COCOMO® III

17th Practical Software and Systems Measurement (PSM)

USERS' GROUP WORKSHOP

24 February 2016

Topics

- What is COCOMO?
- Current effort/schedule estimation model
- Current quality estimation model
- COCOMO III project
- COCOMO III overview of model cost drivers

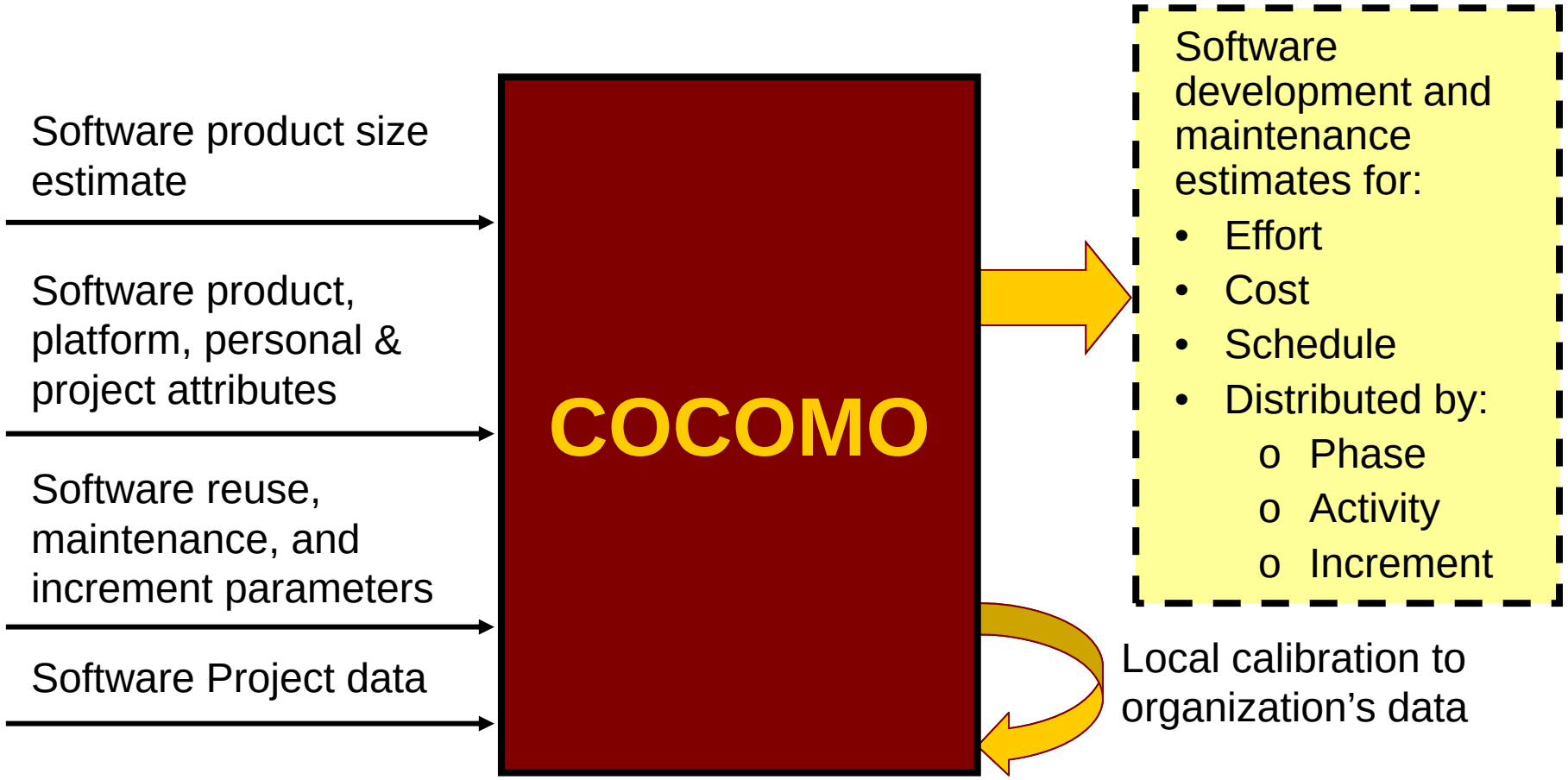
COCOMO®

- COCOMO® (COnstructure COst MOdel) is the most widely used software cost estimation model in the world
  - Registered Trademark for intellectual property protection
  - COCOMO 81 and COCOMO II models are open and free for anyone to use
  - Models have been commercialized
- It has been 16 years since the model has been updated and calibrated to new Software Engineering data
  - Some cost drivers (parameters) are no longer as relevant as they were in 2000
  - New cost drivers that influence effort have arisen
  - Some of the cost driver rating scales have shifted because of increasing software development capability over the years.

Purpose of Previous COCOMO Model

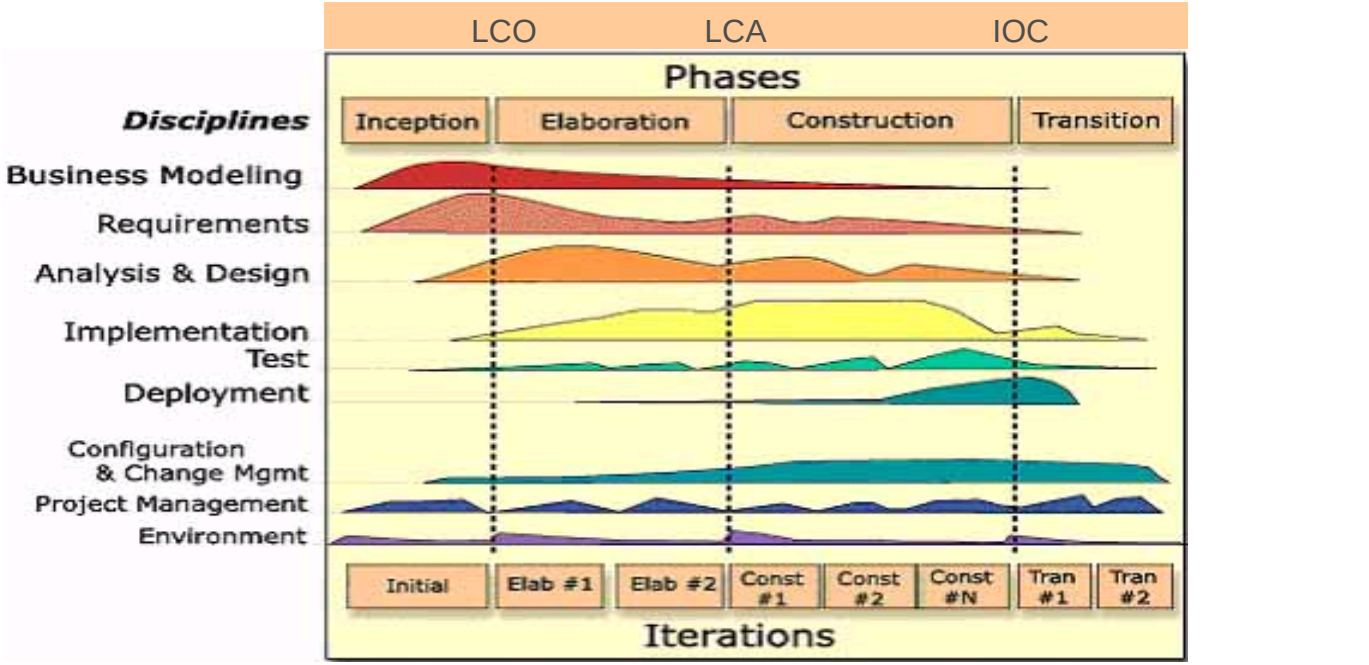
- To help people reason about the cost and schedule implications of their software decisions
  - Software investment decisions
    - When to develop, reuse, or purchase
    - What legacy software to modify or phase out
  - Setting project budgets and schedules
  - Negotiating cost/schedule/performance tradeoffs
  - Making software risk management decisions
  - Making software improvement decisions
    - Reuse, tools, process maturity, outsourcing
- Model versions supported
  - Early design
  - Post-architecture

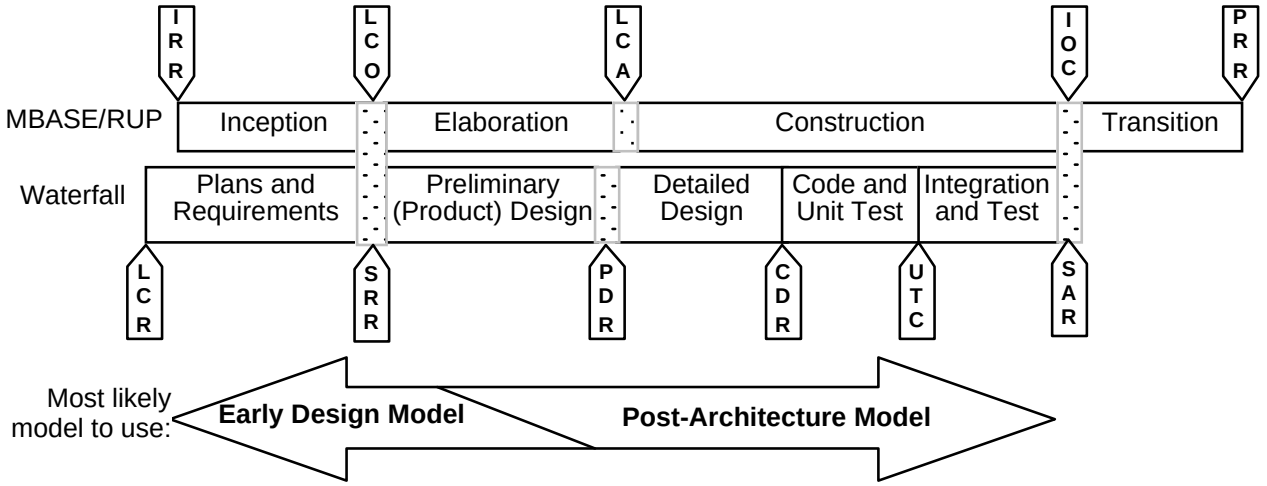
COCOMO Model



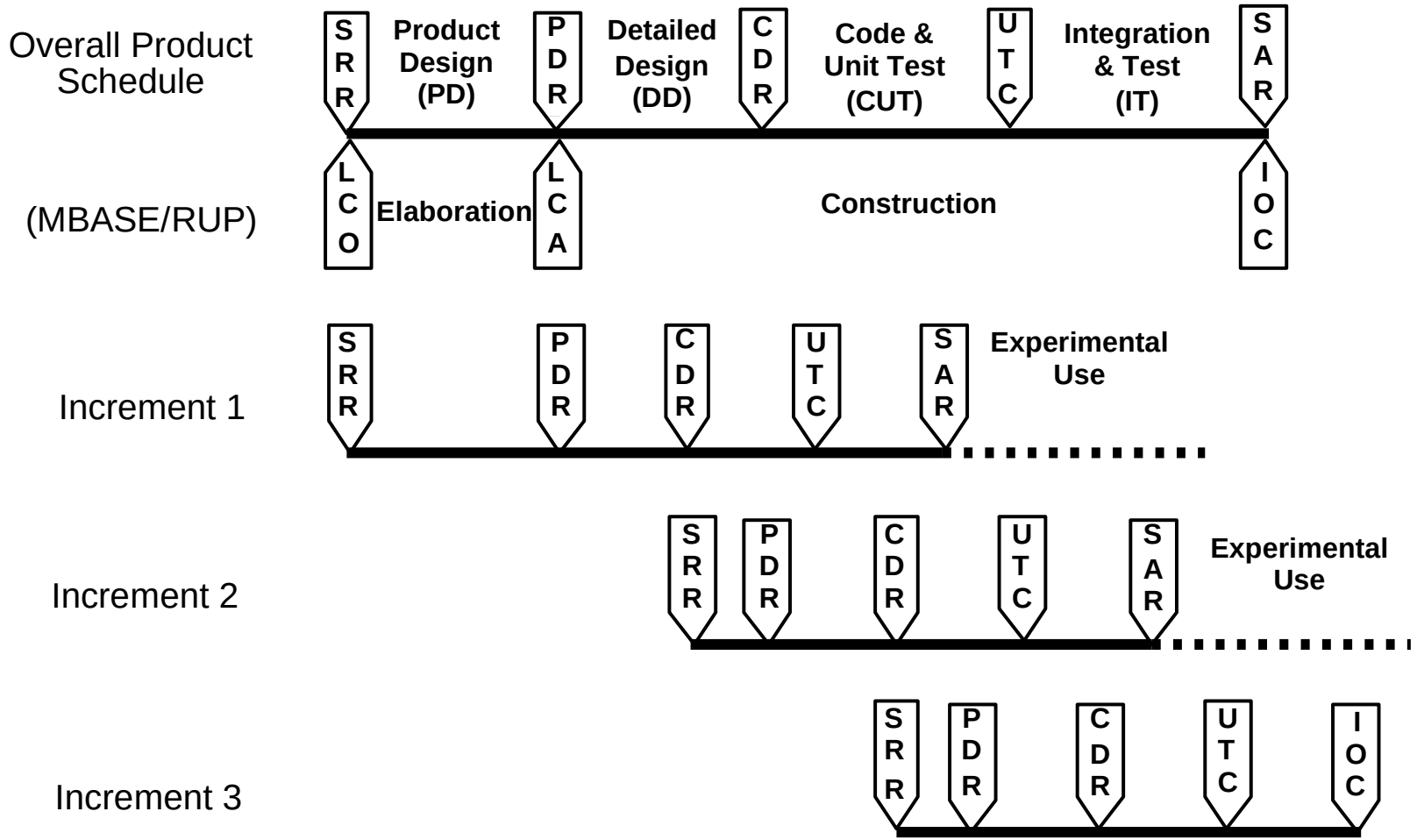
COCOMO is an open and free model

COCOMO II Model Phases

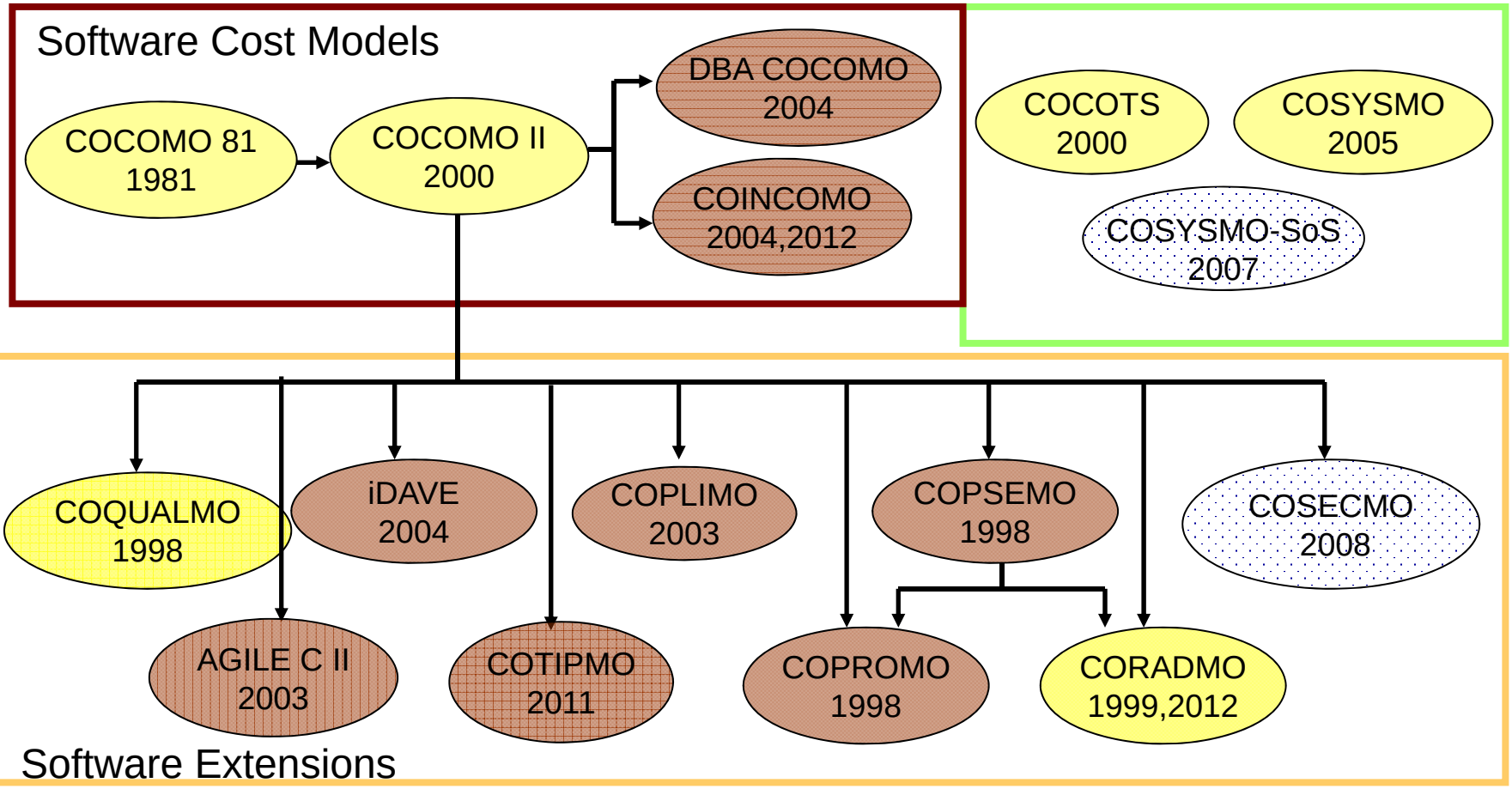




Incremental Estimation



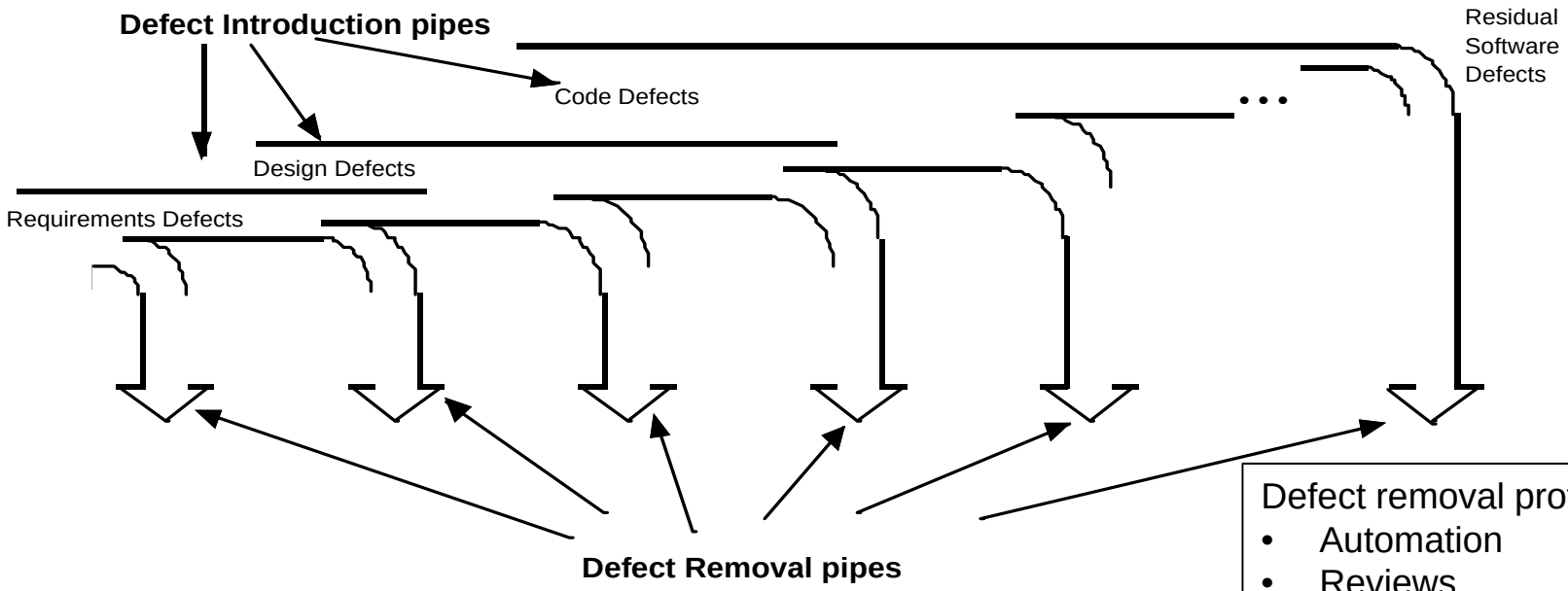
Historical Overview of COCOMO Suite of Models



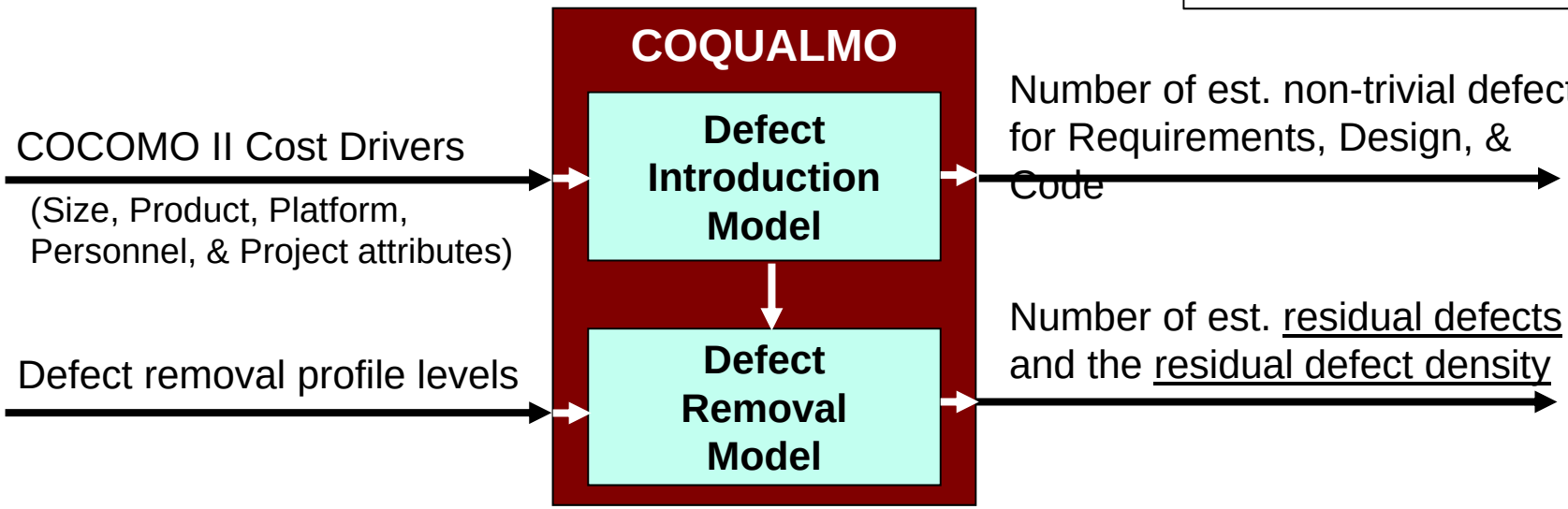
Legend:
- Model has been calibrated with historical project data and expert (Delphi) data
- Model is derived from COCOMO II
- Model has been calibrated with expert (Delphi) data

Dates indicate the time that the first paper was published for the model

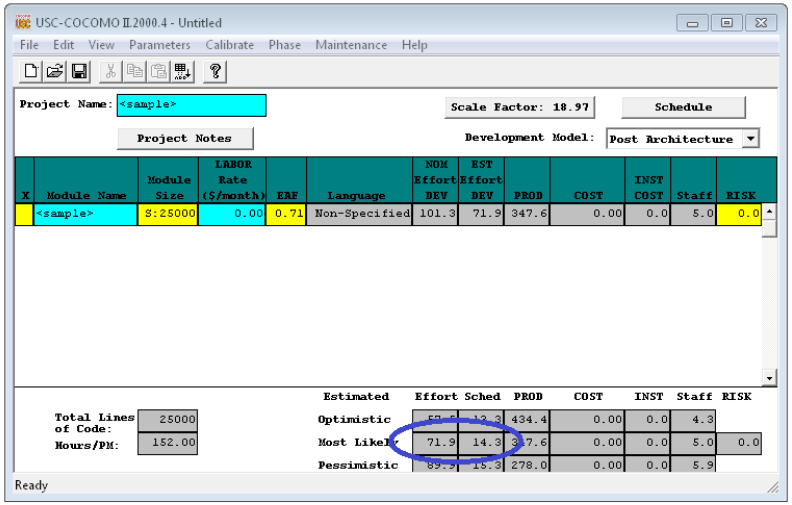
COQUALMO

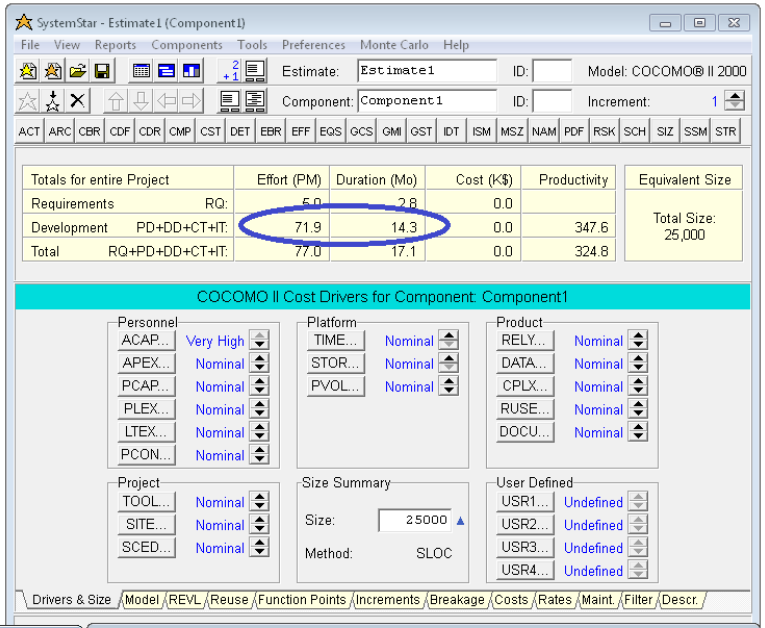


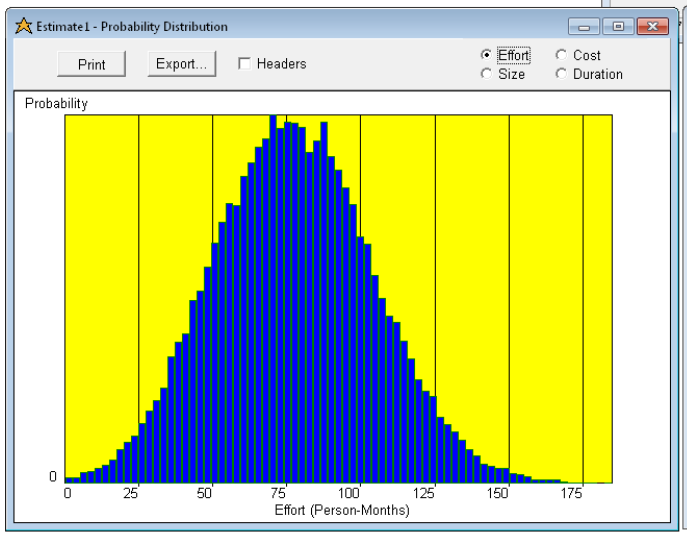
Defect removal profiles:
- Automation
- Reviews
- Testing

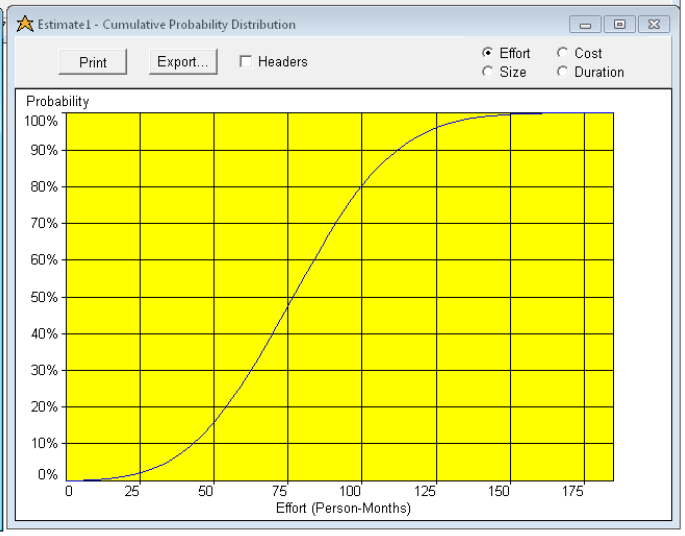


Commercialization – USC COCOMO vs. SystemStar









COCOMO III Project Purpose

- Broaden audiences of COCOMO® and address scope of modern projects: mobile devices, web/internet, big data, cloud-targeted, and multi-tenant software
- Modernize model size inputs
- Consider the impact of modern development processes (e.g. Agile)
- Improve the accuracy and realism of estimates
  - Improve driver definitions
  - New and updated software cost drivers and adjust their ratings as needed
  - Quality estimation capability
  - Point and range estimates based on risk
- Improve value of COCOMO® in decision-making

COCOMO III Project Scope

- COCOMO® III will product estimates for:
  - Effort, Schedule, Cost, Defects
- COCOMO® III can be applied at various moments in a project's lifecycle:
  - Early Estimation, Post-Architecture Estimation, Project Re-estimation
- COCOMO® III's functional vision
  - Single and Multiple component estimate
  - Analysis of alternatives
  - Analysis with Size-Effort-Schedule as independent variables
  - Support for different lifecycle processes
  - Lifecycle cost estimation
  - Legacy system transformation
  - Include **technical debt** and its effects on effort and schedule

COCOMO III Size Inputs

- Intent is to produce an estimation model that takes different software size inputs directly
  - Current software size other than source lines of code (SLOC) is first converted to SLOC and use as “equivalent” size in the model
  - Dependent on the data collected for calibration

- Software Requirements
- Function Point
- SNAP Points
- Fast Function Points
- COSMIC Points
- Object / Application Points

- Feature Points
- Use Case Points
- Story Points (*Agile Development*)

COCOMO III Cost Drivers -1

- Product Attributes
  - Impact of Software Failure (FAIL) (Formerly RELY)
  - Product Complexity (CPLX)
  - Developed for Reusability (RUSE)
  - Required Software Security (SECU)
  - Dropped:
    - Documentation Match to Lifecycle Needs
    - Database Size
- Platform Attributes
  - Platform Constraints (PLAT)
    - Combined Execution and Storage Constraints
  - Platform Volatility (PVOL)

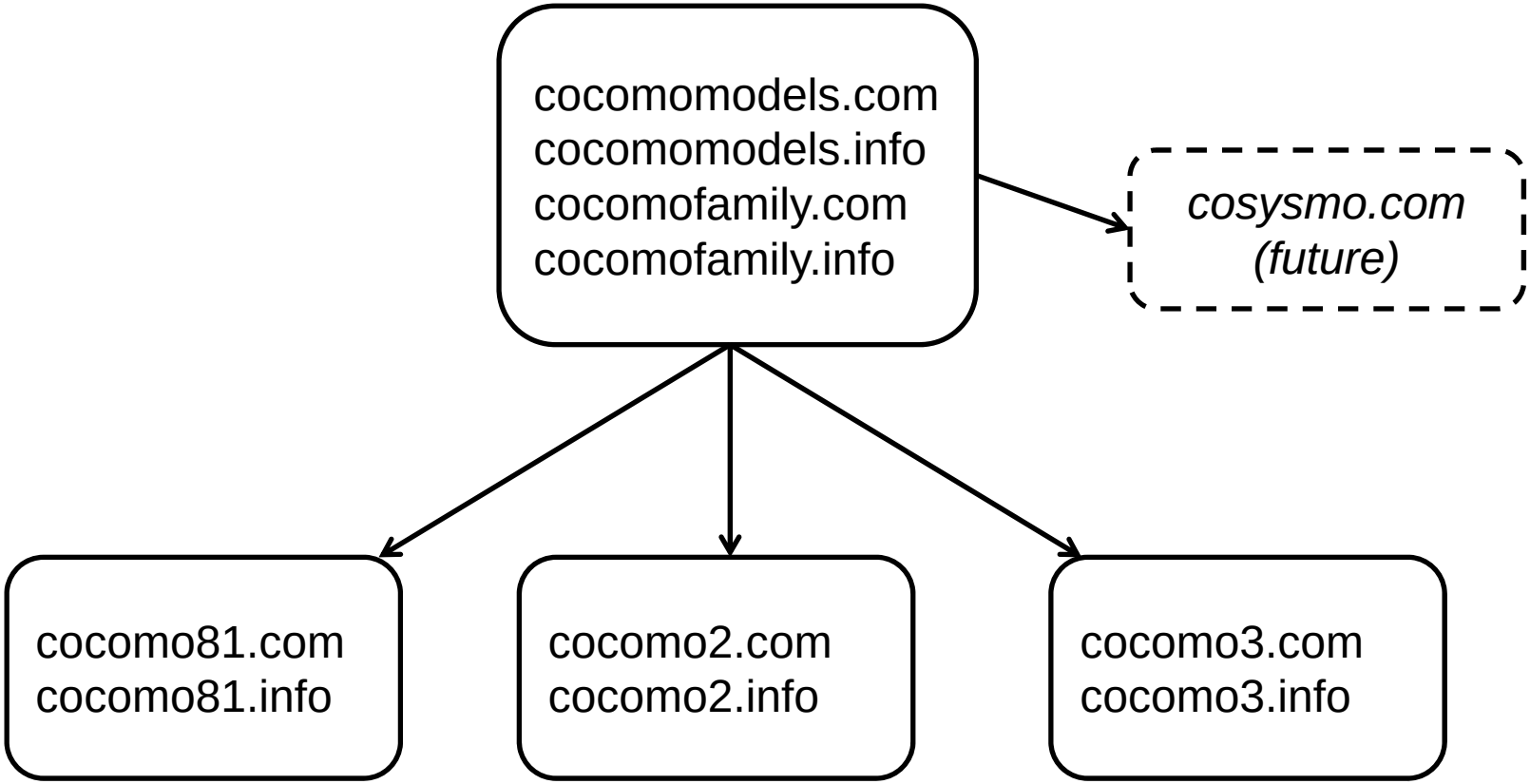
COCOMO III Cost Drivers -2

- Personnel Attributes
  - Analyst Capability (ACAP)
  - Programmer Capability (PCAP)
  - Personnel Continuity (PCON)
  - Applications Experience (APEX)
  - Language and Tool Experience (LTEX)
  - Platform Experience (PLEX)

COCOMO III Cost Drivers -3

- Project Attributes
  - Precedentedness (PREC)
  - Development Flexibility (FLEX)
  - Opportunity and Risk Resolution (RESL)
  - Stakeholder Team Cohesion (TEAM)
  - Process Capability & Usage (PCUS) (Formerly PMAT)
  - Use of Software Tools (TOOL)
  - Multisite Development (SITE)

COCOMO® Model Websites



Invitation to Participate

- CSSE invites you to collaborate on model development
  - Review model formulation
  - Submit data for model calibration
    - Actual Size
    - Effort
    - Schedule
    - Defects
    - Model Parameters
  - Review of COCOMO III model
  - If you contribute data for model calibration, you will receive:
    - An advanced copy of the new model
    - Comparison of your data with respect to other data points used to calibrate the model
- ***Please talk with me afterwards if you are interested***