THE DEVELOPMENT OF WICOMO

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The Development of WICOMO
Introduction

- The Development of WICOMO
- WICOMO Ports
- Frequently Requested Enhancements
- Known Bugs
Chronology

Fall 1981  
*Software Engineering Economics* Published

January 1982  
WICOMO Development Initiated

May 1982  
WICOMO Development Complete
Development Environment

- Developed in a Wang Institute *Project Course*
- 5 Students, 2 to 7 years experience
- Democratic team
- 13 week semester, 10 hours each = 650 hours for the project, nominally
- 3 other courses taken concurrently (including *Project Management* and *Software Engineering*)
## WICOMO Development -- Time Distribution by Phase

<table>
<thead>
<tr>
<th>Task</th>
<th>Hours</th>
<th>Percentage of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements Definition &amp; Planning</td>
<td>40</td>
<td>5%</td>
</tr>
<tr>
<td>Specification</td>
<td>161</td>
<td>20%</td>
</tr>
<tr>
<td>Architectural Design</td>
<td>88</td>
<td>11%</td>
</tr>
<tr>
<td>Preliminary Test Plan</td>
<td>46</td>
<td>6%</td>
</tr>
<tr>
<td>Detailed Design, Programming, Unit Test</td>
<td>403</td>
<td>49%</td>
</tr>
<tr>
<td>Design &amp; Doc</td>
<td>69</td>
<td>9%</td>
</tr>
<tr>
<td>Code &amp; Fix</td>
<td>191</td>
<td>23%</td>
</tr>
<tr>
<td>Unit Test</td>
<td>81</td>
<td>10%</td>
</tr>
<tr>
<td>Review &amp; Meet</td>
<td>51</td>
<td>6%</td>
</tr>
<tr>
<td>Misc</td>
<td>11</td>
<td>1%</td>
</tr>
<tr>
<td>Integration Testing &amp; Final Documentation</td>
<td>75</td>
<td>9%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>813</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
What explains the High Quality?

- Clear requirements were written
- Prototype was developed -- *and thrown away*
- User's Manual was written during specification phase
- Architectural design review
- Every line of code was reviewed before testing
Why is WICOMO so easy to port?

Requirements specified that WICOMO would run on Primos.

WICOMO was developed on UNIX 4.1.

As a consequence, it is easy to port it to other Pascal environments.
How well would COCOMO have predicted WICOMO?

Current Component: wicomo
Level: 1

RELY: nom  DATA: nom  CPLX: nom
TIME: nom  STOR: nom  VIRT: nom  TURN: lo
AEXP: nom  PCAP: hi  VEXP: lo  LEXP: lo
MODP: hi  TOOL: nom  SCED: nom

PDCOST:$ 0  DDCOST:$ 0  CUTCOST:$ 0  ITCOST:$ 0

DSI: 3900

--------------------------------------------

MODE:* organic
How well would COCOMO have predicted WICOMO?

<table>
<thead>
<tr>
<th>Phase</th>
<th>Man-Months</th>
<th>Cost (K$)</th>
<th>Months</th>
<th>Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD</td>
<td>1.6</td>
<td>0.0</td>
<td>1.2</td>
<td>1.3</td>
</tr>
<tr>
<td>DD</td>
<td>2.6</td>
<td>0.0</td>
<td>3.4</td>
<td>1.7</td>
</tr>
<tr>
<td>CUT</td>
<td>3.3</td>
<td>0.0</td>
<td>(included in DD)</td>
<td></td>
</tr>
<tr>
<td>IT</td>
<td>1.5</td>
<td>0.0</td>
<td>1.1</td>
<td>1.4</td>
</tr>
<tr>
<td>Total</td>
<td>9.0</td>
<td>0.0</td>
<td>5.8</td>
<td></td>
</tr>
</tbody>
</table>
Reasons for Discrepancy

COCOMO hasn’t been calibrated for Wang Institute

No communication or decision making delays in the Project Course
How Many copies of WICOMO have been Distributed?

<table>
<thead>
<tr>
<th>System</th>
<th>Copies</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIX 4.1</td>
<td>70</td>
</tr>
<tr>
<td>VMS</td>
<td>77</td>
</tr>
<tr>
<td>Primos</td>
<td>7</td>
</tr>
<tr>
<td>IBM PC</td>
<td>70</td>
</tr>
<tr>
<td>Wang PC</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>231</strong></td>
</tr>
</tbody>
</table>

How much support does Wang Institute supply?

- None guaranteed!!
- You can get help if you can’t install WICOMO
- We update the User’s Manual occasionally
- We’ll listen to technical questions -- usually we’re able to satisfy those who call
- We hope to add some enhancements in the next year
- No other ports are planned
Frequently Requested Enhancements

- Add requirements phase estimates (18 people)
- Add Maintenance phase estimates (20 people)
- Support basic, intermediate, and detailed models (7 people)
- Automatically adapt to terminal (8 people)
- Record History & Actuals (23 people)
- Improve initialization speed
- Improve help speed
- Add Adapted software
Frequently Requested Enhancements -- continued

- Pert estimating
- Assist in calibration
- Link to Gantt charts
- Hold schedule or team size constant; vary other parameters
- Check for existence of files
- Permit in-between cost driver values
- Other reports: Effort vs. Activity
Known Bugs

Schedule Cost driver isn’t implemented properly