UNIVERSITY OF
SOUTHERN CALIFORNIA

October 24, 2000

CORADMO DELPHI EXERCISE
Data Collection Instrument (Round 2)

ticipant Information:

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)ata Submission:

For your convenience a pre-addressed, stamped return envelope has been provided for the return of this orm. Please send in this form as soon as possible. The return mailing address is:

COCOMO II Data Submission
Center for Software Engineering
Salvatori Hall Room 328
University of Southern California
941 West 37th Place
Los Angeles, CA 90089-0781

ructions:

CORADMO has six RAD Schedule and Effort drivers, which adjust the phase distributions of schedule effort produced by the mainstream COCOMO II model* to reflect the different distributions of schedule and ort (and their totals) found in a RAD project.

For each of the six schedule and effort drivers, please indicate in the space provided how you would ust the currently assigned Schedule Multiplier Range (SMR) and Effort Multiplier Range (EMR), based upon ır best engineering judgment and experience, given the description of how to assign a *low, nominal, high*, etc. ıng for each driver. Also please indicate in the space provided your rationale behind the change you made to . EMR or SMR.

In estimating the EMR or SMR for each driver, consider only the driver's unique contribution to :reasing or decreasing project schedule and effort above/below COCOMO II's ratings and calculated effort, cluding the effects of other correlated drivers. If you do not agree with the assumption about the staff level, us know in your comments.

OCOMO RAD MODEL (CORADMO)

The COCOMO RAD model has its roots in the results of a 1997 CSE Focused Workshop on Rapid pplication Development[1]. RAD is taken to mean an application of any of a number of techniques or strategies ı reduce software development cycle time. There are six classes of strategies whose degree of implementation ın be used to parameterize a schedule estimate given an effort and schedule estimate produced by COCOMO -2000. These strategies are preferable to just adding people to the task. The six classes are the following: evelopment process re-engineering (DPRS), re-use and very high level languages (RVHL), collaboration fficiency (CLAB), architecture investment and risk resolution (RESL), RAD capability of personnel (RCAP), nd pre-positioning of assets (PPOS). RESL corresponds to the COCOMO II scale driver; the other five are ew. All have their effects reflected as multipliers on effort (person months, PM), schedule (months, M) and/or ıumber of personnel (P). Person months of effort can actually be increased because certain pro-active trategies, like pre-positioning of assets, are only possible with extra effort.

The CORADMO model utilizes the COCOMO phase distributions of effort and schedule, which are ınchored at the LCO/LCA/IOC points in a development life cycle. A phased schedule and effort distribution is ıeeded because the effects of the RAD strategies identified above are different for the different phases. Also, a new mathematical function is used to calculate (predict) the calendar months for a given amount of effort: the function is only radically different in low (under 16) person-month's efforts where it seems more normal have an equal number of people and months to accomplish the task. At the higher (greater than 64) person-month's efforts, the traditional COCOMO II-2000 function is used which is based on the traditional cube-root-like function of effort. A smooth curve is fit within these ranges.

The intent of the CORADMO model is to calculate/predict the schedule (months, M), personnel (P), and adjusted effort (person-months, PM) based on the distribution of effort and schedule to the various stages, and impacts of the selected schedule driver ratings on the M, P, and PM of each stage.

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[1] B. Boehm, S. Chulani, and A. Egyed, "Knowledge Summary: USC-CSE Focused Workshop on Rapid Application Development", USC-CSE Technical Report, June 1997.

* with the mainstream COCOMO II Schedule Compression (SCED) factor excluded

lication Type: This field captures a broad description of the type of activity this software application is npting to perform.

le One: Command and Control, MIS, Simulation,
Communication, Operating Systems, Software Development Tools,
Diagnostics, Process Control, Testing,
Engineering and Science Signal processing, Utilities

ıer:_____

ınstraints: Please rank the importance (1 being highest) of the following constraints for the type of projects · which you are providing your ratings. Schedule-Constrained should be 1 for the ratings to be used in the)RADMO Delphi exercise.

_____Cost-Constrained, _____ Schedule-Constrained, _____ Personnel Constrained

ercentage Effort per Stage: Allocate the effort (person months) used in each of the stages as a percentage of e total effort during Elaboration and Construction. The sum of the percentages of Elaboration and onstruction should be 100%. The effort during Inception (as a percentage of total Elaboration and onstruction) is added to get the Total IE&C, which should be greater than 100%.

	LCO	LCA	IOC		
Stage	**Inception**	**Elaboration**	**Construction**	**Total E & C**	**Total I E & C**
%Effort	6.0	24.0	76.0	**100%**	
%Effort				**100%**	

Percentage Schedule per Stage: Allocate the schedule (calendar months) for each of the stages as a percentage of the total schedule during Elaboration and Construction. The sum of Elaboration and Construction should be 100%. The schedule during Inception (as a percentage of total Elaboration and Construction) is added to get the Total IE&C, which should be greater than 100%.

	LCO	LCA	IOC		
Stage	**Inception**	**Elaboration**	**Construction**	**Total E & C**	**Total I E & C**
%Schedule	12.5	37.5	62.5	**100%**	
%Schedule				**100%**	

Drivers

Reuse and VHLL's (RVHL) – Reuse and Very High Level Languages

e driver refers to the degree to which re-use of other than code and/or very high level languages are utilized. is driver reflects schedule compression in Inception and Elaboration stages due to faster prototyping or option ploration. For this driver, the effort compression is hypothesized to be the same as the schedule compression; t is, the team size would stay the same over a shorter period. The rating for this driver depends on the ount of Rapid Prototyping Experience the development team has had in the domain of the project being aluated.

Schedule Multipliers	
Inception Multiplier Range (Highest/Lowest = MR)	**EMR = SMR** = 1.04 / 0.90 = 1.16
Inception Effort (PM) Multiplier Range	**Your Adjusted EMR = _____**
Inception Schedule (M) Multiplier Range	**Your Adjusted SMR = _____**
Elaboration Multiplier Range (Highest/Lowest = MR)	**EMR = SMR** = 1.0 / 0.8= 1.25
Elaboration Effort (PM) Multiplier Range	**Your Adjusted EMR = _____**
Elaboration Schedule (M) Multiplier Range	**Your Adjusted SMR = _____**
Construction Multiplier Range (Highest/Lowest = MR)	**EMR = SMR** = 1.00 / 1.00 = 1.00
Construction Effort (PM) Multiplier	**Your Adjusted EMR = _____**
Construction Schedule (M) Multiplier	**Your Adjusted SMR = _____**
Rationale:	
Comments:	

DPRS (Development Process Reengineering and Streamlining) Rating Scale

ıe driver refers to the degree to which the project and organization allow and encourage streamlined or re-ıgineered development processes: the current level of bureaucracy is a clear indicator. Again, the EMR = ⅣIR hypothesis postulates that DPRS rating levels would not affect team size.

Schedule Multipliers	
Inception Multiplier Range (Highest/Lowest = MR)	**EMR = SMR** = 1.20 / 0.90 = 1.33
Inception Effort (PM) Multiplier	**Your Adjusted EMR =** _____
Inception Schedule (M) Multiplier	**Your Adjusted SMR =** _____
Elaboration Multiplier Range (Highest/Lowest = MR)	**EMR = SMR** = 1.15 / 0.95 = 1.21
Elaboration Effort (PM) Multiplier	**Your Adjusted EMR =** _____
Elaboration Schedule (M) Multiplier	**Your Adjusted SMR =** _____
Construction Multiplier Range (Highest/Lowest = MR)	**EMR = SMR** = 1.15 / 0.95 = 1.21
Construction Effort (PM) Multiplier	**Your Adjusted EMR =** _____
Construction Schedule (M) Multiplier	**Your Adjusted SMR =** _____
Rationale:	
Comments:	

CLAB – Collaboration

ams and team members who can collaborate effectively can reduce both effort and schedule; those that don't llaborate effectively have increased schedule and effort (due to wasted time). With this multiplier also, staff 'el does not change based on collaboration efficiency.

Schedule Multipliers	
Inception Multiplier Range (Highest/Lowest = MR)	**EMR = SMR** = 1.21 / 0.80 = 1.51
Inception Effort (PM) Multiplier	**Your Adjusted EMR = _____**
Inception Schedule (M) Multiplier	**Your Adjusted SMR = _____**
Elaboration Multiplier Range (Highest/Lowest = MR)	**EMR = SMR** = 1.15 / 0.86 = 1.24
Elaboration Effort (PM) Multiplier	**Your Adjusted EMR = _____**
Elaboration Schedule (M) Multiplier	**Your Adjusted SMR = _____**
Construction Multiplier Range (Highest/Lowest = MR)	**EMR = SMR** = 1.10 / 0.93 = 1.82
Construction Effort (PM) Multiplier	**Your Adjusted EMR = _____**
Construction Schedule (M) Multiplier	**Your Adjusted SMR = _____**
Rationale:	
Comments:	

RESL – Architecture/Risk Resolution

.is is the same as the COCOMO II RESL rating scale. The architecture portion enables parallel construction, ıs reducing schedule during the construction phase assuming that staff level increases during construction ıile applying the same effort.

Schedule Multipliers	
Inception Multiplier Range (Highest/Lowest = MR)	**EMR = SMR** = 1.0 / 1.0 = 1.0
Inception Effort (PM) Multiplier	**Your Adjusted EMR = _____**
Inception Schedule (M) Multiplier	**Your Adjusted SMR = _____**
Elaboration Multiplier Range (Highest/Lowest = MR)	**EMR = SMR** = 1.0 / 1.0 = 1.0
Elaboration Effort (PM) Multiplier	**Your Adjusted EMR = _____**
Elaboration Schedule (M) Multiplier	**Your Adjusted SMR = _____**
Construction Multiplier Range (Highest/Lowest = MR)	**EMR = SMR** = 1.0 / 1.0 = 1.0
Construction Effort (PM) Multiplier	**Your Adjusted EMR = _____**
Construction Schedule (M) Multiplier	**Your Adjusted SMR = _____**
Rationale:	
Comments:	

PPOS – Prepositioning Assets

is concerns the degree to which assets are pre-tailored to a project and furnished to a project for use on nand. The pertinent issues are people skills and teambuilding, processes and tools, and architecture and nponentry.

Schedule Multipliers	
Inception Multiplier Range (Highest/Lowest = MR)	**EMR** = 1.1 / 1.0 = 1.10 **SMR** = 1.0 / .8 = 1.25
Inception Effort (PM) Multiplier	**Your Adjusted EMR** = _____
Inception Schedule (M) Multiplier	**Your Adjusted SMR** = _____
Elaboration Multiplier Range (Highest/Lowest = MR)	**EMR** = 1.1 / 1.0 = 1.10 **SMR** = 1.0 / .8 = 1.25
Elaboration Effort (PM) Multiplier	**Your Adjusted EMR** = _____
Elaboration Schedule (M) Multiplier	**Your Adjusted SMR** = _____
Construction Multiplier Range (Highest/Lowest = MR)	**EMR** = 1.1 / 1.0 = 1.10 **SMR** = 1.0 / .8 = 1.25
Construction Effort (PM) Multiplier	**Your Adjusted EMR** = _____
Construction Schedule (M) Multiplier	**Your Adjusted SMR** = _____
Rationale:	
Comments:	

RCAP – RAD Capability of Personnel

is accounts for the effects of personnel capability and experience in Rapid Application Development projects.

Schedule Multipliers	
Inception Multiplier Range (Highest/Lowest = MR)	**EMR** = 1.20 / 0.80 = 1.50 **SMR** = 1.5 / 0.5 = 3.00
Inception Effort (PM) Multiplier	**Your Adjusted EMR** = _____
Inception Schedule (M) Multiplier	**Your Adjusted SMR** = _____
Elaboration Multiplier Range (Highest/Lowest = MR)	**EMR** = 1.20 / 0.80 = 1.50 **SMR** = 1.5 / 0.5 = 3.00
Elaboration Effort (PM) Multiplier	**Your Adjusted EMR** = _____
Elaboration Schedule (M) Multiplier	**Your Adjusted SMR** = _____
Construction Multiplier Range (Highest/Lowest = MR)	**EMR** = 1.20 / 0.80 = 1.50 **SMR** = 1.5 / 0.5 = 3.00
Construction Effort (PM) Multiplier	**Your Adjusted EMR** = _____
Construction Schedule (M) Multiplier	**Your Adjusted SMR** = _____
Rationale:	
Comments:	

This concludes the worksheet. Thank you for your assistance!