



Omnisys
THE ART OF SYSTEMS DESIGN

*Measurable System
Engineering*



Lecture Objectives

- Reason to measure
- Methods of measuring system engineering
- Effective metrics

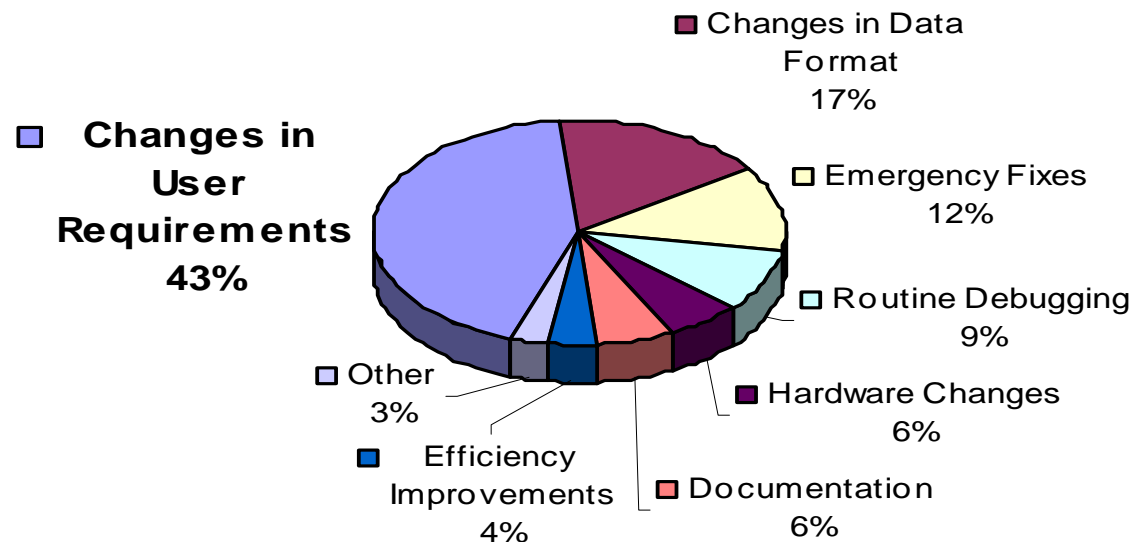


In God we trust...all others bring data.

[Dr. W. Edwards Deming]

Why Measure?

Cost of Requirements Errors and Changes Telelogic Survey of 500 Major Projects' Maintenance Costs



Why Measure?

- Better prediction
 - Schedule
 - Budget
 - Performance
- Better quality
 - Product
 - Processes
- Better satisfaction
 - Customer
 - Team-self, management of project/organization

Process Improvement

- Process understanding
- Definition of performance and measurable indexes
- Definition of suitable metrics
- Tracking measurable process data
- Understanding and analysis of measured data
- Learn from and improve for the next stage of the process or the next project

Process Understanding



- ← Requirement
- ← Top-level and detailed design
- ← Development facilities
- ← Application
- ← Verification
- ← Validation

Definition of Performance and Measurable Indexes



- System Engineering
 - Requirements' stability and completeness
 - No rework
- Development Facilities
 - Maximal testing and monitoring capabilities
- Development groups (SW and HW)
 - Minimal number of bugs
- Testing teams
 - No major defects will be found after tests are executed

Definition of Suitable Metrics (1)

- Added value for the developer or SE
- Indication of quality factors
- Simple, understandable, repeatable
- Unambiguously defined
- Economical and simple to collect
- Quantifiable
- Objective

Definition of Suitable Metrics (2)

System Engineering Metrics

- Technical performance
- System engineering process quality
- Project risk indication
- Earn value
- Customer satisfaction

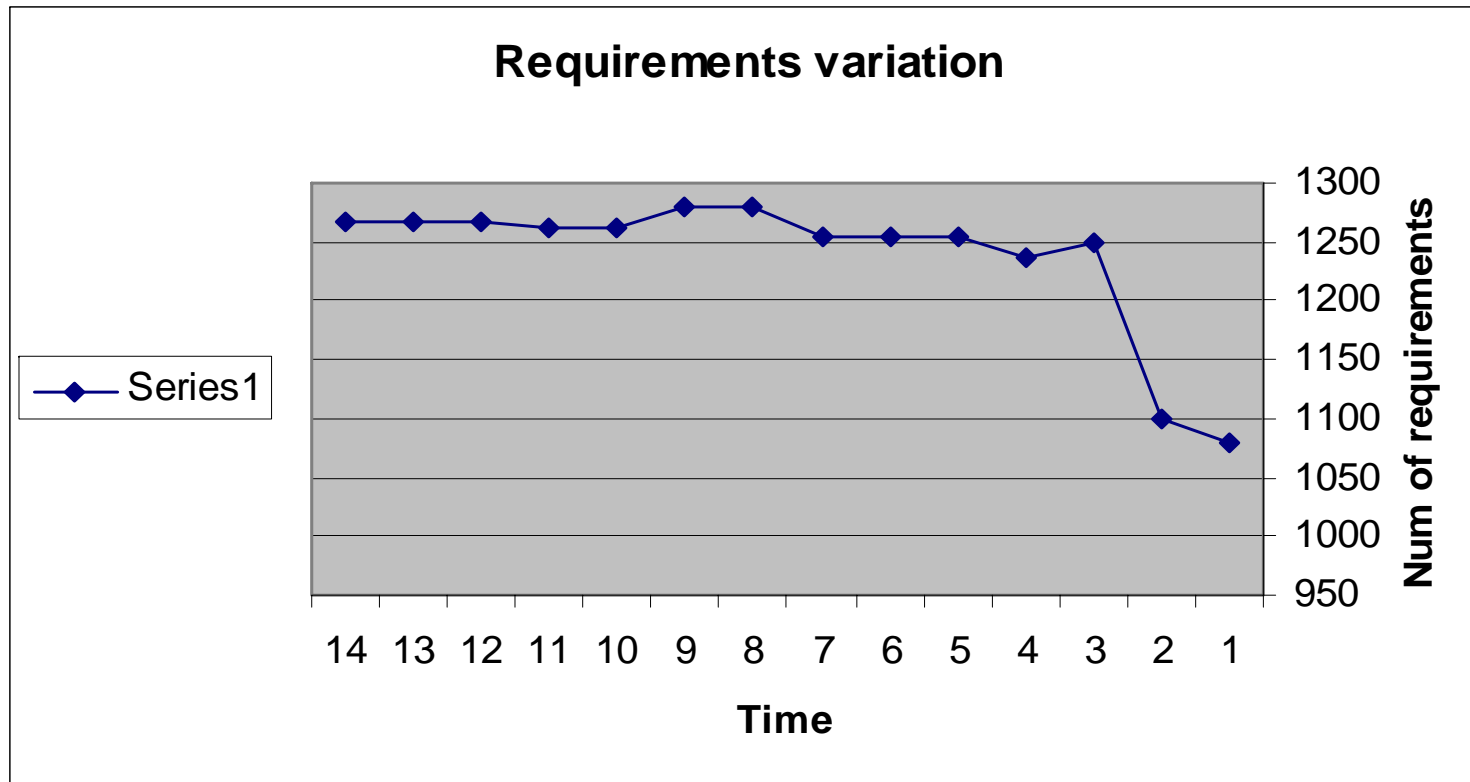
System Engineering Process Quality

- Requirements stability
- Developed and derived requirements' completeness
- Implementation quality
- Quality of verification

Requirements Stability (1)

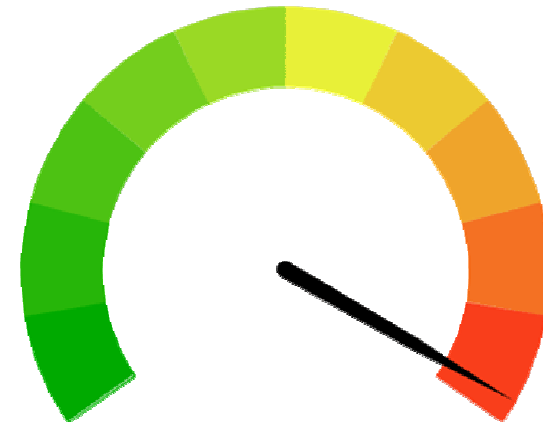
- Quantify the degree of change in the requirements:
 - Track original requirements
 - Identify changes in the requirements
 - Identify the reason of change according to:
 - Initiated by customer
 - Engineers' initiative

Requirements Stability (2)



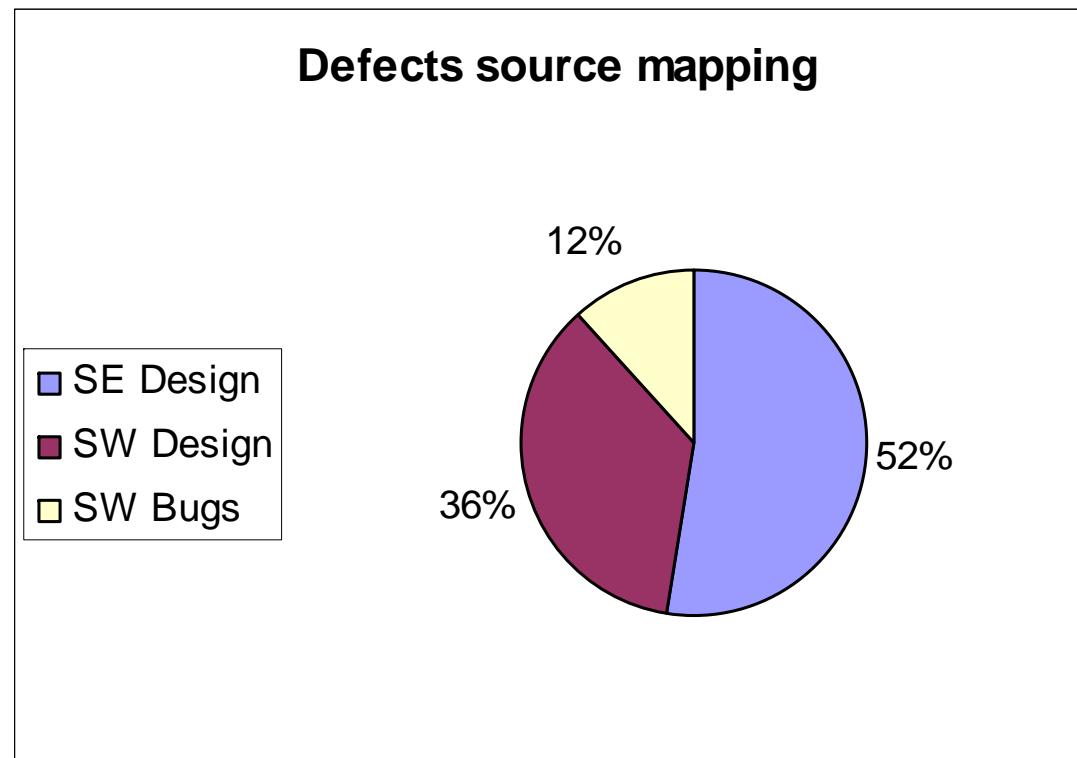
Implementation Quality (1)

- Quantify the project's team experience and quality due to trouble reports:
 - Use System Trouble Report technique
 - Track STR
 - Apply to all disciplines
 - Apply to all phases



Implementation Quality (2)

■ Example:



Verification Quality (1)

- Analyze opened System Trouble Reports:
 - Identify the phase of verification:
 - Unit test
 - Black box test
 - Sub-system test
 - System test
 - Identify criticality of STR

Verification Quality (2)

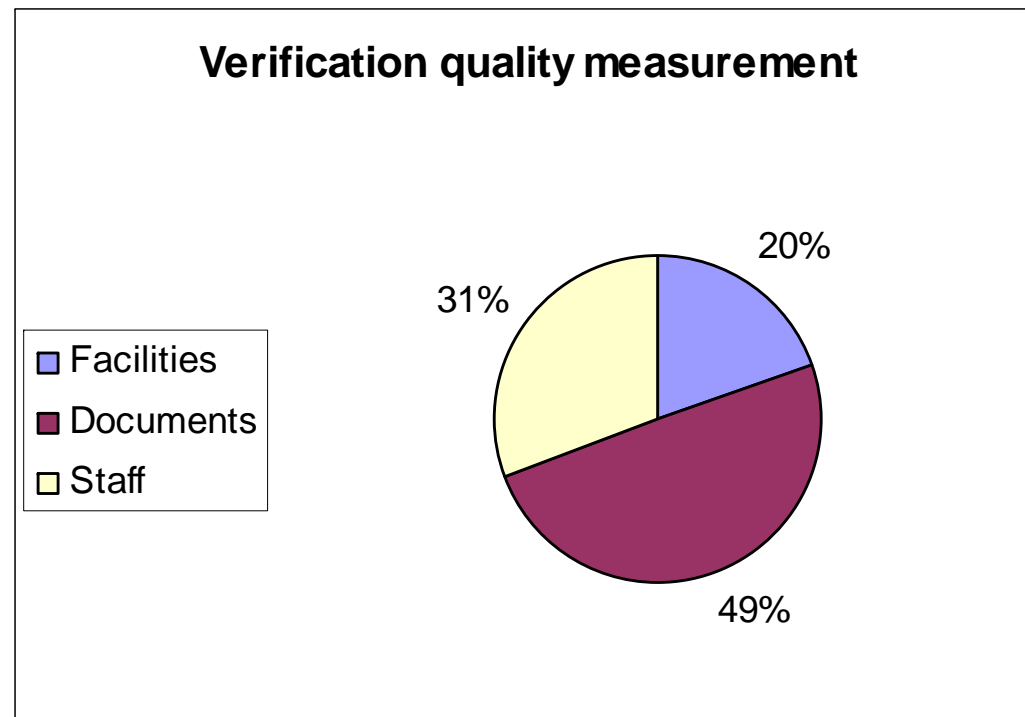
- Measurement techniques:
 - Count total number of critical STR
 - Count number of missed critical STRs that were not opened at previous verification phase

Verification Quality (3)

- Analyze opened System Trouble Reports (cont.):
 - For critical STR - analyze the previous stage of verification and the incompleteness of testing methods:
 - Facilities (quality of design)
 - Test procedure (quality of test documents)
 - Staff (quality of staff)

Verification Quality (4)

■ Example:



Summary

- Better prediction of quality, schedule and budget slip can be obtained by SE indexes measurement.
- Measurable System Engineering should catalyze the improvement of processes.
- Smart chosen measured parameters will create competition between groups and ambition for better work.

Systems View



Thank You