



# Project control based on functional size

Which method to use?

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# Harold van Heeringen

- **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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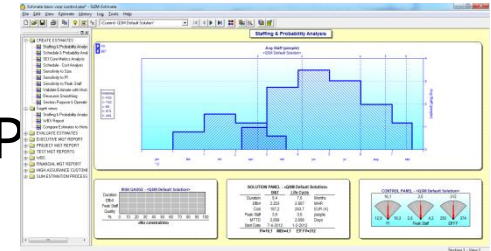
# Agenda

- **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

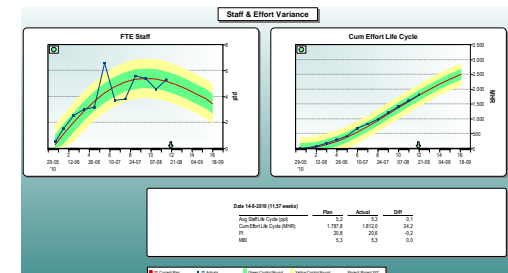


## • Project Planning

- 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, 2<sup>nd</sup> 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
<b>Size limit per function</b>	<b>Yes</b>	<b>Size is not limited</b>
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

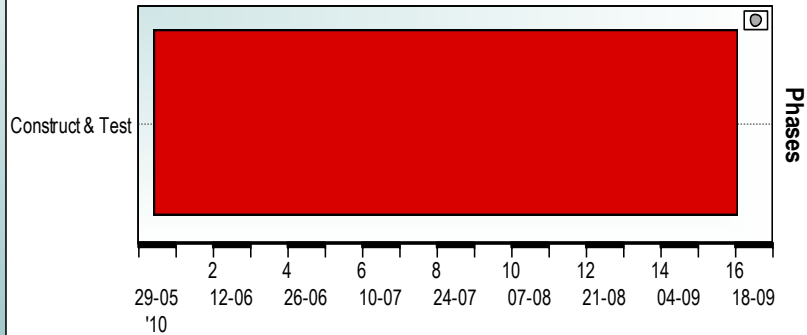
- **Project name: XYZ**
- **Programming language: Java**
- **Development method: waterfall**
- **Functional size:**
  - 371 FP (IFPUG)
  - 494 CFP (COSMIC)
- **Effort hours planned: 2.505 hours**
- **Planned start date: 26-05-2010**
- **Planned end date: 12-09-2010**

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

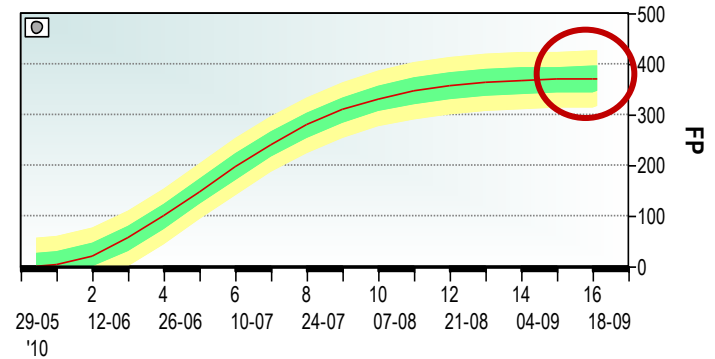
# The IFPUG plan

## SEI Core Metrics

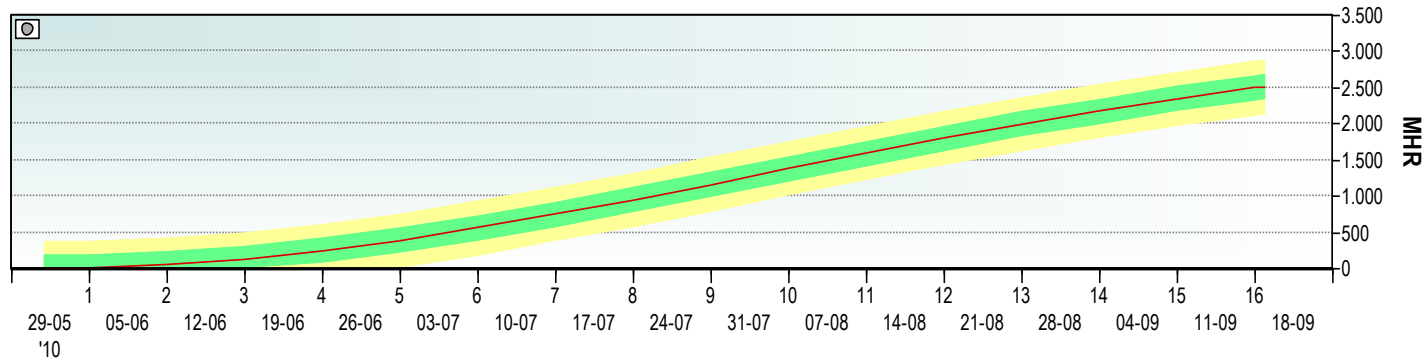
### Schedule



### Size



### Cum Effort Life Cycle



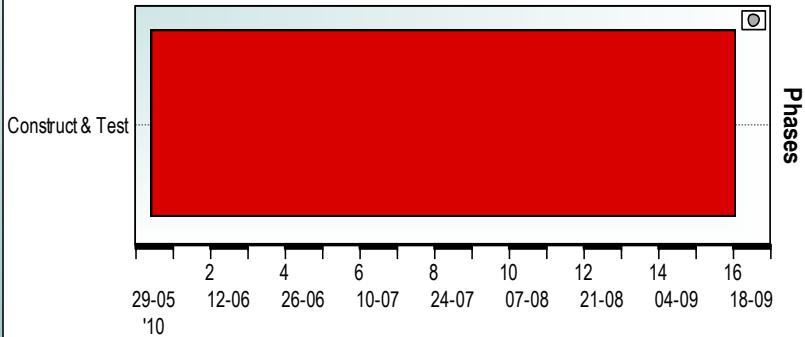
■ - Current Plan   
 ■ - Actuals   
  - Current Forecast   
  Green Control Bound   
  Yellow Control Bound   
 Project: Project XYZ



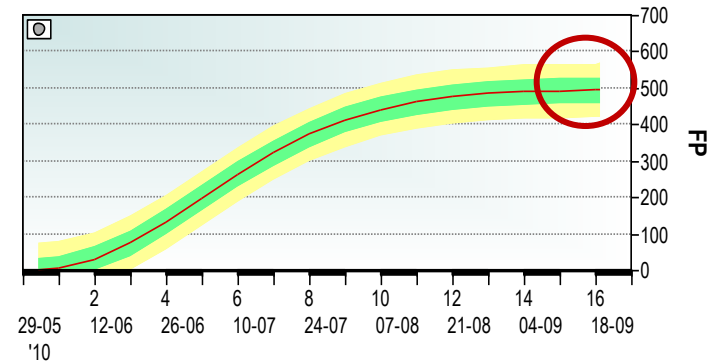
# The COSMIC plan

## SEI Core Metrics

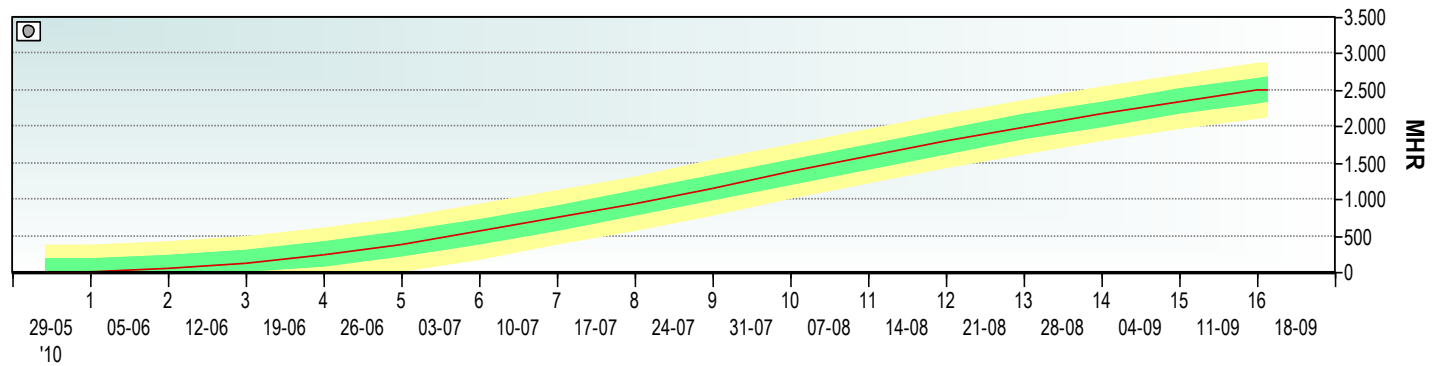
### Schedule



### Size



### Cum Effort Life Cycle



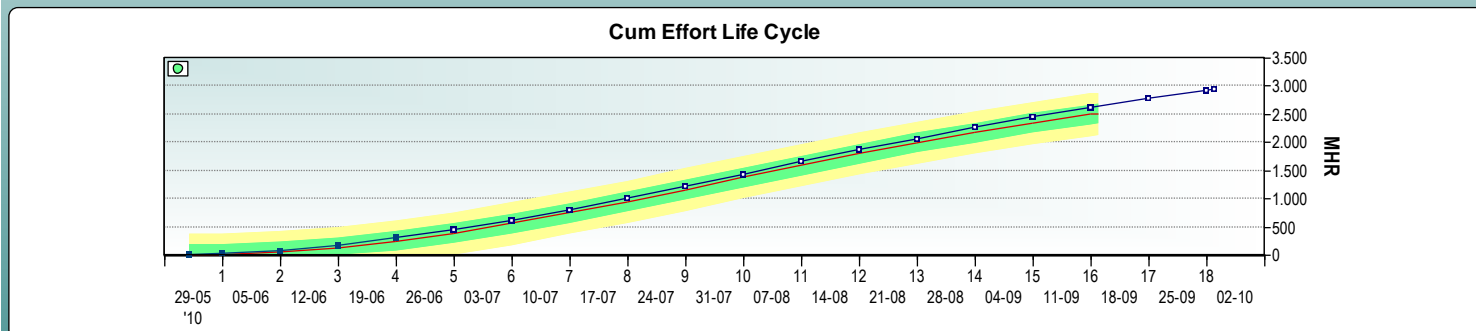
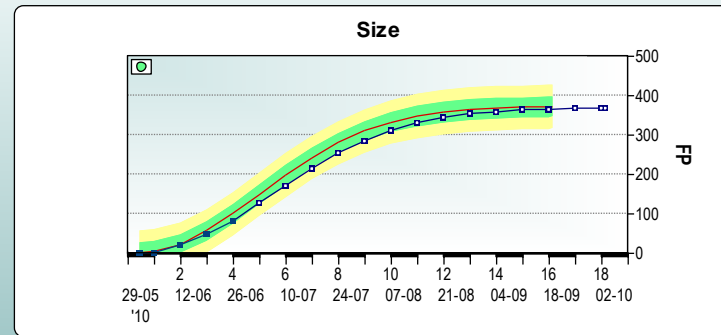
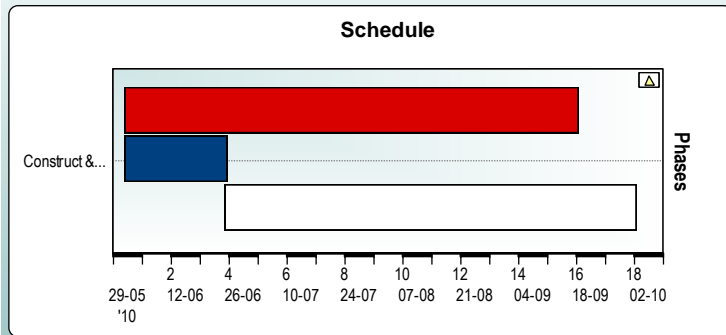
■ - Current Plan   
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 Project: Project XYZ

# 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

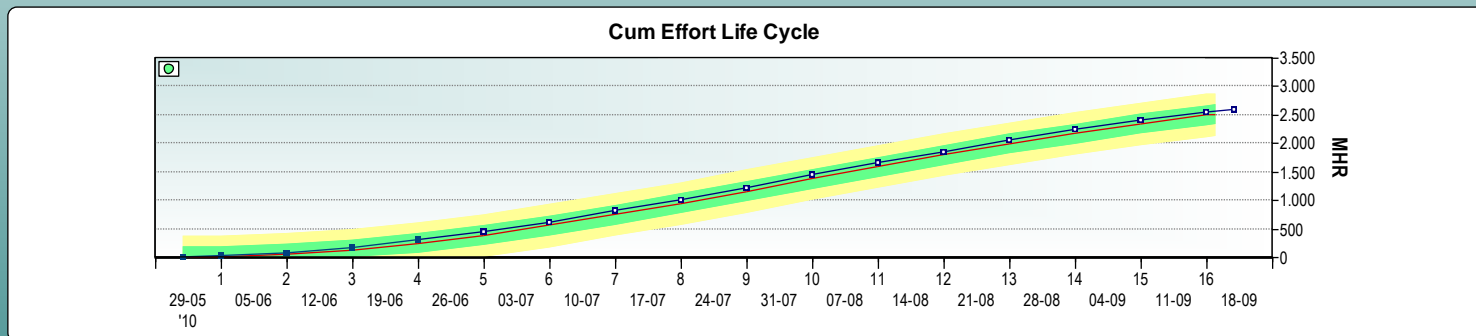
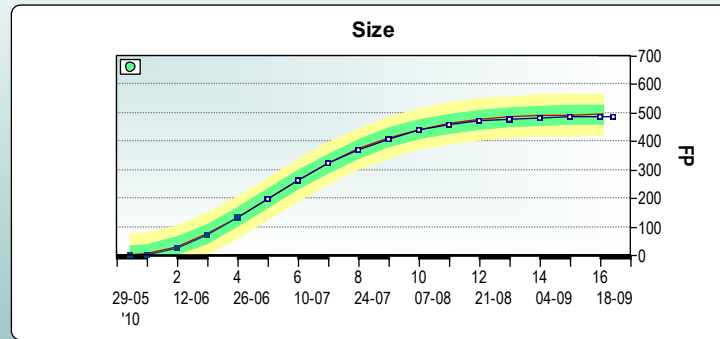
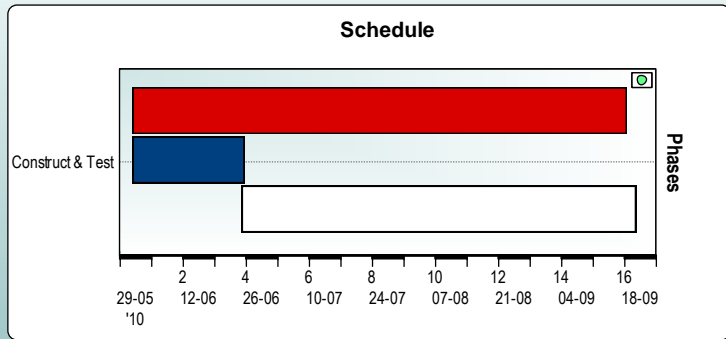


# After 4 weeks: forecast COSMIC

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SEI Core Metrics



# Forecast after 4 weeks

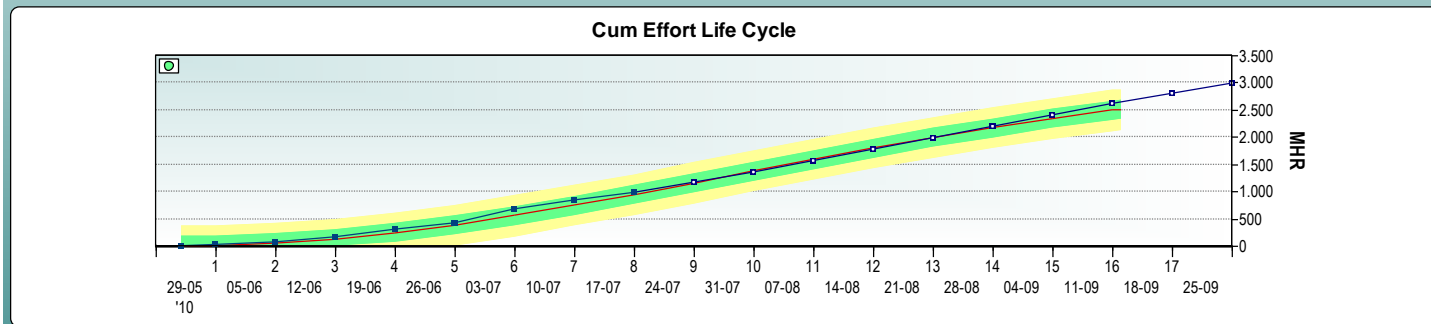
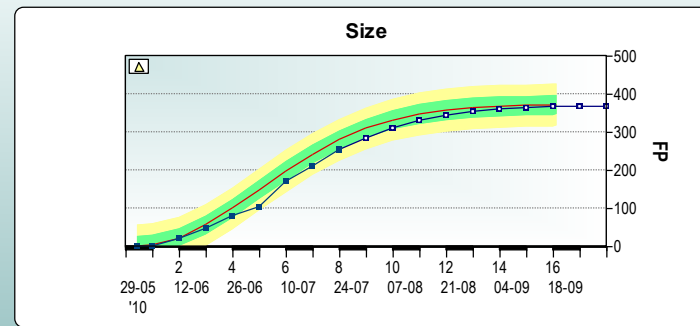
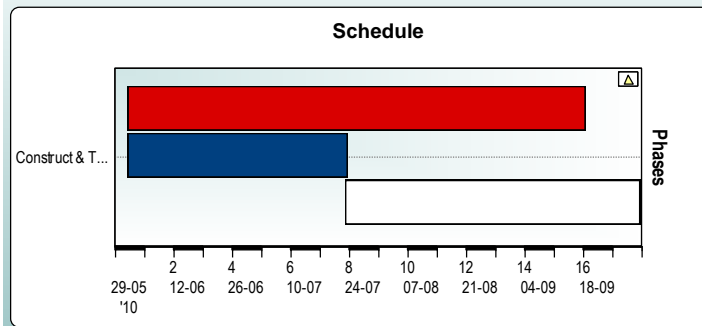
Metric	Plan	Forecast	Overrun/underrun
<u>Based on IFPUG FP</u>			
Hours	2.505	2.933	+428 hours (+17%)
Schedule	12-09-2010	26-09-2010	2 weeks
<u>Based on COSMIC FP</u>			
Hours	2.505	2.601	+96 hours (+4%)
Schedule	12-09-2010	14-09-2010	2 days

- **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
<b>Final</b>	<b>+81</b>	<b>+4 days</b>	<b>+81</b>	<b>+4 days</b>

# 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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Sizing, Estimating & Control

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## Sogeti Sizing, Estimating & Control

NESMA – board member

NESMA – chair working group COSMIC

NESMA – chair working group Benchmarking

NESMA – working group Sizing Packages

NESMA – working group Estimation maturity

COSMIC – International Advisory Council

COSMIC – Benchmarking Committee

ISBSG – President