

Deploying a Project Risk Program

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“Project Risk data can provide your organization with quantifiable evidence of efficiencies and improvements in the performance of your teams and in the execution of your projects.”

What is Project Risk?

Project Risk can be defined in many ways.

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- “Project Risk management is the systemic process of identifying, analyzing, and responding to project risk. It includes maximizing the probability and consequences of positive events and minimizing ...”, PMIBOK
- Cost/ Benefit to the organization before the project begins
- Risk to organization of project not implemented or failing before the project begins
- Risk of project failing during execution of the project.

Using the last definition as the basis of the program allows risk analysis to be performed from project inception through post implementation.

How Can Project Risk Data Help?

For the entire organization, before projects are funded, throughout the project lifecycle and after the project is over, Project Risk Data can be an invaluable asset.

Project not yet funded

- Create estimates that include quantifiable scope and quality
- Provide Sr. Mgmt. with probabilities of success & risk data
- Provide Line Mgmt. with alternate scenarios for a project.

Project Lifecycle through Implementation

- Comparing quantitatively scope output, effort, schedule estimates to actual results
- Creating measurable, objective project reporting (e.g. RAG)
- Providing very early warning of any project deviation

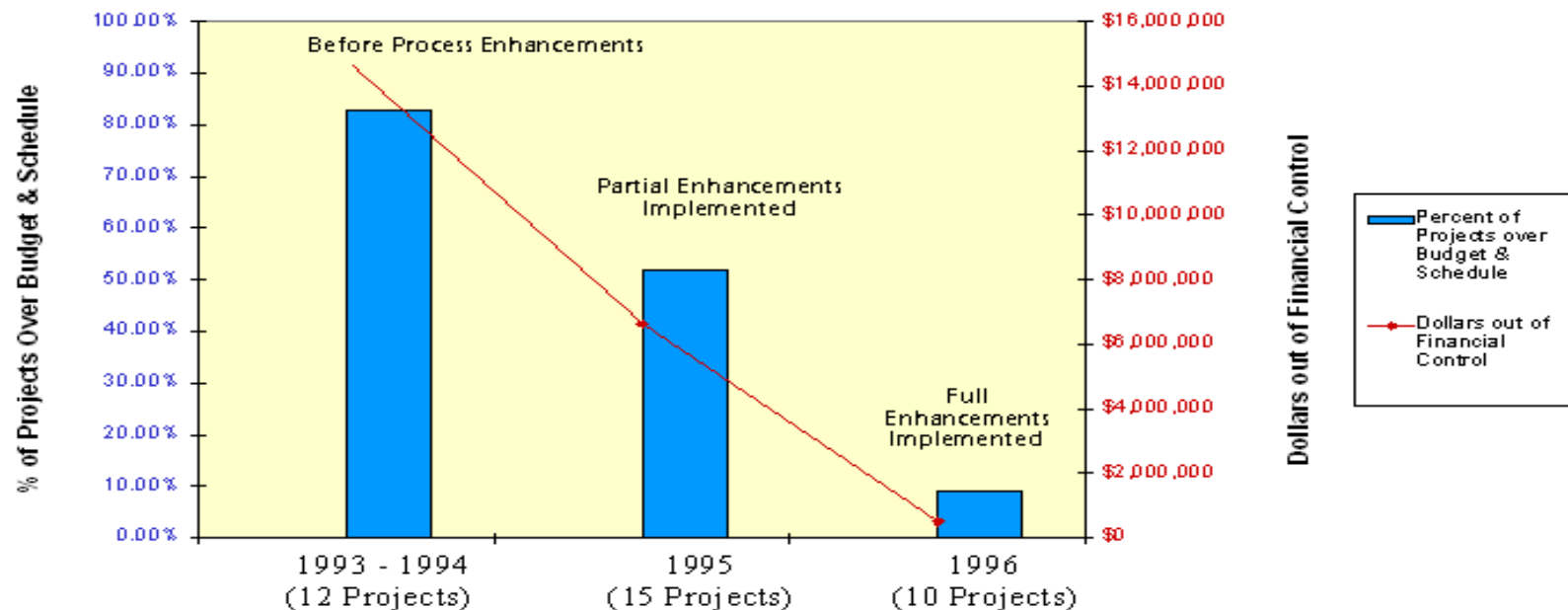
Post Project

- Documenting existing team capabilities
- Creating measurable team productivity improvements

Risk data can improve the overall organization by improving processes and team productivity by learning from the measurable data.

2 of the key project management practices that have long been the Achilles' heels of development projects are Risk Management and Estimation.

Experience of a Large Telecommunications Supplier



Case study: Before & After Project Risk Implementation
Percentage of projects over schedule reduced from 84% to 5%
Amount of cost overruns of project portfolio reduced from \$14.5 MM to \$500K

The Solution & Recommendations

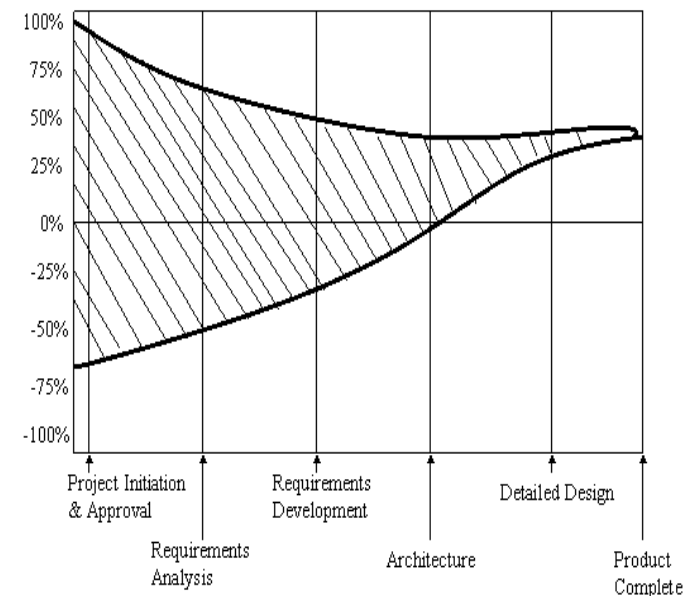
The solution is to create a repeatable, predictable, adaptive, Project Risk process that integrates and quantifies staff, budget, duration, scope and risk of a project. Create a process and database of metrics that can be used to make future efforts more accurate.

Recommendations

- Industry *best practices* tell us to expect gradually increasing estimation accuracy through the SDLC
- Consistent with PMI and CMMI 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) and +/- 10% (Design)

Cone of Uncertainty



Taken from "Software Project Survival Guide" by Steve McConnell

Many factors need to be addressed in the Business Case (or other project inception documentation) for the Project Risk program.

- Accurate scope data at the inception of a project.
- Changing scope, cost, schedule, resource data throughout the lifecycle.
- Aligning data when changes occur.
- Validating data when challenges occur.
- Presenting of detailed data or high level data.
- Integrating with existing processes (SDLC, Project Accounting, Project Plans, etc.).

*These considerations and pitfalls will be addressed in more detail
throughout the rest of the presentation.*

There are a couple of data types that need to be quantified to make a Project Risk implementation successful.

- Standard cost, resource, schedule data (integrated)
- Productivity
- Standardized Scope Components
- Components Mapping Tool

Documentation of assumptions and data is key to adding confidence to this process.

There are 40 elements divided into 4 categories.

- Scale ranges from 0 – 40.
- Compared to industry, existing firm data or team data.
- Measured before project begins and after project completes.

Categories:	Detailed Questions for Assessment:	Assessment Rating (Select from drop down list in each cell)
How good are the tools & methodologies that will support this development process?	What was your level of familiarity with the development hardware?	
	What was the availability of the development system?	
	What was the role of database management in this system?	
How would you rate the technical complexity of this project?	What was the intensity of memory utilization in the system?	
	What was the volume of data in this system?	
	What was the complexity of data manipulation in this system?	
How would you rate the competence, experience & skill level of the development team?	What was the effectiveness of management and leadership?	
	What was the availability of training?	
	What was the level of staff turnover?	
	What was the availability of skilled manpower?	
	What was the level of functional knowledge?	
	What level of experience did the development team have with this application type?	
	What was the level of motivation of the development team?	
	What was the level of cohesiveness of the development team?	
How would you rate the quantity and complexity of integrating reused, unmodified software?	What was the level of human communication complexity?	
	What was the relative % of reused software?	
	What was the level of complexity of integrating products with new code?	
	What was the level of experience using the specific products?	

Productivity assessment is the starting point of data collection.

Component sizing has to fit at every stage of measurement and must also be translatable.

- Release Level
- Business Requirements
- High Level Requirements
- Detailed Requirements
- Full Lifecycle Build
- RAD Build

Project:		Name of Project:		Expected Start Date:				
Project Manager:		Name of PM - Date:						
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 may enter just the Most Likely value.								
Function Unit:		IU <small>Note: The function unit here must be consistent with the function unit being used in the SLIM-Estimate workbook which imports this estimate.</small>						
#	Component Name	Gearing Factor (IU/Component)				Number of Components		
		Low	Most Likely	High		Low	Most Likely	High
Design								
1	Technical Spec. (Simple)	120	240	360	IU/Technical Spec. (Simple)	0	0	0
2	Technical Spec. (Average)	240	480	720	IU/Technical Spec. (Average)	0	0	0
3	Technical Spec. (Complex)	480	960	1440	IU/Technical Spec. (Complex)	0	0	0
4	Module Spec. (Simple)	24	48	72	IU/Module Spec. (Simple)	0	0	0
5	Module Spec. (Average)	48	96	144	IU/Module Spec. (Average)	0	0	0
6	Module Spec. (Complex)	72	144	216	IU/Module Spec. (Complex)	0	0	0
Build								
7	Tables Simple	25	50	75	IU/Tables Simple	0	0	0
8	Tables Average	50	100	150	IU/Tables Average	0	0	0
9	Tables Complex	100	200	300	IU/Tables Complex	0	0	0
10	Stored Procedures Simple	25	50	75	IU/Stored Procedures Simple	0	0	0
11	Stored Procedures Average	50	100	150	IU/Stored Procedures Average	0	0	0
12	Stored Procedures Complex	125	250	375	IU/Stored Procedures Complex	0	0	0
13	QFSA Stored Procedures Simple	80	160	240	IU/QFSA Stored Procedures Simple	0	0	0
14	QFSA Stored Procedures Average	240	480	720	IU/QFSA Stored Procedures Average	0	0	0
15	QFSA Stored Procedures Complex	320	640	960	IU/QFSA Stored Procedures Complex	0	0	0
16	Reports w/Table Simple	45	90	135	IU/Reports w/Table Simple	0	0	0
17	Reports w/Table Average	115	230	345	IU/Reports w/Table Average	0	0	0
18	Reports w/Table Complex	170	340	510	IU/Reports w/Table Complex	0	0	0
19	Reports w/o Table Simple	15	30	45	IU/Reports w/o Table Simple	0	0	0

The types of components documented are organization dependent.

Translates business language into technical quantifiable data.

- Provides agreement to what developers are creating and how they are being documented.
- Assists in tracking when scope gets developed.

2	Component Translation for SLIM																								
3				Extracts (PL/SQL Pgm)			File Load (Batch Uploader)			Java			ETL			DDL Size			New Tables			Or. Rep.			Comments
4				h	m	s				h	m	s	h	m	s	h	m	s	h	m	s	h	m	s	
80	CIIS																								
82	Create new mapping tables																			2					
83	Create/modify Cobol file layouts(programs)														10									ETLs were re-classified to low based on comparisons to other projects.	
84	Create JCL and data sets														10										
85	Create test file for PREMIS(and accept 1 new file from SEM)																								
104	CPP Data Warehouse																								
106	Code DataStage (ETL)														15										
107	Code SyncSort (ETL)														20										
108	Code scripts (ETL)														5										
109	Code Autosys Jils (ETL)														10										
110	DDL																	17							
112	Extracts				1	4																			
114	Reporting																						20		
115	Oracle Reports build																					1			
117	Finance Server																								
118	ETL																								
119	Code ETL														1										
120	Code Cobol														2										
295	Totals			10	4	0	0	4	0	2	10	0	0	0	195	0	23	0	2	0	0	1	20	0	

This documentation was vital to our implementation and very unique.

Integrating With Other Processes

There are a couple of data types that ideally should be integrated to make a Project Risk implementation successful.

- SDLCs
- Project Tracking/ accounting
- Scope Change Management
- Issues/ Risk Management
- Scheduling Tool (MS Project)
- Project Reporting

Implementing this process can be used as the impetus to integrate other disparate processes.

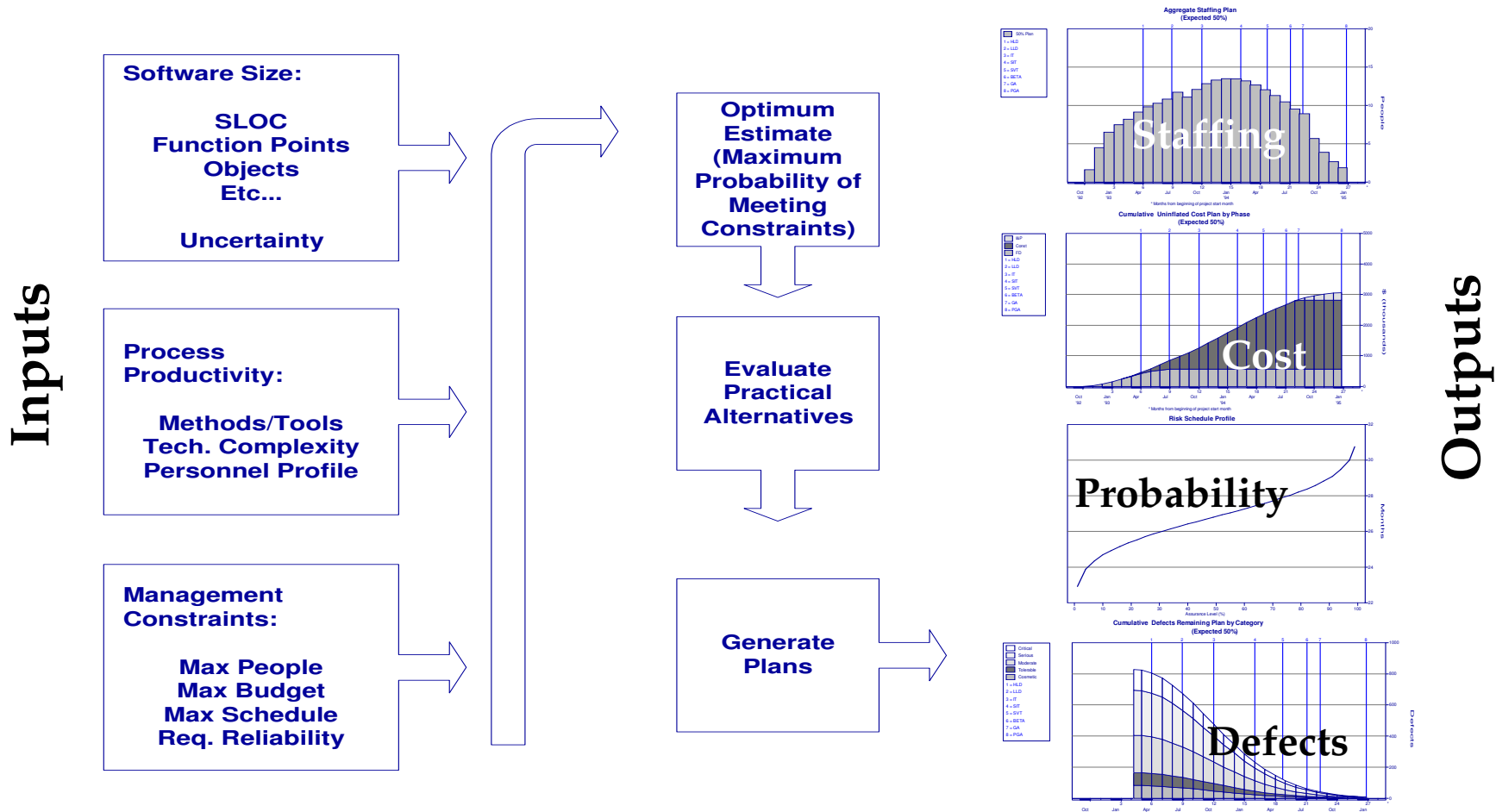
SLIM is an artificial intelligence software tool that has an associated database that contains over 7000 projects.

- Founded by Larry Putnam, international expert in software estimation.
- QSM Software Lifecycle Management Tools (SLIM Suite) Used Worldwide by Fortune 500 Clients, Federal, and State Agencies to Measure, Estimate, and Control Software Development



The software tools and the database provide the foundation of the project risk program.

The SLIM generic process.

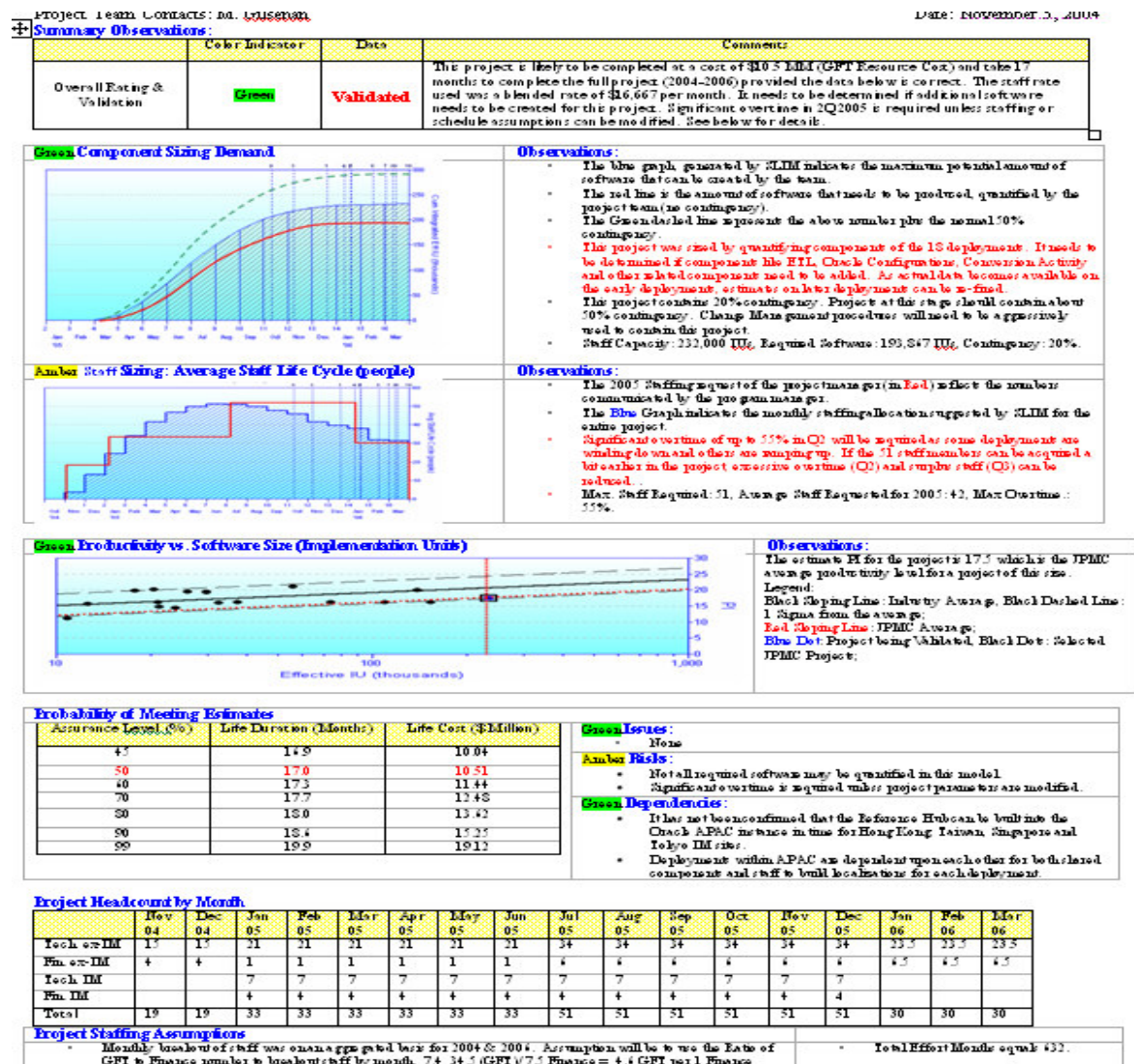


The generic foundation provides a basis for firm customizations.

Output Elements: Projects Not Started

Scorecards can tell the whole story on a single page!

- Component Sizing (Scope)
- Staffing Analysis
- Productivity Analysis
- Probability of Success
- Defect Forecast, Alternative Scenario (not pictured)

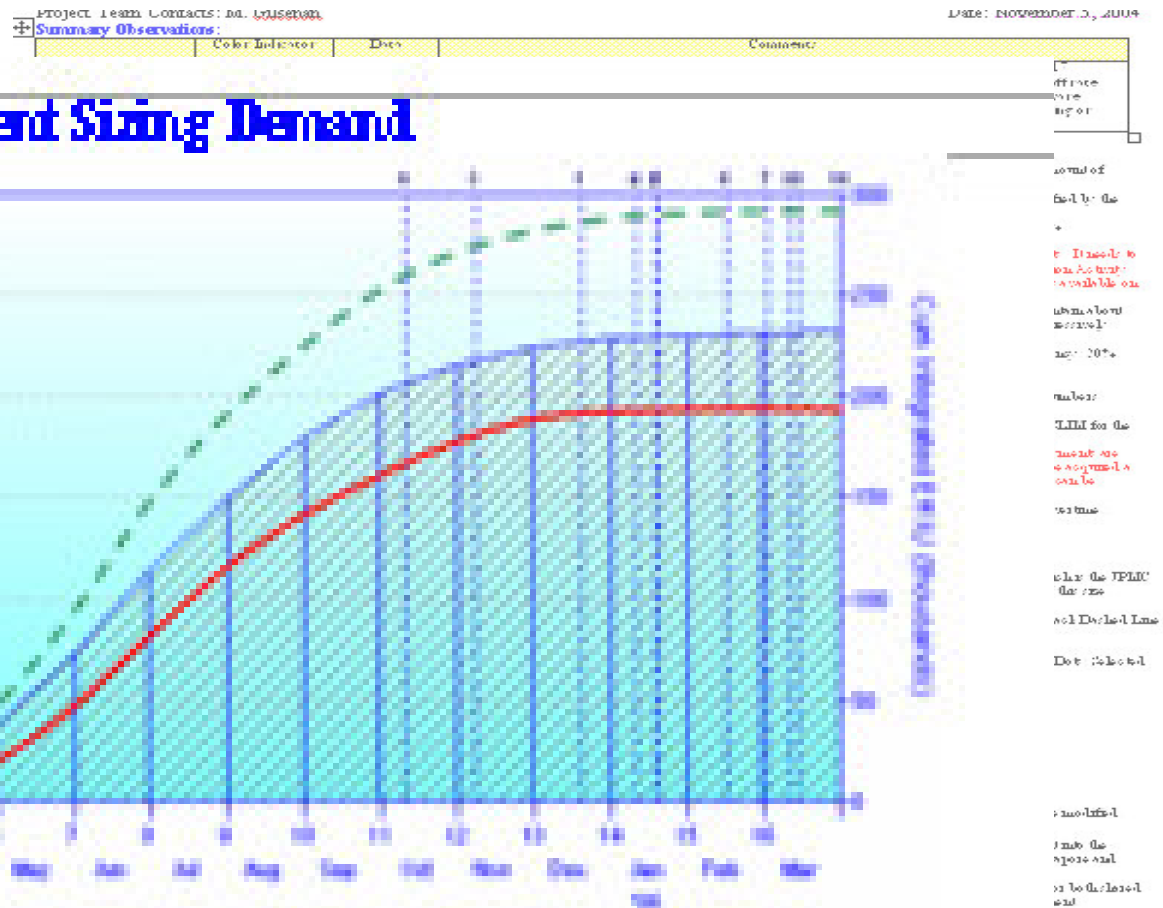


Output Elements: Projects Not Started

Scorecards can tell the whole story on a single project

Green Component Sizing Demand

- Compo
- Staffing
- Produc
- Probab
- Defect Scenar



	Dec 04	Dec 05	Jan 06	Feb 06	Mar 06	Apr 06	May 06	Jun 06	Jul 06	Aug 06	Sep 06	Oct 06	Nov 06	Dec 06	Jan 07	Feb 07	Mar 07
Total Effort	10	10	33	33	33	33	33	33	31	31	31	31	31	31	30	30	30
Finance Effort	1	1	1	1	1	1	1	1	*	*	*	*	*	*	*	*	*
Total Effort	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Finance Effort	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Project Staffing Assumptions

Monthly workload of staff per component per year for 2004 to 2007. Assumptions will be to use the ratio of GFI to Finance numbers to calculate staff by month: $7 + 34 \times \text{GFI} \div \text{Finance} = \text{Staff per 1 Finance}$

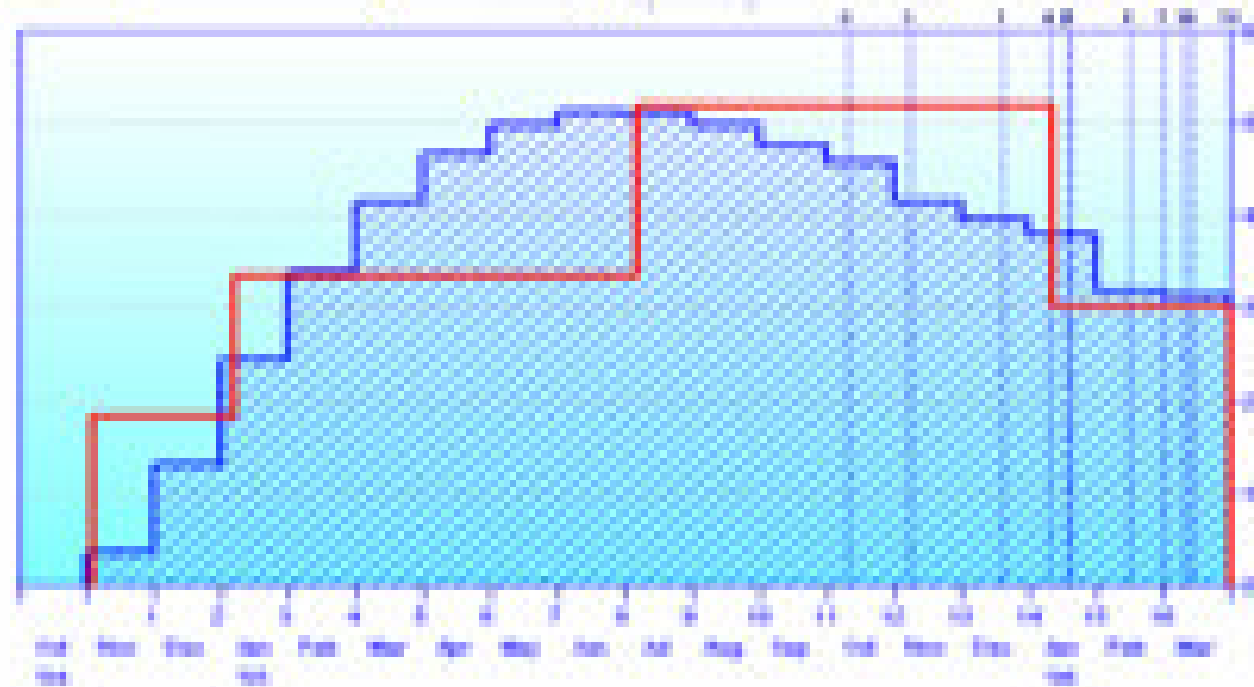
Total Effort/Finance equals 33

Output Elements: Projects Not Started

Scorecards can tell the whole story on a single page!

- Co
- Sta
- Pro
- Pro
- De
- Sci

Amber Staffing: Average Staff Life Cycle (people)



Project Headcount by Month

	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
Total Effort	10	15	20	25	30	35	35	35	35	35	35	35	35	30	25	20
Finance Effort	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Technical Effort	9	14	19	24	29	34	34	34	34	34	34	34	34	29	24	19
Total	10	15	20	25	30	35	35	35	35	35	35	35	35	30	25	20

Project Staffing Assumptions

Monthly headcount of staff per month for 2004 to 2006. Assumptions will be to use the ratio of GFI to Finance numbers to calculate staff by month. $7 + 34 \times \text{GFI} \div \text{Finance} = \text{Staff per month}$

Total Effort Months equal 400

Output Elements: Projects Not Started

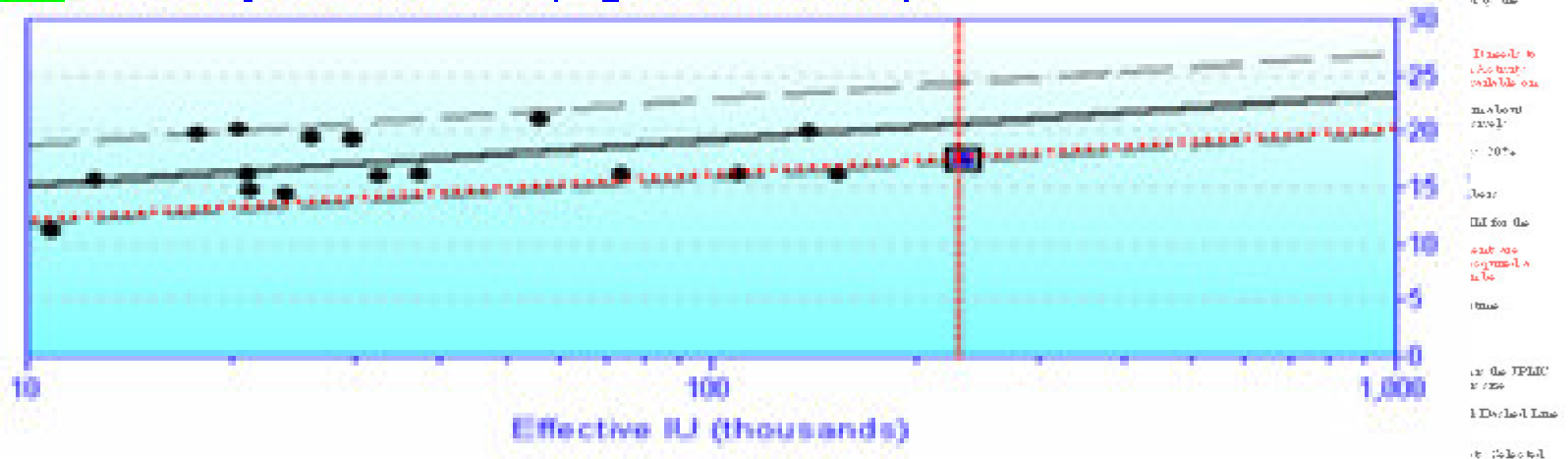
Scorecards can tell the whole story on a single page!

PROJECT TEAM CONTACTS: DR. LOISELLO
DATE: NOVEMBER 2, 2004

Summary Observations:		
Color Indicator	Date	Comments
Overall Estimate		This project is likely to be completed at a cost of \$10.5 MM. GFI Resource Cost and take 1 month to complete the full project (2004-2006) provided the data below is correct. The estimate is for 100% completion.

- Co
- Sta
- Prc
- Prc
- De
- Sci

Green Productivity vs. Software Size (Implementation Units)



Probability of Meeting Estimates

Assurance Level (%)	Life Duration (Months)	Life Cost (\$ Million)
40	1.5	10.04
50	1.70	10.51
60	1.75	11.44
70	1.77	12.40
80	1.80	13.42
90	1.84	14.50
95	1.85	15.12

Green Issues:

None

Amber Risks:

- Not all required software may be quantified in the model
- Significant software is required under project phases that are unquantified

Green Dependencies:

- It has not been confirmed that the Reference Hub can be built into the Check & PAC machine matrix for Hong Kong, Taiwan, Singapore and Tokyo Hub sites.
- Deployment under PAC are dependent upon whether for 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
Team Core HM	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Fin Core HM	+	+	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Team HM	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Total	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Project Staffing Assumptions

Monthly headcount of staff per phase per year for 2004 to 2006. Assumptions will be to use the Ratio of GFI to Finance numbers to headcount staff by month. $7 + 34 \times \text{GFI} \div \text{Finance} = + \text{GFI per 1 Finance}$

Total Effort Months equal 432

Output Elements: Alternative Scenarios (Not Started)

Alternative scenarios can be created in minutes when original expectations are unrealistic.

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.

Senior Management will listen when you have data to back up your case!

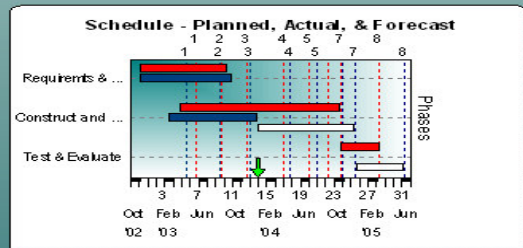
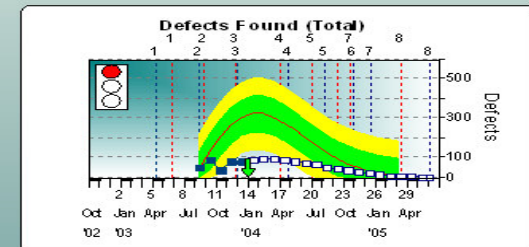
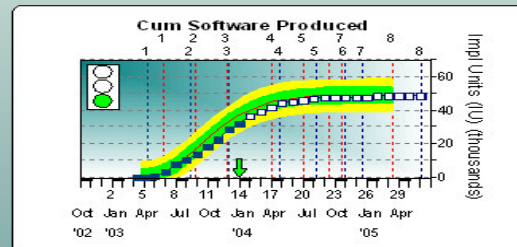
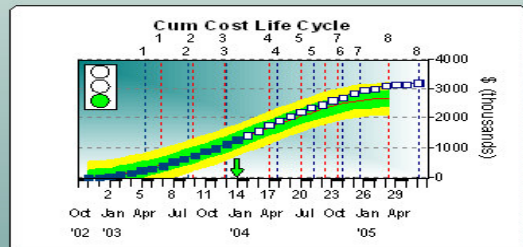
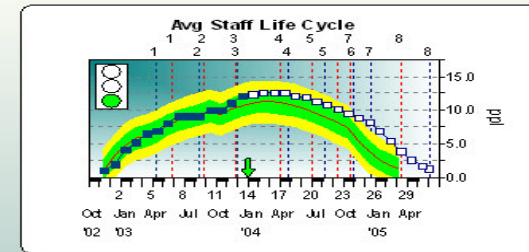
Projects in-flight can compare quantified estimates to actuals and then create a predictive forecast.

OVERALL SUMMARY AS OF 12/31/2003: A

PROJECT MANAGER: Numerous requirements changes have caused rework, pushing effort higher and has slowed development progress. If changes continue, then schedule, cost or overall scope must be changed.

METRICS INDICES: Project is on track with regard to all metrics indices except for the defect rate; however there is a forecasted schedule extension.

METRICS FORECAST: A lower production rate is being achieved than planned, therefore a schedule overrun is predicted.



Date 12/31/2003 (14.00 mos)

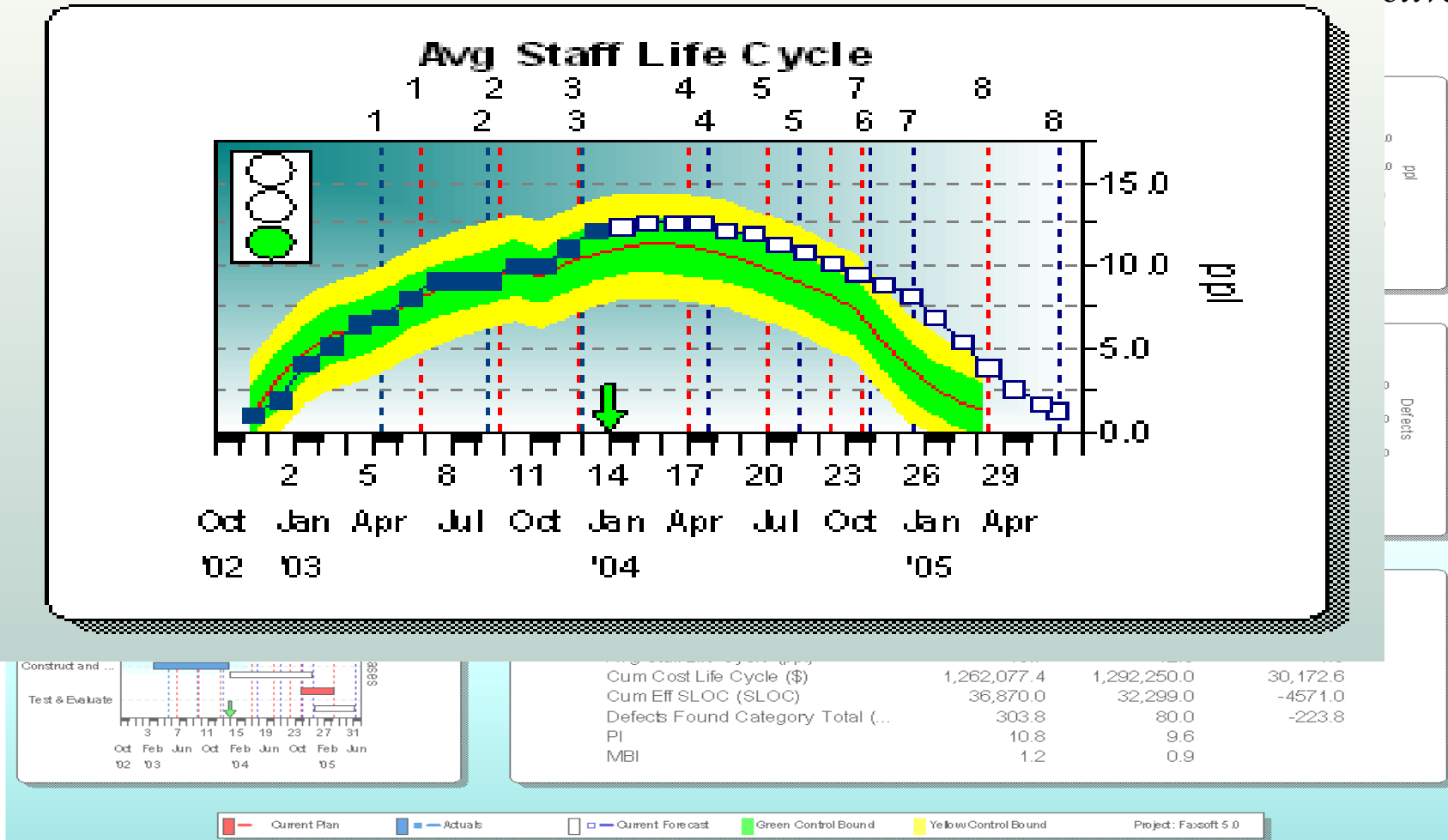
	Plan	Actual/ Forecast	Diff
Avg Staff Life Cycle (ppl)	10.7	12.0	1.3
Cum Cost Life Cycle (\$)	1,262,077.4	1,292,250.0	30,172.6
Cum Eff SLOC (SLOC)	36,870.0	32,299.0	-4571.0
Defects Found Category Total (...)	303.8	80.0	-223.8
PI	10.8	9.6	
MBI	1.2	0.9	

— Current Plan
 — Actuals
 □ Current Forecast
 ■ Green Control Bound
 ■ Yellow Control Bound
 Project: Faxsoft 5.0

The earlier you correct a project issue, the easier it is to achieve!

Output Elements: Projects In-Flight

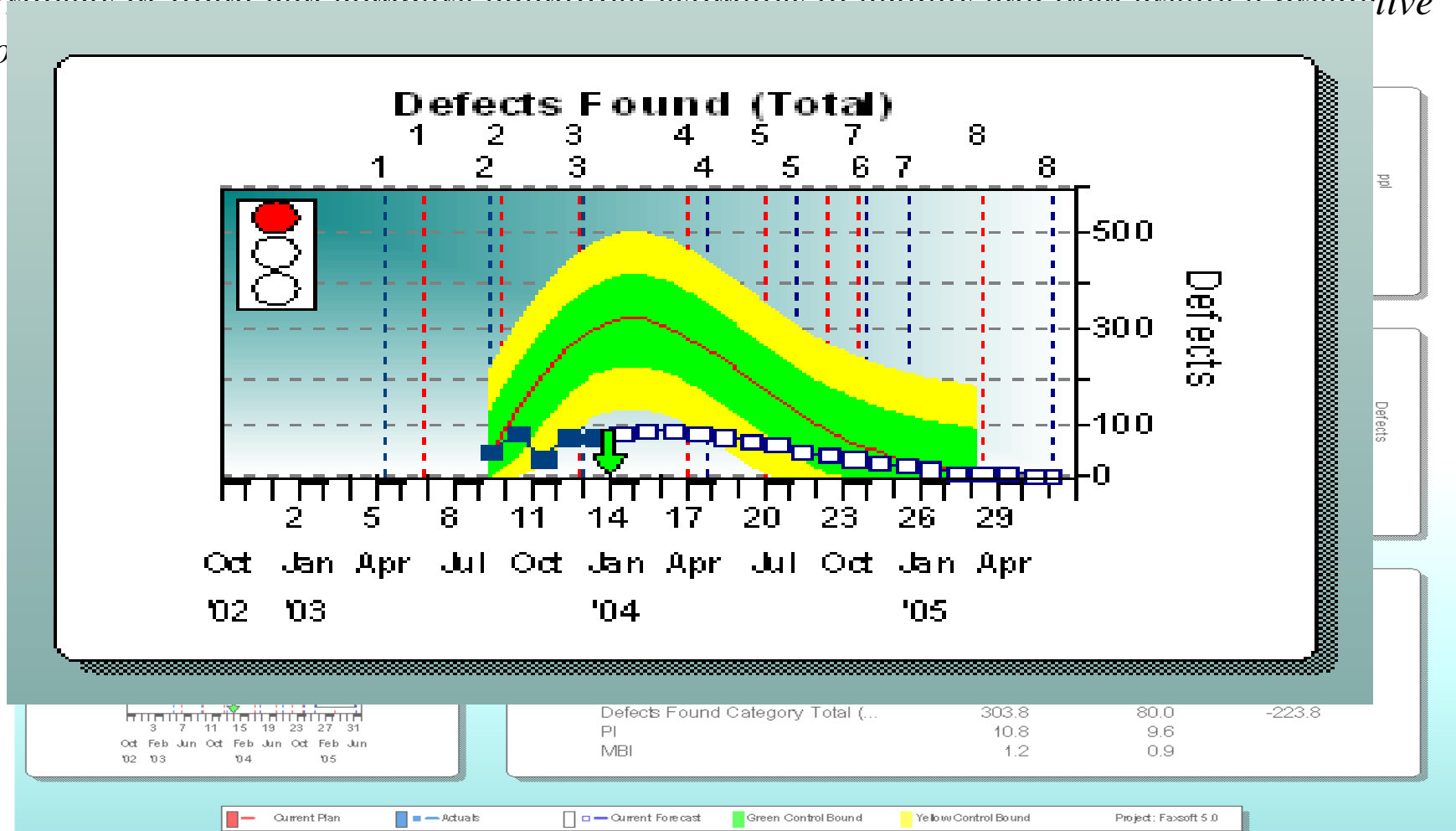
Projects in flight can compare quantified estimates to actuals and then create a predictive forecast



The earlier you correct a project issue, the easier it is to achieve!

Output Elements: Projects In-Flight

Projects in flight can compare quantified estimates to actuals and then create a predictive forecast



The earlier you correct a project issue, the easier it is to achieve!

Post project reviews are typically not done or overlooked. Why?

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 Tool mapping document.
- Actual defect data will be added when it is received by the Quality Team.

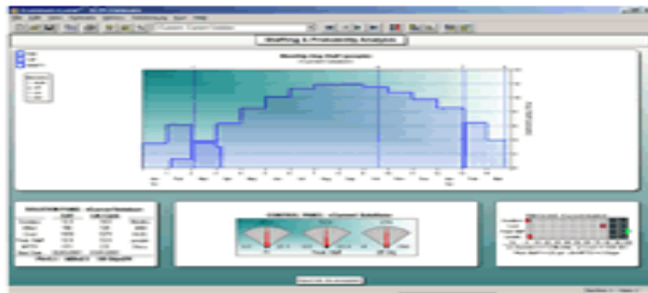
Main Lessons Learned

- 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.**

*Quantified versus subjective data can improve the teams next project
and ultimately improve the organization in the future.*

Output Elements: Project Aggregates

Release, Program, Group level reports can be generated automatically.



SLIM-Estimate

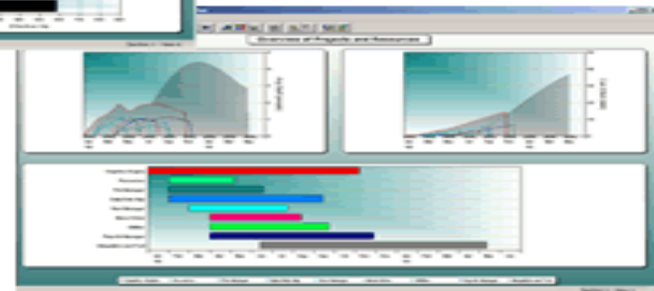
gives you the power to...

**Develop realistic, data-driven cost
and schedule estimates.**

**Sanity-check plans
against your history
and QSM industry
trends.**



**Roll up multi-release
projects in
SLIM-MasterPlan for
enterprise-level
planning**



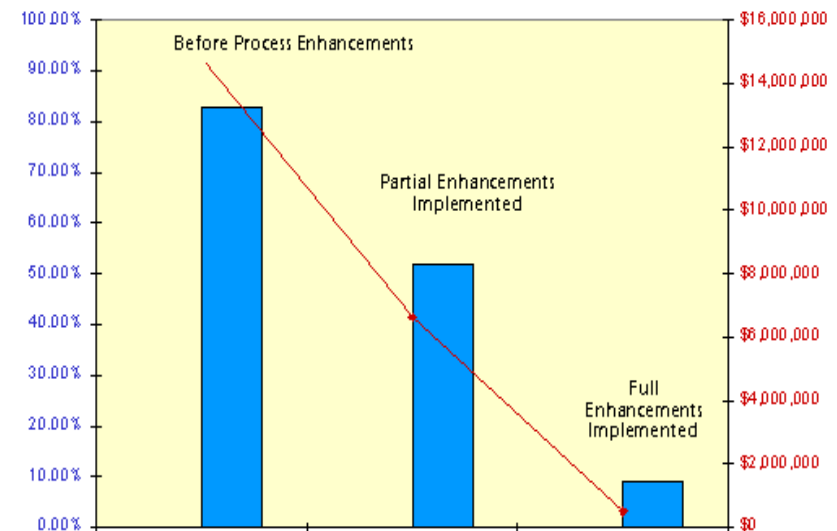
Senior Management reporting is easy and a by product of the other processes!

The chart below highlights the differences in various processes after the project risk program has been implemented.

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.
Modeling alternative scenarios	Manually redone.	Done within seconds and can be compared against previous estimates easily.
Ability to align with actuals	No	PRS, 18 Month Forecast 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, firm, 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.

186 Projects, 14 programs were evaluated at 4 discrete phases and were tracked continuously by 1 senior staff member and 3 junior staff members.

- Presented “At Risk” projects to senior management.
- Documented reductions in project cost and schedule variances.
- Documented measurable productivity increases in project teams.
- Created a level 5 CMM Project Risk Process in level 1 and 2 organizations.
- Developed the KPIs and benchmarks and syndicated them with senior management and other stakeholders.
- Implemented the SLIM tool to support the program.
- Tracked project performance metrics against the evaluations to determine variance.
- Created Balanced Scorecards to Senior Management and created Best Practices.
- Created Microsoft Project Plan template that integrated many processes.
- Managed vendor budget and resource and then eliminated the need for costly external consulting after the first 6 months.



Senior Management used a variance on this process to perform the annual budgeting exercise for the larger organization!

How To Get Project Risk Started

“Project Risk data can provide your organization with quantifiable data to assist in determining what projects should be launched and evidence of efficiencies and improvements in the performance of your teams and the execution of your projects.”
Establishing a program requires a two prong strategy.

Organizational Level (One time)

- Assess organization, determine gap and make recommendations. **Bring in experts** to ensure impartiality and accelerate the implementation & data gathering processes
- Ensure SDLC and other processes are able to create quantifiable metrics
- Implement various software including SLIM. Create or modify estimation tools
- Begin program with enthusiastic pilot(s)

Pilot/ Project Level (More than one time)

- Gather scope, effort, schedule, productivity data. Gather it at different stages of the project
- Model according to current expectations. Create alternate models if necessary
- Track consistently, report results and baseline project data
- Market and Communicate Results

Establishing a successful project risk program requires commitment from senior management and effort from the project teams!