
By

Hyderabad Benchmarking Special Interest Group (HBSIG)
of
Hyderabad Software Process Improvement Network (HYDSPIN)
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- ADP
- Capgemini
- CMC Ltd
- CoOptions Technologies
- Foursoft
- Infor Technologies
- Infotech
- Invensys
- Olive Technologies
- Polaris
- Satyam
- Sierra Atlantic
- ValueLabs
- Wipro Technologies
Executive Briefing

Hyderabad SPIN, which has around 100 individuals and 20 organizations as members, conducted benchmarking of metrics at industry level, represented by good sample of Hyderabad software industry. Objective of this benchmarking is to derive industry standards for Hyderabad software industry, gather the best practices and help organizations in their process improvement efforts by finding the level of scope of improvement.

A special interest group (HBSIG) conducted the benchmarking exercise in four months time frame. Ten organizations have participated in benchmarking covering a good sample of Hyderabad software industry.

Focused measurements of this benchmarking for development projects include Productivity levels, Defect rates and Cost of Quality apart from other measures like Phase Containment Effectiveness, Defect and Effort distribution.

Focused measurements for maintenance projects include Resource Utilization, Maintenance Productivity, MR (Maintenance Requests) inflow, Average open-age of MR, On-time delivery index and Bad Fix. In addition to publishing the metric data, the benchmarking also carried out analysis, general observations and trends. Some of the best practices in the sample organizations are also collected during this process.

HYDSPIN also carried out process benchmarking in parallel to the metrics benchmarking. Project Management, Quality Management and Configuration Management processes are considered for benchmarking. HYDSPIN is working on providing great value addition of the Process & Metrics Benchmarking, by identifying possibility of establishing correlation between the process and metric benchmarking results.
1 Introduction

Hyderabad SPIN a non-profit professional group and is part of WW SPIN (World Wide Software Process Improvement Network). Hyderabad SPIN is founded by a group of practicing software professionals in the second half of 1995, today it has come a long way in organizing knowledge sharing lectures, news letters, e-groups, presentations, discussions, contributing to Software Process Improvement. These sessions have been contributed by the professionals from the software development organizations in the Hyderabad city and eminent people who were visiting Hyderabad from other cities and countries.


In the last ten years since its inception it had participating members from various software development organizations in the Cyber City during its monthly sessions. Some frequently participating organizations include Wipro, Satyam, Infosys, Microsoft, Infotech, Infor, Invensys, Polaris, Invesco, Intergraph, Mega soft, CMC, Sierra Atlallantic, Capgemini, etc. It also had academicians representing ESCI, IPE, ISQT, QSIT, Osmania University. Hyderabad SPIN has been an active supporter for the Annual SEPG Conferences being held in India since 1999.

HYDSPIN is the first network in the Hyderabad Software Industry, in conducting the benchmarking on both Process & Metrics together at industry level. Objective of this benchmarking is to derive industry standards for Hyderabad Software industry, gather the best practises and help organizations in their process improvement efforts.

A special interest group (HBSIG) conducted benchmarking in duration of four months time frame.
Following fourteen organizations, covering good sample of Hyderabad software industry participated in the 2007 benchmarking. They are -

- ADP
- Capgemini
- CMC Ltd
- CoOptions Technologies
- Foursoft
- Infor Technologies
- Infotech
- Invensys
- Olive Technologies
- Polaris
- Satyam
- Sierra Atlantic
- ValueLabs
- Wipro Technologies

Measurements of this benchmarking for development projects include Productivity levels, Defect rates and Cost of Quality apart from other measures like Phase Containment Effectiveness, Defect and Effort distribution. Measurements of this benchmarking for maintenance projects include On Resource Utilization, Maintenance Productivity, MR inflow, Average open-age of MR, On-time delivery index and Bad Fix.

2 Scope
This benchmarking is limited to data provided by the participating organizations
Minimum criteria for selection of projects in case of development projects
- Project size at-least 5 KLOC
- Project duration more than 3 calendar months
- Total project effort at-least 175 Person days

3 References
Software measurements by Caper Jones
4 Definitions

<table>
<thead>
<tr>
<th>Development metrics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>Size of the project in Kilo Lines of Code (non-commented, non-blank statements). Size can also be expressed in terms of function points. For the purpose of metrics calculations, function points are converted to LOC using the caper Jones conversion factors.</td>
</tr>
<tr>
<td>Cost of Quality</td>
<td>Prevention cost – Training, Planning</td>
</tr>
<tr>
<td></td>
<td>Appraisal cost - Review/Inspection, Testing efforts.</td>
</tr>
<tr>
<td></td>
<td>Failure cost - Rework, Re-review, Re-test efforts. Captured as Effort &amp; Expressed as % of total project effort</td>
</tr>
<tr>
<td>Code Phase Productivity</td>
<td>Expressed as Size (LOC)/Code phase effort (Person Day)</td>
</tr>
<tr>
<td>Defects</td>
<td>From System Test, Integration Test, Unit Test, Reviews (Requirements, Design, Code).</td>
</tr>
<tr>
<td>Defect density</td>
<td>Expressed as Defects / Size (KLOC)</td>
</tr>
<tr>
<td>Effort distribution</td>
<td>Expressed in Person days across various phases of the project which includes Requirements, Analysis, Design, Coding, Testing, Project Management, Configuration Management, Software Quality Assurance &amp; Project specific Trainings.</td>
</tr>
<tr>
<td>Productivity</td>
<td>Expressed as size (LOC) / Project Effort (Person Day)</td>
</tr>
<tr>
<td></td>
<td>Total Project Effort is used that includes efforts on Requirements, Analysis, Design, Coding, Testing, Project Management, Configuration Management, Software Quality</td>
</tr>
<tr>
<td>Assurance &amp; Project specific Trainings.</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Phase containment efficiency</strong></td>
<td></td>
</tr>
<tr>
<td>This metrics is calculated for Requirements, design and code phases. Expressed in Percentage.</td>
<td></td>
</tr>
<tr>
<td>E.g. PCE for Requirement phase is defined as Total Defects founds in Requirements / Total Requirement defects</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Maintenance metrics</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resource utilization</strong></td>
</tr>
<tr>
<td>Total Effort spent on request / Total available effort Expressed in %</td>
</tr>
<tr>
<td><strong>Maintenance productivity</strong></td>
</tr>
<tr>
<td>Total number of Requests Handled/Total Effort Spent Expressed as Maintenance Request (MRs) / Person days</td>
</tr>
<tr>
<td><strong>MR Inflow</strong></td>
</tr>
<tr>
<td>Total Requests Received / Number of Months Expressed as Maintenance Request (MRs) / Month</td>
</tr>
<tr>
<td><strong>Average Open age of MR's</strong></td>
</tr>
<tr>
<td>Sum of the duration of the Requests taken for completion / Total Number of Requests handled Expressed in Calendar days</td>
</tr>
<tr>
<td><strong>On time delivery</strong></td>
</tr>
<tr>
<td>Number of Requests delivered with in the agreed timelines * 100 / Total Number of Requests handled Expressed in %</td>
</tr>
<tr>
<td><strong>Bad Fix</strong></td>
</tr>
<tr>
<td>Number of Requests rejected * 100 / Total Number of Requests delivered Expressed in %</td>
</tr>
</tbody>
</table>
## Benchmarking process stages and milestones

<table>
<thead>
<tr>
<th>Bench mark stages</th>
<th>Milestones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presented the purpose and process of Benchmarking to all member organizations of SPIN. Identified areas and metrics for benchmarking</td>
<td>June 2007</td>
</tr>
<tr>
<td>Participation confirmation from organizations. Signing of Authorization letters and NDA</td>
<td>July 2007</td>
</tr>
<tr>
<td>Definition of common parameters and measurements. Finalization of template for Data collection</td>
<td>August 2007</td>
</tr>
<tr>
<td>Data collection, data validation and check for consistency in metrics</td>
<td>September 2007</td>
</tr>
<tr>
<td>Process Benchmarking survey results, consolidation, validation</td>
<td>September 2007</td>
</tr>
<tr>
<td>Data validation and check for consistency in metrics</td>
<td>October 2007</td>
</tr>
<tr>
<td>Analysis of data, Completion of benchmarking metrics</td>
<td>November 2007</td>
</tr>
<tr>
<td>Consolidation of best practices, Final presentation to the HBSIG team and consultants</td>
<td>November 2007</td>
</tr>
<tr>
<td>Presentation at the SPIN, Hyderabad Annual meeting</td>
<td>December 2007</td>
</tr>
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</table>
### 6 Benchmarking details

<table>
<thead>
<tr>
<th>Number of participating companies</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Projects</td>
<td>60</td>
</tr>
<tr>
<td>Effort spent on Benchmarking Data Collection, analysis and presentations.</td>
<td>12 person day</td>
</tr>
</tbody>
</table>
| Metrics Benchmarked – Development projects | • Effort distribution  
• Defect distribution  
• Cost of quality  
• Productivity  
• Defect density  
• Phase containment effectiveness |
| Metrics Benchmarked – Maintenance projects | • On time delivery  
• Customer acceptance %  
• Productivity |
| Types of projects                 | Development, Maintenance |
| Broad domains categorized:        | Client Server, Web Applications, Embedded |
| Languages                         | Converted to C equivalent |
| Average effort for projects (person days) | 479 person days |
| Average cycle time for projects (calendar days) | 243 calendar days |
7 Benchmarking results

7.1 Development projects

7.1.1 Effort distribution

![Phase wise effort distribution chart]

- Requirements: 14%
- Design: 4%
- Coding and Unit Testing: 4%
- System Testing: 2%
- Project Management: 3%
- Configuration Management: 9%
- Software Quality Assurance: 12%
- Documentation: 43%
- Technical Training: 9%
7.1.2  Defect distribution

Phase wise defect distribution

- Requirements review: 61%
- Design review: 12%
- Code review: 7%
- Integration testing: 5%
- System testing: 8%
- Post release: 7%

7.1.3  Severity wise Defect Distribution

Development projects - severity wise defect distribution

- S-1: 37%
- S-2: 27%
- S-3: 36%
7.1.4 Cost of quality

Cost of Quality

<table>
<thead>
<tr>
<th>Domain</th>
<th>COQ %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client server</td>
<td>49.11</td>
</tr>
<tr>
<td>Web applications</td>
<td>44.83</td>
</tr>
<tr>
<td>Embedded systems</td>
<td>41.64</td>
</tr>
</tbody>
</table>

7.1.5 Productivity

Productivity

<table>
<thead>
<tr>
<th>Domain</th>
<th>LOC per person day</th>
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</thead>
<tbody>
<tr>
<td>Client server</td>
<td>184.27</td>
</tr>
<tr>
<td>Web applications</td>
<td>106.16</td>
</tr>
<tr>
<td>Embedded systems</td>
<td>46.9</td>
</tr>
</tbody>
</table>
7.1.6  Defect density

Defect density

<table>
<thead>
<tr>
<th>Domain</th>
<th>Defects per KLOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client server</td>
<td>7.97</td>
</tr>
<tr>
<td>Web applications</td>
<td>6.34</td>
</tr>
<tr>
<td>Embedded systems</td>
<td>2.80</td>
</tr>
</tbody>
</table>

7.1.7  Phase containment effectiveness

Phase containment effectiveness

<table>
<thead>
<tr>
<th>Phase</th>
<th>POE %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements</td>
<td>60</td>
</tr>
<tr>
<td>Design</td>
<td>90</td>
</tr>
<tr>
<td>Code</td>
<td>70</td>
</tr>
</tbody>
</table>

- Client Server
- Web applications
- Embedded Systems
7.2 Maintenance projects

7.2.1 On-time delivery – Across Maintenance Projects

![Graph showing on-time delivery percentages across different statistics for maintenance projects.]

7.2.2 On-time Delivery – Web based Applications

![Graph showing on-time delivery percentages across different statistics for web-based applications.]

7.2.3  On-time Delivery - Mainframe Applications

![On Time Delivery (%)](image)

7.2.4  On-time Delivery - Client Server Applications

![On Time Delivery (%)](image)
7.2.5 Customer acceptance % - Across Maintenance Projects

7.2.6 Customer acceptance % - Web based Applications
7.2.7 Customer acceptance % - Mainframe Applications

7.2.8 Customer acceptance % - Client Server Applications
7.2.9  Productivity – Across Maintenance Projects

7.2.10  Productivity – Web based Applications
7.2.11 Productivity – Mainframe Applications

![Mainframe Applications Productivity Chart]

7.2.12 Productivity – Client Server Applications

![Client Server Applications Productivity Chart]
8 Benchmarking trends

8.1 Development projects

<table>
<thead>
<tr>
<th>Metric</th>
<th>2002</th>
<th>2003</th>
<th>2005</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Productivity (LOC per person day)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Client server</td>
<td>196</td>
<td>60</td>
<td>143</td>
<td>184</td>
</tr>
<tr>
<td>Web applications</td>
<td>79</td>
<td>72</td>
<td>130</td>
<td>106</td>
</tr>
<tr>
<td>Embedded systems</td>
<td>54</td>
<td>NA</td>
<td>66</td>
<td>47</td>
</tr>
<tr>
<td>Defect density (Defects per KLOC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Client server</td>
<td>3</td>
<td>4.6</td>
<td>3.8</td>
<td>8</td>
</tr>
<tr>
<td>Web applications</td>
<td>6.2</td>
<td>5</td>
<td>2.3</td>
<td>6.3</td>
</tr>
<tr>
<td>Embedded systems</td>
<td>6</td>
<td>NA</td>
<td>12</td>
<td>2.80</td>
</tr>
<tr>
<td>Cost of Quality (COQ %)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Client server</td>
<td>35</td>
<td>44</td>
<td>31</td>
<td>49</td>
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<tr>
<td>Web applications</td>
<td>44</td>
<td>35</td>
<td>32</td>
<td>45</td>
</tr>
<tr>
<td>Embedded systems</td>
<td>47</td>
<td>NA</td>
<td>58</td>
<td>42</td>
</tr>
<tr>
<td>PCE for Client server</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Requirements</td>
<td>71</td>
<td>91</td>
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<td>79</td>
</tr>
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<td>Design</td>
<td>77</td>
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<td>100</td>
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<tr>
<td>Coding</td>
<td>70</td>
<td>77</td>
<td>87</td>
<td>82</td>
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<tr>
<td>PCE for Web applications</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Requirements</td>
<td>89</td>
<td>77</td>
<td>88</td>
<td>74</td>
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<tr>
<td>Design</td>
<td>95</td>
<td>89</td>
<td>94</td>
<td>88</td>
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</table>
### Coding

<table>
<thead>
<tr>
<th>Metric</th>
<th>2003</th>
<th>2005</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>On time delivery %</td>
<td>94</td>
<td>96</td>
<td>96</td>
</tr>
<tr>
<td>Customer acceptance rate %</td>
<td>NA</td>
<td>98</td>
<td>98</td>
</tr>
<tr>
<td>Productivity (Person days per request)</td>
<td>NA</td>
<td>NA</td>
<td>17</td>
</tr>
</tbody>
</table>

Note: Maintenance projects are not covered during 2002

### Process Benchmarking

As a part of the Process Benchmarking, best practices of the industry were captured through a questionnaire that has been circulated to the participating organizations. The questionnaire covered three areas of management – Project management, Quality management and Configuration management.

The responses to the questionnaire are consolidated and the summary of the observations are presented in the following sections.
9.1 Project Management Process

9.1.1 Analysis – Project Domains

More than a third (42%) of the respondents are managing web-based (internet) applications. This can also mean that the survey response could have a tendency towards managing such applications.
9.1.2 Analysis – Project Life cycle

Nearly half of the Projects (48%) are of type Development. Maintenance gives a good chunk of Project work at 28%.

9.1.3 Analysis – Project Complexity

More than two-thirds (71%) of the Projects are of High complexity.
9.1.4 Analysis – Process Tailoring

More than half (60%) of the Projects have followed Organizational Processes with tailoring. A small number (6%) of the Projects have followed the Customer specific process. Remaining Projects have used the Organizational Processes without any tailoring.

9.1.5 Analysis – Most Tailored Processes
Configuration Management process is the most tailored process. The reasons could be due to:

- Various technologies in use for software development
- Differences existing in methodologies for builds and releases

9.1.6 Analysis – Most Used Metrics

Effort variance is the most used metric. This means Project Managers are more concerned with Resource Utilization.

9.1.7 Analysis – Level of Metrics Definition
More than half (58%) of the Metrics used are the ones defined at the Organization level. The rest could be a combination of purely tailored metrics as well as customer specific metrics.

9.1.8 Analysis – Most Used Project Specific Metrics

Defect Removal Efficiency is seen as the most used Project specific metric.

9.1.9 Analysis – Most Re-used Process Assets

Project Plan artefact (previous projects as well as sample) is the most re-used Process Asset followed by Risk repository.
9.1.10 Analysis – Most Reasons For Variations in Size

Change requests, Estimation errors are the most reasons provided for Size variation.

9.1.11 Analysis – Most Reasons For Variations in Effort

Estimation errors and Change requests are the most reasons for Effort variation
9.1.12 Analysis – Most Requirement Changes (Phase-wise)

The High Level Design phase has the highest number of requirement changes. Every change in requirements has a tendency to affect the Project progress in many ways. Hence it is important to anticipate changes as early as possible so the net impact would be lesser in terms of scope, cost (effort) and time.

9.1.13 Analysis – Most Schedule Changes
This is a Histogram. The number of schedule changes is plotted against the ranges of schedule changes. Two to three schedule changes have happened in nearly half (48%) of the projects.

9.1.14 Analysis – Factors Most Affecting Project Objectives

Factors most affecting effort, schedule, scope, quality which are the major objectives for a Project:

- Requirements related (unclear, volatile etc.)
  Requirements should be analyzed, validated and agreed upon by the concerned stakeholders. Many times assumptions can go wrong and this causes blurred understanding of requirements thereby causing a failure to meet Project objectives.

- Resources (skills, experience, attrition)
  Resource issues such as lack of skills, lesser experience and attrition can make a dent while meeting Project objectives.

- Inefficient Planning (schedule, resources)
  Planning is one of the basic functions of Management. Planning includes efficient timetable (schedule) of the activities to be executed as well as the resource allocations to these activities. Inefficient planning can disrupt the progress of a Project and create issues with respect to meeting the Project objectives.

9.1.15 Analysis – Factors Most Affecting Project Success

Factors most affecting project success:

- Clear understanding of requirements
  A proper understanding of requirements goes a long way in achieving Project objectives. Clarity in requirements means that all the down-stream processes become smoother.

- Resources (skills, experience, team-spirit etc.)
  Skilled and experiences resources are one of the most important factors for success in any Project. Morale which is also known as group-solidarity or team-spirit is also needed as an ingredient for Project success.

- Efficient Project Management (planning, tracking)
  An efficient Project Management function means that all the activities are tracked and monitored to closure. When this closure of each and every activity is in line with the Project’s objectives, success is achieved.
Customer commitment

Many Projects succeed because of Customer satisfaction. What makes a customer happy is more important than what is thought to make the customer happy. Customer commitment comes in many ways but the end result for a Project to succeed should be always be Customer satisfaction.

Process adherence

A Project team that adheres to the defined Processes has a greater chance of achieving success than a team that exhibits instinctive work patterns. Process ensures repeatability of results thereby meeting Project objectives.

Trainings

A well trained team has more chances to meet Project objectives than a team that is not well trained. It should be remembered that trainings range from Process to Technology to Behavior (Soft skills).

9.1.16 Analysis – Most Effective Risk Mitigating Actions

Risks cannot be avoided. At most risks can only be handled properly depending on the nature and exposure of the risks. Below are the most effective risk mitigating actions:

Knowledge base documentation and trainings

Documentation helps a lot in reducing dependence on people. Whenever there are situations like attrition, absence etc; documentation helps in completing activities on time as planned.

Backup planning to reduce down-time

Backup refers to a situation where the Project can be brought back to the latest baselines when any accidental damages (i.e. risk occurrences) happen.

Close working to reduce attrition

This refers to the relationship between the Project Managers and their subordinates. A humane and professional relationship means that people love working towards the success of the Project. Attritions in the middle of a Project can cause slippages so this is a good way of ensuring that attritions do not happen.

Customer satisfaction

A satisfied customer will ensure that the Project evaluation is given full marks whereas an unhappy customer will not give full credit to the Project team.
• Prototyping

By doing prototyping of requirements, typical pitfalls like technology incompatibilities, performance issues, non-feasibility would be avoided.

• Travel on-site

Certain critical tasks that require the attention of the customer or customer representatives can be done better at the customer site itself. It may mean that the resource needs to travel but this greatly reduces the risks of customer dissatisfaction.

• Iterative development

Iterative development refers to doing the Project in cyclic fashion as against a top-down approach for various Project phases. The advantage of doing this type of development is that progress happens in a verifiable manner.

9.2 Configuration Management Process

9.2.1 Analysis – Role of Respondents

A big proportion (86%) of the respondents are Configuration Managers.
9.2.2 Analysis – Process Definition

A big proportion (87%) of the Projects follows Organization level process.

9.2.3 Analysis – Process Tailoring

More than half (60%) of the Projects follow the Configuration Management processes Defined at Organization level. The rest follow a tailored process.
9.2.4 Analysis – Level of Metrics Definition

More than half (53%) of the Projects use the metrics defined for Configuration Management procedures Defined at Organization level. Nearly a third (27%) follows a tailored process. The ‘Others’ category (20%) includes customer specific metrics etc.

9.2.5 Analysis – Build Process

More than two-thirds (79%) of the Projects follow a Build process as a part of the CM process. Smaller percentage (14%) follows a Build process that is independent of the CM process.
9.2.6 Analysis – Organization Repository

More than two-thirds (69%) of the Projects have submitted documents to the Organization repository.

9.2.7 Analysis – CM Process Audits

A third (33%) of the Projects have included CM process audits under Configuration Audits. A fifth (20%) of the Projects have included CM process audits as part of Project Audits. But the majority (40%) have included CM process audits as part of both (i.e. Configuration Audits and Project Audits).
9.2.8 Analysis – Re-use of CM Repository

More than 60% of the Projects have re-used the CM repository.

9.2.9 Analysis – Directory Structure for Local Folders

About two-thirds (67%) of the Projects followed a directory structure for local folders. A directory structure is a pre-defined list of parent and child folders so the team members place the related documents within those folders only.
9.2.10 Analysis – Frequency of CCB Meetings

Nearly half (46%) of the Change Control Boards (CCB’s) meet in periodically once in a week/month/quarter/half-year. CCB meetings are held to discuss and approve/disapprove and regulate Change Requests. Such meetings are critical to the success of the Projects especially when there are more Change Requests.

9.2.11 Analysis – Best Practices

- 100% of instances have CM process documentation
  
  All the respondents have mentioned existence of a proper and well defined CM process documentation.

- Adherence to the Standards defined for the process
  
  When the team adheres to Standards defined for the process, best results can be expected.

- Baseline activities such as audits
  
  Code baseline as well as other baselines (Requirements, Design etc) forms important constituents of a successful Project; when activities such as audits are performed on such baselines, probability of success increases for the Project.
• Automation

Certain CM processes (such as Build process) are highly repetitive; so much that they naturally give in for automation. Process automation is one of the known ways to achieve success in a Project.

• Usage of CM tools

Usage of CM tools helps in quick turnaround of builds with amazing accuracies. Projects using time tested CM tools will achieve success in the CM practices.

• Trainings

CM process involves complex tasks that need proper training. Improperly trained resources when involved in CM processes increase the chance of Project failures due to the very nature of Configuration process that mostly deals with the composition and configuration of Product of the Project.

9.3 Quality Assurance Process

9.3.1 Analysis – Process Improvement Models

A third of the Organizations have adopted Process Improvement Models related to ISO (and related family of Standards). Nearly a third (29%) of the Organizations have adopted Process Improvement Models related to CMMI ©.
9.3.2 Analysis – Process Design/Definition

![Pie chart showing process documents]

The Software Engineering Process Group (SEPG) is involved in designing and defining Process documents for three-fourths (75%) of the time.

9.3.3 Analysis – QA staff as a Part of SEPG

![Pie chart showing QA staff as part of SEPG]

Exactly half of the Organizations have QA staff as part of SEPG. Ideally these teams should be independent of each other to avoid conflict of interests especially when the QA staff is also involved in Software Testing. Software Testing is an activity that comes under the Verification and Validation Processes and it is possible that there would be conflict of interests while audits are conducted on these activities.
9.3.4 Analysis – Process Trainings

In more than half (58%) of the Projects, process related trainings are conducted by the Quality Assurance (QA) group.

9.3.5 Analysis – Number of Projects per QA Engineer

In two-thirds (67%) of the instances, a QA Engineer is involved in one to 15 projects.
9.3.6 Analysis – Involvement of QA in Requirements Baselining

A Third (33%) of the Projects involves QA Engineers fully in Requirements base lining. This percentage should increase as QA staff involvement is very much essential during Requirements baselining.

9.3.7 Analysis – Involvement of QA in Project Planning

Almost all (92%) Projects involve QA Engineers fully in Project planning.
9.3.8 Analysis – Ownership of QM Plan

Exactly half of the Projects have the Quality Management Plan (QM Plan or QA Plan) owned by the QA group while the rest half of the Projects have it owned by the Project Manager. Irrespective of the ownership, it is necessary for both parties involved (QA group and Project Manager) to take a positive stance in the ownership in order to avoid conflicts in the area of decision making.

9.3.9 Analysis – Involvement of QA resources in Project Reviews

Two-thirds of the Projects involve their QA staff in Project review meetings.
Nearly two-thirds of Internal Quality Audits are done on a Quarterly basis. Less than a fifth (17%) of the audits are done on a Monthly basis. Monthly audits can increase the audit scope and effectiveness but needs more effort per resource or more resources.
10 Members of HBSIG

HBSIG Team

- Project Manager - Maneesha Josyula
- Consultant for overall Benchmarking - K S Prakasa Rao
- Metrics Benchmarking Analysis - K Krishna Kishore
- Process Benchmarking analysis - Ashok Shashikanth

Representatives of participating organizations

- ADP – Phanindranath N, Arunkumar K
- Capgemini – Dr. Neeta Gulati
- CMC Ltd – S Kuppa Rajan, B. Madhava Reddy
- CoOptions Technologies – Mallika K
- Foursoft – Ramakrishna Chikati
- Infor Technologies – Ashok Shashikanth
- Infotech – M. Neelima, Surbhi Mittal
- Invensys – Somisetti Somasekhar
- Olive Technologies – M. Amareshwar, J. V Ananda Aditya
- Polaris – Chandrasekhar NG, Abhay Managavi, Mahesh Kumar
- Satyam – Meera Kar
- Sierra Atlantic – Vamsi Krishna Nori, Madhu Nair
- ValueLabs – Krishna Praveen K, Smeeta Behera, Satya Sreekanth
- Malleswararao
- Wipro Technologies – N V Ramana Rao

11 Future scope of work

It is planned to continue benchmarking exercise next year in 2008 also. The scope of this work can be extended with some more new measures and new charts for the inference purpose. It is proposed to visit the participating organizations and conduct interviews with the senior management and consolidate the observations regarding the best practices.

The Benchmarking findings can be accessed at www.hydspin.org

For any further details, send an email to hydspin@rediffmail.com