Applying the Team Software Process

Noopur Davis, SEI
Bruce Erickson, Intuit

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Topics

- Background
- Overview of TSP
- Highlights of standard development processes in QuickBooks division of Intuit
- Integrating TSP/PSP with Intuit QuickBooks processes
- Adoption of PSP by individual engineers
- Key successes of the application of TSP
- Key challenges to integrating TSP
- Planned improvements to be adopted by the pilot team for their next project
Background

The Team Software Process (TSP) promises

- radical improvements in quality
- superior project status visibility
- predictability
- efficiency
- a framework for continual improvement
Questions

- How does TSP fit into existing culture and processes?
- Can TSP promises be fulfilled when working with a complex code base that has evolved over more than 10 years?
The TSP is a framework and a process structure for building and guiding self-directed teams.

The TSP addresses
- team-building
- team-working

Each phase or cycle of a TSP project starts with a launch or re-launch.

The standard strategy is to
- develop in increments
- use multiple cycles
- work-ahead
Intuit QuickBooks Process Highlights

- Requirements development
- User Interface design and specification
- Technical designs
- Release Commit
- Implementation
- Code Complete
- Functional test complete/UI freeze
- System test complete
- Beta ready
- Shutdown begins
- Manufacturing Release

*Note: Phases overlap as needed. Phases shown here apply to software developers, not to systems testers or other functions in the organization.*
## Integrating TSP with Intuit QuickBooks Processes

<table>
<thead>
<tr>
<th>Feature</th>
<th>W1</th>
<th>W2</th>
<th>W3</th>
<th>W4</th>
<th>W5</th>
<th>W6</th>
<th>W7</th>
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<th>W10</th>
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<th>W12</th>
<th>W13</th>
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<tbody>
<tr>
<td>Feature 1</td>
<td>Implement part 1</td>
<td>Implement part 2</td>
<td>Imp. part 3</td>
<td>Implement part 4</td>
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<tr>
<td>Feature 2</td>
<td>Requirements</td>
<td>Implement feature 2 framework</td>
<td>Implement feature 2</td>
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<td>Implement part 1</td>
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<td>Imp. part 3</td>
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**Keys to success:**

- Immediate PD start
- Extreme parallelism
- Incremental delivery
- Radically high quality (TSP/PSP)
- Aggressive tracking (TSP)
# Integrating PSP with Intuit QuickBooks Processes

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**PSP applied during implementation**

- Design, personal design review, design peer review
- Code, personal code review, code peer review
- Unit test
Adoption of PSP by Individual Engineers

- PSP was adopted to varying degrees
- All engineers kept detailed time logs.
- All engineers recorded defects, especially defects detected in inspection and test.
- All engineers kept their task plans up to date.
- All engineers provided weekly status to the team.
- Some engineers embraced the principles of the PSP, while others remained lukewarm.
Key Successes of the Application of TSP

- Increased visibility into project status
- Improved quality
- Longer development cycle
- Team involvement
Increased Visibility Into Project Status

Each team member, as well as the team as a whole, has detailed insight into project status

- Earned value
- Quality information from early phases
- Task hours
- Tasks completed
- Tasks remaining
Earned Value At Project Completion

Cumulative Earned Value

- Cumulative Planned Value
- Cumulative EV
- Cumulative Predicted Earned Value

Weeks
Mid-way through the project, people started rolling off.
Importance Of Re-Planning

Changes in Total Estimated Effort

Total Estimated Effort Hours

Week
## Weekly Status -1

Some weeks were better…

<table>
<thead>
<tr>
<th>Weekly Data</th>
<th>Plan</th>
<th>Actual</th>
<th>Plan / Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule hours for this week</td>
<td>60.0</td>
<td>51.3</td>
<td>1.17</td>
</tr>
<tr>
<td>Schedule hours this cycle to date</td>
<td>361.0</td>
<td>325.0</td>
<td>1.11</td>
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<tr>
<td>Earned value for this week</td>
<td>8.1</td>
<td>8.8</td>
<td>0.92</td>
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<tr>
<td>Earned value this cycle to date</td>
<td>38.8</td>
<td>37.7</td>
<td>1.03</td>
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<tr>
<td>To-date hours for tasks completed</td>
<td>344.4</td>
<td>326.5</td>
<td>1.06</td>
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<tr>
<td>To-date average hours per week</td>
<td>51.6</td>
<td>46.4</td>
<td>1.11</td>
</tr>
<tr>
<td>EV per completed task hour to date</td>
<td>0.113</td>
<td>0.116</td>
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</table>
Weekly Status -2

...than other weeks!

<table>
<thead>
<tr>
<th>Weekly Data</th>
<th>Plan</th>
<th>Actual</th>
<th>Plan / Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule hours for this week</td>
<td>70.0</td>
<td>57.1</td>
<td>1.23</td>
</tr>
<tr>
<td>Schedule hours this cycle to date</td>
<td>527.0</td>
<td>480.2</td>
<td>1.10</td>
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<tr>
<td>Earned value for this week</td>
<td>8.1</td>
<td>4.8</td>
<td>1.69</td>
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<tr>
<td>Earned value this cycle to date</td>
<td>56.6</td>
<td>49.2</td>
<td>1.15</td>
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<tr>
<td>To-date hours for tasks completed</td>
<td>449.2</td>
<td>463.3</td>
<td>0.97</td>
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<tr>
<td>To-date average hours per week</td>
<td>52.7</td>
<td>48.0</td>
<td>1.10</td>
</tr>
<tr>
<td>EV per completed task hour to date</td>
<td>0.126</td>
<td>0.106</td>
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</tbody>
</table>
## Plan vs. Actual

<table>
<thead>
<tr>
<th></th>
<th>Actual/Plan (Final/Re-launch)</th>
</tr>
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<tbody>
<tr>
<td>Size (N&amp;C LOC)</td>
<td>1.58</td>
</tr>
<tr>
<td>Effort (hours)</td>
<td>1.27</td>
</tr>
<tr>
<td>Schedule</td>
<td>1.22</td>
</tr>
<tr>
<td>Productivity (N&amp;C LOC/Hr)</td>
<td>1.24</td>
</tr>
</tbody>
</table>
Quality Measures

Percent Defects Removed by Activity

- 33% Personal Reviews
- 19% Team Reviews
- 19% Unit Test
- 14% Post Development Defects
- 15% Compile

Most defects removed during personal reviews

Percent Defects Removed by Activity (Ignoring Compile Defects)

- 40% Personal Reviews
- 24% Team Reviews
- 19% Unit Test
- 17% Post Development Defects

Most defects removed during personal reviews.
Component Analysis

Percent Effort by Activity

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percent</th>
<th>Plan</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>23%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Personal and Team Reviews</td>
<td>19%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Implementation</td>
<td>16%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Unit Test</td>
<td>16%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>System Test</td>
<td>19%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>4%</td>
<td>0</td>
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</table>

Percent Defects Removed by Activity

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percent</th>
<th>Plan</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Reviews</td>
<td>38%</td>
<td>862</td>
<td>862</td>
</tr>
<tr>
<td>Compile</td>
<td>16%</td>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>Team Reviews</td>
<td>19%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Unit Test</td>
<td>9%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Post Development</td>
<td>0%</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Quality Profile for Assembly JobCostsByVendor Reports

Program Size

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Plan</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Requirements Pages (SRS)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total HLD Pages (SDS)</td>
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<tr>
<td>Total Detailed Design Lines</td>
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<td></td>
</tr>
<tr>
<td>Base LOC (B)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Deleted LOC (D)</td>
<td>0</td>
<td>2</td>
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<tr>
<td>Modified LOC (M)</td>
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<td>24</td>
</tr>
<tr>
<td>Added LOC (A)</td>
<td>862</td>
<td>892</td>
</tr>
<tr>
<td>Reused LOC (R)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>New and Changed LOC (N)</td>
<td>862</td>
<td>916</td>
</tr>
<tr>
<td>Total LOC (T)</td>
<td>862</td>
<td>890</td>
</tr>
<tr>
<td>Total New Reuse LOC</td>
<td>0</td>
<td>92</td>
</tr>
</tbody>
</table>
87% of known defects removed before system test

Process Yields

87% of known defects removed before system test
Longer Development Cycle

Compare to non-TSP teams who typically spend 50% supporting system test!

Team Member Involvement -1

- Team member comments during the project postmortem
  - “Beginning to like the process. Makes interaction with people more efficient. You know what other team members are doing.”
  - “Liked clear definition of what people are responsible for. Promotes ownership of tasks.”
  - “Lots of things I liked. The power it gives us at getting better at estimating and planning. All the fun data it gives us to see how we can improve. There is a shift in the mental sense to accept the fact that there are defects, and where we can improve is what to do about the defects.”
Team Member Involvement -2

- Team member comments (continued)
  - “It protects us from ourselves. The task plan includes the things that we always say we will do...and it helps us feel good about them when we do them.”
  - “Wish requirements were better expressed. Very little guidance exists for requirements (in the TSP).”
  - “Logging defects early gives an indication of remaining defects.”
Team Member Involvement -3

- Team member comments (continued)
  - “The tool is not flexible enough.”
  - “The tool was my main complaint.”
  - “The TSP creates a lot of interdependencies, but the tool does not help you track them.”
  - “Logging every little change I made as a defect was difficult.”
  - “Almost an overbearing importance on system test defects. Some system test defects were not very important at all.”
Key Challenges to Integrating TSP

- The TSP tool could improve for
  - managing dependencies
  - managing milestones
- PSP training
- Communication
  - with non-TSP teams
  - with Release Management
- Launching using industry data rather than your own
- Balancing roles
  - Manager/Team Lead/Coach/Planning Manager
  - Team Roles (Planning Manager, Quality Manager...)

Noopur Davis/Bruce Erickson
Planned Improvements -1

- Apply TSP to requirements phase.
  - include personal review
  - include team inspection
  - develop specific checklists
  - log time spent and defects found
- Include architects in all design inspections.
- Include code champions in code inspections.
- Separate our high-level and detailed designs, with personal reviews and inspections for both.
- Develop list of QuickBooks-specific assumed behaviors. Use this checklist to help review and inspect designs.
Planned Improvements -2

- During initial launch, focus on getting detail for requirements and plan for requirements activities.
- Investigate conceptual design before the launch. Let architects review conceptual design during the launch.
- Manage expectations so organization understands that re-planning will occur.
- Full cross-functional participation in the launch.
Conclusion

- **What worked well**
  - Team commitment to trying the processes
  - Earned value tracking focused us on our task plans, and protected our quality assessment activities

- **What did not work well**
  - Should have had Product Manager more involved during launch
  - Need to separate our high-level and detailed designs
  - Want to apply to requirements phase to reduce downstream defects
Contact Information

Noopur Davis
- nd@sei.cmu.edu
- ndavis@davissys.com

Bruce Erickson
- bruce_erickson@intuit.com

Visit the SEI TSP web site at
- http://www.sei.cmu.edu/tsp