

# QSM SLIM API usage in IBM



12 April 2012

# QSM SLIM Usage Context in IBM

- IBM has nearly 1000 QSM SLIM users globally
- Full time SLIM deployment support team in place for four years with QSM guidance
- Partnered with IBM Watson research laboratory
- SLIM usage is well over 10 years
- Over 2,500 completed project in IBM SLIM DM file
- QSM has been at IBM developing estimating and performance metrics since the mid 1970's with Larry Putnam Sr.
- SLIM Suite usage
  - SLIM Estimate is the approved confirmatory estimating tool and largest usage
  - SLIM Metrics/Data Manager are global data collection and performance monitoring standard
  - SLIM Master Plan is the approved Complex System Integration (CSI)
  - SLIM Control used for troubled project tracking



# SLIM API Benefits for

## Data Collection

- Collect data with minimal deployment of SLIM DataManager and associated training
- Provide easily adjustable, broadly deployable data collection capability
- Provide data collection once – but for many uses that can be very easily understood and used
- Minimization of data collection errors and omissions
- Increased data collection efficiency
- Improved accuracy and capability of outlier analysis

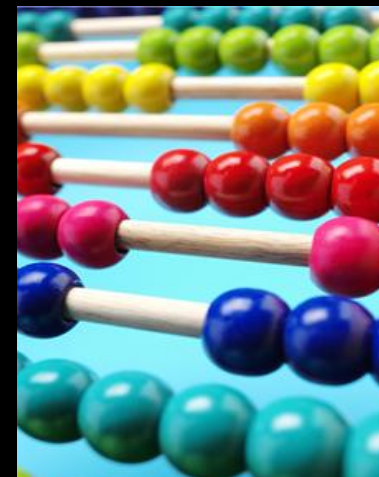


## Estimation

- Decrease the number and impact of troubled projects due to poor estimating
- Conform to the estimating best practice - “two different estimating methods” - to reduce risk of estimating errors and omissions
- Increase the interest in and deployment of SLIM Estimate across GBS
- Provide basic SLIM Estimate capability for comparison purposes without extensive additional training
- Provide “single point” of documentation for two method comparisons
- Extend the use of the spreadsheet-based parametric estimating tool to additional SLIM users (UCEW, AD2.0, etc)
- Provide jointly “calibrated” estimating tools

# QSM API deployment

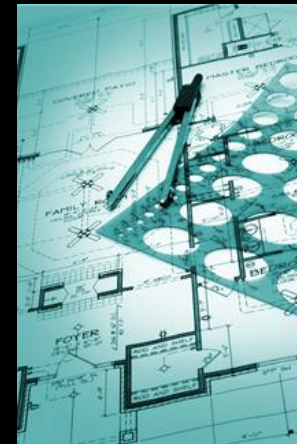
- Estimation
  - SLIM “TAB” is a generic SLIM Estimate utility which can be added to virtually any spreadsheet to provide significant SLIM Estimate capability
  - Can be attached to bottoms up or parametric spreadsheets – or even just a SIZING spreadsheet
  - Example is SLIM integrated with the Use Case Estimating Workbook (UCEW)
  
- Data
  - Data Collection for project estimates and completion actuals
  - Batch or single project data collection
  - Data Analysis/outlier identification
  - Template from basic metrics to detailed for performance benchmarking for root cause analysis
  - Easy to use and globally deployed



# Estimation - SLIM TAB

## SLIM TAB Integration Basics

- API and scripts are in visual basic for applications (VBA)
- All interactions are conducted on the “SLIM TAB” – no change to other estimating worksheets
- Minimal input required –more available
  - Constraints
  - Durations
  - Resources (FTE)
- Depends on initial set up of SLIM Estimate Template to provide consistent method and environmental factors
- Maintain “what if” and “mission impossible” capability within the spreadsheet
- Easy access to run SLIM Estimate directly for reporting and further analysis



## SLIM TAB Integration Basics – Beyond Process Steps

- Utilize SLIM Estimate to fully compare to a UCEW estimate
- Perform iterations (UCEW and SLIM) to close the gap between the two estimates
- Compare assumptions, assumptions, assumptions
- Be reasonable with comparison of both estimates – (linear versus non linear)
- In SLIM Estimate
  - Run multiple scenarios to find boundary conditions
  - Compare resources, effort, durations, size, etc
  - Understand probabilities (documented in BOTH tools)!!



## SLIM-UCEW Integration Basics – Process Steps

- Three “tabs” added to any appropriate spreadsheet
  - General Estimate Input tab is usually hidden
  - Instruction Tab
  - SLIM Estimate Tab
  
- Can be placed anywhere in your tab sequence to follow your process
  
- Once your other estimate process is done, go to the SLIM TAB

	A	B	C	D	E	F	G	H	I	J	K	L	M	
1	<b>GSM-CD - Micro design resources</b>													
2														
3	<b>Micro duration</b>				21.1	Work days			185 hours			1.1 person months		
4							Business Modeling	Requirements	Analysis and Design	Implementation	Test	Deploy	Project Management	
5	Usual' micro effort allocation						1%	12%	25%	20%	20%	2%		
6	Manual adjustment						0%	0%	0%	0%	0%	0%		
7	Effort allocation for this project						1%	12%	25%	20%	20%	2%		
8														
9	Calculated effort allocation (hours)						26	310	647	517	517	52	21	
10														
11	Over (Under) Allocated Effort (hours)						(26)	(310)	(647)	(517)	(517)	(52)	(21)	
12														
13	Confidence Factor / General Estimate Input / SLIM Estimate / SLIM Estimate- Usage / GSMCD - Solution outline / GSMCD - Macr													

# SLIM TAB first steps and usage requirements

## Minimum Input

Estimate/Project Attributes		Value	Descr
Project Name	UCEWFirst		
Brief Description			
Expected Start	14-Mar-12		
Expected Completion			
IBM Estimation Team	Practitioner Name		Contact

- Project Name
- Project Start Date
- Size of Project in ESLOC or native size
- Automatically provided by UCEW

Use-case Package	Name	Release	Iteration	Complexity	Certainty	Iter 1	Iter 2	Iter 3	Total	Multiplex	Granularity
UC000001	UC000001	1	1	1	100%	1	1	1	3	1	Essential
UC000002	UC000002	1	1	1	100%	1	1	1	3	1	Essential
UC000003	UC000003	1	1	1	100%	1	1	1	3	1	Essential
UC000004	UC000004	1	1	1	100%	1	1	1	3	1	Essential
UC000005	UC000005	1	1	1	100%	1	1	1	3	1	Essential
UC000006	UC000006	1	1	1	100%	1	1	1	3	1	Essential
UC000007	UC000007	1	1	1	100%	1	1	1	3	1	Essential
UC000008	UC000008	1	1	1	100%	1	1	1	3	1	Essential
UC000009	UC000009	1	1	1	100%	1	1	1	3	1	Essential
UC000010	UC000010	1	1	1	100%	1	1	1	3	1	Essential
UC000011	UC000011	1	1	1	100%	1	1	1	3	1	Essential
UC000012	UC000012	1	1	1	100%	1	1	1	3	1	Essential
UC000013	UC000013	1	1	1	100%	1	1	1	3	1	Essential
UC000014	UC000014	1	1	1	100%	1	1	1	3	1	Essential
UC000015	UC000015	1	1	1	100%	1	1	1	3	1	Essential
UC000016	UC000016	1	1	1	100%	1	1	1	3	1	Essential
UC000017	UC000017	1	1	1	100%	1	1	1	3	1	Essential
UC000018	UC000018	1	1	1	100%	1	1	1	3	1	Essential
UC000019	UC000019	1	1	1	100%	1	1	1	3	1	Essential
UC000020	UC000020	1	1	1	100%	1	1	1	3	1	Essential
UC000021	UC000021	1	1	1	100%	1	1	1	3	1	Essential
UC000022	UC000022	1	1	1	100%	1	1	1	3	1	Essential
UC000023	UC000023	1	1	1	100%	1	1	1	3	1	Essential
UC000024	UC000024	1	1	1	100%	1	1	1	3	1	Essential
UC000025	UC000025	1	1	1	100%	1	1	1	3	1	Essential
UC000026	UC000026	1	1	1	100%	1	1	1	3	1	Essential
UC000027	UC000027	1	1	1	100%	1	1	1	3	1	Essential
UC000028	UC000028	1	1	1	100%	1	1	1	3	1	Essential
UC000029	UC000029	1	1	1	100%	1	1	1	3	1	Essential
UC000030	UC000030	1	1	1	100%	1	1	1	3	1	Essential
UC000031	UC000031	1	1	1	100%	1	1	1	3	1	Essential
UC000032	UC000032	1	1	1	100%	1	1	1	3	1	Essential
UC000033	UC000033	1	1	1	100%	1	1	1	3	1	Essential
UC000034	UC000034	1	1	1	100%	1	1	1	3	1	Essential
UC000035	UC000035	1	1	1	100%	1	1	1	3	1	Essential
UC000036	UC000036	1	1	1	100%	1	1	1	3	1	Essential
UC000037	UC000037	1	1	1	100%	1	1	1	3	1	Essential
UC000038	UC000038	1	1	1	100%	1	1	1	3	1	Essential
UC000039	UC000039	1	1	1	100%	1	1	1	3	1	Essential
UC000040	UC000040	1	1	1	100%	1	1	1	3	1	Essential
UC000041	UC000041	1	1	1	100%	1	1	1	3	1	Essential
UC000042	UC000042	1	1	1	100%	1	1	1	3	1	Essential
UC000043	UC000043	1	1	1	100%	1	1	1	3	1	Essential
UC000044	UC000044	1	1	1	100%	1	1	1	3	1	Essential
UC000045	UC000045	1	1	1	100%	1	1	1	3	1	Essential
UC000046	UC000046	1	1	1	100%	1	1	1	3	1	Essential
UC000047	UC000047	1	1	1	100%	1	1	1	3	1	Essential
UC000048	UC000048	1	1	1	100%	1	1	1	3	1	Essential
UC000049	UC000049	1	1	1	100%	1	1	1	3	1	Essential
UC000050	UC000050	1	1	1	100%	1	1	1	3	1	Essential
UC000051	UC000051	1	1	1	100%	1	1	1	3	1	Essential
UC000052	UC000052	1	1	1	100%	1	1	1	3	1	Essential
UC000053	UC000053	1	1	1	100%	1	1	1	3	1	Essential
UC000054	UC000054	1	1	1	100%	1	1	1	3	1	Essential
UC000055	UC000055	1	1	1	100%	1	1	1	3	1	Essential
UC000056	UC000056	1	1	1	100%	1	1	1	3	1	Essential
UC000057	UC000057	1	1	1	100%	1	1	1	3	1	Essential
UC000058	UC000058	1	1	1	100%	1	1	1	3	1	Essential
UC000059	UC000059	1	1	1	100%	1	1	1	3	1	Essential
UC000060	UC000060	1	1	1	100%	1	1	1	3	1	Essential
UC000061	UC000061	1	1	1	100%	1	1	1	3	1	Essential
UC000062	UC000062	1	1	1	100%	1	1	1	3	1	Essential
UC000063	UC000063	1	1	1	100%	1	1	1	3	1	Essential
UC000064	UC000064	1	1	1	100%	1	1	1	3	1	Essential
UC000065	UC000065	1	1	1	100%	1	1	1	3	1	Essential
UC000066	UC000066	1	1	1	100%	1	1	1	3	1	Essential
UC000067	UC000067	1	1	1	100%	1	1	1	3	1	Essential
UC000068	UC000068	1	1	1	100%	1	1	1	3	1	Essential
UC000069	UC000069	1	1	1	100%	1	1	1	3	1	Essential
UC000070	UC000070	1	1	1	100%	1	1	1	3	1	Essential
UC000071	UC000071	1	1	1	100%	1	1	1	3	1	Essential
UC000072	UC000072	1	1	1	100%	1	1	1	3	1	Essential
UC000073	UC000073	1	1	1	100%	1	1	1	3	1	Essential
UC000074	UC000074	1	1	1	100%	1	1	1	3	1	Essential
UC000075	UC000075	1	1	1	100%	1	1	1	3	1	Essential
UC000076	UC000076	1	1	1	100%	1	1	1	3	1	Essential
UC000077	UC000077	1	1	1	100%	1	1	1	3	1	Essential
UC000078	UC000078	1	1	1	100%	1	1	1	3	1	Essential
UC000079	UC000079	1	1	1	100%	1	1	1	3	1	Essential
UC000080	UC000080	1	1	1	100%	1	1	1	3	1	Essential
UC000081	UC000081	1	1	1	100%	1	1	1	3	1	Essential
UC000082	UC000082	1	1	1	100%	1	1	1	3	1	Essential
UC000083	UC000083	1	1	1	100%	1	1	1	3	1	Essential
UC000084	UC000084	1	1	1	100%	1	1	1	3	1	Essential
UC000085	UC000085	1	1	1	100%	1	1	1	3	1	Essential
UC000086	UC000086	1	1	1	100%	1	1	1	3	1	Essential
UC000087	UC000087	1	1	1	100%	1	1	1	3	1	Essential
UC000088	UC000088	1	1	1	100%	1	1	1	3	1	Essential
UC000089	UC000089	1	1	1	100%	1	1	1	3	1	Essential
UC000090	UC000090	1	1	1	100%	1	1	1	3	1	Essential
UC000091	UC000091	1	1	1	100%	1	1	1	3	1	Essential
UC000092	UC000092	1	1	1	100%	1	1	1	3	1	Essential
UC000093	UC000093	1	1	1	100%	1	1	1	3	1	Essential
UC000094	UC000094	1	1	1	100%	1	1	1	3	1	Essential
UC000095	UC000095	1	1	1	100%	1	1	1	3	1	Essential
UC000096	UC000096	1	1	1	100%	1	1	1	3	1	Essential
UC000097	UC000097	1	1	1	100%	1	1	1	3	1	Essential
UC000098	UC000098	1	1	1	100%	1	1	1	3	1	Essential
UC000099	UC000099	1	1	1	100%	1	1	1	3	1	Essential
UC000100	UC000100	1	1	1	100%	1	1	1	3	1	Essential

### Requirements:

- You must have the SLIM Suite loaded on your computer with an active license
- You must have a SLIM Estimate template with appropriate reference groups and trend lines
- Should have basic SLIM Estimate training (**very highly recommended**)

## SLIM TAB size input

- Data from parent spreadsheet
- Input cell locations into SLIM TAB
- Gearing factors are local to the SLIM TAB
- Sizing is same in SLIM Estimate Template
  - Function Points
  - RICEF
  - Integration
  - Use Cases
- Results in ESLOC
- Tab is usually “hidden” from user

Essential Use Cases		
Complexity	Number of Objects	Description/Assumption
High	16	
Medium	0	
Low	8	
Very Low	0	
w/reuse	0	

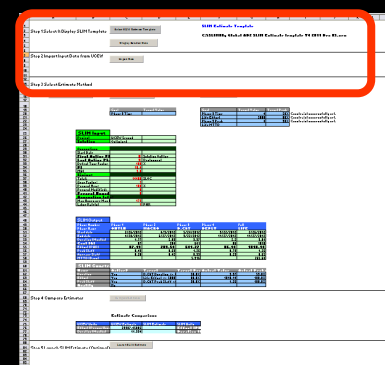
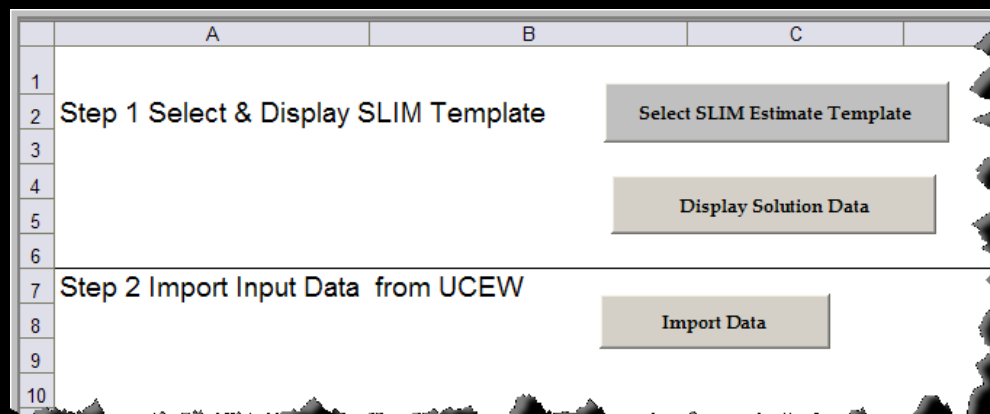
Median Use Cases		
Complexity	Number of Objects	Description/Assumption
High	16	
Medium	0	
Low	8	
Very Low	0	
w/reuse	0	

Decomposed Use Cases		
Complexity	Number of Objects	Description/Assumption
High	16	
Medium	0	
Low	8	
Very Low	0	
w/reuse	0	

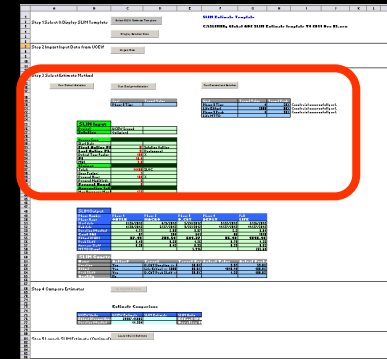
## SLIM TAB – Once you've completed your other estimate

- Select approved template and import
- Display template solution data
- Then import key data from your other estimating tool



# SLIM TAB – Once you've completed your other estimate

- You are provided three estimating methods
  - Default
  - Design to solution
  - Constrained solution (full)
- Error checking and validation is provide
- SLIM Input is documented



Step 3 Select Estimate Method

Run Default Solution      Run Design-to Solution      Run Constrained Solution

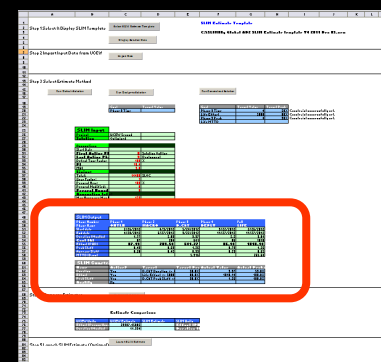
Goal	Target Value	Target Prob	
Phase 3 Time			
Phase 3 Time	4	50%	Constraint successfully set.
Life Effort	5000	80%	Constraint successfully set.
Phase 3 Peak	4	90%	Constraint successfully set.
Life MTTD			

SLIM Input	
Project	UCEW Second
Solution	Optimized
Assumptions	
Start Date	
First Active Phase	0 Solution Outline
Last Active Phase	3 Deployment
Phase Time Factor	100%

## SLIM TAB – Once you've completed your other estimate

- SLIM estimate is provided by phase
- Constraints and basis are displayed



### SLIM Output

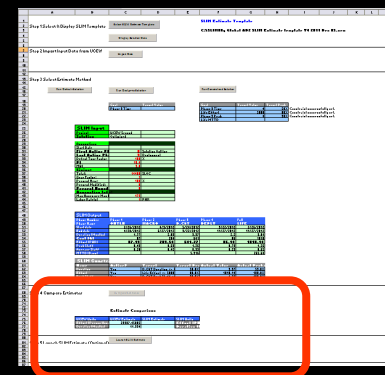
Phase Number	Phase 1	Phase 2	Phase 3	Phase 4	Full
Phase Name	OUTLN	MACRO	D,C&T	DEPLY	LIFE
Start date	2/26/2012	4/3/2012	5/24/2012	9/22/2012	2/26/2012
End date	4/20/2012	6/27/2012	9/22/2012	11/27/2012	11/27/2012
Duration (Months)	1.77	2.83	3.97	2.2	9.01
Cost (\$)	87	204	641	86	1018
Effort (PHR)	87.19	203.54	641.27	86.14	1018.14
Peak Staff	0.43	0.63	1.26	0.73	1.26
Average Staff	0.28	0.42	0.93	0.23	0.65
MTTD (Days)			5.916		265.64

### SLIM Constraints

Name	Active?	Target	Target Probability	Actual Value	Actual Probability
Duration	Yes	D,C&T Duration <= 4 Mo	50.0%	3.97	53.8%
Effort	Yes	Life Effort <= 5000 PHR	80.0%	1018.14	100.0%
Peak Staff	Yes	D,C&T Peak Staff <= 4 p	90.0%	1.26	100.0%
Quality	No				

# SLIM TAB – Once you've completed your other estimate

- Compare both estimates
- Run iterations to minimize the delta and understand the differences
- Run SLIM Estimate for full documentation and additional "what ifs"

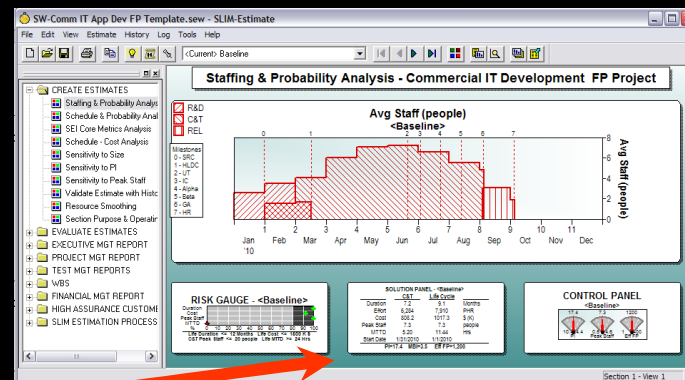


Step 4 Compare Estimates

**Estimate Comparison**

UCEW Units	UCEW Estimate	SLIM Estimate	SLIM Units
Effort (Person Hours)	4909.5	1495.3	Effort (PHR)
Duration (Months)	5.883	6.87	Duration (Months)

Step 5 Launch SLIM Estimate (Optional)



# Data Collection

# Data Collection – Single Project, Tab 1 Usage Instructions

- Example is relatively complete
- One button update to DM file
- Versions easily tailored
  - Minimal data
  - Project Type
- Six tabs
  1. Instructions and links on Usage tab
  2. Survey Questions for data quality
  3. General Project Details
  4. Sizing Details
  5. Effort and Duration Details
  6. Optional Data

**Post Project Data Collection Form**

**SLIM USER:** The macros security is set to highest to turn off the macros by default. You will get a prompt mentioning this, but just click "OK" to Enable macros and then upload the data into SLIM DM.  
**SLIM SME:** - You will first need to go to the menu "Tools -> Macro -> Security" and set the "Security Level" to "Medium".  
 - Then you will need to just go to the menu "Format -> Sheet -> Unhide" and then unhide the "Generate SLIMDM" sheet to upload data.  
 - Before data upload to a SLIM DM file, it is recommended to use the starter DM file from the CAD template release package and rename the DM file following the naming convention : Historical Data Collection\_<GEO / Practice Area / Account>\_<Date>.smp

**INSTRUCTIONS**

- ▶ **Step 1** - Read the usage sheet to understand the data collection utility.
- ▶ **Step 2** - Provide responses to the survey questions to help us understand your project better, with respect to the metrics collection process.
- ▶ **Step 3** - Enter general project details. When using this form for historic data collection in SLIM or SLIM-Control, the boxed fields are required.
- ▶ **Step 4** - Please provide a count of the delivered system size using either Effective Source Lines of Code (ESLOC), Function Points, RICEFs, or a
- ▶ **Step 5** - Please select the project type / methodology and enter the effort, duration, staffing details etc. in the appropriate table corresponding to
- ▶ **Step 6** - Enter additional project details - reliability, constraints, environmental information including hardware, software etc.

**INDEX**

- ▶ Data requirement is mandatory for the field labels colored in red.
- ▶ Data should be entered only in the yellow cells.
- ▶ Data should be selected from the options only in the tan cells.
- ▶ Help texts are colored in blue.
- ▶ Data should be selected only from the list in the fields with

**CONTACTS**

- ▶ Karthikeyan Ponnalagu/India/IBM
- ▶ Susmita Gupta/India/IBM
- ▶ Pnya M Lobo/India/IBM
- ▶ Carl Engel/Atlanta/IBM
- ▶ Joe Zhou/Somers/IBM

Go to Survey  
 Go to General Project Details  
 Go to Sizing Details  
 Go to Effort & Duration Details  
 Go to Other Details (Optional)

1. Usage / 2. Survey Questions / 3. General Project Details / 4. Sizing Details / 5. Effort & Duration Details / 6. Other Details (Optional) / Revision History

## Data Collection Survey – Tab 2

- Data quality has a huge impact on validity of reference groups and trend lines.
- Our process includes collecting “metrics” on the person filling out the form.
- Low confidence data is not thrown away, but may not be used for trend line development

	A	B	C	D
1				
2	<b>DATA QUALITY</b>			
3	Overall Confidence in the Data			
4				
5	#	SURVEY QUESTION & RESPONSE OPTIONS		Put X to answer
6	1	<b>How is the final metrics data captured verified?</b>		
7	a	The metrics data captured is verified with the responsible stakeholders of the project		
8	b	The metrics data captured is verified with the project data source & the measurement procedure is verified against project quality plan document / data harvesting procedure document		
9	c	The metrics data captured is not verified		
10	2	<b>What is the experience level of capturing and preparing project metrics?</b>		
11	a	Data capturing is done by experienced project member like project manager		
12	b	The project member responsible to collect the data has limited experience of project manager, but has many years of experience in software engineering (including programming and/or architecture design)		
13	c	The project member responsible to collect the data is relative new to data capturing process		
14	3	<b>How is staffing for each phase in the project measured?</b>		
15	a	By asking others (like architects)		
16	b	Taken from the project planning document that has been well updated		
17	c	I am the project manager, I know this from my memory		
18	d	Taken from the time sheet of the employees working on this project for each phase		
19	4	<b>How is effort for each phase in the project calculated?</b>		
20	a	By asking the team members		
21	b	Taken from the timesheets that is entered regularly in the project		
22	c	I am the project manager, I know this from my memory		
23	5	<b>How the effective SLOC counted?</b>		
24	a	SLOC is counted based on the guidelines provided in data harvesting procedure document for counting tool and definitions of new/modified/reuse code.		
25	b	The SLOC count is asked to others (like architects)		
26	c	SLOC is counted using code counter tool that were used in the past (If this is selected, provide name of code counting tool)		
27	6	<b>In case delivered size is specified in units other than SLOC, how was the function point/use cases/ user metric count arrived at?</b>		
28	a	By visiting the design & requirements documents and arriving at the size		
29	b	There is another source that has such information (If this is selected, provide source name)		
30	c	Based on individual memory		
31	d	By asking others		
32				

# Data Collection – Details Tabs 3 and 4

- General Project Details Tab 3
  - Fundamentals
  - Key to analysis granularity
  - GR data
  
- Sizing Detail Tab 4
  - Flexible sizing
  - Gearing factors in SLIM Estimate
  - Languages

Project Methodology

Enter Additional Sizing units only if not captured as part of primary Sizing units.

Sizing Unit	Scenario	SLOC per component	New	Modified or Changed	Tested / Reused but not changed <sup>(2)</sup>
EI Sizing	EI Adapters	1520			
Use Cases	Decomposed - Medium	60			
Function Points	Cobol	77			
RICEFs					
	Reports - Low Complexity				
	Reports - Medium Complexity				
	Reports - Medium Complexity				
	Enhancements - Medium Complexity				
	Enhancements - High Complexity				
	Forms - Low Complexity				
	Forms - Medium Complexity				
	Forms - High Complexity				
		0			
		0			
		0			
		0			
		0			
		0			
		Grand SUM Total in SLOC	0.00	0.00	0.00

Programming Language(s) along with percentage distribution

Language Type <sup>(3)</sup>	Language Name <sup>(4)</sup>	Percentage of Total
High level language		100

Design Complexity

## Data Collection – Tab 5 Effort and Duration

- Project Method - AD, Oracle, Package, etc
- Basic phase/effort data
- Accuracy is important
- Phase/template confirmation

**PROJECT EFFORT AND DURATION**

Please select the project type / methodology and enter the effort, duration, staffing details etc. in the appropriate table below, corresponding to each project lifecycle phase.

Project Methodology

**Enter Project Lifecycle Data**

Lifecycle Phase Name <sup>(1)</sup>	Start Date	End Date	Effort (Person-Hours) <sup>(2)</sup>	Peak Staff
Solution Outline / Feasibility Study				
Macro Design / Functional Design				
Micro Design, Build and Test / Main Build (Unit, System, Integration & User Acceptance Testing)				
Deploy & Close / Maintenance				

Date System was Ready for Delivery <sup>(4)</sup> - (MM/YY)

(1) The lifecycle is divided into 4 phases in SLIM. Enter the resource information for all phases which are applicable to the completed project. A brief description of each phase is as follows: **Feasibility**  
(2) Effort is the total person months expended by all development staff during a given phase. The number of person months should be reported in Full Time Equivalents (FTEs), including both internal and external/contractor staff (if any). For example, two people working half-time in project management would be included as one FTE. If you track effort in actual hours worked (net hours), then divide by the appropriate number of hours per month to determine the FTE effort.  
(3) Indicate the month and year that the system was ready for delivery. This should coincide with the end of the Main Build phase. In the case of mission critical software, if the system was not delivered until sometime after the end of the Main Build, please make a note of when in phase 4 this occurred.

## Data Collection – Tab 6 Other Details

- Rarely Used
- Does provide increased analysis capability
- Primarily PM data

RELIABILITY OF THE DELIVERED SYSTEM			
How many errors <sup>(1)</sup> were found during the period from the start of integration testing to the time the system was ready for			<input type="text"/>
How many errors were found during the first month that the system was in commercial use/production?			<input type="text"/>
What was the Mean Time to Defect (MTTD) <sup>(2)</sup> in hours during the first month the system was in production?			<input type="text"/>
<p>(1) An error is defined as each unique discrepancy between the program test results and the specification or code. Don't include queries or feature requests, only actual program errors. These counts should include all error severity categories, from cosmetic to critical. If the breakout by severity category is known, please note the distribution.</p> <p>(2) The Mean Time to Defect (MTTD) is the average time between occurrences of a unique error (a defect once the product is shipped). This can be calculated by dividing the number of hours the system was operational by the number of defects discovered by the user(s).</p>			
PROJECT CONSTRAINTS			
Please indicate any initial project constraints or limiting factors that were imposed on the project's Main Build phase (detailed			<b>Main Build</b>
Cost (\$ x 1000)			<input type="text"/>
Maximum available staff			<input type="text"/>
Duration (in calendar months)			<input type="text"/>
Computer Resource Limits (0 = none, 1 = some, 2 = significant)			<input type="text"/>
ENVIRONMENTAL DETAILS			
List the hardware and software used during the development:			
Hardware brand and type			<input type="text"/>
Operating System			<input type="text"/>
Choose the number of years experience (averaged over the whole team, where appropriate) at the start of the project:			
<b>Aspect</b>	<b>Years Experience</b>	<b>Aspect</b>	<b>Years Experience</b>
Similar projects	<input type="text"/>	Similar applications	<input type="text"/>
Methods and techniques used	<input type="text"/>	Programming languages	<input type="text"/>
Development tools used	<input type="text"/>	Hardware	<input type="text"/>
Management team	<input type="text"/>		
Choose the number that best describes the unexpected staff changes which occurred during the Main Build:			<input type="text"/>
Choose the number that best describes the effectiveness of the tools and utilities used:			<input type="text"/>
Choose the number that best describes the average response time of the development computer for typical compiles and			<input type="text"/>

# Data Analysis

# Data Analysis – Outlier Determination

- Previously performed in SLIM Metrics visually – tended to be subjective
- Identify and investigate anomalies
- Data collection is expensive – don't waste data
- X-Y comparison flexibility
- Productivity and quality improvement tool
- 3 Tabs
- Allows independent data analysis

**SLIM DM Outlier Identifier Tool**  
Instructions for use

Step

- In your SLIM Data Manager file, define two custom metrics: SizeEffortOutlier and SizeDurationOutlier
- 1. Create a backup copy of the SLIM Data Manager file and store it in a safe place**
- On worksheet *SLIMDM-Import and Export*, enter the file name (including the full path) of the SLIM Data Manager file
- Click the *Import Projects* button. The data is imported and displayed on the *Outlier Filter Data* worksheet.
- On *Outlier Filter Data*, click the *Identify Outliers* (see column X) button to determine the outliers. Inspect the *Outlier Filter Data* worksheet to see which projects were marked as outliers
- On the *Outlier Filter Data* worksheet, outliers are indicated in columns U and V, the green box in columns X:AA displays parameters of the regression, sigma values, and the number of outliers detected
- On the *SLIMDM-Import and Export* worksheet, click *Update Projects* to mark the outliers in the original input data manager file. **WARNING: The original input file will be modified**

File name (including full path)

Number of Projects

Confidence	Application Type	Country	PI	Effort in PHR	Duration (Months)	Effective Size	Log (Effort)	Log (Duration)	Log (Size)	Log (Effort) Residual	Log (Duration) Residual	Size Effort Outlier	Size Duration Outlier
5	High	Business	United States		308	420	5.730099783		6.040254711	0.346552033		0	1
6	High	Business	United States		56	360	4.025351691		5.885104031	-0.85982813		0	1
7	High	Business	United States	19.4	160	0.91	5.075173815	-0.09431068	7.390181428	-0.26329886	-0.71366022	0	0
8	High	Business	United States	10.7	136	1.84	4.912654886	0.609765572	6.173786104	0.074215343	0.381164433	0	0
9	High	Business	United States	20.2	104	0.65	4.844390899	-0.43078292	6.984776332	-0.52740407	-0.919882399	0	0
10	High	Business	United States	14.7	176	1.55	5.170483995	0.438254931	6.394776332	-0.00193997	-0.05084514	0	0
11	High	Business	United States	19.5	104	0.65	4.844390899	-0.43078292	6.902394763	-0.45249572	-0.96131498	0	0
12	High	Business	United States	37.1	80	0.06	4.382026535	-2.81341072	7.783224016	-1.1800710	-2.55901918	0	1
13	High	Business	United States	13.1	144	1.9	4.9689133	0.641853886	6.902394763	-0.12703332	0.211321825	0	0
14	High	Business	United States	1.7	200	4.1	5.298317367	1.410986974	5.192956851	0.863074971	1.497462239	0	0
15	High	Business	United States	2.6	104	4.1	4.844390899	1.410986974	5.192956851	0.209149504	1.497462239	0	0
16	High	Business	United States	10.3	96	1.03	4.564348191	0.029558802	5.192956851	0.129105796	0.116034067	0	0
17	High	Business	United States	11.9	120	0.91	4.787491743	-0.09431068	5.490638923	0.232989629	-0.10024888	0	0
18	High	Business	United States	14.6	640	2.89	6.461460176	1.061296502	8.237479289	0.774690145	0.939725476	0	0

Effort vs Size		Duration vs Size	
b	0.411070	b	0.23212477
sigma	2.300533	sigma	-1.75463326
<b>Outliers</b>	<b>0.643</b>	<b>Outliers</b>	<b>0.952</b>
10*b	1508443	10*b	1378882

## Summary

- IBM uses the API to
  - Reduce the cost/time to value realization of SLIM Estimate deployment
  - Improve the rate of adoption of improved estimating tools
  - Improve capability for performance benchmarking and trendline/reference group generation
  - Reduce data collection errors thus improving trend line accuracy
  
- General comments
  - QSM has a great starter set of examples and documentation on line
  - Fundamental script programming knowledge required only
  - Don't try to solve all of your estimating or data collection problems at one time with giant applications built on the API
  - Do start small to sell the concepts and get implementation buy in
  - Be careful of API usage without understanding SLIM Estimate



## Developers/Authors

- Carl Engel - Carl Engel is the Estimating Program Manager for IBM's Global Business Services responsible for the development and deployment of performance benchmarking and estimating process, methods and tools including the support for nearly 1,000 SLIM Suite users. Carl has been with IBM for 12 years as an Associate Partner and has had previous roles as the program manager for IBM's worldwide project management methodology and tools. He is an IBM certified Executive Project Manager, PMP with over 30 years of program and project management experience primarily in very large scale efforts in the nuclear industry and U.S. National Laboratories: [engecarl@us.ibm.com](mailto:engecarl@us.ibm.com)
- Karthikeyan Ponnalagu - Karthikeyan Ponnalagu joined IBM in 2000 and is working with IBM Research - India Bangalore for the past 6 years. Recently, he has been specifically involved with Estimation Data Harvesting, SLIM API based tooling development for leveraging SLIM Data manager and SLIM Estimate capabilities and challenges in planning and estimation for globalization projects. He has developed a Multi-Step Data Filtering (Completeness, Correctness and Outlier) and Clustering Technique that can be repeatedly deployed with different data sets and for multiple account centric needs. He also built the Automation Utilities for SLIM DM file generation and 2 sigma based Outlier deduction. He also developed SLIM API based integration Worksheets for BAO and UCEW Estimation tools that are Excel based. He also developed a "Task Allocation Network" concept for addressing Globalization in Estimating projects
- Joe Zhou - Dr. Nianjun Zhou (Joe) is a research staff member at IBM T.J. Watson Research Center. He is serving as PIC (Professional Interest Community) Chair of Services Computing at IBM research. His current research areas mainly focus on services sciences and service computing to achieve IT and services solution optimization. He is leading research for resource estimation and optimization of IT solution and maintenance under global integration environment; and leading a solution framework development using standardized toolset, method, and assets to simplify service engagement.