

- Organization’s historic data not available for some project work products

- Largest distributed team with 40% new employees
  - 17 person team

- Typical questions
  - Will team size impact quality and schedule?
  - How quickly will new team members be able to work at maturity level 5?
  - Are historic data and experiences valid?
  - Will processes scale up?
Project Status - 1

- System in production 1 week ahead of schedule
- No changes in commitment to customer
- High velocity development with over 570 KLOC delivered into production in ~100 weeks
- Met federal mandates for security
- Product engineering effort was 82.7% of total project effort (17 person team)
- 0.097 defects/KLOC in Production
Project Status - 2

In production ahead of schedule
Production target
Project Status - 3

In production ahead of schedule
Production target

Year 1  |  Year 2  |  Year 3

- Earned Value Deviation

EV Deviation
One Standard Deviation
Start The Project Right

- Jelled team at project initiation – formal team launch process

- All team members involved in making plans they can *fully commit* to, based on organization and individual historic data

- Teams take *ownership* of process, plan and quality

- Teams have *required* skills – technical, planning and quality management
Plan In Detail

- Use *historic data* where possible
  - Developer will *re-plan* each assigned component
  - Use *team data* when individual data is not available

- Plan the unknowns
  - Plan for proof of concept / research / *pilot component* tasks

- Keep plan current
  - Track against *current* plan, report against *baseline*
  - Detailed planning at start of each year

- *Tailored* processes
  - Revise processes based on project experience and need
Execute With Discipline

- Granular plan with weekly Earned Value tracking – team, individual
- Component postmortems and feedback – individual, team
- Quality above all
## Detailed Project Status - Team

<table>
<thead>
<tr>
<th>Data for week of</th>
<th>5-Apr-10</th>
<th>PROJECTED END DATE</th>
<th>Week Of</th>
<th>Week(s) Ahead</th>
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<tr>
<td>Project Hours</td>
<td>1.09</td>
<td>Rem EV Eff &amp; Avg EV Eff/Wk</td>
<td>20-Dec-10</td>
<td>-16</td>
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<td>0.81</td>
<td>Rem EV Eff and Estimating Accuracy</td>
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<td>To Date Hours Per EV (excl Blocked EV Eff)</td>
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<td>EV To-Date</td>
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<td>EV Effort</td>
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<td>FOR ONTIME COMPLETION</td>
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<tr>
<td>Blocked EV Effort</td>
<td></td>
<td>Avg EV / Week</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Avg EV Eff / Week</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To-Date Hours for EV Tasks Closed</td>
<td>0.90</td>
<td>Total EV Effort Required</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To-Date Hours for Rework Tasks Closed</td>
<td>0.90</td>
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<td></td>
<td></td>
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<tr>
<td>Cost of Quality [(A4+FR+PREV)/TOTAL EFFORT]</td>
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<td></td>
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<tr>
<td>Appraisal COQ (Closed Tasks Only)</td>
<td>Product Engineering</td>
<td>74.67%</td>
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<tr>
<td>Failure COQ (Closed Tasks Only)</td>
<td>Non Product Engineering</td>
<td>25.33%</td>
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</table>

### Key information
- What is the project’s current status?
- What is the projected completion date?
- What is required for on-time completion?
- Is the team’s actual effort distribution as planned?
Corrective Actions

- Processes streamlined to minimize non-product engineering effort
- Processes and task % distribution revised for standard components
- Processes redefined for new component types
- Each team member committed to expending additional effort over a 12 week period instead of adding 1.5 additional resources
Weekly Plan - Individual

Key information
- What tasks do I need to work on?
- When should I close each task?
- What are the dependencies?
- Am I making sufficient progress for the week?
Component Postmortem

- Data analysis at completion of each component
  - Questionnaire with 5 *basic analysis* questions regarding size, productivity, quality and schedule
  - If pilot component, actual productivity data is used for future components
  - Updated personal review checklist
  - Updated inspection checklist
  - Revised development process steps
Quality Above All

- Staff trained in quality methods
- Structured personal reviews and team inspections of all work products
  - Individual checklist for reviews, revised based on current defects and data analysis
  - Statistical process control analysis to assist in identifying components for re-inspection
- Predicting component quality using PQI
  - Revised based on analysis of over 150 components
    - Database components: > 0.365
    - Middle-Tier components: > 0.369
    - User Interface components: > 0.249
- Highest quality into test
  - 76.4% of components with 0 post unit test defects
Most Valuable Asset

- Team morale
  - Team members have *positive experience* on the project
  - Effective *communication* within the team

- Employee confidence and growth
  - Matched with *strengths*
  - Opportunity to *expand skills*
  - One-on-one *coaching*
  - *Mentoring* by peer
Customer Communication

- Periodic documented status updates

- Frequent issue resolutions, technical interchanges and product demonstrations
  - Discuss and *defend* technical decisions and suggestions
  - Maintain *decision log*

- Provide intermediate and frequent deliveries for acceptance

- *No surprises and achieve buy-in*
Project Summary

- ~680 total KLOC developed over 3 years
- Met required federal standards
- Zero system downtime due to functionality
- 0.097 defects/KLOC in Production
- Final product in production 1 month ahead of schedule
- End user productivity increased by ~300%
- Saved the customer ~2 million in support costs
- Exceeded customer needs for Quality, Value and Timeliness
Summary

- CMMI, TSP & PSP form the backbone of AIS’ success
- Training, mentoring, and one-on-one coaching expedite a new resource’s capability to work at high maturity
- Processes customized by developers form the backbone of project development
- Individual’s and team’s dedication and discipline in following the processes deliver the results
Success is understanding and adapting from experiences.

Excellence is making success repeatable.
Dedicating the success of this project to Watts Humphrey
Contact Information

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