

Project control based on functional size

Which method to use?

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- **Short intro:**

- **Sogeti Nederland BV** senior consultant software metrics
- **ISBSG** president
- **NESMA** board member
- **NESMA** working group chair COSMIC
- **NESMA** working group chair Benchmarking
- **COSMIC** IAC member



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Sizing, Estimating & Control

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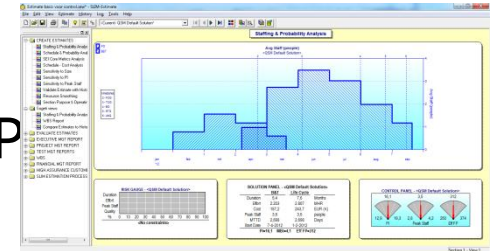
Agenda

- **Parametric project control**
- **Product size ready**
- **Differences IFPUG vs. COSMIC relevant for Project control**
- **Experiment: Project control with two methods**
- **Conclusions**

Project Management

• Project Estimation

- Parametric estimates based on (COSMIC) FP
- Effort hours, duration, staff, defects
- Galorath SEER-SEM / QSM SLIM Estimate / other tools
- Productivity (PDR = hours/FP) that is expected

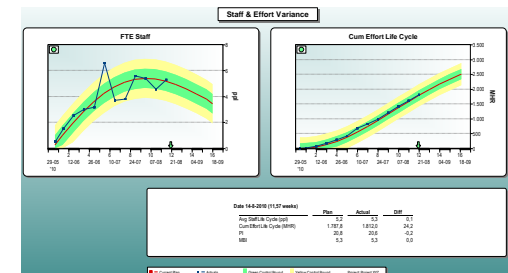


• Project Planning

- Transform the estimate into the plan

• Project Control

- Track the status based on FP
- Do we meet our expected PDR?
- Forecasting based on actuals



Project Control

- **How do Project managers manage their software realization project?**
 - Administration of effort hours (weekly)
 - Compare effort hours against planned hours (weekly)
- **Project status**
 - If more hours than planned have been spent, we must be ahead of schedule, right?
 - If less hours than planned have been spent, the project is easier than expected, right?
- **To measure hours is easy, but what about 'product delivered'?**

Inaccurate project status

- **Most used:**

- How many hours do you need to finish 'activity X'?
- Expert estimate/judgment is used to assess the status of the 'work done'
- PM collects the status of all people and aggregates this info into a status report

- **Problem:**

- experts are usually optimistic, underestimating the work that still needs to be done
 - Documenting, bug fixing, 2nd round of testing, etcetera

- **Result:**

- Inaccurate status until very late in the project !

Parametric project control

- **Control the project, using functional size for the 'product ready'**
- **Project status:**
 - Effort hours spent vs. effort hours planned
 - Actual functional size ready vs. planned functional size ready
 - Forecasting based on the actuals
- **Galorath SEER-SEM**
 - Parametric Project Monitoring & Control tool (PPMC)
- **QSM SLIM Control**
 - Part of the QSM SLIM toolsuite

How the tools work

1. Put in the baseline plan

- Start and end date
- Milestone dates
- Effort hours planned
- Product size to be delivered in (C) FP



2. Record actuals (every week / 2 weeks)

- Effort hours
- Dates
- Defects
- Product size ready in (C) FP



3. Forecast project results

4. Calculate corrective actions

Project control

- **Putting in the baseline plan is easy (project plan of the PL)**
- **Collecting actual hours, milestone dates and defects is also fairly easy**
- **Measuring the 'product size ready' is more complicated**
 - When is an EI ready? When is an EIF ready?
 - How can we objectively assess a function point being ready?
- **→ Function point ready – after the programmer reports it ready for systems testing**
- **Measuring the correct 'product size ready' is crucial for Project Control**

Product size ready

- **Multiple methods to measure 'product size ready'**
- **Technical: SLOCs**
 - Easy to measure actuals, but hard to predict/estimate total
 - Baseline plan slocs is inaccurate, but actuals are accurate
- **Functional: (COSMIC) Function Points**
 - Harder to measure, based on quality of documentation
 - Baseline plan and actuals can both be accurately measured
- **Which functional size measurement method is most accurate?**

NESMA/IFPUG vs. COSMIC

Characteristic	NESMA/IFPUG FPA	COSMIC
Applicable on domain	Business software	Business / Real-time / Infrastructure software
Data model required?	Required	Not required (but very handy)
Measurement of separate components	Not possible	Possible
Size limit per function	Yes	Size is not limited
Benchmarking data	ISBSG (aug 12), n= 4316	ISBSG (aug 12), n=446
Measurement of processing functionality	No	No, but local extension is possible
Early sizing	Based on data model	Based on process model

Functional complexity

- **IFPUG/NESMA does not really measure differences in functional complexity**
 - EI: 3,4 or 6 FP (never less than 3, never more than 6)
 - EO: 4,5 or 7 FP (never less than 4, never more than 7)
- **But: in real life functions can differ from very low complexity**
 - e.g. drop down list 'Client' (EO: 1 FTR, 2 DET, **4 FP**)
- **...to very complex**
 - e.g. to make a new insurance contract perhaps clicking through 5 screens: (EI: 8 FTR, 121 DET, **6 FP**)
- **Difference in FP does not reflect difference in effort needed.**

COSMIC and Project control

- **Theoretically, COSMIC should be the better method to use for Project Control**
- **The data model does not explicitly get points.**
 - In project control, it's difficult to assess status regarding the realization of the data model (When is an EIF ready?).
- **The functional processes are not restricted in size**
 - E.g. drop down list Client: 3 CFP (EO: 4 FP)
 - Make a new insurance contract: 38 CFP (EI: 6 FP)
- **Difference in size reflects the difference in effort needed more realistically**

Some examples

User Function	IFPUG type	IFPUG size	COSMIC type	COSMIC size
Add customer	EI	3 FP	Functional Process	8 CFP
Change customer	EI	4 FP	Functional Process	7 CFP
Delete customer	EI	3 FP	Functional Process	4 CFP
Show revenue per customer and region	EO	7 FP	Functional Process	12 CFP
Customer	ILF	7 FP	-	0

Case: Government agency

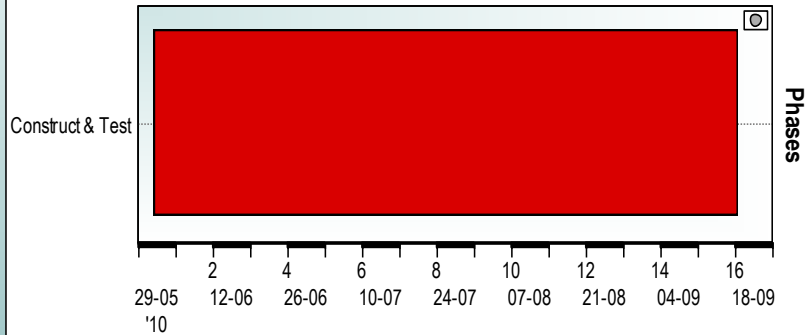
- **Project name: XYZ**
- **Programming language: Java**
- **Development method: waterfall**
- **Functional size:**
 - 371 FP (IFPUG)
 - 494 CFP (COSMIC)
- **Effort hours planned: 2.505 hours**
- **Planned start date: 26-05-2010**
- **Planned end date: 12-09-2010**

CONST. & TEST	IFPUG FP	COSMIC FP	Hours planned	Start date	End date
Project XYZ	371	494	2505	26-5-2010	12-09-2010

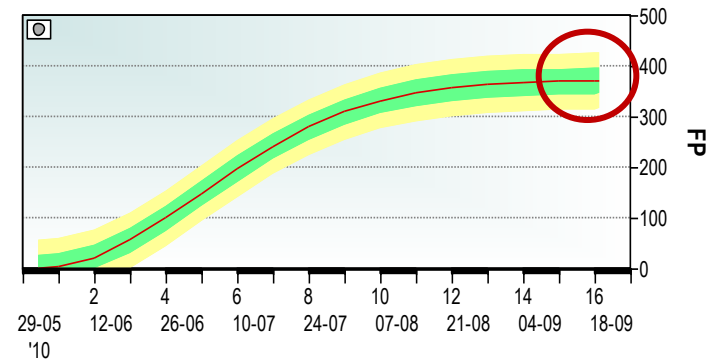
The IFPUG plan

SEI Core Metrics

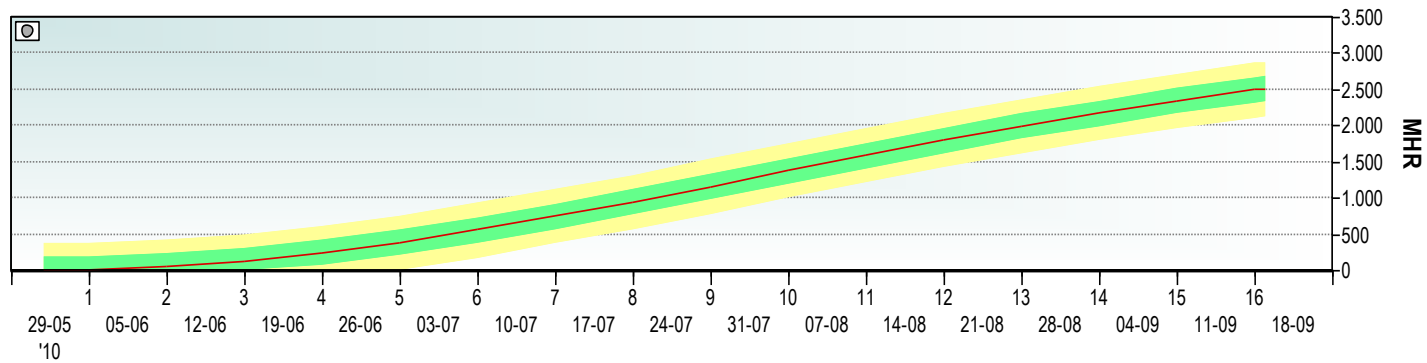
Schedule



Size



Cum Effort Life Cycle

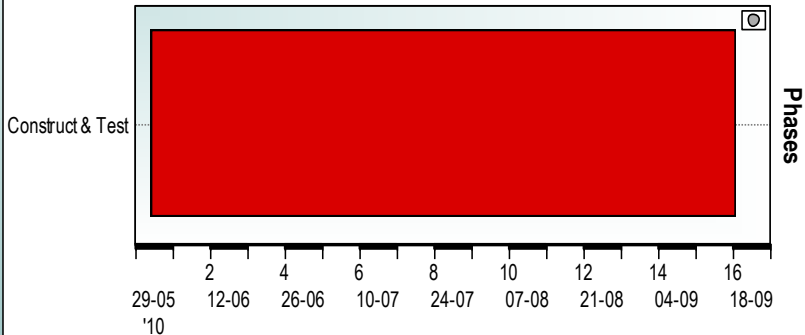


■ - Current Plan
 ■ - Actuals
 - Current Forecast
 Green Control Bound
 Yellow Control Bound
 Project: Project XYZ

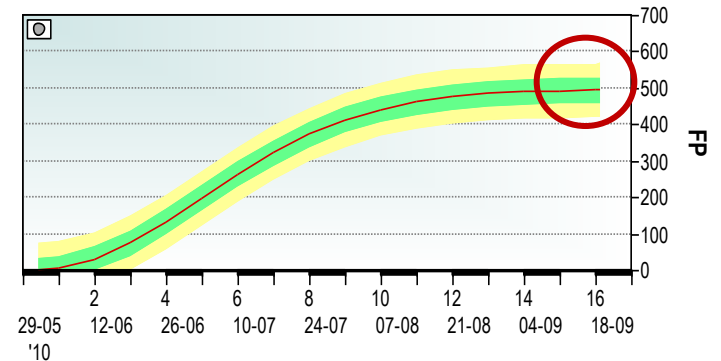
The COSMIC plan

SEI Core Metrics

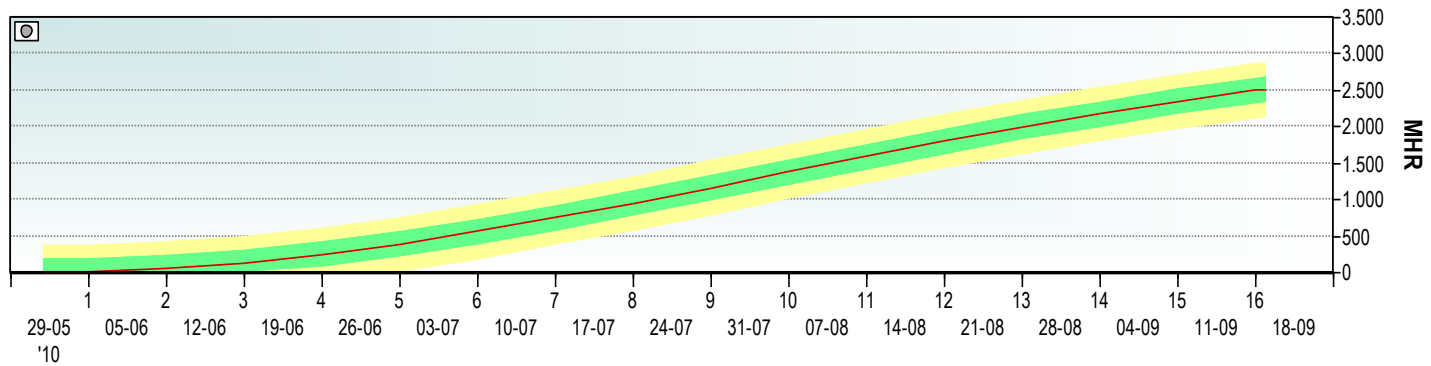
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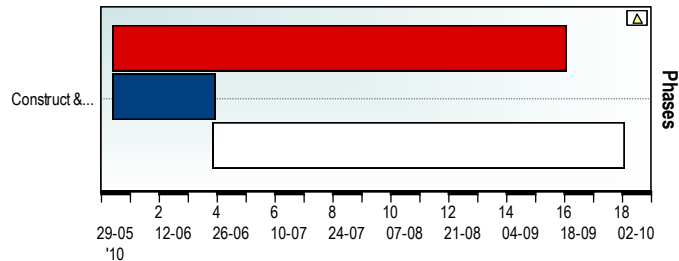
After 4 weeks: forecast IFPUG

• First Actuals

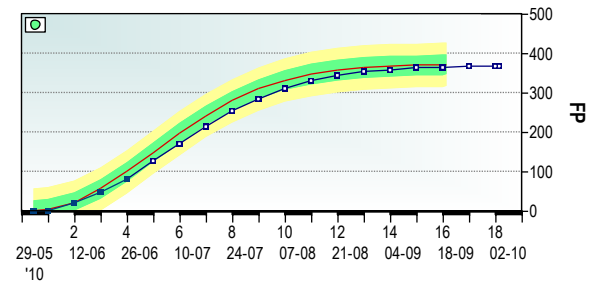
Metric	Plan	Actual	Difference
Hours spent	238	294	+56
IFPUG FP ready	99	80	-19
COSMIC FP ready	132	130	-2

SEI Core Metrics

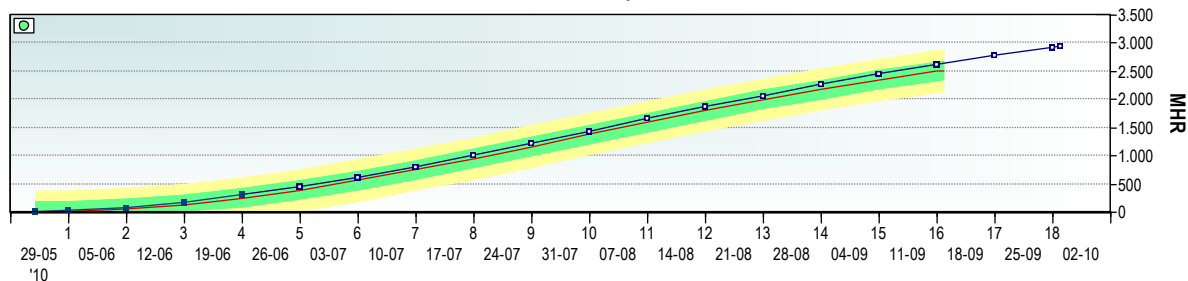
Schedule



Size



Cum Effort Life Cycle

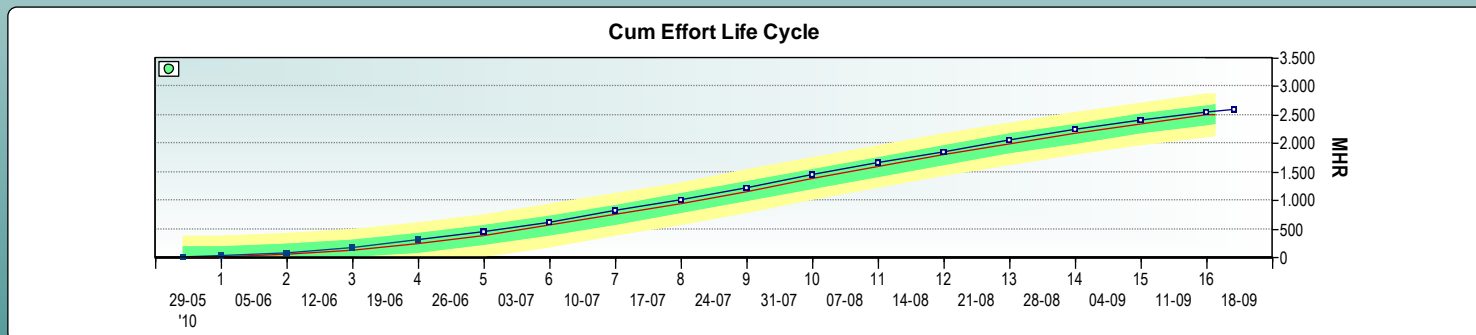
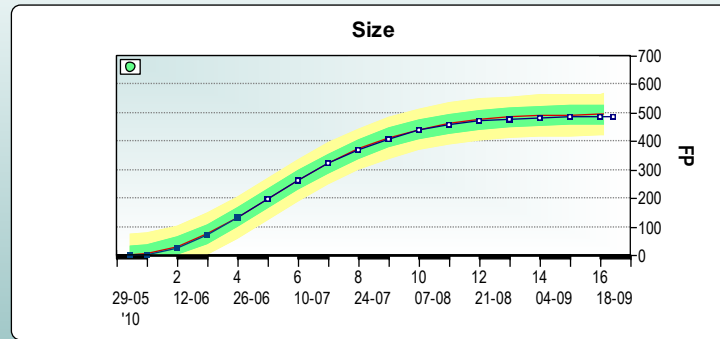
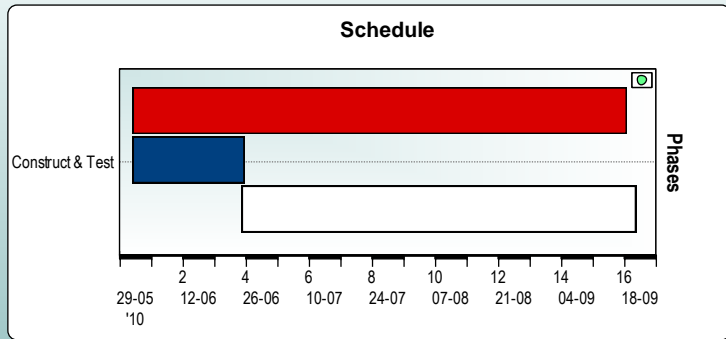


After 4 weeks: forecast COSMIC

• First Actuals

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IFPUG FP ready	99	80	-19
COSMIC FP ready	132	130	-2

SEI Core Metrics



Forecast after 4 weeks

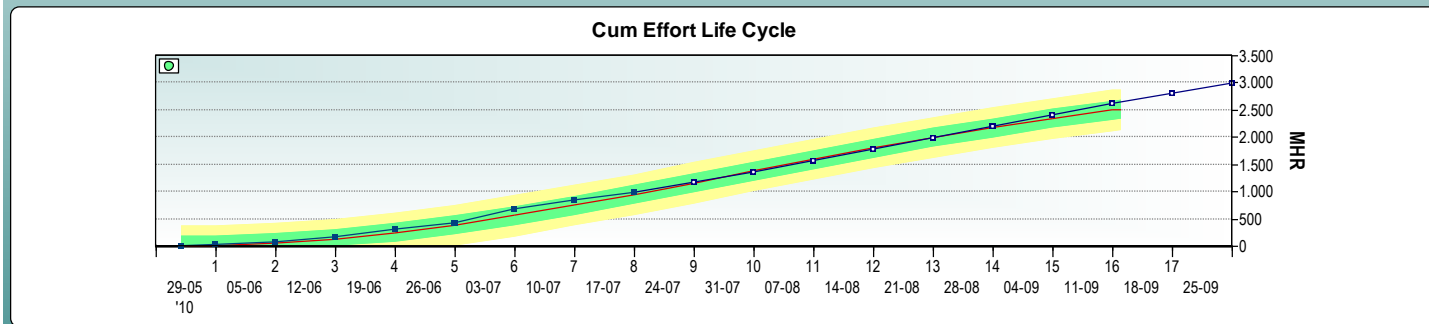
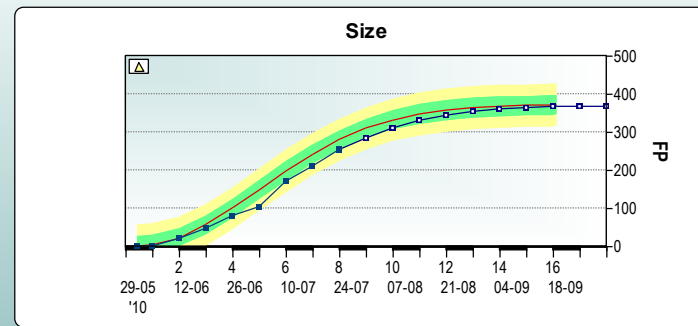
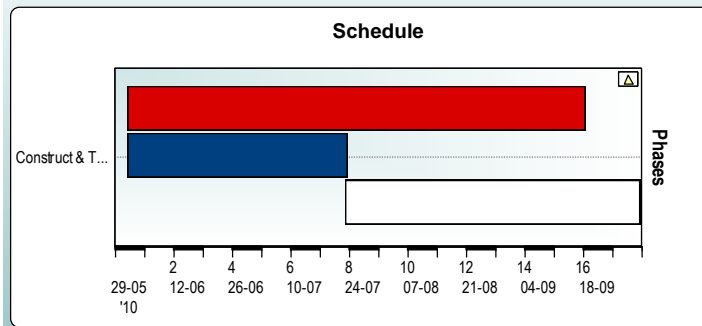
Metric	Plan	Forecast	Overrun/underrun
<u>Based on IFPUG FP</u>			
Hours	2.505	2.933	+428 hours (+17%)
Schedule	12-09-2010	26-09-2010	2 weeks
<u>Based on COSMIC FP</u>			
Hours	2.505	2.601	+96 hours (+4%)
Schedule	12-09-2010	14-09-2010	2 days

- **Project manager thinks everything is OK**
- **Team members agree**

Actuals after week 8: Forecast IFPUG

Metric	Plan	Actual	Difference
Hours spent	941	982	+41
FP ready	279	252	-27
COSMIC FP ready	371	366	-5

SEI Core Metrics



Forecast after 8 weeks

- **PM still thinks everything is on track, but is getting a little nervous**
- **Team members still agree**

Metric	Plan	Forecast	Overrun/underrun
<u>Based on IFPUG FP</u>			
Hours	2.505	2.991	+486 hours (+19%)
Schedule	12-09-2010	24-09-2010	12 days
<u>Based on COSMIC FP</u>			
Hours	2.505	2.690	+185 hours (+7%)
Schedule	12-09-2010	15-09-2010	3 days

After 12 weeks

Metric	Plan	Actual	Difference
Hours spent	1.788	1.812	+24
FP ready	357	348	-9
COSMIC FP ready	471	470	-1

Metric	Plan	Forecast	Overrun/under run
<u>Based on IFPUG FP</u>			
Hours	2.505	3.009	+504 hours (+20%)
Schedule	12-09-2010	25-09-2010	13 days
<u>Based on COSMIC FP</u>			
Hours	2.505	2.730	+225 hours (+9 %)
Schedule	12-09-2010	16-09-2010	4 days

Final results

- **Small overrun in time and effort**

Metric	Plan	Actual	Difference
Hours spent	2.505	2.586	+81
Project end date	12 -09-2010	16-09-2010	+4 days
FP ready	371	371	0
COSMIC FP ready	494	494	0

The forecasts analyzed

- **IFPUG forecasts show considerable overruns until late in the project**
- **COSMIC forecasts more conservative**
- **COSMIC forecasts more in line with the feeling of the team and the PM**

Forecast	IFPUG FP		COSMIC FP	
	Hours overrun	Schedule overrun	Hours overrun	Schedule overrun
4 weeks	+428	+ 2 weeks	+96	+2 days
8 weeks	+486	+12 days	+185	+3 days
12 weeks	+504	+13 days	+225	+ 4 days
Final	+81	+4 days	+81	+4 days

Conclusions

- **In theory, COSMIC should be the better method to use in parametric project control**
 - No size limit per function: more accurate product size ready
 - No explicit points for the data model: Easier to measure 'project size ready'
- **This experiment confirms this theory**
 - COSMIC forecasts closer to reality than IFPUG forecasts
- **More experiments are needed to support this conclusion**

Sogeti Sizing, Estimating & Control



Thanks for your attention !

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NESMA – working group Estimation maturity

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COSMIC – Benchmarking Committee

ISBSG – President