

Attributes of a Successful Reliability Improvement Metric

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Attributes of Metric

- **assumption of predictive model**
- **data collection**
- **periodic reporting**
- **validation of data primitives**
- **statistical analysis**
- **global assessment metric**
- **product and process metrics**
- **identification of opportunities**
- **corrective action process**

Actual to Predicted Comparison

- **Six million serialized circuit packs**
- **1500 circuit pack types**
- **60 major customer groupings**
- **Four life cycle process groupings**
- **Ratio of actual returns to predicted returns**

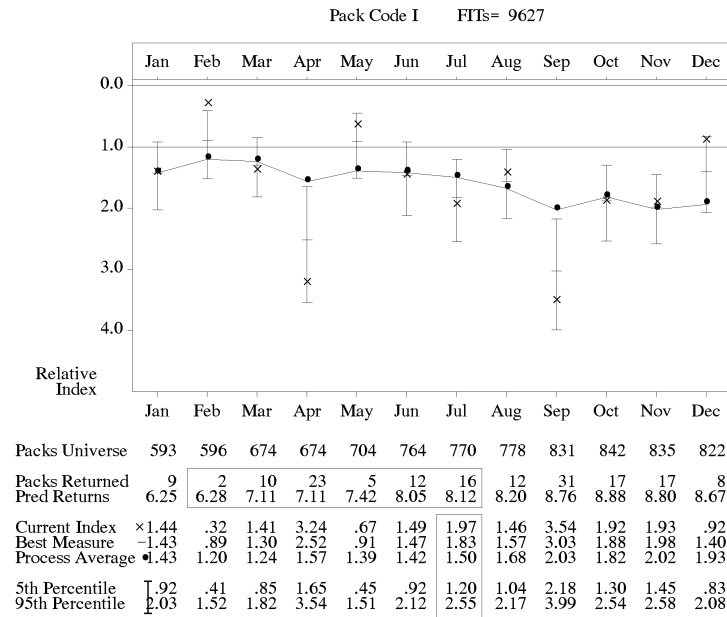
Predicted Returns

- **Function of universe in service**
- **FIT prediction based on Bellcore standards**
- **Assumption about No Fault Found circuit packs**

Actual Returns and Statistical Comparison

- **Monthly tabulation**
- **Ratio of current month actual to predicted**
- **Ratio of six month actual to predicted**
- **QMP 90 % Confidence Interval**

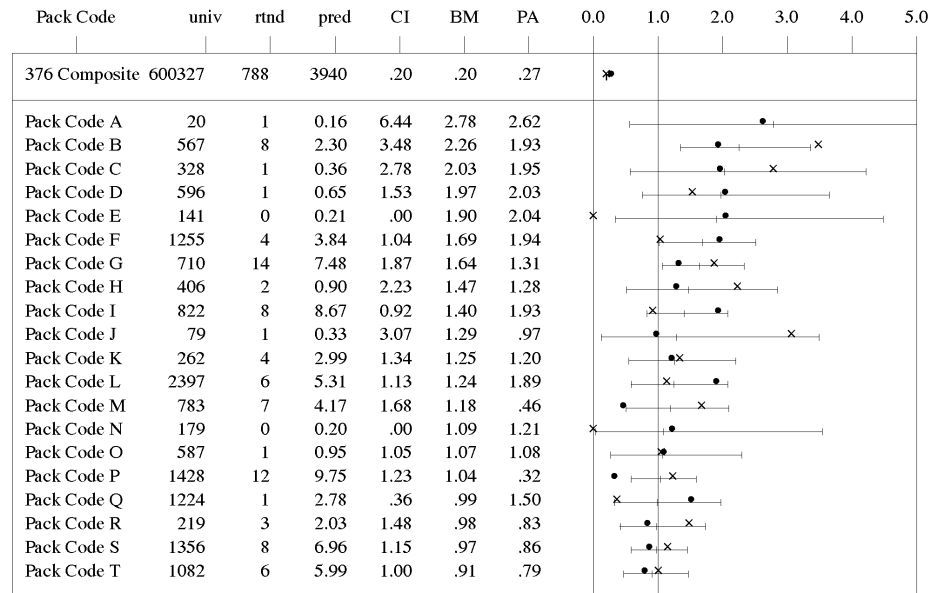
QMP Trend Chart



QMP Trend Chart (data detail)

Packs Universe	593	596	674	674	704	764	770
Packs Returned	9	2	10	23	5	12	16
Pred Returns	6.25	6.28	7.11	7.11	7.42	8.05	8.12
Current Index	×1.44	.32	1.41	3.24	.67	1.49	1.97
Best Measure	-1.43	.89	1.30	2.52	.91	1.47	1.83
Process Average	•1.43	1.20	1.24	1.57	1.39	1.42	1.50
5th Percentile	┌.92	.41	.85	1.65	.45	.92	1.20
95th Percentile	└2.03	1.52	1.82	3.54	1.51	2.12	2.55

QMP Ranking Chart



QMP Ranking Chart (detail)

Pack Code	univ	rtnd	pred	CI	BM	PA	0.0	1.0	2.0	3.0	4.0	5.0
376 Composite	600327	788	3940	.20	.20	.27	•					
Pack Code A	20	1	0.16	6.44	2.78	2.62			•			
Pack Code B	567	8	2.30	3.48	2.26	1.93			•	x		
Pack Code C	328	1	0.36	2.78	2.03	1.95			•	x		
Pack Code D	596	1	0.65	1.53	1.97	2.03		x	•			

Aggregation by Process

- **Predicted returns by part type for new**
- **Predicted returns by part type for repaired**
- **Predicted returns for balance of production**
- **For each universe, compared actual with predicted**

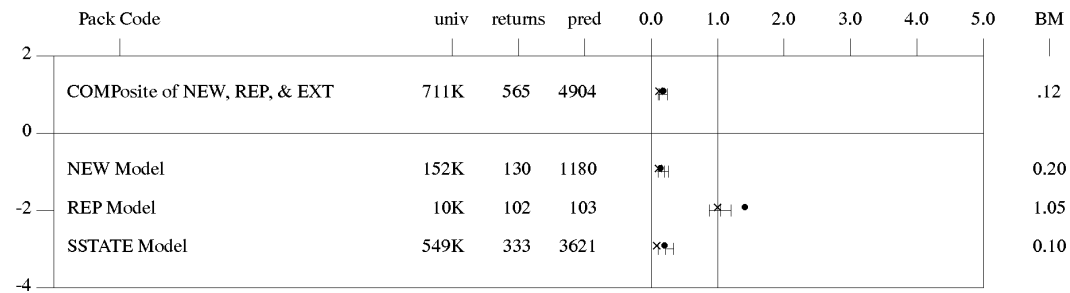
Identification and Correction

- **Definitive criteria for identification**
 - Return rate 5th percentile greater than 1.00
 - Return rate Best Measure greater than 2.00
 - Number of returns for current month greater than 3

- **Definitive Corrective Action Process**

- **Definitive criteria for closure**
 - Return Rate Best Measure less than 1.00

Aggregation by Process



Results

- **Drives corrective action in design**
- **Drives corrective action in manufacturing**
- **Drives corrective action in repair operations**
- **Custom reports for customers**

Attributes of Metric

- **Each part type with own prediction (FIT)**
- **Data collection and validation**
- **Standardized on ratio of actual to predicted**
- **Monthly statistic contains six months of data**
- **Rankings compare “top 40” to composite**

Attributes of Metric

- **Product and process measurement**
- **Minimum producer's risk**
- **Sufficient corrective action initiatives**
- **Corrective action initiation criteria**
- **Corrective action closure criteria**

Conclusions

- **Method is accurate, descriptive, and useful**
- **Provides identification for product and process improvement activities**
- **Reports on product, customer and process universes**
- **Successful use of statistical data**
- **Successful use of corrective action**