Precision Estimation & Metrics

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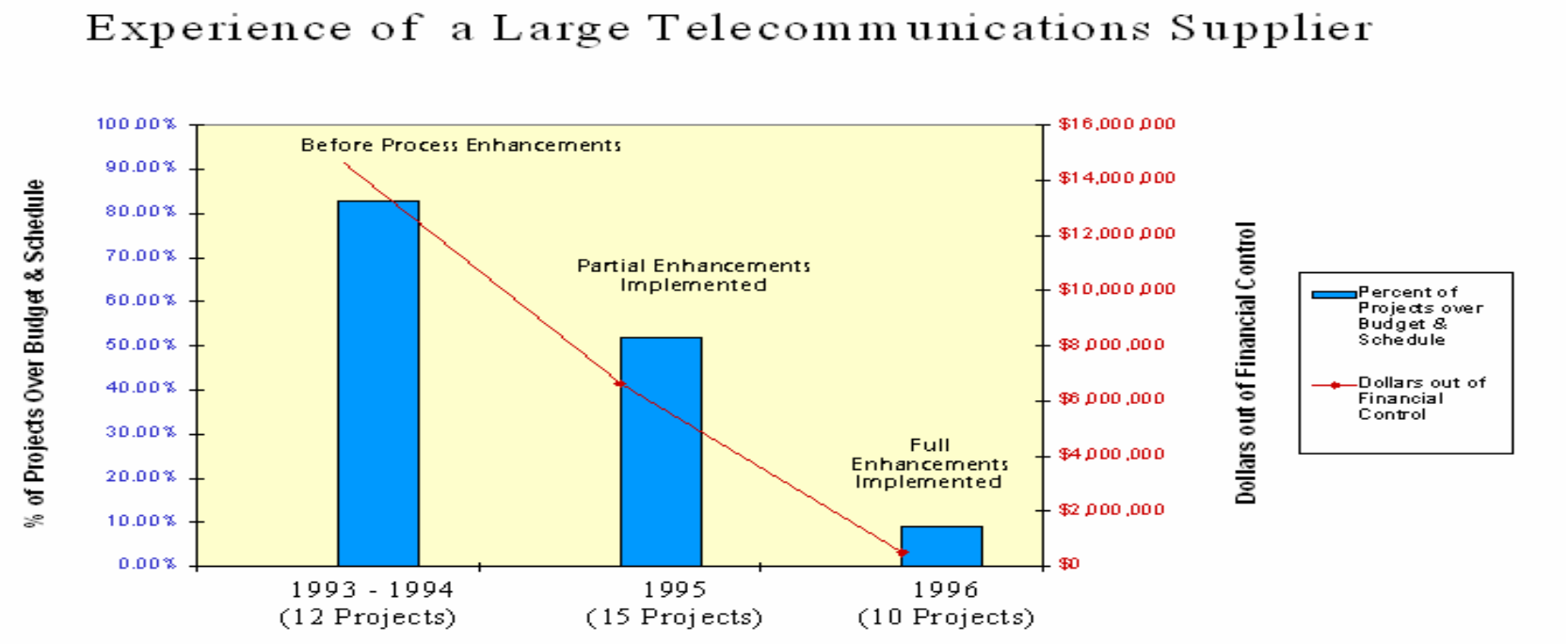
Introduction & The Problem

2 of the key Project Management practices that have long been the Achilles' heels of development projects are **Estimation** and **Risk Management**. Independent of the specific SDLC or method chosen, there are some key elements of these practices that are well worth examining.

- Poor estimation (and lack of metricable data) generally results in promising delivery in impossible timescales, and underestimating the resources necessary to complete the job.
- This leads in most cases to failing to meet quality, budget and time commitments.

Clearly, a more predictable process is needed. The following scenario highlights the benefits:



The Solution & Estimation Recommendations

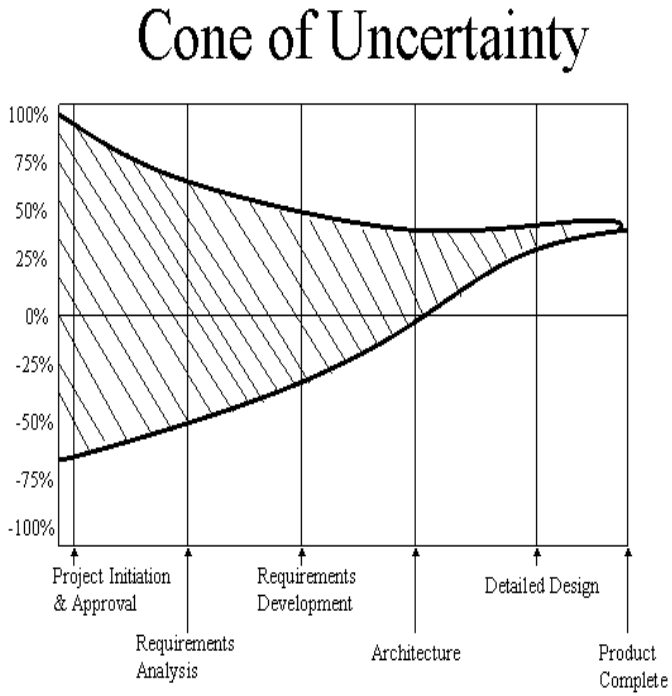
The Solution

Create a repeatable, predictable, adaptive, Estimation Process
that integrates and quantifies staff, budget, duration, scope and risk of a project.

Create a process and database of metrics that can be used to make future estimation efforts more accurate.

Recommendations

- Industry *best practices* tell us to expect gradually increasing estimation accuracy through the SDLC
- Consistent with PMI and CMM Estimating Guidelines and Measurements, projects would estimate at 3 discrete points in the lifecycle:
  - Concept Development
  - Analysis
  - Design
- We recommend estimation accuracy targets of:
  - +/- 50% (Concept Development)
  - +/- 25% (Analysis)
  - +/- 10% (Design)



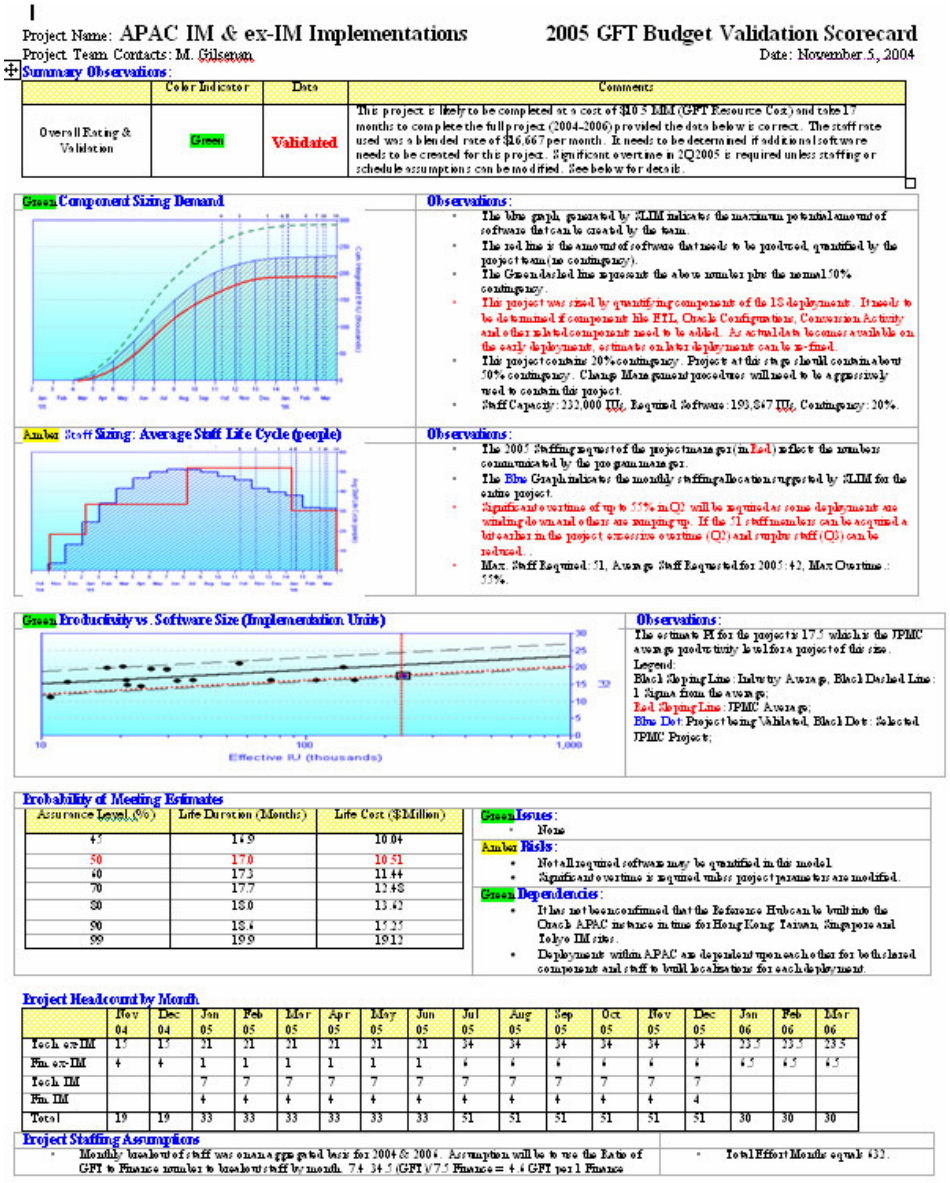
Taken from "Software Project Survival Guide" by Steve McConnell

Benefits

- **Will improve decision making regarding project selections.**
- **Clarity in the relationship between product delivery, quality (defects) and risks associated with the effort.**
- **Using a common sizing template will foster common project estimating practices.**
- **Will provide consistent understanding of productivity from project to project.**
- **Standardization, combined with more robust scoping and estimation practices will reduce the variance between project budget and project spend.**
- **Comparisons to 7000 projects database can be utilized when no other sizing and estimation data is available.**
- **When project expectations change or are unrealistic, modeling can be performed and "What If" scenarios developed instantly by altering cost, schedule, resource, functionality or defects assumptions.**
- **Projects "in-flight" can be analyzed using mid-project radar analysis (red/amber/green).**

Output Elements: Projects Not Started

- Component Sizing (Scope), Staffing, Productivity, Probability of Success comparisons and validation.
- Defect Forecast (not pictured).
- Alternative scenario comparisons and analysis (not pictured).
- Projects can be compared to each other.
- Project can be aggregated into program and higher level scorecards.



Project Name: APAC IM & ex-IM Implementations — 2005 GFT Budget Validation Scorecard

Project Team Contacts: M. Gilsenan — Date: November 5, 2004

Summary Observations:

	Color Indicator	Data	Comments
Overall Rating & Validation	Green	Validated	This project is likely to be completed at a cost of $10.5 MM (GFT Resource Cost) and take 17 months to complete the full project (2004-2006) provided the data below is correct. The staff rate used was a blended rate of $16,667 per month. It needs to be determined if additional software needs to be created for this project. Significant overtime in 2Q2005 is required unless staffing or schedule assumptions can be modified. See below for details.

Green Component Sizing Demand

Observations:

- The blue graph generated by SLIM indicates the maximum potential amount of software that can be created by the team.
- The red line is the amount of software that needs to be produced, quantified by the project team (no contingency).
- The Green dashed line represents the above number plus the normal 10% contingency.
- This project was sized by quantifying components of the 1S deployment. It needs to be determined if components like FIL, Oracle Configuration, Conversion Activity and other related components need to be added. As actual data becomes available on the early deployment, estimates on later deployment can be re-fined.
- This project contains 20% contingency. Projects at this stage should contain about 50% contingency. Change Management procedures will need to be aggressively used to contain this project.
- Staff Capacity: 232,000 IUs, Required Software: 193,847 IUs, Contingency: 20%.

Amber Staff Sizing: Average Staff Life Cycle (people)

Observations:

- The 2005 Staffing request of the project manager (in Red) reflect the numbers communicated by the program manager.
- The Blue Graph indicates the monthly staffing allocation suggested by SLIM for the entire project.
- Significant overtime of up to 55% in Q2 will be required as some deployment are winding down and others are ramping up. If the 51 staff members can be acquired a lot earlier in the project, excessive overtime (Q2) and surplus staff (Q3) can be reduced.
- Max. Staff Required: 51, Average Staff Requested for 2005: 42, Max Overtime: 55%.

Green Productivity vs. Software Size (Implementation Units)

Observations:

The estimate PI for the project is 17.5 which is the IPMC average productivity level for a project of this size.

Legend:
Black Sloping Line: Industry Average, Black Dashed Line: 1 Sigma from the average,
Red Sloping Line: IPMC Average,
Blue Dot: Project being Validated, Black Dot: Selected IPMC Projects;

Probability of Meeting Estimates

Assurance Level (%)	Life Duration (Months)	Life Cost ($Million)
45	169	10.04
50	170	10.51
60	173	11.44
70	177	12.48
80	180	13.42
90	184	15.25
99	189	19.12

Green Issues:

- None

Amber Risks:

- Not all required software may be quantified in this model.
- Significant overtime is required unless project parameters are modified.

Green Dependencies:

- It has not been confirmed that the Reference Hub can be built into the Oracle APAC instance in time for Hong Kong, Taiwan, Singapore and Tokyo IM sites.
- Deployment within APAC are dependent upon each other for be the shared component and staff to build localizations for each deployment.

Project Headcount by Month

	Nov 04	Dec 04	Jan 05	Feb 05	Mar 05	Apr 05	May 05	Jun 05	Jul 05	Aug 05	Sep 05	Oct 05	Nov 05	Dec 05	Jan 06	Feb 06	Mar 06
Tech ex-IM	17	17	21	21	21	21	21	21	34	34	34	34	34	34	23.5	23.5	23.5
Fin ex-IM	4	4	1	1	1	1	1	1	4	4	4	4	4	4	4.5	4.5	4.5
Tech IM			7	7	7	7	7	7	7	7	7	7	7	7			
Fin IM			4	4	4	4	4	4	4	4	4	4	4	4			
Total	19	19	33	33	33	33	33	33	51	51	51	51	51	51	30	30	30

Project Staffing Assumptions

- Monthly headcount staff was aggregated basis for 2004 & 2005. Assumption will be to use the Ratio of GFT to Finance number to headcount staff by month. 7.4: 34.5 (GFT)/7.5 Finance = 4.6 GFT per 1 Finance
- Total Effort Months equals 432.

Output Elements: Alternative Scenarios (Not Started)

Original Expectation: Convert 120 reports using 3 staff by September 1st.

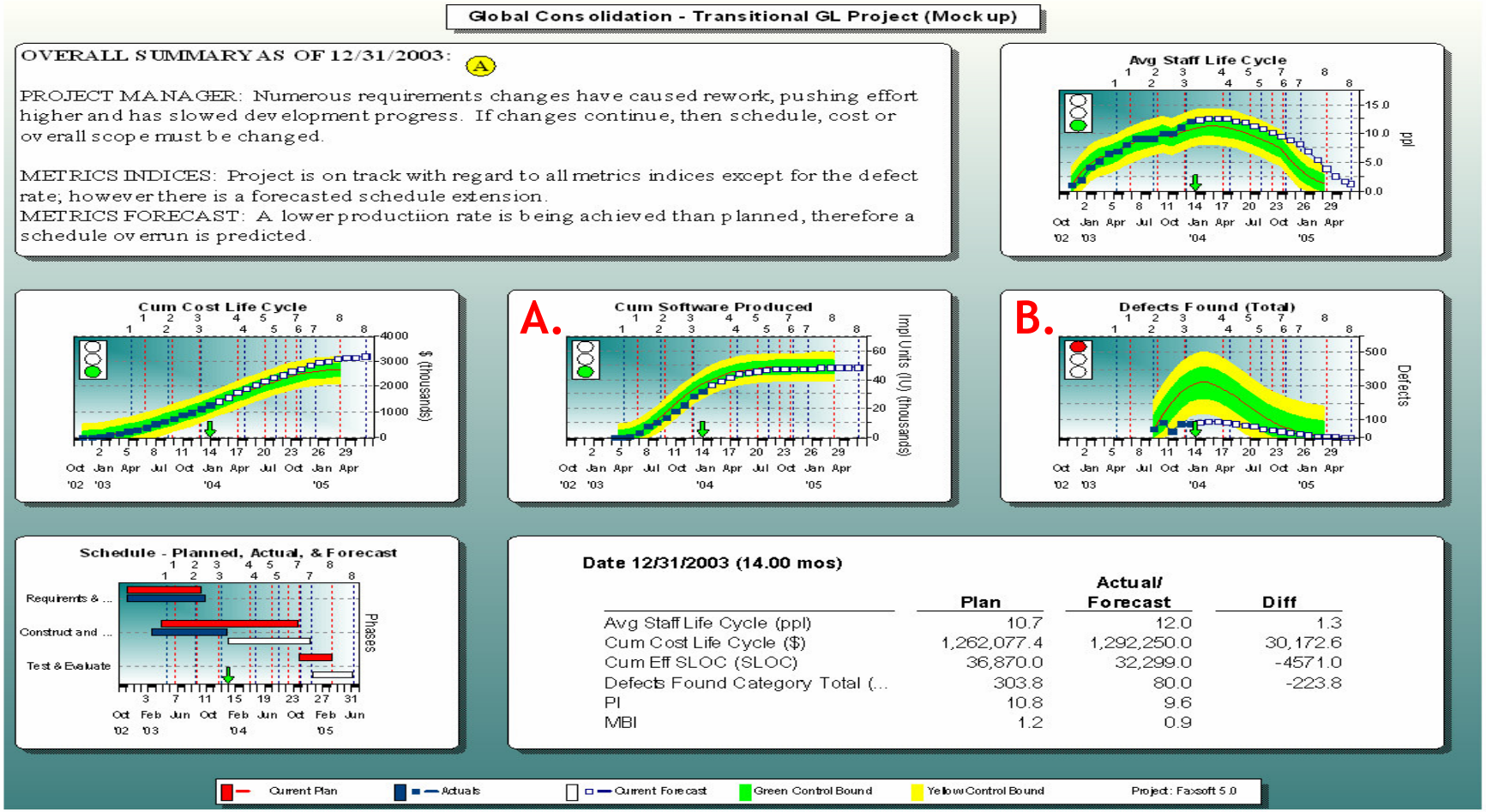
Refine Requirements: Staff can only be utilized at rate of 2.25 due to vacations and other non-project time. Only 20 of the 160 reports can be completed in timeframe.

Best Practice: With other areas using the standard techniques, yields better estimates allowing to fine tune the estimate to 100 reports.

Scheduling, Resourcing, Costing and other assumptions can now be modified, yielding instant Estimate Re-Calculations.

Scenario	Reports Ready for SIT	Scope	Staff	Probability of Success	Comments
Original Mandate	9/1/2005	120 out of 120 Reports	3	< 5 %	To gain a reasonable probability of Success would require 50 staff members.
Accelerated Scenario	11/21/2005	25 priority reports out of 100	8	70%	Scope was refined to 100 reports after further requirements gathering.
Preferred Scenario	12/15/2005	100 out of 100 Reports	8	70%	75 out of 100 reports will be done by beginning of SIT. By Test Tollgate milestone (1/2/04), all 100 reports will be completed.

Output Elements: Projects In-Flight



A. Highlights Units of Output produced (Plan vs. Actual vs. Forecast).

B. Highlights DEFECTS (planned vs. Actual defects found vs. forecast). This graph indicates a green status as of today, but if things continue, yellow and red indicators will soon be warranted. Changes can be made well in advance of problems!

Output Elements: Post Project and Next Project (Sample)

SUMMARY OBSERVATIONS	
Summary	Project was required to produce 20% more software than originally quantified. Overtime and an actual increase in productivity helped to achieve this. Data sources for this estimate includes: Interview notes, detailed staff resource sheet, Microsoft Project Plan and a MSP to SLIM mapping document. Actual defect data will be added when it is received by the QI team.
Main Lessons Learned	Contingency should be included in all estimates. Estimates and Actuals should be measured using the same criteria. PRS codes should be set up for each project as soon as possible. At least 13% more effort for Initiation and Requirements activities should be included in the next estimates.

Precision Scoping & Estimation Summary

Quantifiable Component Sizing (Scope), Staffing, Productivity, Probability of Success comparisons, Defect Forecasts, Alternate Scenario creation and validation with other projects can lead to:

- Better integrated Estimates at the start of a project
- Alternate Scenarios when expectations are not realistic
- Better control of projects in-flight
- Better post project data that ultimately leads to more predictable future projects.

Appendices

Benefits comparison
Input details

Benefits Comparison

Best Practice	Before Process Enhancement	After Process Enhancement
Modeling Method	Excel file that is effort based by deliverable, not standardized.	Matches Staff (Supply) with Component (Demand) of the project and compares against like projects. Standardized.
Re-Estimation/ Modeling/ Alternative Scenarios	Manually redone.	Done within seconds and can be compared against previous estimates easily.
Ability to align with actuals	No	PRS, 5 Quarter and Project Plan data can be aligned against plan to determine variance.
Ability to Forecast and re-forecast based on actuals.	No	After actuals aligned with plan, a predictive forecast can be created.
Ability to Compare Between Projects	Yes to a vary limited degree.	Yes in a database. Very flexible. Compare to industry, UBS, other team's similar projects, same team's past projects.
Ability to change staff resources.	No. Resource efforts are either based on an average or on the specific capabilities.	Yes. Resources may be interchanged easily by altering productivity of the team.
Provide Risk ratings of project success to client and Technology Management	No	Yes. Risk ratings are provided for on every scenario within a project estimate. Scenarios can be evaluated using risk criteria.

Inputs Elements: Normal Data & Productivity

Normal Data: Cost, Duration, Resource (staff and other)

Productivity: 40 attributes, divided into 4 categories, can be used to help gauge before and during the project. After the project is completed, these can be baselined and re-evaluated providing better metrics for the next project.

Initially these factors are based on a 7000+ project industry database.

Attributes are graded relatively to the database and/ or our own data.

	A	B
1	**Directions: Select how you will enter your assessment for each category, then enter assessment(s):**	
2		
3	**CATEGORIES**	**High Level Assessment Rating: (Select rating from drop down list in cells below)**
4	How good are the tools & methodologies that will support this development process?	
5		
6	How would you rate the technical complexity of this project?	
7		
8	How would you rate the competence, experience & skill level of the development team?	
9		
10	How would you rate the quantity and complexity of integrating reused, unmodified software?	

Input Elements: Quantifiable Standardized Build Components

3	**Project:**			**Name of Project:**						
4	**Project Manager:**			**Name of PM - Date:**						
6										
7	**Enter data in columns B-E and G-I. You may enter Low, Most Likely, and High OR you may enter just the range (Low and High) OR you**									
8	**may enter just the Most Likely value.**									
9										
10	**Function Unit:**		**IU**	*Note. The function unit here must be consistent with the function unit being used in the SLIM-Estimate workbook which imports this estimate.*						
11										
12										
13			**Gearing Factor** *(IU/Component)*				**Number of Components**			
14	**#**	***Component Name***	***Low***	***Most Likely***	***High***		***Low***	***Most Likely***	***High***	
22	**Build**									
23	7	Tables Simple	25	50	75	IU/Tables Simple	0	0	0	
24	8	Tables Average	65	130	195	IU/Tables Average	9	10	11	
25	9	Tables Complex	100	200	300	IU/Tables Complex	0	0	0	
26	10	Stored Procedures Simple	25	50	75	IU/Stored Procedures Simple	0	0	0	
27	11	Stored Procedures Average	50	100	150	IU/Stored Procedures Average	0	0	0	
28	12	Stored Procedures Complex	125	250	375	IU/Stored Procedures Complex	0	0	0	
29	13	OFSA Stored Procedures Simple	80	160	240	IU/OFSA Stored Procedures Simple	0	0	0	