COCOMO III Workshop: Refining the COCOMO III Model Outbrief

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Workshop Participants

1. Jim Alsted
2. Masumi Toyoshima
3. Allen Bouchard
4. Mike Konrad
5. Barry Boehm
6. Bill Nichols (on the phone)
7. Brad Clark (facilitator)

Workshop Agenda

- Brief Model Overview
- Overview of model cost drivers (handout)
- Delphi exercise on cost driver productivity ranges

Development Process Coverage

- Plan-driven
- Set of requirements “frozen” at the start of an iteration
- High- and low-level design activities executed
- Implementation followed by Integration activities
- Ends with an acceptance activity

Best Fits of Estimation-Types to ICSM Common Cases

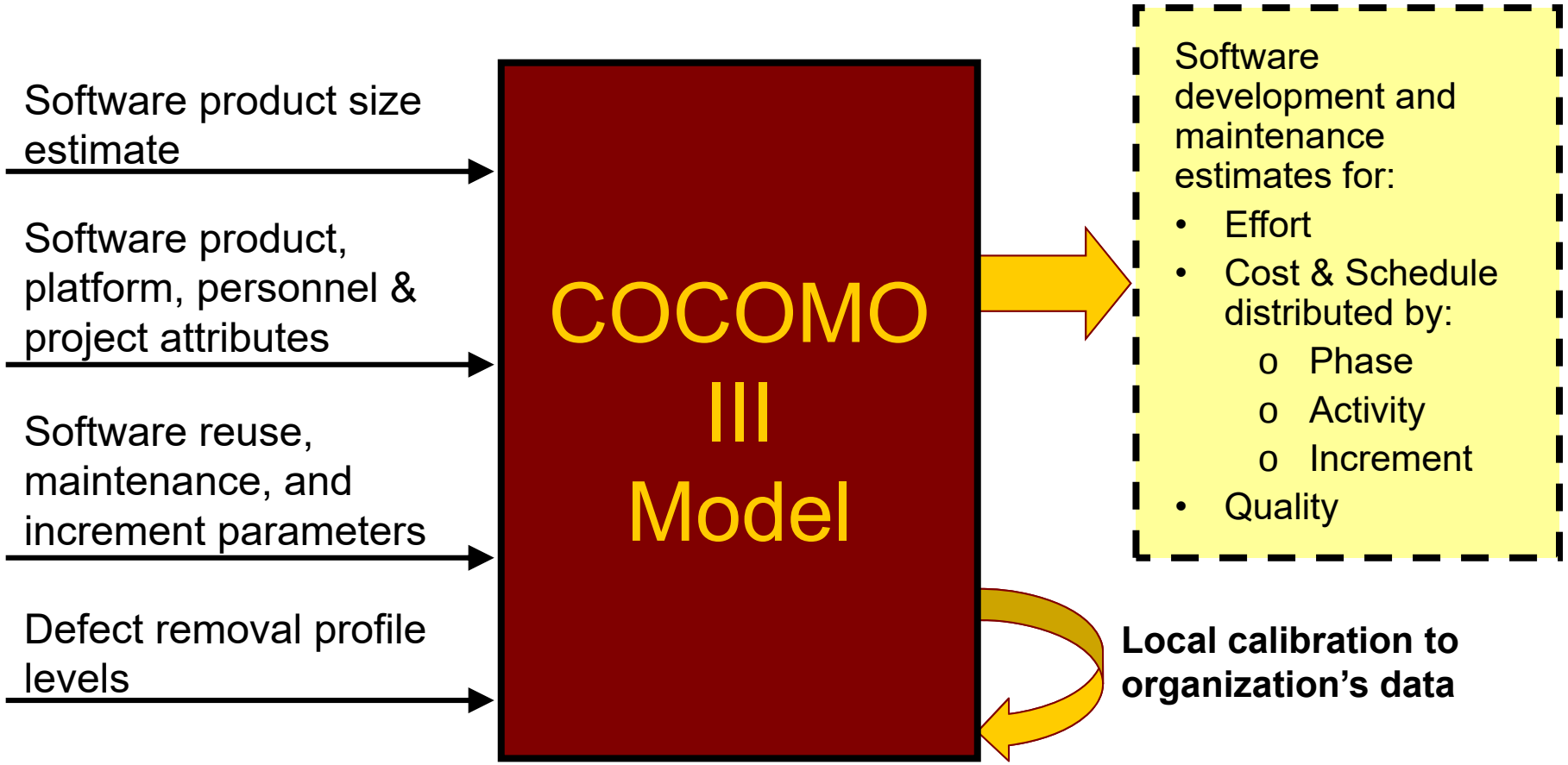
- Pure Agile: Planning Poker, Agile COCOMO III
- Architected Agile
  - COSYSMO for architecting; Planning Poker, CAIV-SAIV for sprints, releases; IDPD for large systems
- Formal Methods: $/SLOC by Evaluated Assurance Level
- NDI/Services-Intensive: Oracle, SAP, other ERP
  - RICE Objects: (R)eports, (I)nterfaces, (C)onversions, (E)nhancements
  - COCOTS, Value-Added Function Points, Agile for portions
- Hybrid Agile/Plan-Driven
  - Expert Delphi, COCOMO III, Agile for portions; IDPD
- Systems of Systems
  - COSYSMO for Integrator; Hybrid Agile/Plan-Driven for component systems (COCOMO III)
- Family of Systems: COPLIMO
- Brownfield: COSYSMO for refactoring; above for rebuilding

Model Breadth

- There are a number of different activities in software development:
  - Requirements analysis
  - Architecting
  - Detailed Design
  - Assembling or Coding
  - Integration Testing
  - System Testing
  - Acceptance Testing
  - Deployment
  - Training
- COCOMO III will cover a subset of these activities

Model Depth

- Development activities include/exclude different types of work:
  - Management
  - Requirements analysis
  - Product design
  - Programming
  - Test and evaluation
  - Configuration Management / Quality Assurance
  - Documentation
- COCOMO III covers a number of work types (next slide)
  - The work covered is an indicator for whether the model is suitable for estimating a development process (re: 11 cases discussed earlier)



COCOMO is an open and free model

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) - *New*
  - Dropped:
    - Documentation Match to Lifecycle Needs
    - Database Size
- **Platform Attributes**
  - Platform Constraints (PLAT) – *New*
  - 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)**
- Defect Removal Profile
  - Automated Analysis
  - People Reviews
  - Execution Testing and Tools

Delphi Exercise

- Attendees were asked to consider a nominal software development project
  - A nominal estimate is where all cost driver ratings were set to nominal
- Size:
  - 2,415 Function Points
  - 128,000 lines of estimated Java code
- Effort:
  - 610.4 Person Months
- Duration:
  - 30.5 Months
- Average staffing level:
  - 20 People

Delphi Example

Developed for Reusability (RUSE)

- **This cost driver accounts for the additional effort needed to construct components intended for reuse on the current or future projects. This effort is consumed with creating more generic design of software, more elaborate documentation, and more extensive testing to ensure components are ready for use in other applications.**
- **Ratings:**
  - **Very Low: N/A**
  - **Low: none**
  - **Nominal: across project**
  - **High: across program**
  - **Very High: across product line**
  - **Extra High: across multiple product lines**

Low # People:_____ Nominal # People: 20 High # People:_____

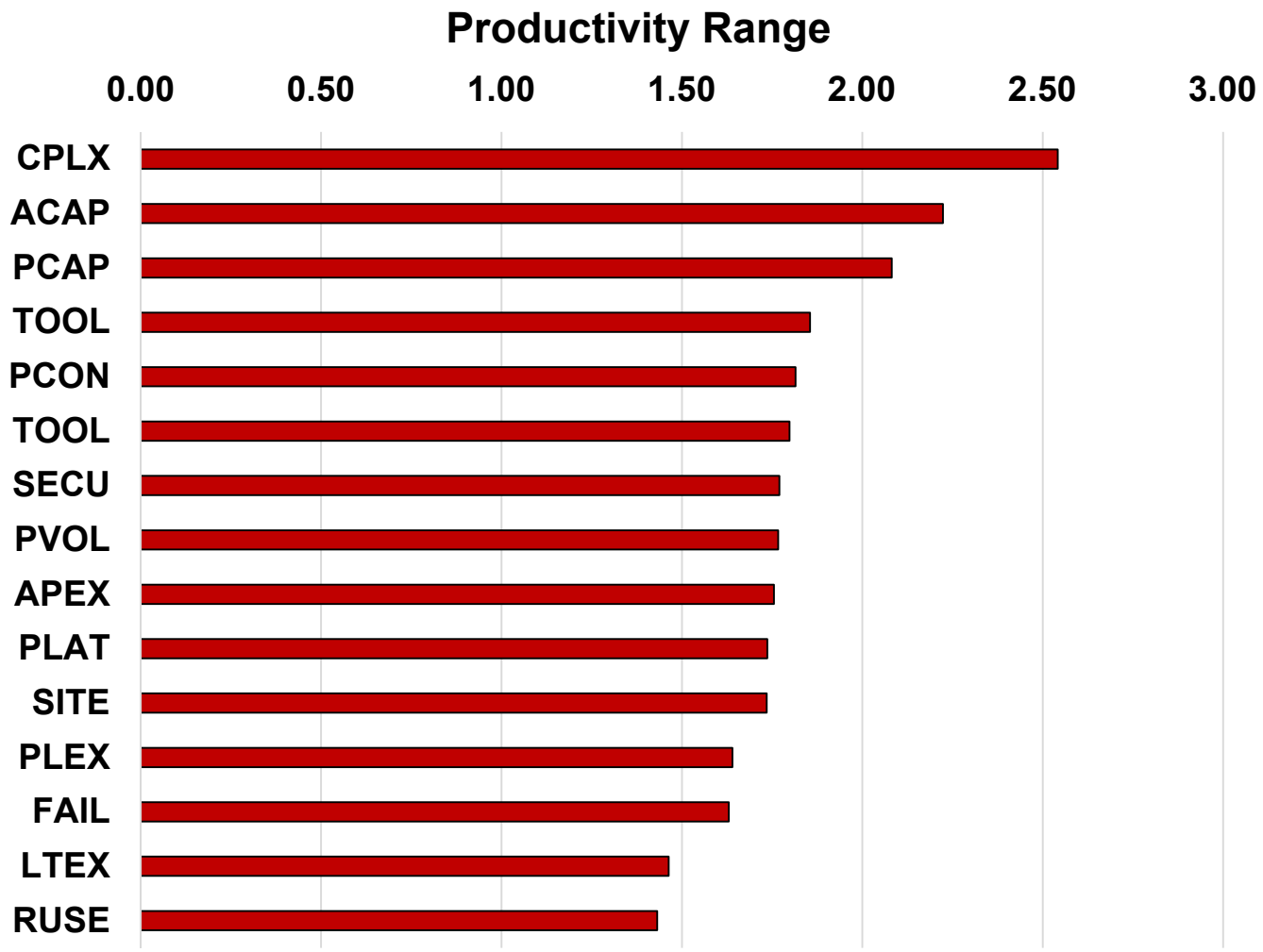
1st Round Delphi Results

CD	1	2	3	4	5	6	Mean	StdDev	CV
CPLX	2.33	1.60	2.00	5.00	1.88	1.50	2.38	1.32	0.55
SECU	1.50	1.30	1.25	2.50	2.50	1.20	1.71	0.62	0.36
FAIL	1.56	1.30	2.00	3.00	2.00	1.40	1.88	0.62	0.33
ACAP	2.00	2.60	2.00	4.00	2.00	2.30	2.48	0.78	0.31
TOOL	1.44	1.70	1.66	3.00	1.73	1.60	1.86	0.57	0.31
APEX	1.50	1.30	1.66	2.67	1.80	1.60	1.76	0.48	0.27
PLAT	1.55	1.20	1.50	2.50	2.00	1.67	1.74	0.46	0.26
PVOL	1.53	1.60	2.00	2.50	1.67	1.30	1.77	0.43	0.24
PCAP	1.80	2.30	1.66	2.67	1.56	2.50	2.08	0.47	0.23
PCON	1.62	1.60	2.00	2.50	1.67	1.50	1.82	0.38	0.21
RUSE	1.32	1.40	1.25	1.75	1.67	1.20	1.43	0.23	0.16
PLEX	1.41	1.80	1.66	2.00	1.67	1.30	1.64	0.25	0.16
SITE	1.41	1.50	2.00	2.00	1.80	1.70	1.74	0.25	0.14
LTEX	1.41	1.30	1.50	1.60	1.67	1.30	1.46	0.15	0.11

2nd Round Delphi Results

CD	1	2	3	4	5	6	Mean	StdDev	CV
FAIL	1.65	1.30	1.63	2.00	1.70	1.50	1.63	0.23	0.14
CPLX	2.33	2.30	2.92	3.30	2.40	2.00	2.54	0.48	0.19
SECU	1.67	1.30	1.45	2.00	3.00	1.20	1.77	0.67	0.38
ACAP	2.00	2.00	2.14	2.50	2.40	2.30	2.22	0.21	0.09
TOOL	1.44	1.70	1.75	2.50	1.80	1.60	1.80	0.37	0.20

Final Delphi Results



Next Steps/Action Items

- Refine the definition of the Required Security cost driver
- Conduct 1 additional Delphi to gather more expert opinion input
- Commence model data collection

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Questions?