

**Guidelines for PCB and PPM**

**Version History**

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# Organizational Business Goals

 Organizational Business Goals encompasses the quality and process performance objectives. The quantitative objectives for quality and process performance, traceable to business objectives should be established and maintained. Processes which relate to the organization’s set of standard processes should be identified and selected. Measures that provide appropriate insight into the organizations quality and process performance should be selected and Included into the organizations set of common measures.

Bucket Identification is the process to identify the exact bucket for a project in order to perform statistical analysis on the data and derive process performance baseline. The bucket holds projects that are similar in nature and have compliance requirements.

# Collection of Organizational Data

 The data collected from all these phases through different sources is compiled to have real picture of the project.

Software project data collection is achieved through various sources and tools as listed below:

* Project planned effort and schedule is obtained from project plan.
* Review related data is collected from module wise review reports. This gives information about review defects and effort spent in review activity.
* System testing defects statistics are generated from Bugzilla and TFS
* Actual efforts, Schedule are generated from organization timesheet.
* The size of each module in the project is taken from Software Project Estimation.
* The final size of module updated after any new change requests were implemented.
* The data compiled from different sources are integrated into single data sheet.

# Bucket Identification

* Once data is collected from all the different type of projects the Test of Hypothesis is conducted on data for the formation of different buckets using Normality Test.



Figure 1: Sample Normality test

* To identify the buckets for the data collected from various projects, size of the modules in the project is considered. Size designates the number of features or functionality in a module which can be inferred from SRS.
* Statistical analysis is performed on size data using F Test and T Test.



Figure 2: Tests for Equal Variances for projects B—1 and B—2

Table 1: Sample Result of F-Test

|  |
| --- |
| 95% Bonferroni confidence intervals for standard deviations |
|  | N | Lower | StDev | Upper |
| B--1  | 9 | 3.55378  | 5.54527  | 11.8217 |
| B--2  | 22 | 3.90298  | 5.25806  | 7.9415 |
| F-Test (Normal Distribution) |
| Test statistic = 1.11, p-value = 0.789 |

* Projects are grouped in a bucket if the test of equal variance and equal mean holds true.

# Determine Process Performance Measures

Senior management shall publish high level objectives using Business Goals. Based on the organizational business goals, SEPG team shall determine Y-factors e.g. Schedule Variance, Effort Variance and Defect density.

# Analyze and Establish Process Performance Baselines

Organization’s process-performance baselines should be determined and maintained. The processes should include the following:

* Historical Project data is collected for the selected period and consolidated.
* The consolidated outputs are reviewed for completeness and integrity.
* Perform Normality test on the accumulated historical data to check the normality of the data using Tool i.e. Minitab.
* Perform Control charting to check the Outliers.

Figure 2: Sample Control Chart

* The extreme outliers, which look like errors, are removed from the consolidated output and the same is informed to project manager for root cause analysis.
* The outliers falling beyond the process limits (based on 3 sigma limits) are identified and recorded separately.
* Data points with these variations are analyzed for the causes so that the special causes are identified and removed from the data set and the process.
* Such data points are informed to the concerned project teams so that actions are taken on these special cause variations to stabilize the process.
* All other data points that include the common cause variations are considered for establishing the organizational baselines.
* Now we can establish our Baselines (PPB).

 Now Organization's process-performance information should be available across the organization. Organization’s process-performance baselines should be revised as necessary.

# Establish Process Performance Models

Establish the process-performance models based on the organization’s set of standard processes and the organization’s process-performance baselines.

* Use baselined data to establish Process Performance Model.
* Perform a normality test on the final data set generated in PPB sheet.
* Select data set once p-value > 0.05 implying that the data set follows normal distribution.
* Find Regression Equation of Y-factors with its corresponding X-factors. Conduct regression testing with multiple trials to ensure that
* R-Sq > 60% indicates that the model fits the data extremely well.
* R-Sq (adj) > 60% accounts for the number of predictors in the model. It also indicates that the model is suitable for the data set.
* p-value <= 0.05
* At least 2 variables (x factors) should be marked to make a regression equation
* Revise the process-performance models as necessary.

# PPM

Yes

No

Yes

P values < 0.05

Yes

START

Use Baselined data to establish PPM

Regression Equation of Y factors with its corresponding X factors

Is equation Logical?

No

Regression Equation

R-Sq >60% ?

R-Sq Adj >60%?

No

No

**INPUT**

Process Performance Baseline

PPM Established

STOP

PPM

# PCB

No

No

Yes

Does Outliers occur?

Data comparison with trial limit (Upper and Lower Bound)

Similar Data Sample

Establish Baseline

STOP

Yes

Baseline Establish

Trial Limits i.e. LCL, UCL, Mean

Data Collection (Metric)

Normality test using MiniTab

Control Charting to check outlier

Normality Test

Control Chart

START

Data Collection (Metric)

Normality test using MiniTab

Control Charting to check outlier

Does Outliers occur?

Outlier Analysis and Normalize data

Normality Test

Control Chart

**INPUT**

Process Documents

Organizational Data