CORADMO
Constructive Rapid Application Development Model

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Background

RAD (Rapid Application Development)
an application of any of a number of techniques or strategies to reduce software development cycle time

Another step

As COCOMO II evolves, it will have a more extensive schedule estimation model, reflecting the different classes of process model a project can use; the effects of reusable and COTS software; and the effects of applications composition capabilities.

COCOMO II Schedule

- Reflects a waterfall process model
- Duration calculation unreasonable for small projects
- Model does not address RAD strategies

Need to Improve Classic Schedule Model

Need stronger capability to reason about RAD Opportunity Tree strategies/tradeoffs

- Reuse, Very High Level Languages (VHLL) (RVHL)
- Development Process Reengineering (DPRS)
- Collaboration Technology (CLAB)
- Architecture, Risk Resolution (RESL)
- Prepositioning Assets (PPOS)

COCOMO II Duration Calculation

$$\text{Months} \approx 3 \sqrt[3]{\text{Person-Months}}$$
**CORADMO RAD Opportunity Tree**

- **Eliminating Tasks**
  - Business process reengineering - DPRS
  - Development process reengineering - DPRS
  - Reusing assets - RVHL
  - Applications generation - RVHL
  - Design-to-schedule - DPRS
  - Tools and automation - O
  - Workstreaming (80-20) - O
  - Increasing parallelism - DPRS
  - Reducing failures - RVHL
  - Reducing their effects - RVHL

- **Reducing Time Per Task**
  - Early error elimination - RESL
  - Process anchor points - RESL
  - Improving process maturity - O
  - Collaboration efficiency - CLAB
  - Avoiding high fan-in, fan-out - DPRS
  - Reducing task variance - DPRS
  - Removing tasks from critical path - DPRS

- **Reducing Backtracking**
  - Prepositioning resources - PPOS
  - Nightly builds, testing - PPOS
  - Weekend warriors, 24x7 development - PPOS

- **Activity Network Streamlining**
  - Early error elimination - RESL
  - Process anchor points - RESL
  - Improving process maturity - O
  - Collaboration efficiency - CLAB
  - Avoiding high fan-in, fan-out - DPRS
  - Reducing task variance - DPRS
  - Removing tasks from critical path - DPRS

- **Increasing Effective Workweek**
  - Prepositioning resources - PPOS
  - Nightly builds, testing - PPOS
  - Weekend warriors, 24x7 development - PPOS

- **Better People and Incentives**
  - O - covered by classic cube root model

- **Transition to Learning Organization**
  - O - covered by classic cube root model

(Source: 1997 CSE Focused Workshop on Rapid Application Development)

**CORADMO Process Model**

- **Stages**
  - Inception
  - Elaboration
  - Construction
  - Transition

- **Process Activities**
  - Requirements Capture
  - Analysis & Design
  - Implementation
  - Test

- **Supporting Activities**
  - Management
  - Environment
  - Deployment

- **Activities & Staff/Loading**

(Source: Rational Software Corporation)
COSSEMO Duration Calculation

Months = F(PM)

- COSSEMO
- CII-M [Cube Root]
- COSSEMO-M [Square Root]
- CII-M

Logical COCOMO II RAD Extension

COCOMO II cost drivers (except SCED)

Language Level, experience, ...

Stage Distributions

Baseline effort, schedule

Effort, schedule by stage

RAD effort, schedule by stage
Reuse and VHLLs (RVHL)

Standard 3GL module reuse: no adjustment

Schedule compression in Inception and Elaboration stages due to faster prototyping, option exploration
- effect depends on level of capability and experience in doing this (similar to Rapid Prototyping experience)
- same effect on effort; staff level held constant

<table>
<thead>
<tr>
<th>Schedule and Effort Multipliers</th>
<th>Rapid Prototyping Experience Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VL</td>
</tr>
<tr>
<td>Inception</td>
<td>1.04</td>
</tr>
<tr>
<td>Elaboration</td>
<td>1.02</td>
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<tr>
<td>Construction</td>
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</table>
Development Process Reengineering and Streamlining (DPRS)

Detailed rating scale provided
Gains depend on current level of bureaucracy

- Same effect on effort; staff level held constant

<table>
<thead>
<tr>
<th>Schedule and Effort Multipliers</th>
<th>Inception</th>
<th>Elaboration</th>
<th>Construction</th>
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</thead>
<tbody>
<tr>
<td>VL - Heavily Bureaucratic</td>
<td>1.20</td>
<td>1.15</td>
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<tr>
<td>L - Bureaucratic</td>
<td>1.08</td>
<td>1.06</td>
<td>1.06</td>
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<tr>
<td>N - Basic good business practices</td>
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<tr>
<td>H - Partly streamlined</td>
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<td>.98</td>
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<tr>
<td>VH - Fully streamlined</td>
<td>.90</td>
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Schedule and effort multipliers depend on current level of bureaucracy.

VL - Heavily Bureaucratic
L - Bureaucratic
N - Basic good business practices
H - Partly streamlined
VH - Fully streamlined

Schedule and effort multipliers:
- VL: 1.20
- L: 1.08
- N: 1.0
- H: 0.96
- VH: 0.90

Effort and schedule improvements:
- VL: 1.15
- L: 1.06
- N: 1.0
- H: 0.98
- VH: 0.95

Schedule and Effort Multipliers:
- VL - Heavily Bureaucratic: 1.20
- L - Bureaucratic: 1.08
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- VH - Fully streamlined: 0.90

Multipliers for effort reduction:
- VL: 1.15
- L: 1.06
- N: 1.0
- H: 0.98
- VH: 0.95

Inception:
- VL: 1.20
- L: 1.08
- N: 1.0
- H: 0.96
- VH: 0.90

Elaboration:
- VL: 1.15
- L: 1.06
- N: 1.0
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Construction:
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Construction:
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DPRS Rating Scale

<table>
<thead>
<tr>
<th>Number of approvals required per task</th>
<th>VL</th>
<th>L</th>
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<td>Mature</td>
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<td>Actively Reduced</td>
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<tr>
<th>Reduced task dependencies, critical path tasks</th>
<th>VL</th>
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<th>H</th>
<th>VH</th>
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<th>Followup to expedite task completion</th>
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<th>Process measurement &amp; streamlining</th>
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Collaboration Efficiency (CLAB)

Detailed rating scale provided

- SITE ratings also include
  - collaboration tool maturity, experience
  - scope effects: domain, negotiation, option-analysis tool support

Same effect on effort; staff level held constant

Schedule & Effort | VL | L | N | H | VH | EH
--- | --- | --- | --- | --- | --- | ---
Inception Multipliers | 1.21 | 1.10 | 1.00 | 0.93 | 0.86 | 0.80
Elaboration Multipliers | 1.15 | 1.07 | 1.00 | 0.95 | 0.90 | 0.86
Construction Multipliers | 1.10 | 1.05 | 1.00 | 0.98 | 0.95 | 0.93

Architecture / Risk Resolution (RESL)

Same as COCOMO II RESL rating scale

Enables parallel construction

- Assumes higher level of staffing available and used
- Otherwise no schedule compression

| Schedule Multipliers (Effort Unchanged) | VL | L | N | H | VH | EH |
--- | --- | --- | --- | --- | --- | ---
Inception | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
Elaboration | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
Construction | 1.0 | 1.0 | 1.0 | .91 | .83 | .75 |
Prepositioning Assets (PPOS)

Degree to which assets are pre-tailored to project and furnished to project for use on demand

- People skills and teambuilding
- Processes and tools
- Architecture and componentry

<table>
<thead>
<tr>
<th>PM/M=P Multipliers</th>
<th>N Basic project legacy, no tailoring</th>
<th>H Some prepositioning &amp; tailoring</th>
<th>VH Key items prepositioned &amp; tailored</th>
<th>EH All items prepositioned &amp; tailored</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating Inception</td>
<td>1.0/1.0=1.0</td>
<td>1.03/.93=1.11</td>
<td>1.06/.86=1.23</td>
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<tr>
<td></td>
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