User Manual

COCOMO II.2000
Post-Architecture Model
Spreadsheet Implementation
(Microsoft Excel 1997)

Center for Software Engineering
University of Southern California
# Manual for the Spread Sheets of Post-Architecture Model

## I. Explanation of Spreadsheet

- **PostArch**

## Scale Factor

- **PREC**
- **FLEX**
- **RESL**
- **TEAM**
- **PMAT**
- **PMAT Eval**

## Group Of Product Factors

- **RELY**
- **DATA**
- **CPLX**
- **RUSE**
- **DOCU**

## Group Of Platform Factors

- **TIME**
- **STOR**
- **PVOL**

## Group Of Personnel Factors

- **ACAP**
- **PCAP**
- **APEX**
- **PLEX**
- **LTEX**
- **PCON**

## Group Of Project Factors

- **TOOL**
- **SITE**
- **SCED**

## II. Relationship Of the Spreadsheets
I. Explanation of COCOMO Spreadsheet Manual for Post Architecture Model

There are 24 spreadsheets in this COCOMO Spreadsheet Post Architecture Model. The users can find the following information at this manual.

- the functions of each spreadsheet
- the functions and operations of some specific cells
- the specific linkages of the factors in the spreadsheets

The Sources Of The Rating Values And The Formula

Rating Values: COCOMO manual

Sunita Chulani

Formula: COCOMO Manual
**PostArch**

**Scale Factor (SF) Section**

This section contains Scale Factors: PREC, FLEX, RESL, TEAM, and PMAT. For the full titles and the explanations of above factors, please check COCOMO II manual.

<table>
<thead>
<tr>
<th>Scale Factor</th>
<th>Very Low</th>
<th>Low</th>
<th>Norm</th>
<th>High</th>
<th>Very High</th>
<th>Extra High</th>
</tr>
</thead>
<tbody>
<tr>
<td>PREC</td>
<td>6.20</td>
<td>4.96</td>
<td>3.72</td>
<td>2.48</td>
<td>1.24</td>
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<tr>
<td>FLEX</td>
<td>5.07</td>
<td>4.05</td>
<td>3.04</td>
<td>2.03</td>
<td>1.01</td>
<td>0.00</td>
</tr>
<tr>
<td>RESL</td>
<td>7.07</td>
<td>5.65</td>
<td>4.24</td>
<td>2.83</td>
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</tr>
<tr>
<td>TEAM</td>
<td>5.48</td>
<td>4.38</td>
<td>3.29</td>
<td>2.19</td>
<td>1.10</td>
<td>0.00</td>
</tr>
<tr>
<td>PMAT</td>
<td>7.80</td>
<td>6.24</td>
<td>4.68</td>
<td>3.12</td>
<td>1.56</td>
<td>0.00</td>
</tr>
</tbody>
</table>

The Scale Values are linked to the spreadsheet of the specific Scale Factor individually.

All the results are from the input of each file of each factor. Users can go to each file of each factor to change the values.

The buffer values of the scales of each factor are listed as follows.

<table>
<thead>
<tr>
<th>Scale Factor</th>
<th>Very Low</th>
<th>Low</th>
<th>Norm</th>
<th>High</th>
<th>Very High</th>
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<tbody>
<tr>
<td>PREC</td>
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<td>1.24</td>
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<td>4.68</td>
<td>3.12</td>
<td>1.56</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**SF**
The SF formula is PREC+FLEX+RESL+TEAM+PMAT

**B Calculation Section**
The formula is as follows.

\[ B = 0.91 + 0.01 \times (\text{PREC} + \text{FLEX} + \text{RESL} + \text{TEAM} + \text{PMAT}) \]

**EM section**
This section contains all effort multipliers used in Post Architecture Model. For the full titles, and the explanations of above factors, please check COCOMO II manual.

The values of the scales are linked to files of the factors individually.
The buffer values of the scales of each factor are listed as follows.

<table>
<thead>
<tr>
<th></th>
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<th>High</th>
<th>Very High</th>
<th>Extra high</th>
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</thead>
<tbody>
<tr>
<td>RELY</td>
<td>---</td>
<td>0.82</td>
<td>0.92</td>
<td>1.00</td>
<td>1.10</td>
<td>1.26</td>
<td>---</td>
</tr>
<tr>
<td>DATA</td>
<td>---</td>
<td>0.82</td>
<td>0.90</td>
<td>1.00</td>
<td>1.14</td>
<td>1.28</td>
<td>---</td>
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<tr>
<td>CPLX</td>
<td>---</td>
<td>0.73</td>
<td>0.87</td>
<td>1.00</td>
<td>1.17</td>
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<td>1.74</td>
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<tr>
<td>RUSE</td>
<td>---</td>
<td>0.95</td>
<td>1.00</td>
<td>1.07</td>
<td>1.15</td>
<td>1.24</td>
<td></td>
</tr>
<tr>
<td>DOCU</td>
<td>---</td>
<td>0.81</td>
<td>0.91</td>
<td>1.00</td>
<td>1.11</td>
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**Platform Factors**

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<td>1.00</td>
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<tr>
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<td>---</td>
<td>---</td>
<td>1.00</td>
<td>1.05</td>
<td>1.17</td>
<td>1.46</td>
</tr>
<tr>
<td>PVOL</td>
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<td>1.00</td>
<td>1.15</td>
<td>1.30</td>
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**Personnel Factors**

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<tr>
<td>ACAP</td>
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<td>1.42</td>
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<td>0.85</td>
<td>0.71</td>
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</tr>
<tr>
<td>PCAP</td>
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<td>1.34</td>
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<td>1.00</td>
<td>0.88</td>
<td>0.76</td>
<td>---</td>
</tr>
<tr>
<td>APEX</td>
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<td>1.22</td>
<td>1.10</td>
<td>1.00</td>
<td>0.88</td>
<td>0.81</td>
<td>---</td>
</tr>
<tr>
<td>PLEX</td>
<td>---</td>
<td>1.19</td>
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<td>0.91</td>
<td>0.85</td>
<td>---</td>
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<tr>
<td>LTEX</td>
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<td>1.20</td>
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<td>1.00</td>
<td>0.91</td>
<td>0.84</td>
<td>---</td>
</tr>
<tr>
<td>PCON</td>
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<td>1.29</td>
<td>1.12</td>
<td>1.00</td>
<td>0.90</td>
<td>0.81</td>
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</tr>
</tbody>
</table>

**Project Factors**

<table>
<thead>
<tr>
<th></th>
<th>Not Apply</th>
<th>Very Low</th>
<th>Low</th>
<th>Nominal</th>
<th>High</th>
<th>Very High</th>
<th>Extra high</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOOL</td>
<td>---</td>
<td>1.17</td>
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<td>0.90</td>
<td>0.78</td>
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</tr>
<tr>
<td>SITE</td>
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<td>1.00</td>
<td>0.93</td>
<td>0.86</td>
<td>0.80</td>
</tr>
<tr>
<td>SCED</td>
<td>---</td>
<td>1.43</td>
<td>1.14</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

EM

\[ EM = RELY \times DATA \times CPLX \times RUSE \times DOCU \times TIME \times STOR \times PVOL \times ACAP \times PCAP \times APEX \times PLEX \times LTEX \times PCON \times TOOL \times SITE \times SCED \]

**Calculation Section**

PM formula

\[ PM = EM \times A \times [(1-BRAK/100)\times SIZE]^B + [(ASLOC\times AT/100)/ATPROD] \]

**EM** Cost drivers that have a multiplicative effect on predicting effort are called Effort Multipliers (EM). Each EM has a rating level that expresses the impact of the multiplier on development effort, PM. These rating can range from Extra Low to Extra High. For the purposes of quantitative analysis, each rating level of each EM has a weight associated with it. The nominal or average weight for an EM is 1.0. If a rating level causes more software development effort, then its corresponding EM weight is above 1.0. Conversely, if the rating level reduces the effort then the corresponding EM weight is less than 1.0. The selection of effort-multipliers is based on a strong rationale that they would independently explain a significant source of project effort or productivity variation.
A is a constant. The buffer value is set as 2.94.

**BRAK** should be input by the users. COCOMO II uses a breakage percentage, BRAK, to adjust the effective size of the product. Breakage reflects the requirements volatility in a project. It is the percentage of code thrown away due to requirements changes. For example, a project which delivers 100,000 instructions but discards the equivalent of an additional 20,000 instructions has a BRAK value of 20. This would be used to adjust the project’s effective size to 120,000 instructions for a COCOMO II estimation.

**SIZE** should be input by the users.

B is the sum of project scale factors. It is linked from result at B Section in this spreadsheet.

**ASLOC** should be input by the users. It is use to estimate the amount of code to be adapted.

AT should be input by the users.

**ATPROC** should be input by the users.

**PM** is the estimated person-months with the SCED effort multiplier.

'EM is the result of the calculation of EM without SCED.

'PM is the estimated person-months without the SCED effort multiplier.

**TDEV** is the calendar time in months from the determination of a product’s requirements baseline to the completion of an acceptance activity certifying that the product satisfies its requirements. The formula is $3.67 \times PM^{0.28 + 0.2 \times (B - 1.01)} \times SCED\% / 100$. 

SCALE FACTORS

**PREC**

Type: Scale Factor

The spreadsheet contains the features of PREC and the evaluation rates.

Features of Evaluate PREC: Users should select ratings by type "xxxx" under each selected value. The selected rating values are overridable in the purple cells.

SUM: The SUM of the results would be calculated and presented next to "SUM".

Your rating: According to the SUM, the users can choose the rating value from the scale list by typing "xxxx" under the selected rate. The selected rating values are overridable in the purple cells.

The COCOMO II-1998 calibrated values of the scales of PREC are listed as follows.

<table>
<thead>
<tr>
<th></th>
<th>Very Low</th>
<th>Low</th>
<th>Norm</th>
<th>High</th>
<th>Very High</th>
<th>Extra High</th>
</tr>
</thead>
<tbody>
<tr>
<td>PREC</td>
<td>6.20</td>
<td>4.96</td>
<td>3.72</td>
<td>2.48</td>
<td>1.24</td>
<td>0.00</td>
</tr>
</tbody>
</table>

PREC (B39): The selected value of PREC is shown next to "PREC" on this page and one the PostArch summary worksheet "selected value" column for PREC.

**FLEX**

Type: Scale Factor

The spreadsheet contains the features of FLEX and the evaluation rates.

Features of Evaluate FLEX: Users should select ratings by type "xxxx" under each selected value. The selected rating values are overridable in the purple cells.

SUM: The SUM of the results would be calculated and presented next to "SUM".

Your rating: According to the SUM, the users can choose the rating value from the scale list by typing "xxxx" under the selected rate. The selected rating values are overridable in the purple cells.

The COCOMO II-1998 calibrated values of the scales of FLEX are listed as follows.

<table>
<thead>
<tr>
<th></th>
<th>Very Low</th>
<th>Low</th>
<th>Norm</th>
<th>High</th>
<th>Very High</th>
<th>Extra High</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLEX</td>
<td>5.07</td>
<td>4.05</td>
<td>3.04</td>
<td>2.03</td>
<td>1.01</td>
<td>0.00</td>
</tr>
</tbody>
</table>

FLEX (B34): The selected value of FLEX is shown next to "FLEX" on this page and one the PostArch summary worksheet "selected value" column for FLEX.

**RESL**

Type: Scale Factor

The spreadsheet contains the features of RESL and the evaluation rates.

Features of Evaluate RESL: Users should select ratings by type "xxxx" under each selected value. The selected rating values are overridable in the purple cells.

SUM: The SUM of the results would be calculated and presented next to "SUM".

Your rating: According to the SUM, the users can choose the rating value from the scale list by typing "xxxx" under the selected rate. The selected rating values are overridable in the purple cells.
The COCOMO II-1998 calibrated values of the scales of RESL are listed as follows.

<table>
<thead>
<tr>
<th></th>
<th>Very Low</th>
<th>Low</th>
<th>Norm</th>
<th>High</th>
<th>Very High</th>
<th>Extra High</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESL</td>
<td>7.07</td>
<td>5.65</td>
<td>4.24</td>
<td>2.83</td>
<td>1.41</td>
<td>0.00</td>
</tr>
</tbody>
</table>

RESL (B59) : The selected value of RESL is shown next to "RESL" on this page and one the PostArch summary worksheet "selected value" column for RESL.

**TEAM**

Type : Scale Factor  
The spreadsheet contains the features of TEAM and the evaluation rates.  
Features of Evaluate PREC : Users should select ratings by type "xxxx" under each selected value. The selected rating values are overridable in the purple cells.  
SUM : The SUM of the results would be calculated and presented next to "SUM".  
Your rating : According to the SUM, the users can choose the rating value from the scale list by typing "xxxx" under the selected rate. The selected rating values are overridable in the purple cells.

The COCOMO II-1998 calibrated values of the scales of TEAM are listed as follows.

<table>
<thead>
<tr>
<th></th>
<th>Very Low</th>
<th>Low</th>
<th>Norm</th>
<th>High</th>
<th>Very High</th>
<th>Extra High</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEAM</td>
<td>5.48</td>
<td>4.38</td>
<td>3.29</td>
<td>2.19</td>
<td>1.10</td>
<td>0.00</td>
</tr>
</tbody>
</table>

TEAM (B38) : The selected value of TEAM is shown next to "TEAM" on this page and one the PostArch summary worksheet "selected value" column for TEAM.

**PMAT**

Type : Scale Factor  
The spreadsheet contains PMAT evaluation rates.  
Features of Evaluate PMAT : Users should select ratings by type "xxxx" under each selected value. The selected rating values are overridable in the purple cells.  

The COCOMO II-1998 calibrated values of the scales of PMAT are listed as follows.

<table>
<thead>
<tr>
<th></th>
<th>Very Low</th>
<th>Low</th>
<th>Norm</th>
<th>High</th>
<th>Very High</th>
<th>Extra High</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMAT</td>
<td>7.80</td>
<td>6.24</td>
<td>4.68</td>
<td>3.12</td>
<td>1.56</td>
<td>0.00</td>
</tr>
</tbody>
</table>

PMAT is not applied to some specific situations, such as some short-term student projects. We suggest the users put 9.36 as the value of "for not apply" in PMAT.  
Your rating : The users can choose the rating value from the scale list by typing "xxxx" under the selected rate. The selected rating values are overridable in the purple cells.  
PMAT (B13) : The selected value of PMAT is shown next to "PMAT" on this page and one the PostArch summary worksheet "selected value" column for PMAT.
PMAT Eval is to assist to evaluate PMAT. It is the sub-spreadsheet for PMAT. The spreadsheet contains the PMAT features, Key Process Areas, and the evaluation rates.

Rating: The users can choose the rating value from the scale list by typing "x" in the selected rate of each feature. The selected rate would be presented at the rating column.
GROUP OF PRODUCT FACTORS
It is evaluated by RELY, DATA, CPLX, RUSE and DOCU.

RELY
Type: Effort Multiplier
Rating: After evaluating RELY by its feature, the users should select the rating by type "xxxx" under the selected value. The selected rating value is overridable in the purple cell.
RELY (B12): It is linked from G9.

DATA
Type: Effort Multiplier
Rating: After evaluating DATA by its feature, the users should select the rating by type "xxxx" under the selected value. The selected rating value is overridable in the purple cell.
DATA (B24): It is linked from G23.

CPLX
Type: Effort Multiplier
CPLX spreadsheet contains CPLX features and the its evaluation rates.
Rating: After evaluating CPLX by its features, the users should select the ratings by type "xxxx" under the selected values. The selected rating values are overridable in the purple cells.
SUM (B74): It is the sum of the rating grades.
Rating: Based on the SUM and the suggested ratings, the users should select a rating value (from B79 to L79) by type "xxxx" under the selected value. The result would be presented at M78 and M79.
CPLX (B83): It is linked from M78.

RUSE
Type: Effort Multiplier.
RUSE spreadsheet contains RUSE features and the its evaluation rates.
Rating: After evaluating RUSE by its feature, the users should select the rating by type "xxxx" under the selected value. The selected rating value is overridable in the purple cell.
RUSE (B36) : It is linked from G35.

DOCU (B48) : It is linked from G47.

Type : Effort Multiplier
Rating : After evaluating DOCU by its feature, the users should select the rating by type "xxxx" under the selected value. The selected rating value is overridable in the purple cell.
GROUP OF PLATFORM FACTOR
It is evaluated by TIME, STOR, and PVOL.

TIME
Type: Effort Multiplier
Rating: After evaluating TIME by its feature, the users should select the rating by type "xxxx" under the selected value. The selected rating value is overridable in the purple cell.
TIME (B12): It is linked from G9.

STOR
Type: Effort Multiplier
Rating: After evaluating STOR by its feature, the users should select the rating by type "xxxx" under the selected value. The selected rating value is overridable in the purple cell.
STOR (B26): It is linked from G24.

PVOL
Type: Effort Multiplier
Rating: After evaluating PVOL by its feature, the users should select the rating by type "xxxx" under the selected value. The selected rating value is overridable in the purple cell.
PVOL (B42): It is linked from G40.
GROUP OF PERSONNEL FACTORS
It is mainly evaluated by ACAP, PCAP, AEXP, PEXP, LTEX, and PCON.

PCON
Type : Effort Multiplier
Rating : After evaluating PCON by its feature, the users should select the rating by type "xxxx" under the selected value. The selected rating value is overridable in the purple cell.
PCON (B12) : It is linked from G9.

ACAP
Type : Effort Multiplier
Rating : After evaluating ACAP by its feature, the users should select the rating by type "xxxx" under the selected value. The selected rating value is overridable in the purple cell.
ACAP (B23) : It is linked from G21.

PCAP
Type : Effort Multiplier
Rating : After evaluating PCAP by its feature, the users should select the rating by type "xxxx" under the selected value. The selected rating value is overridable in the purple cell.
PCAP (B37) : It is linked from G35.

APEX
Type : Effort Multiplier
Rating : After evaluating APEX by its feature, the users should select the rating by type "xxxx" under the selected value. The selected rating value is overridable in the purple cell.
APEX (B51) : It is linked from G49.
<table>
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| Type : Effort Multiplier  
Rating : After evaluating PLEX by its feature, the users should select the rating by type "xxxx" under the selected value. The selected rating value is overridable in the purple cell.  
PLEX (B64) : It is linked from G62. |

<table>
<thead>
<tr>
<th>LTEX</th>
</tr>
</thead>
</table>
| Type : Effort Multiplier  
Rating : After evaluating LTEX by its feature, the users should select the rating by type "xxxx" under the selected value. The selected rating value is overridable in the purple cell.  
LTEX (B77) : It is linked from G75. |
GROUP OF PROJECT FACTORS
It is mainly evaluated by TOOL, SITE, and SCED.

**TOOL**

Type : Effort Multiplier
Rating : After evaluating TOOL by its feature, the users should select the rating by type "xxxx" under the selected value. The selected rating value is overridable in the purple cell.
TOOL (B14) : It is linked from G12.

**SITE**

Type : Effort Multiplier
Rating : After evaluating SITE by its feature, the users should select the rating by type "xxxx" under the selected value. The selected rating value is overridable in the purple cell.
SITE (B31) : It is linked from G29.

**SCED**

Type : Effort Multiplier.
Rating : After evaluating SITE by its features, the users should select the ratings by type "xxxx" under the selected values. The selected rating value is overridable in the purple cell.
SCED (B50) : It is linked from G43.
Percentage(B51) : It is linked from G48 and applied to spreadsheet PostArch.
II. The Relationship Of The Spreadsheets