CORADMO in 2001: A RAD Odyssey

Cyrus Fakharzadeh

fakharza@usc.edu

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Introduction

RAD (Rapid Application Development)

- an application of any of a number of techniques or strategies to reduce software development cycle time

CORADMO

- COCOMO II model extension
- Focuses on software development schedules and costs using RAD techniques

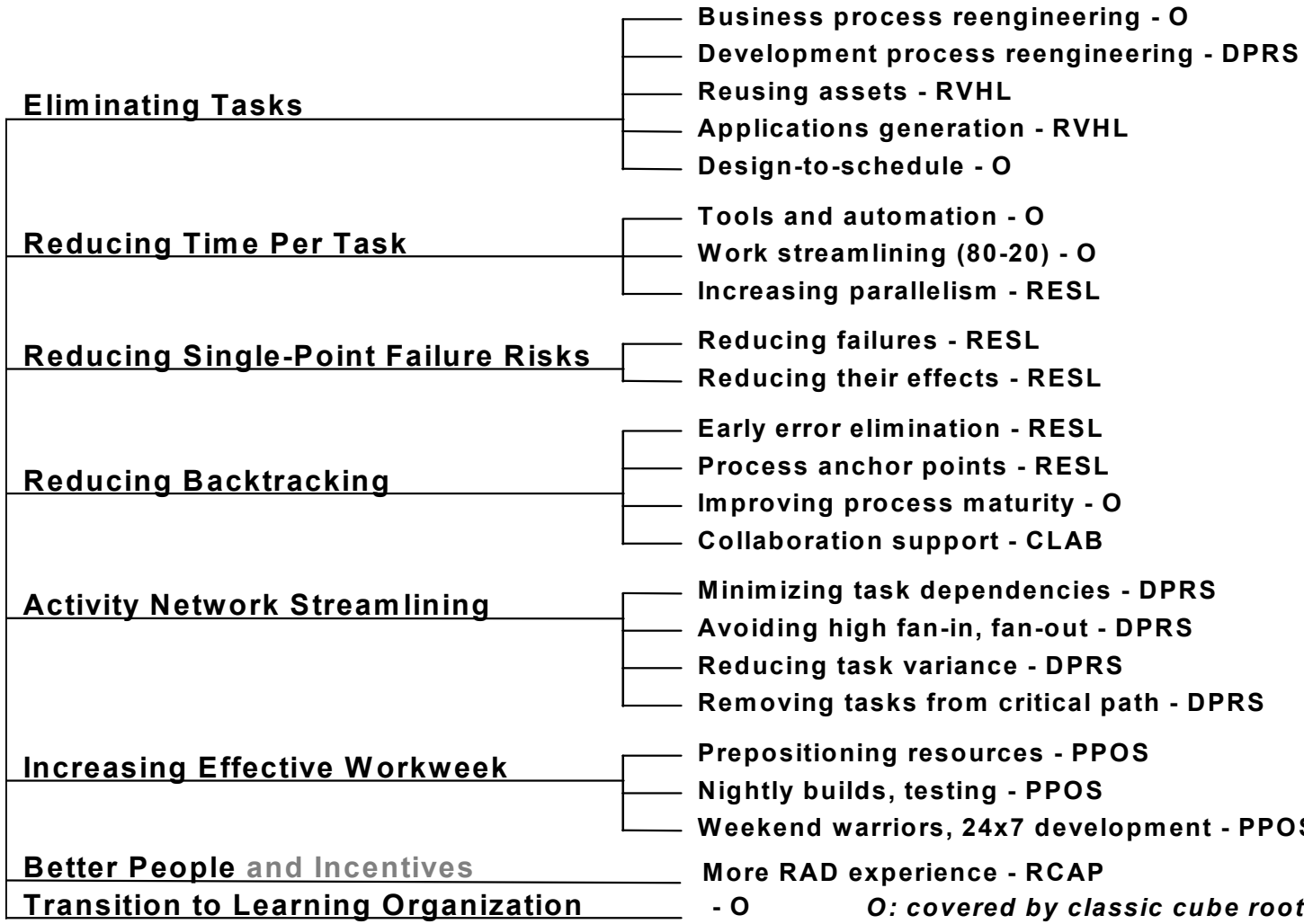
Constructive Rapid Application Development Model

- Calculates/predicts
  - schedule (months, M)
  - personnel (P)
  - adjusted effort (person-months, PM)
- Based on
  - Effort and schedule distribution to the various phases
  - Selected schedule driver ratings impacts on the M, P, and PM of each phase.

Six Classes of Strategies for RAD

- Reuse, Very High-level Languages (RVHL)
- Development Process Reengineering (DPRS)
- Collaboration Support (CLAB)
- Architecture, Risk Resolution (RESL)
- Prepositioning Assets (PPOS)
- RAD Capability of Personnel (RCAP)

RAD Opportunity Tree



O: covered by classic cube root model

Background

COCOMO II Schedule shortfalls:

- Reflects projects optimized for minimum cost
- Model does not address RAD strategies

COCOMO II.2000 Duration Calculation

Cube Root Law: Months ~ 3.67 (Person-Months)^{f}

where $0.28 \leq f \leq 0.34$

CORADMO differs from COCOMO:

- A square root instead in computing the number of months needed to complete a small project
- Square root law (i.e. f = 0.5)

COPSEMO

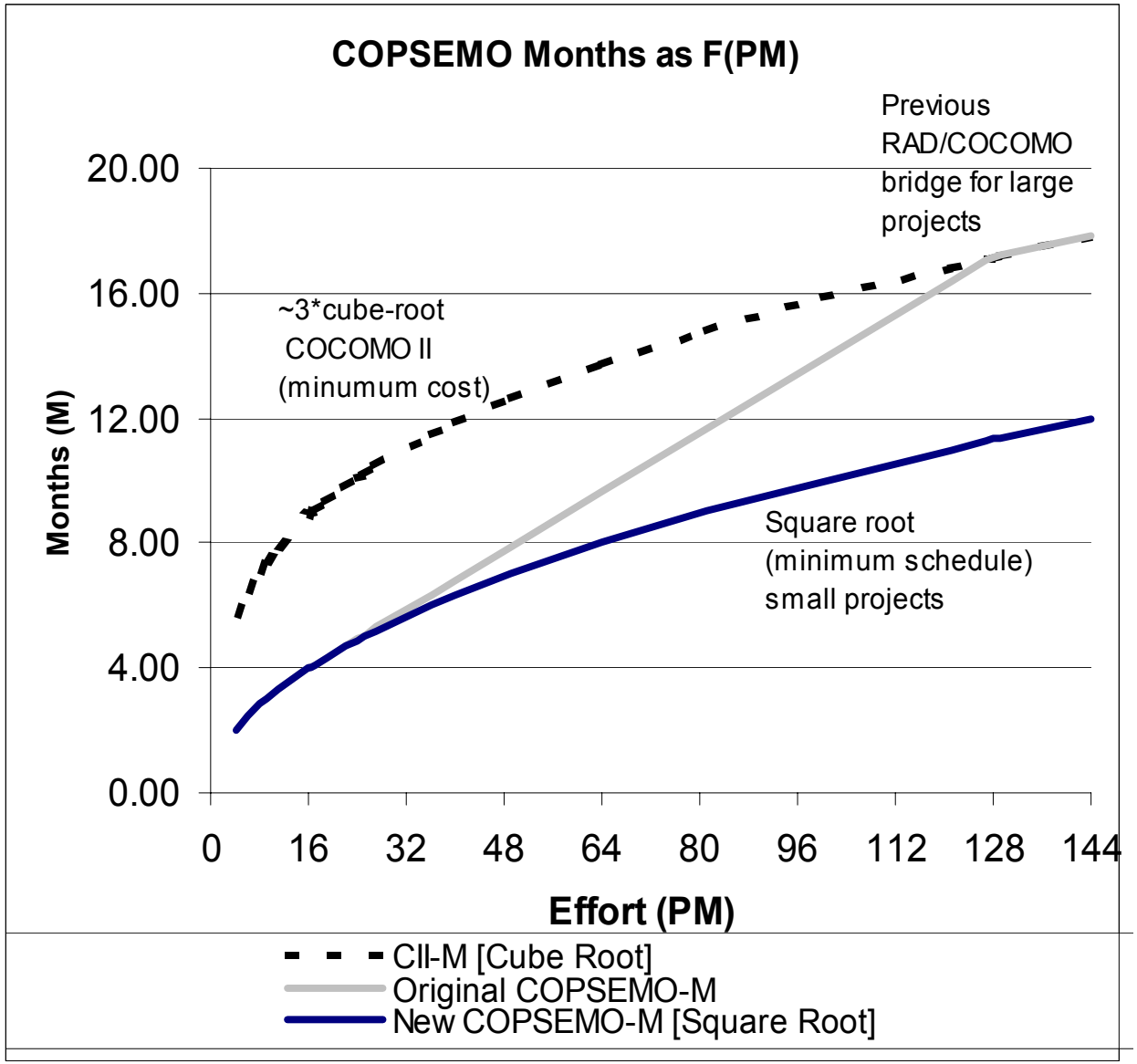
Constructive Phased Schedule and Effort Model

Inputs: the baseline effort and schedule from COCOMO II

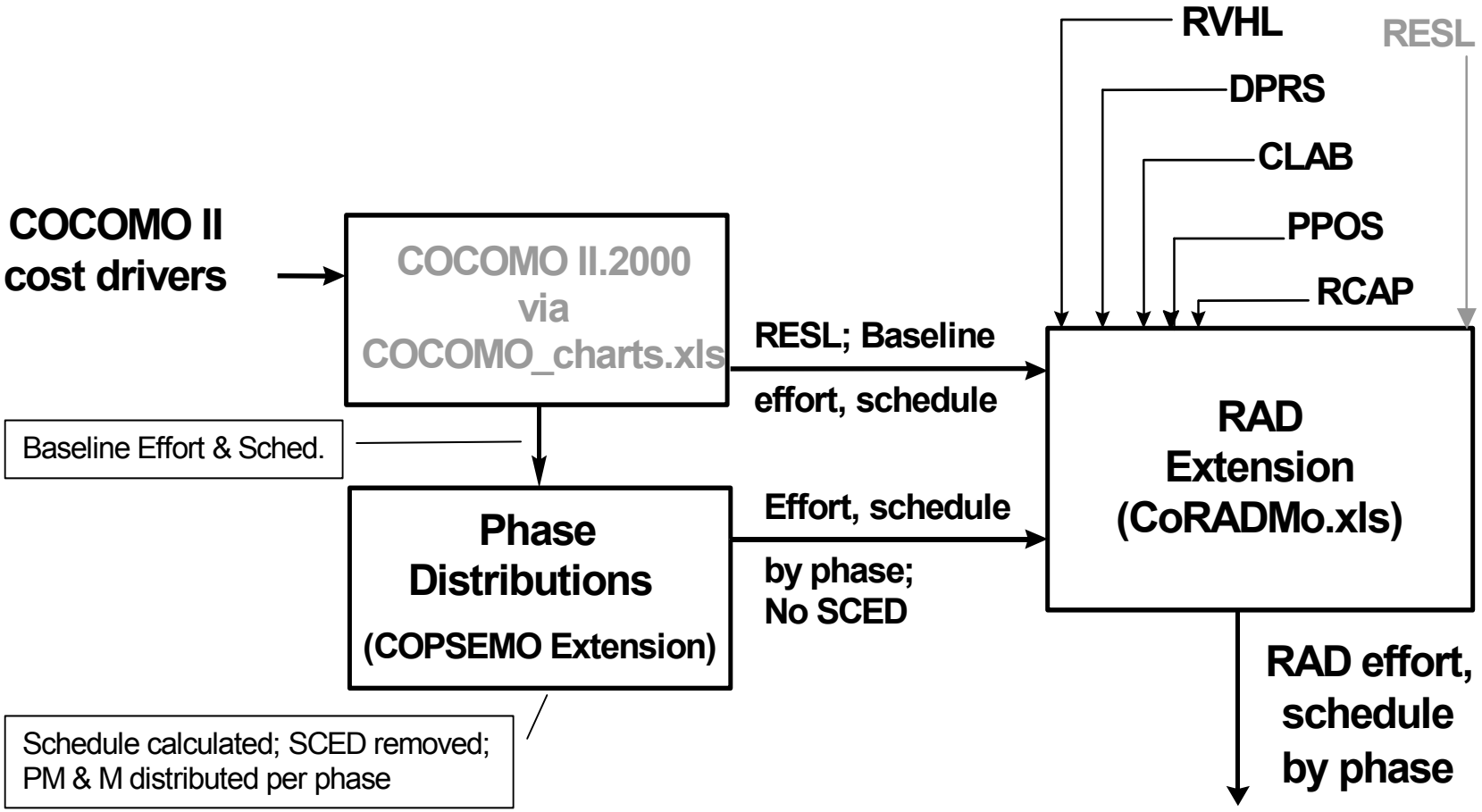
Outputs: the effort and schedule by phase needed for CORADMO.

Phases: Inception, Elaboration, Construction, and Transition

Source: MBASE/RUP (Model-Based Architecting & Software Engineering/Rational Unified Process) life-cycle model


COPSEMO Months as F(PM)
Previous RAD/COCOMO bridge for large projects
~3*cube-root COCOMO II (minumum cost)
Square root (minimum schedule) small projects
Months (M)
20.00
16.00
12.00
8.00
4.00
0.00
0
16
32
48
64
80
96
112
128
144
Effort (PM)
CII-M [Cube Root]
Original COPSEMO-M
New COPSEMO-M [Square Root]

Physical Model



Results

- Delphi Exercise Forms distributed
- Experts from Academia, Industry and Government
  - Affiliates, Professors, and Researchers
- EMR (Effort Multiplier Range)
  - Highest divided by Lowest across the rating scale for effort
- SMR (Schedule Multiplier Range)
  - Highest divided by Lowest across the rating scale.

% Effort per phase

	Original	Delphi Mean	Delphi Standard Deviation
Inception – I	6.0	10.29	4.75
Elaboration – E	24.0	23.71	5.38
Construction – C	76.0	71.29	12.00
Total I, E, & C	106.0	105.29	4.24

% Schedule per phase

	Original	Delphi Mean	Delphi Standard Deviation
Inception – I	12.5	15.71	4.99
Elaboration – E	37.5	29.86	5.64
Construction – C	62.5	63.14	11.94
Total I, E, & C	112.5	108.71	6.94

Reuse, Very High-level Languages

Degree to which re-use of artifacts other than code and/or very high-level languages are utilized

RVHL	EMR			SMR		
	Original	Delphi Mean	Delphi Standard Deviation	Original	Delphi Mean	Delphi Standard Deviation
Inception	1.16	1.25	0.08	1.16	1.22	0.06
Elaboration	1.07	1.25	0.09	1.07	1.24	0.08
Construction	1.00	1.16	0.11	1.00	1.13	0.09

Development Process Reengineering

Measures the degree to which the project and organization allow and encourage streamlined or reengineered development processes

DPRS	EMR			SMR		
	Original	Delphi Mean	Delphi Standard Deviation	Original	Delphi Mean	Delphi Standard Deviation
Inception	1.33	1.32	0.02	1.33	1.25	0.05
Elaboration	1.21	1.24	0.04	1.21	1.21	0.02
Construction	1.21	1.30	0.06	1.21	1.22	0.04

Collaboration Support

Accounts for Multisite tool support plus special collaboration tools, yields a reduced effect on schedule and effort

CLAB	EMR			SMR		
	Original	Delphi Mean	Delphi Standard Deviation	Original	Delphi Mean	Delphi Standard Deviation
Inception	1.51	1.34	0.09	1.51	1.27	0.13
Elaboration	1.34	1.23	0.07	1.34	1.23	0.06
Construction	1.18	1.23	0.08	1.18	1.21	0.05

Architecture, Risk Resolution

Same as COCOMO II RESL

RESL	EMR			SMR		
	Original	Delphi Mean	Delphi Standard Deviation	Original	Delphi Mean	Delphi Standard Deviation
Inception	1.00	1.24	0.34	1.00	1.21	0.35
Elaboration	1.00	1.24	0.34	1.00	1.23	0.35
Construction	1.00	1.27	0.33	1.33	1.35	0.29

Prepositioning Assets

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

PPOS	EMR			SMR		
	Original	Delphi Mean	Delphi Standard Deviation	Original	Delphi Mean	Delphi Standard Deviation
Inception	1.10	1.13	0.02	1.25	1.22	0.02
Elaboration	1.10	1.14	0.04	1.25	1.23	0.02
Construction	1.10	1.20	0.04	1.25	1.26	0.03

RAD Capability of Personnel

Accounts for the effects of RAD personnel capability & experience in RAD projects

RCAP	EMR			SMR		
	Original	Delphi Mean	Delphi Standard Deviation	Original	Delphi Mean	Delphi Standard Deviation
Inception	1.50	1.48	0.15	3.00	2.48	0.26
Elaboration	1.50	1.44	0.14	3.00	2.48	0.25
Construction	1.50	1.46	0.14	3.00	2.49	0.25

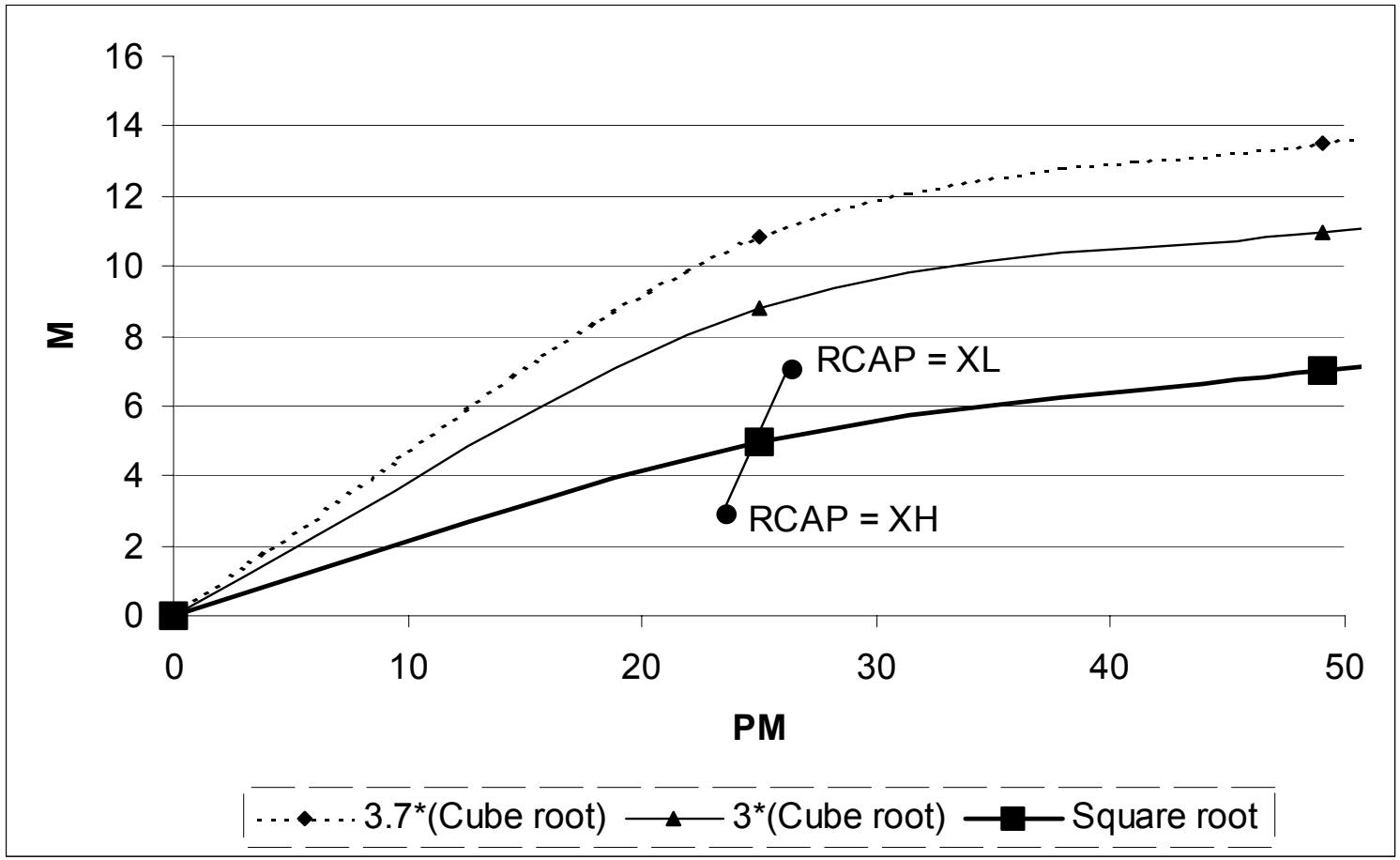
Example

With RCAP = Nominal => PM=25, M=5, P=5
Result: The square root law: 5 people for 5 months: 25 PM

With RCAP=XH (Extra High) => PM=20, M=2.8, P=7.1
Result: A super team can put on 7 people and finish in 2.8 months: 20 PM

With RCAP = XL (Extra Low) => PM=30, M=7, P=4
Result: Trying to do RAD with an unqualified team makes them less efficient (30 PM)

RCAP Effort/Schedule Effect



Next Steps

- Complete another Delphi Round
- Gather more RAD data
  - Please contact me if you have some
- Analyze Data from RAD projects
- Bayesian Analysis
- Calibrate Model

Issues for Breakout Group

- Treatment of square root, cube root models
- Treatment of RAD drivers
- Relevance to your RAD experience
- Expediting data collection