SEMPR: The TSP Software Engineering Measured Performance Repository

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**SEMPR: The TSP Software Engineering Measured Performance Repository**

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Team Software Process (TSP-2014) Symposium, 3-6 Nov, Pittsburgh, PA.

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Team Software Process (TSP-2014) Symposium, 3-6 Nov, Pittsburgh, PA.
Agenda

1. Introduction
2. SEMPR data and analysis
3. Conclusion
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1. Introduction
2. SEMPR data analysis
3. Conclusion
Purpose of this presentation

• This presentation tells...

• Project overview in SEMPR
• Benchmark planning parameters in SEMPR
• Benchmark project level performance and work item (component) level performance
About SEMPR

• Software Engineering Measured and Performance Repository

• SEI has collected data from organizations that have adopted TSP in SEMPR

• Stores project data in Tuma Solutions Team Process Data Warehouse
  • From 109 project cycles (in this report)
  • Used the Software Process Dashboard
How did we measure data quality in SEMPR

- Time log and defect log have high correctness and consistency by automatic data recording.

- Size log and task log have low correctness by manual data recording.
What do the data tell us?

1. Introduction
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How are projects organized?

Pattern (a)

Pattern (b)

Pattern (c)

Pattern (d)

Pattern (e)

Pattern (f)
How many projects are found in each pattern?

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Projects</th>
<th>Project Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>(b)</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>(c)</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>(d)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>(e)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>(f)</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
What were the project durations?
What are the planning period durations?

Most Common 9-12 weeks
Half Shorter than 13 weeks

Mean = 16.9
Median = 13.0
n = 113

Many a half year or more
Why longer?
How many team members on projects?
How many task hours per week?
mean Team Member Weekly Direct Hours per Week

Mean = 10.3
Median = 9.0
n = 111

Load factor = hours/40
Depends on the project

COV = standard deviation
average hours
= 0.25!
How do Plan and Actual planned project hours compare?

The scatterplot: Plan task hours vs. Actual task hours in project

- $R^2 = 0.9084$
- Slope = 1.053
- Intercept = 1.115

Project level time hours data is highly predictable.

The scatterplot: Log plan task hours vs. Log actual task hours in project

- $R^2 = 0.8685$
- Slope = 0.8864
- Intercept = 0.1657

Log transformed
How do Plan and Actual component hours compare? (work item)

Log transformed work item level time hours data is predictable.

Log transformed work item level time hours data is predictable.
How did they perform to planned schedule?

schedule performance =

\[ \text{actual duration} - \text{plan duration} \]

\[ \frac{\text{plan duration}}{\text{plan duration}} \]

Project performance

histogram of schedule performance in all projects
overflow bin = 5

Work item performance

histogram of schedule performance in all work items
overflow bin = 2
How well did they estimate effort?

\[
\text{effort performance} = \frac{\text{actual effort} - \text{plan effort}}{\text{plan effort}}
\]

**Project performance**

Histogram of effort performance in all projects

**Work item performance**

Histogram of effort performance in all work items

Overflow bin = 2
How fast are defects injectioned? (all work items)
What were the defect removal rates? (all work items)

The distribution of defect removal rate is same as that of defect injection rate
How did defect injection rates differ by phase

DIR in code review has wide range and highest median.
How did defect removal rates differ by phase

- **All phase**
  - Boxplot of defect removal rate in all work items

- **DRR in Compile and DRR in code review** are higher than DRR in unit testing.

- **Except compile phase**
  - Boxplot of defect removal rate in all work items
What were the total defect densities
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Conclusion

SEMPR collects TSP project data for benchmark and analysis

Projects organize in many ways

Benchmarks include

- distributions for defect injection and removal rates
- Ranges of task hours
- Effort estimation accuracy
- Schedule estimation accuracy

Much work remains

- Include more contextual data
- Continue to add projects the database
Acknowledgement

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http://www.processdash.com/tpdw
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