ABSTRACT

IT firms that specialize in outsourcing must provide assurances to their customers that they are adding value to that business relationship. The purpose of this paper is to describe a practical set of metrics that are focused on customer satisfaction and that are easily understood by both customer and developer organizations. The metrics established by Keane, Inc., a large US-based IT services firm, are based upon the goals and concepts of the Software Engineering Institute’s (SEI) Capability Maturity Model (CMM®) for software.

INTRODUCTION

Outsourcing is one of the fastest growing segments of the IT market. For example, IDC estimates that the number of large outsourcing contracts rose 100% between 1997 and 1998 and Chris Pickering’s 1998 Survey of Advanced Technology reported that 75% of organizations surveyed have significant backlogs of IT work making outsourcing an increasingly attractive option for many CIOs. Dataquest, an IT industry research firm, estimated this market at approximately $116 billion in the U.S. and $80 billion in Europe for 1999. Industry sources believe these amounts represent approximately 20% of the total expenditures for software development and management. Most IT-related spending is currently allocated to in-house delivered initiatives. Industry analysts, however, forecast a greater share of this spending will rapidly shift to external service providers. Outsourcing, whether in the plan, build, or manage phases, can yield faster improvements in many organizations and, in many cases, have not progressed beyond simple measurements of schedule, cost, and level of effort. While these measurements and these improvement efforts are certainly translatabl...
and manage application software. The major components of Keane’s metrics program include the Project Control and Reporting Process, the Project Status Display Workbook, Quality of Service Reports, Service Level Agreement Reports and Software Quality Assurance Audit Reports.

PROJECT CONTROL AND REPORTING PROCESS

The foundation of Keane’s metrics program is the Project Control and Reporting Process (PCRP). The process was developed to provide management with a snapshot of compliance with corporate project management standards and to obtain an early indication of issues that may impact cost, schedule or quality.

PCRP standards identify critical measurement points before, during and after a project and set the stage for on time, on budget delivery of a quality product.

Since Keane’s various methodologies are built around a common four-phase “framework”, the PCRP was similarly configured to facilitate the establishment and execution of quality and measurement checkpoints. Adherence to the standards is quantified on a project report card, using a scale of 1 (poor/unacceptable) to 4 (excellent/fully meets requirements), and is summarized at the branch and corporate level. This provides a point-in-time view of project progress and compliance at all levels of the organization. Projects rated below a defined minimum score are placed on a corporate ‘watch list’, and must develop and execute a plan to bring the project back within acceptable limits. Ratings are performed and report cards issued on a quarterly basis or at the completion of a project phase.

Phase 1: Proposal Development

As a proposal for services is being developed, the risks associated with the project are assessed, quantified and graphically represented using the Project Risk Assessment Method (PRAM) Profile. The PRAM provides measurements that may indicate adjustments to a proposed estimate or schedule.

PRAM Profile

Phase 2: Project Initiation

During the project initiation phase, the project management environment is established, the defining documents (i.e., statement of work or service level agreement) and project plan are prepared, and the PRAM Profile is re-evaluated. Ratings are applied to each of these deliverables.

Phase 3: Project Execution

Throughout the project execution phase, PCRP monitors and reports on the following attributes:

- team status meetings
- weekly project status report
- weekly status review with client
- maintenance of a project notebook
- project plan updates
- change control procedures
- acceptance procedures
- Project Summary Display (PSD) trend reporting (see below)
- monthly branch project review
- branch support
- client satisfaction

Phase 4: Post Project Summation

At the conclusion of a project, PCRP requires that all deliverables have been formally accepted by the client, the project notebook and other key assets used to manage the project have been archived, and a ‘lessons learned’ document has been prepared by the project manager.

PROJECT STATUS DISPLAY WORKBOOK

The Project Status Display (PSD) Workbook is a tool that enables project managers to track and report project status and financial results at a deliverable level and provides client management with a summarized view of the project on a weekly basis. Based on data from the project plan, the PSD is maintained with an Excel workbook, consisting of six worksheets:

- Project & Billing information – General information for the initiation of the project is recorded, including a project number, client number and other standard information that will be used as headings for the other sheets in the workbook.
- Planned – Includes planned resources, billing rates and weekly hours.
- Actual – Records actual resources assigned, billing rates, and actual hours spent on the project. The estimated hours to complete is captured and used to project variances.
- Project Status Summary (PSS) Data Sheet – For each deliverable in the project plan, the estimated effort hours and cost, actual effort hours and cost, client acceptance, and any change control applied are updated weekly.
- Formatted PSS – A tabular report computed from the data sheet.
- Summary Sheet – A graphical and tabular summary of the project’s value and actual costs, an analysis of variance, and notes related to change control. Significant variations between planned and actual performance must be addressed by project management through a formal action plan.

The tabular summary below contains the following computed fields:

- Original Contract Value – The total original estimate of effort and value approved at contract award.
- Total Approved Changes – Total effort and value of approved changes to be performed under change control terms.
- Total Current Estimate – Original contract value plus approved changes.
- Activity to Date – Actual effort hours and associated value (billing rate*hours) as well as any non-effort expended to date on all products in the project plan.
- Estimate to Complete – The effort and associated value, as well as any non-effort associated value remaining to be expended on all products in the project plan.
- Forecast Total – The sum of the Activity to Date and the Estimate to Complete.
- Project Variance – The total variance between all estimated and all actual effort and value expended.
- Earned Value of Approved Products – The value of all delivered products’ original estimates plus their approved change estimates. This does not reflect actual costs incurred (as computed in the Activity calculations). Typically used for fixed price or flat monthly billing where the value of approval is based on planned rather than actual effort.
- Actual Value of Approved Products – The actual value of all delivered products. This does not reflect actual costs incurred from the activity calculations. Typically used for time and materials billing projects where
QUALITY OF SERVICE SURVEYS

Although customer satisfaction is one of the attributes that is regularly monitored and quantified through PCRP audits, its focus is typically at a client sponsor level. Quality of Service surveys are intended to solicit feedback from end users, where perspective of quality and satisfaction may differ significantly from client management. Surveys are distributed to individuals in customer business units at predefined intervals, or at completion of a deliverable. The survey consists of a standard set of questions designed to assess what went well and what did not during the specified period, so that best practices and opportunities for improvement can be identified and addressed. End users are asked to rate the quality of service provided on a scale of 1 (poor/unacceptable) to 5 (excellent/exceeds expectations).

Typical questions include:
- To what extent were expectations met?
- How well were requirements met?
- What is your satisfaction with the professionalism of the team?
- To what extent were you kept informed of the status of your request?
- Was your request fulfilled properly the first time?

SERVICE LEVEL AGREEMENT METRICS

The Service Level Agreement (SLA) is an essential tool for managing service-based projects. It defines the scope and objectives of the project in terms of services that will be provided and helps to guarantee a mutual commitment between Keane and the customer. The SLA establishes the volume of work products that will be delivered, the priority of the services provided and acceptance criteria for responsiveness and quality of the deliverables. It becomes the reporting vehicle for performance measurement and provides the opportunity to identify service level improvements throughout the project. Below are suggested minimum metric components of a SLA.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Cost</th>
<th>Cycle Time</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td># Hours</td>
<td>Average</td>
<td># Calls</td>
</tr>
<tr>
<td>Support</td>
<td>% Effort</td>
<td>Response</td>
<td>Hours of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time</td>
<td>Operation</td>
</tr>
<tr>
<td>User</td>
<td># Hours</td>
<td>Average</td>
<td># Calls</td>
</tr>
<tr>
<td>Support</td>
<td>% Effort</td>
<td>Response</td>
<td>Hours of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time</td>
<td>Operation</td>
</tr>
<tr>
<td>Maintenance</td>
<td>% Hours</td>
<td>% Complete</td>
<td># Requests</td>
</tr>
<tr>
<td>Requests</td>
<td>% Effort</td>
<td>by Due Date</td>
<td>Completed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enhancement</td>
<td>% Hours</td>
<td>% Complete</td>
<td># Requests</td>
</tr>
<tr>
<td>Requests</td>
<td>% Effort</td>
<td>by Due Date</td>
<td>Completed</td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Development</td>
<td>% Hours</td>
<td>% Complete</td>
<td># Requests</td>
</tr>
<tr>
<td>Requests</td>
<td>% Effort</td>
<td>by Due Date</td>
<td>Completed</td>
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<tr>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td>% Hours</td>
<td></td>
<td># Defects</td>
</tr>
<tr>
<td>Control</td>
<td>% Effort</td>
<td></td>
<td>per Request</td>
</tr>
</tbody>
</table>

The project manager typically reports performance against SLA commitments to the customer and Keane corporate on a monthly basis. Trends over time are used to track productivity and performance improvements. As shown in the sample chart below, process improvement activities such as root cause analysis resulted in a significant decrease in production support effort hours over the course of three years.

SOFTWARE QUALITY ASSURANCE AUDITS

A Software Quality Assurance (SQA) Plan is developed at the beginning of a project in conjunction with the project plan, to identify the quality checkpoints. SQA audits focus primarily on compliance to defined processes. To provide maximum business value, processes which will be included in the audit schedule are mutually agreed to by SQA and project
management.

Standard processes incorporated into all SQA Plans include audits and/or reviews of peer reviews, software configuration management, project plans and/or service level agreements, statements of work and other defining documents and the preparation and execution of test plans. Other process audits more specifically related to the project are added to the plan as necessary and appropriate.

Non-compliance issues identified during an audit are analyzed to determine whether:

- any steps in the process were skipped
- any steps not defined in the process were performed
- the order of execution was changed

Analysis of these points provides a solid basis for determining whether process improvements may be indicated or additional training for the team may be required. SQA is responsible for making recommendations to the SEPG who has the authority to act on these recommendations.

Additional SQA responsibilities include tracking, trending and analysis of defects identified at various stages of the development lifecycle. The major classifications of defect tracked are:

- Defects identified through peer reviews (\# of defects, type, severity, SDLC phase) as a means of providing management with insight into areas where process improvements may be indicated, or additional training for the team is needed.
- Defects discovered during the course of a process audit (\# of defects, type, severity).
- Defects discovered during any phase of testing (\# of defects, type, severity).
- Defects identified by the end user during acceptance (\# of defects, type, severity).
- Production rework, defined as defects discovered after a deliverable has been placed in production (\# of items returned, type, origination). Analysis of the phase in which defects were discovered should prompt SQA and the SEPG to investigate where earlier defect identification efforts were inadequate so that those efforts can be improved to incorporate additional quality control checkpoints.

**EVALUATING METRICS**

No metric is useful unless the organization can identify the business value it provides. Frequently cited indicators of business value for metrics are (Humphrey, 1989; Pahlk, 1999):

- Is the metric a good indicator of how well the process is performing, e.g., an indicator of efficiency or effectiveness?
- Can the values for this metric be predictably changed by changing the process or how the process is implemented?

- Can the metric be consistently reproduced by different people?
- Can data be collected and analyzed such that you can predict and/or control process performance?
- Is the data relatively easy and cost-effective to obtain?
- Is the metric one that the customer thinks is an important indicator or process and/or product quality, e.g., an indicator of reliability?
- Is the metric one that the customer requires be reported?
- Is the metric one that the end user thinks is an important indicator of process and/or product quality, e.g., an indicator of usability?
- Is the metric one that senior management thinks is an important indicator of process and/or product quality?
- Is the metric one the organization requires to be reported, i.e., is it one of the common, standard measures defined for the organization?
- Is the metric one that the project manager thinks is an important indicator of process and/or product quality, e.g., an indicator of progress?

**CONCLUSION**

Metrics have little value if they are not aligned with the business objectives of the organization at large and are useful and consistent on the project level. In addition, customer satisfaction plays an increasingly larger role in quality measures. As organizations attempt to progress up the CMM maturity levels, they must ensure that they are capturing the useful metrics, analyzing them in a consistent manner and then taking appropriate actions as a result of the analyzed data. The metrics framework presented in this paper illustrates how one large IT consulting organization is using metrics to provide both internal and customer-focused feedback on core operating procedures. It is also clear that this metric framework meets many if not all of the evaluation criteria specified in the previous section.

**REFERENCES**

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