2006 State of Software Measurement Practice Survey

NDIA CMMI Technology and Users Conference

Mark Kasunic
November 15, 2006
Agenda

Introduction
  • Survey objectives & approach
  • The population being studied
  • Sampling plan

Results
  • Response rates and outcome
  • Population demographics
  • Attitudes and beliefs about measurement use
  • Measurement guidance that is used
  • Measures that are reported

Summary Observations
Survey Objectives

The objectives of this survey are to characterize

• the degree to which software practitioners use measurement when conducting their work

• the perceived value of measurement

• approaches that are used to guide how measures are defined and used

• the most common types of measures used by software practitioners
Characteristics of the Survey

We used a structured, self-administered questionnaire that was available both via the World Wide Web and in paper form.

The questionnaire was designed to be short (17 questions) and easy-to-complete with questions phrased in close-ended format. Several questions allowed for short open-ended responses.

Stratified random sampling was used to select candidate respondents from a population comprised of members from three different subpopulations.

Candidate respondents were offered incentives to participate including

- platinum membership to the Software Engineering Information Repository (SEIR) that provides access to documents otherwise unavailable through regular membership

- early access to the survey results
The Population Being Studied

The population that we would have *liked* to have studied is the entire existing body of software practitioners in the world. However, such a representative database was unavailable to us.

The population that we did use for this study included individuals who:

1. were entered into the SEI customer relations database during 2004-2005
2. registered to gain access to the SEI’s Software Engineering Information Repository (SEIR) during 2004-2005
3. became an SEI Member during 2004-2005
Important to Remember When Interpreting Survey Results

Survey results can not be generalized beyond the population used in this study.
## Sampling Plan

<table>
<thead>
<tr>
<th>Subpopulation</th>
<th>Population Size</th>
<th>Sample Size</th>
<th>Adjusted Sample Size</th>
<th>Actual Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Relations</td>
<td>6,398</td>
<td>603</td>
<td>2010</td>
<td>1,670</td>
</tr>
<tr>
<td>SEI Members</td>
<td>1,242</td>
<td>434</td>
<td>1,242</td>
<td>951</td>
</tr>
<tr>
<td>SEIR registrants</td>
<td>7,540</td>
<td>612</td>
<td>2040</td>
<td>1,539</td>
</tr>
<tr>
<td>Total</td>
<td>15,180</td>
<td>1,649</td>
<td>5,292</td>
<td>4,160</td>
</tr>
</tbody>
</table>

Calculated for: precision of ± 2.5% confidence of 95%

Adjusted based on estimated 30% response outcome.

- Invalid email addresses
- Non-responses
- Ineligible respondents
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Summary Observations
Response Outcome Rates

Minimum Response Rate

\[ RR_1 = 42.4\% \]

Counts partial interviews as respondents

\[ RR_2 = 50.7\% \]

http://www.aapor.org/pdfs/standarddefs_4.pdf
84 Countries Represented
Survey Respondents

- Other: 33.5% (634 responses)
- Project manager: 17.9% (340 responses)
- Engineer: 13.2% (250 responses)
- Executive manager: 12.0% (227 responses)
- Program manager: 11.2% (225 responses)
- Analyst: 5.9% (152 responses)
- Programmer: 5.2% (67 responses)

1895 Responses
Approximate Population Proportions

- DoD & Government: 27.4%
- Commercial: 72.6%
Agenda

- Results
  - Response rates and outcome
  - Were subpopulations different?
  - Population demographics
  - Attitudes and beliefs about measurement use

  *How are you involved with measurement?*
  *Are purposes for measurement understood?*
  *Does measurement help?*
  *Is measurement used to understand product/service quality?*
  *Documented measurement processes?*
  *Measurement definitions understood and consistent?*
  *Do measurable criteria exist for products and services?*
  *Is corrective action taken when thresholds are exceeded?*

- Measures that are reported
Involvement With Measurement

- Provider: 15.3% (290 responses)
- User: 17.1% (324 responses)
- Both a provider and a user: 60.3% (1142 responses)
- Other: 7.1% (136 responses)

Common responses:
- Don’t do measurement.
- I set up measurement programs.

1892 Responses
Provides (only) or Uses (only)

- Uses measurement data but does not provide it to someone else.
- Provides measurement data but does not use it.

289 Provider
321 User
Purpose for Measuring Is Understood

- Frequently: 1286 responses (69.6%)
- Occasionally: 390 responses (21.1%)
- Rarely: 69 responses (3.7%)
- Never: 18 responses (1.0%)
- I don't know: 14 responses (0.8%)
- N/A: 70 responses (3.8%)

1847 Responses
Believe That Measurement Helps (To Some Degree)

- Agree: 92%
- Disagree: 2%
- N/A: 2%
- Not sure: 4%

1868 Responses
Measurement Used to Understand Quality of Products & Services

- Frequently: 825 responses, 44.5%
- Occasionally: 723 responses, 39%
- Rarely: 210 responses, 11.3%
- Never: 39 responses, 2.1%
- I don’t know: 17 responses, 0.9%
- N/A: 38 responses, 2.1%

Total responses: 1852
Documented Process for Collecting Measurement Data

- Frequently: 876 responses (47.3%)
- Occasionally: 559 responses (30.2%)
- Rarely: 269 responses (14.5%)
- Never: 87 responses (4.7%)
- I don’t know: 18 responses (1.0%)
- N/A: 43 responses (2.3%)

1852 Responses
Measurement Definitions Are Understood & Consistent

- Agree: 70%
- Disagree: 24%
- N/A: 2%
- Not sure: 4%

1868 Responses
Measurable Criteria Exist for Products & Services

- Frequently: 799 responses (43.1%)
- Occasionally: 711 responses (38.4%)
- Rarely: 233 responses (12.6%)
- Never: 31 responses (1.7%)
- I don’t know: 30 responses (1.6%)
- N/A: 48 responses (2.6%)

1852 responses in total.
Corrective Action Taken When Measurement Threshold Exceeded

- Frequently: 745 responses (40.3%)
- Occasionally: 644 responses (34.9%)
- Rarely: 259 responses (14.0%)
- Never: 86 responses (4.7%)
- I don’t know: 52 responses (2.8%)
- N/A: 61 responses (3.3%)

Total responses: 1847
Action-Oriented Response to Measurement Information

- Measurable criteria established (frequently)
- Corrective action taken when threshold met (frequently)
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Summary Observations
Measurement Methods Used

The percentages do not add to 100% because some individuals use more than one method.
“Other” Methods Used

- Home-Grown: 39
- No Metrics (comment): 32
- Proprietary: 25
- Other: 25
- Customized from Other: 20
- CMM: 19
- Standards (IEEE, ISO, etc.): 17
- Six-Sigma: 15
- ITIL: 7
- Balanced Scorecard: 7
- By Mandate: 5
- SPC: 5
- Function Points: 3

219 Responses
Those Using “CMMI M&A Process Area”
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Summary Observations
Measurements that Are Reported

- Risks identified: 156 (90.4%)
- Schedule progress: 50 (97.0%)
- Code growth: 490 (62.7%)
- Defects removed: 217 (86.0%)
- Defects identified: 158 (90.0%)
- Effort applied to tasks: 115 (93.0%)
- Capability/requirements stability: 401 (73.6%)

Frequency

1796 Responses
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→ Summary Observations
In general, there were significant differences in response patterns when comparing management versus staff.

<table>
<thead>
<tr>
<th>Management</th>
<th>Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive</td>
<td>Engineer</td>
</tr>
<tr>
<td>Program Manager</td>
<td>Analyst</td>
</tr>
<tr>
<td>Project Manager</td>
<td>Programmer</td>
</tr>
</tbody>
</table>

Statistical tests of significance demonstrated that the differences were significant with confidence of at least 99% in all cases (and 99.9% in some cases).

- Hypothesis test for equality of proportions
- Chi-Square test for significance
Influence of Role on Response - 2

When compared to staff, management responded more strongly that

- they understand the purposes for measurement
- measurement helps their team perform better than without it
- they use measurement more often to understand the quality of their products and services
- they follow a documented process more often for collecting and reporting measurement data
- measurement definitions are commonly understood and consistent in their organization
- measurable criteria exist for their products and services
- corrective action is taken when a measurement-based threshold has been exceed

In general, the differences are statistically significant.
## Influence of Organizational Size - 1

<table>
<thead>
<tr>
<th>Number in Organization</th>
<th>( \leq 100 )</th>
<th>101 - 499</th>
<th>( \geq 500 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using measurement-based data helps my team to perform better than without using it.</td>
<td>78.4%</td>
<td>81.5%</td>
<td>86.8%</td>
</tr>
<tr>
<td>There exist measurable criteria for the products and services to which I contribute.</td>
<td>37.0</td>
<td>46.4</td>
<td>54.7%</td>
</tr>
<tr>
<td>I use measurement to understand the quality of the products/services that I work on.</td>
<td>35.1%</td>
<td>41.1%</td>
<td>46.2%</td>
</tr>
<tr>
<td>My team follows a documented process for collecting measurement data.</td>
<td>65.7%</td>
<td>71.6%</td>
<td>72.1%</td>
</tr>
</tbody>
</table>

* Percent that Agree or Strongly Agree.

* Percent that responded, “Frequently” to the listed questionnaire item.
Comparing Industry to Government

<table>
<thead>
<tr>
<th>Statement</th>
<th>Industry</th>
<th>Government</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using measurement-based data helps my team to perform better than without using it.</td>
<td>84.5%</td>
<td>80.0%</td>
</tr>
<tr>
<td>Definitions of measures used in my organization are commonly understood &amp; consistent.</td>
<td>37.1%</td>
<td>31.9%</td>
</tr>
</tbody>
</table>

* Percent that Agree or Strongly Agree.

Differences statistically significant with confidence 95%.
Comparing USA to Other Countries

<table>
<thead>
<tr>
<th>Statement</th>
<th>USA</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using measurement-based data helps my team to perform better than without using it.</td>
<td>80.1%</td>
<td>85.9%</td>
</tr>
<tr>
<td>Definitions of measures used in my organization are commonly understood &amp; consistent.</td>
<td>31.3%</td>
<td>42.4%</td>
</tr>
</tbody>
</table>

* Percent that Agree or Strongly Agree.

Differences statistically significant with confidence 99%.
Using Measurement to Improve

It is notable and a bit alarming that only 40.3% of all respondents reported that corrective action is taken when a measurement threshold has been exceeded.

Close to 20% of respondents reported that corrective action is rarely or never taken when a measurement threshold is exceeded.

Measurement doesn’t help much unless the information is acted upon.
To be published this year:

The State of Software Measurement Practice: Results of 2006 Survey
TECHNICAL REPORT
CMU/SEI-2006-TR-009
ESC-TR-2006-009
Acknowledgements

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