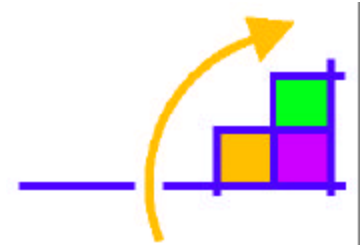


Quality Costs and PSM

Mike Bower

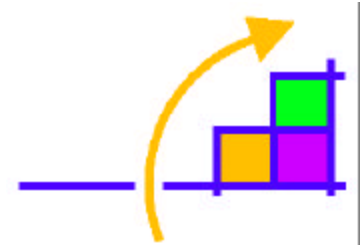
Software Improvements Pty Ltd

PSM UG conference July 2000



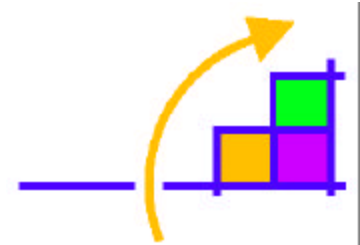
Outline of Presentation

- Some definitions of Cost of Quality (CoQ)
- Australian Standard AS 2561-1982
- Work that I did, and issues arising
- Other ideas
- The role of PSM



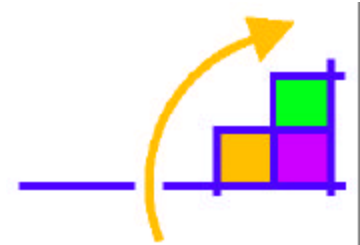
Philip Crosby - “Quality is Free” 1979

- **Cost of Quality:** *The expense of non-conformance - the cost of doing things wrong.*
- Also quoted by Watts Humphrey, Capers Jones, and James H Dobbins, and others.



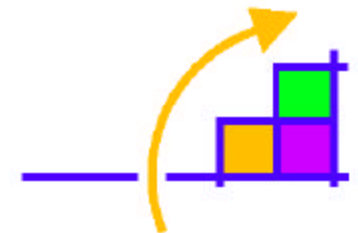
Philip Crosby - “Quality is Free” 1979

- More details provided, covering:
 - Prevention Costs
 - Appraisal Costs
 - Failure Costs
- based on the manufacturing area, does not address software.



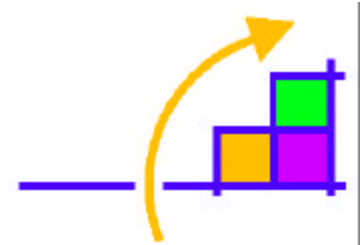
Cost of Quality as % of sales

Crosby's stages		Reported	Actual	CMM
Stage I	Uncertainty	unknown	20%	Initial
Stage II	Awakening	3%	18%	Repeatable
Stage III	Enlightenment	8%	12%	Defined
Stage IV	Wisdom	6.5%	8%	Managed
Stage V	Certainty	2.5%	2.5%	Optimizing

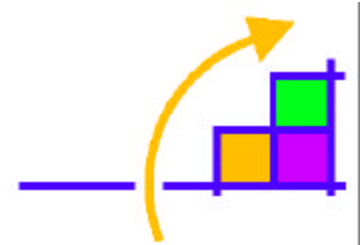


AS 2561-1982

- **Australian Standard: *Guide to the determination and use of quality costs***
 - Quality cost: - the difference between the actual cost to a company of making and selling products, and the cost which would exist if there were no failure, and no possibility of failure.

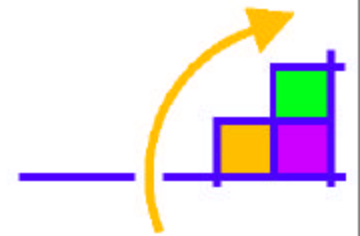


- More details are provided, covering:
 - Prevention Costs
 - Appraisal Costs
 - **Internal** Failure Costs - prior to transfer to customer
 - **External** Failure Costs - after transfer of ownership
- Also based on the manufacturing area, and does not address software.



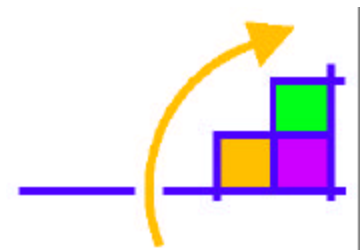
Cost analysis using this standard

- Part of Telecom Australia, in 1992/93
- Software development and on-going support for network operations
- Development and Support Centres in 3 states
- 5 major projects and Protocol Development area
- Budget \$15.5M, reported as Labour (\$4.5M) and Material (\$11M)



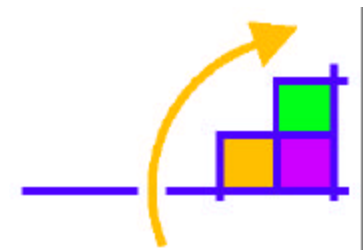
Prevention Costs

- **Quality Planning**
- **Quality Auditing**
- **Supplier Quality Assurance**
- **Design Review and Verification**
- Process Control Engineering
- Design Quality Test Equipment
- **Quality Training** Acquisition of Quality Data
- **Quality Improvement Programmes**
- Product Recall Insurance Product Recall Planning
- Other Prevention



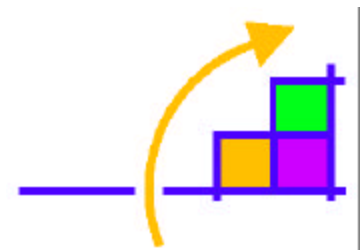
Appraisal Costs

- Design Appraisal Receiving Inspection
- **Inspect and Test** Materials Consumed
- **Inspect and Test Equipment**
- Analysis of Test Results
- Field Performance tests Stock Evaluation
- Approvals and Endorsements
- Record Storage of quality data
- Other Appraisal



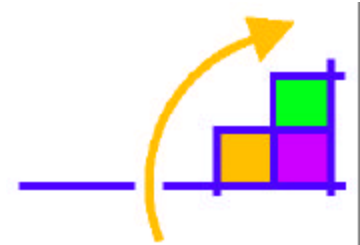
Internal Failure Costs

- Scrap
- **Replace, Rework, Repair**
- Re-inspection and re-test
- Defect analysis
- Disposition determination
- Downtime
- Downgrading (seconds)
- Other Internal Failure

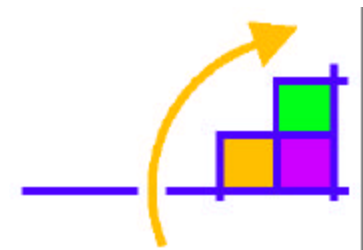
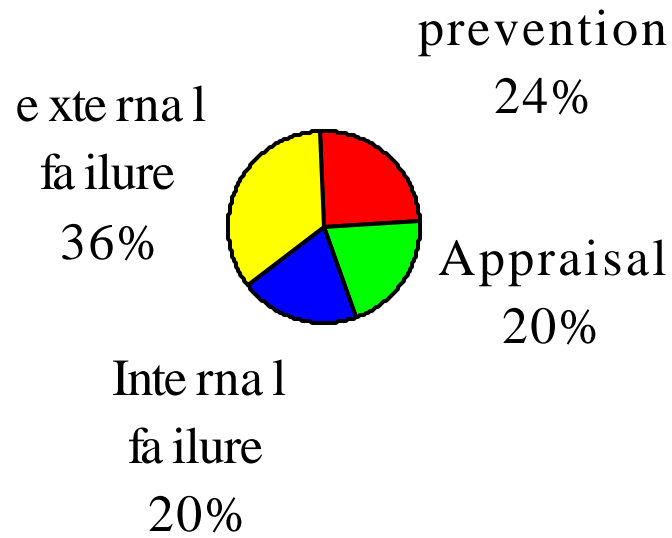


External Failure Costs

- Complaints
- Warranty Claims
- **Product Reject and Return**
- Concessions
- Loss of Sales
- Recall Costs
- Product Liability
- Other External Failure

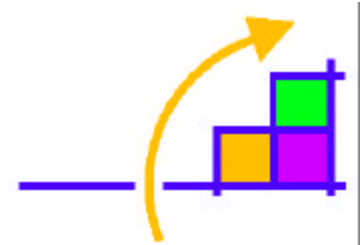


Summary of Quality Costs



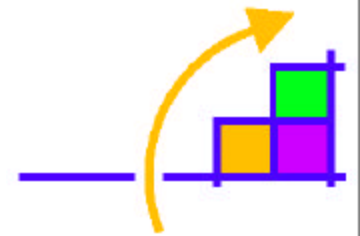
Summary Statistics

Prevention	\$470K	24%
Appraisal	\$386K	20%
Internal Failure	\$383K	20%
External Failure	\$698K	36%
Total Quality Cost	\$1937K	100%
Quality Cost as % of total expenditure		12.5%



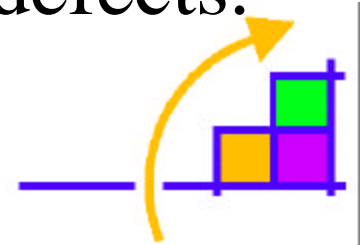
Positive points

- Some useful results were obtained, using basic accounting information and some assumptions, based on actual practice.
- The results were obtained with only a fairly modest effort.
- Management learned something more about software quality management.



Issues to consider

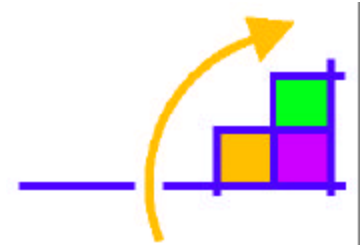
- Assumptions should be reviewed, and more accurate estimate of costs made.
- The report is at the organisation level for the year. Results for each office and major project are needed.
- The CoQ of the system life cycle should be developed.
- There should be a greater focus on defects.



Other work

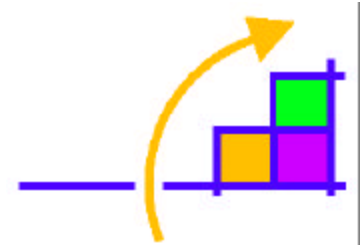
- **Using the Cost of Quality Approach for Software**

Herb Krasner, (Krasner Consulting),
in *Crosstalk, November 1998*



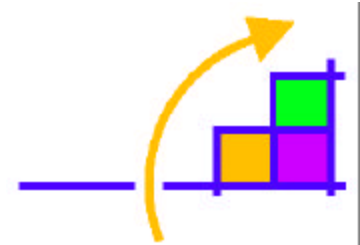
Herb Krasner's Points

- Uses a CoQ model similar to AS 2561.
- There is no validated economic theory of software quality today.
- Current work based on the theory used for manufacturing, with total CoQ having a point of diminishing returns. This may not apply to software.



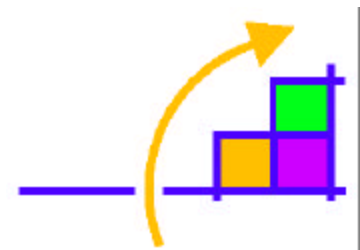
Herb Krasner's Points (cont.)

- We have collected very little data to challenge or validate this theory.
- Krasner provides a summary of the data found in the open literature.
- He also provides the framework of a cost of software quality programme. This includes some good advice on the practical aspects of collecting data and presenting the findings.



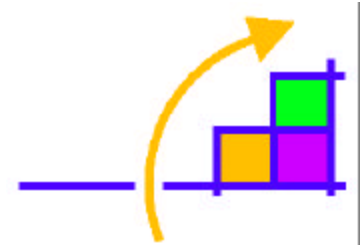
The role of PSM

- Consider **Cost of Quality** as an Issue on a project.
- Measurement Categories of
 - Prevention
 - Appraisal
 - Internal Failure
 - External Failure



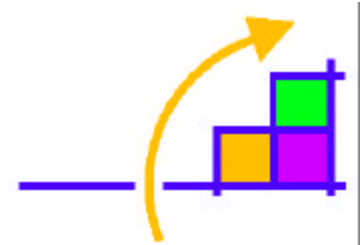
Prevention measures

- Measure (in hours or dollars)
 - Quality planning activities
 - Quality auditing activities
 - Training hours
 - Process improvement work during the project
 - Collecting and analysing measurements
- Aggregate these over time.



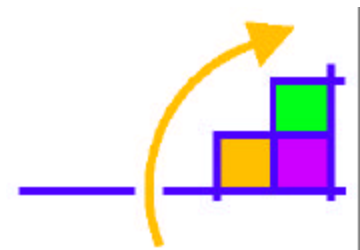
Appraisal measures

- Measure (in hours or dollars)
 - Review and inspection activities
 - Testing activities
 - Software quality assurance activities
 - Product quality audit activities
- Aggregate these over time



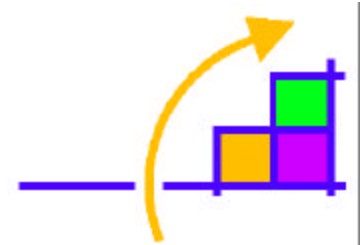
Internal Failure measures

- Measure (in hours or dollars)
 - Pre-release defect management activities
 - Rework activities
 - Re-reviews
 - Re-testing
- Measure
 - Defects
- Aggregate these over time.



Development Project

- The aggregate measures proposed previously could be shown against total development cost.
- Analyse cost of quality measures against defect measures.



Full project life cycle

- Measure (in hours or dollars)
 - Post-release technical support activities
 - Complaint investigation and resolution activities
 - Defect notification and resolution activities
 - Remedial upgrade activities
- Measure
 - Defects

