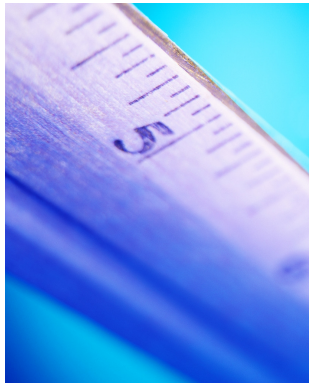

AEMES 2007

Conversion of Functional Size

FPA ←→ COSMIC

Harold van Heeringen

October 1st 2007
Madrid, Spain

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Overview

- Why study conversion possibilities?
- Similarities and differences
- Conversion studies
- Conversion Framework
- Conclusions and discussion

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COSMIC

- Second generation FSM, exists since late ’90s
- Applicable on domains : business application software, real-time software, infrastructure software en hybrids
- Enables measurement of separate components
- Applicable for sizing documentation delivered by modern design and development methods
- Applicable for sizing modern architectures
- Also applicable for sizing traditional development methods and architectures

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Sogeti Bid challenge

Sogeti bid process:

- Bottom-up (expert) estimate
- Top-down (metrics) estimate

Problem:

- Requirements delivered by (potential) clients
- Requirements often un-FPA'able
- Experience base / Estimation tools based on FP

Need:

- COSMIC analysis
- Transformation → FPA
- Use estimation tools with FPA

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Estimating wizard

Input

Development tools	Java	
Distribution of work	**Onshore**	**Offshore**
Construction	0%	100%
System test	0%	100%
System test strategy	TMap Medium	
Delivery test	Yes	
Complexity	Medium	
Size	1235	FP
Start date	01-08-07	

Duration in weeks	15	17	19	**21**	23	25	27
Delivery for acceptance	14-11-07	28-11-07	12-12-07	**26-12-07**	9-01-08	23-01-08	6-02-08
Total effort	9462	8106	7026	**6342**	5916	5646	5400
Effort per FP	15,77	13,51	11,71	**10,57**	9,86	9,41	9
Totaal cost	€ 413.352	€ 354.126	€ 306.936	**€ 277.056**	€ 258.414	€ 246.594	€ 236.022
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Data randomly altered

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Possible reasons to migrate to COSMIC

- New development methods and therefore new forms of functional documentation
- Organizations want to measure software in real-time, telecommunications or infrastructure domain as well
- Organizations want to size separate distinct components (e.g. SOA architectures)
- Organizations want to measure more accurately the relative differences between functions
- Organizations are structured in a way that teams are only creating part of an elementary function

Reasons why organizations don’t migrate

- COSMIC is unknown to the large ‘public’
- Few skilled analysts ‘on the market’
- Few training facilities
- Not much benchmarking data available
  > ISBSG R10: 110 projects out of 4200 in total
- No general ‘rules of thumb’ available

- Organizations: ‘fear’ to lose the experience base
- People: ‘fear’ to lose their ‘rules of thumb’ based on FPA

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Sogeti conversion study

Study objectives:

3) To find a statistically reliable transformation formula, based on our own experiences and data

5) Incorporate the formula in our estimation process and tools

7) To learn from the study results to be able to construct a framework in order to help clients to migrate their FSM

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Differences and similarities between FPA and COSMIC

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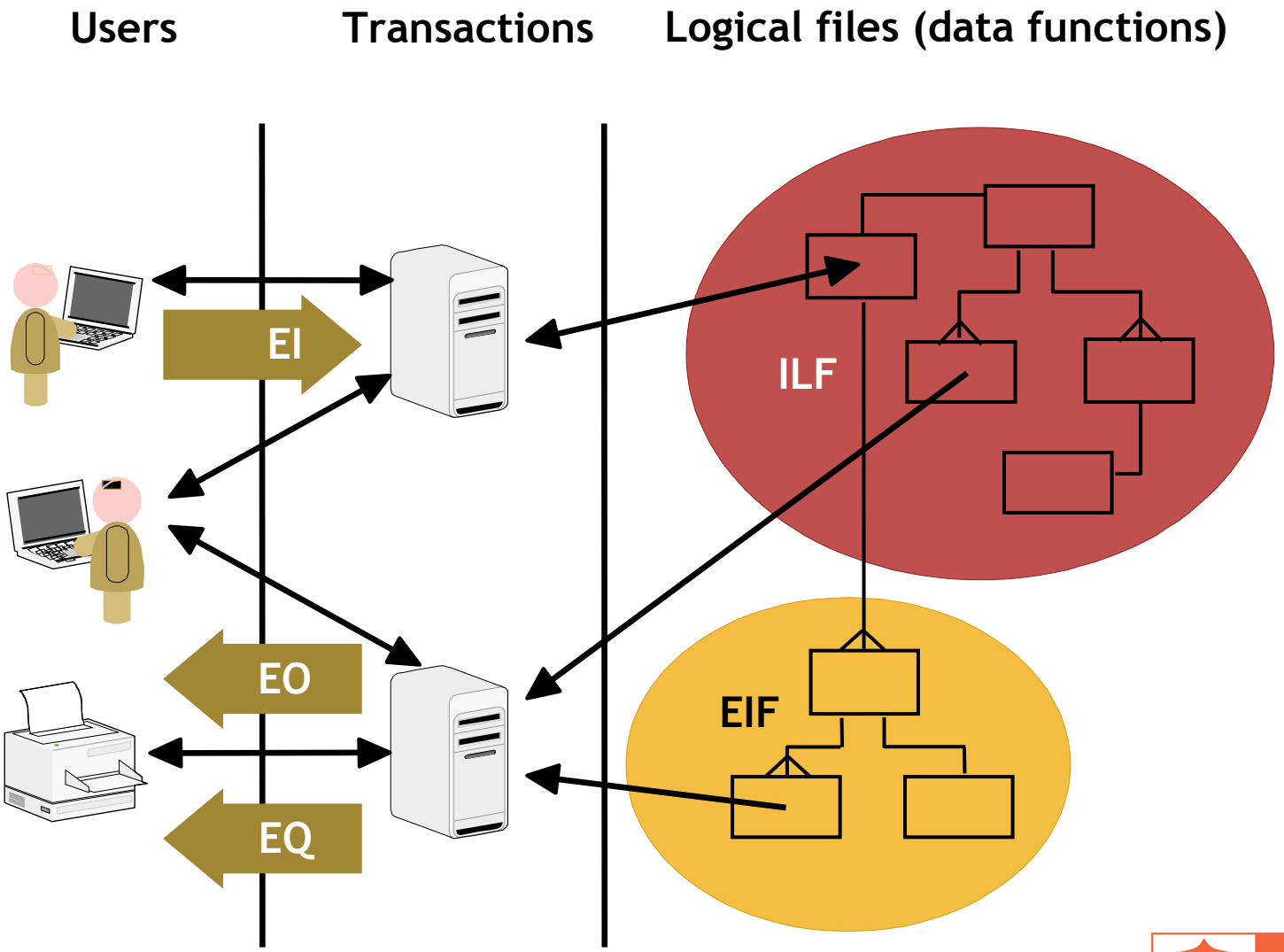
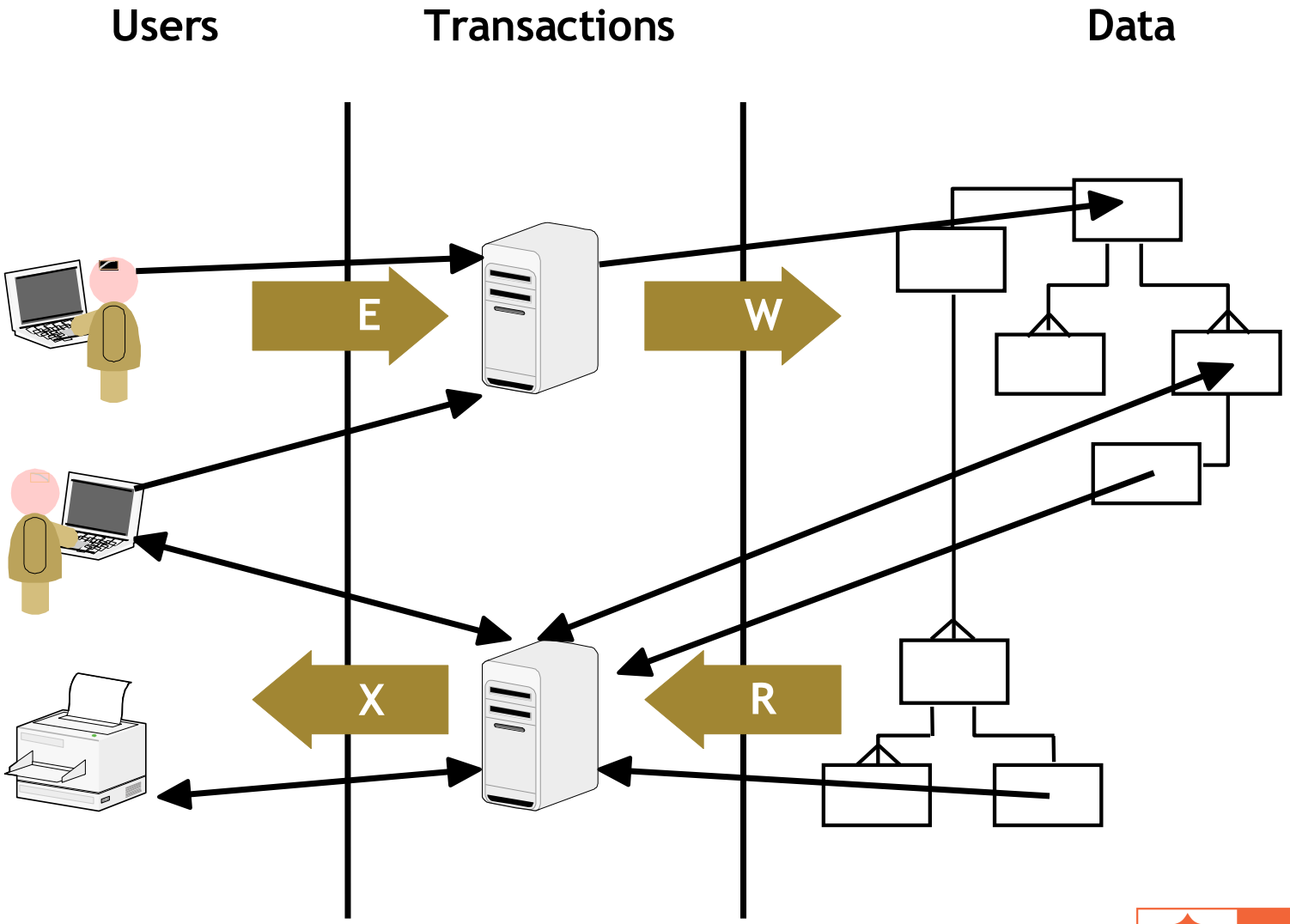
FPA


Users
Transactions
Logical files (data functions)
EI
EO
EQ
ILF
EIF

FPA in a nutshell

- Applicability of FPA is strongly dependable on the existence of a data model
- FPA grants function points to both data functions and to logical transactions
- The maximum size of data functions and logical transactions is limited
  - > ILF: 7,10 or 15 FP
  - > EIF: 5, 7 or 10 FP
  - > EI: 3,4 or 6 FP
  - > EQ: 3,4 or 6 FP
  - > EO: 4,5 or 7 FP

COSMIC



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COSMIC in a nutshell

- COSMIC is **not** dependable on the existence of a data model

- COSMIC values data movements within functional processes and does **not explicitly** reward data functions

- This value is **not limited** per functional process
  - > Theoretically the size of a COSMIC functional process can be any number between 2 and infinity

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Most important differences

	FPA	COSMIC
Applicable on Domain	Business Software	Business, Real-time, Infrastructure Software
Data model required?	Required	Not required (but useful)
Measurement of separate components?	Not possible	Possible
Size limit per function	Yes	Size is not limited
Benchmarking data	Many (ISBSG R10: n=3108)	Few (ISBSG R10: n=110)
Measurement of processing functionality	No	No, but local extensions are possible
Early sizing	Based on data model	Based on process model

Correlation?

There is no exact conceptual mapping

> The data model is quantified in FPA, but is not in COSMIC

> Complexity of the functions is established differently

> Different counting guidelines

But…. There is a high correlation

> FPA transactions ≈ COSMIC functional processes

> FPA data functions vs. extra CFP for large processes

Average CFP/functional process = 7.6

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Conversion
from FPA to COSMIC

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Earlier conversion studies

- **Fetcke (1999)**
  - > N=4
  - > Y(CFP) = 1,1(FP IFPUG) – 7,6
  - > R^2 = 0.97

- **Vogelezang & Lesterhuis (2003)**
  - > N=11
  - > Y(CFP) = 1,2(FP NESMA) – 87
  - > R^2 = 0.99
    - <200 FP: Y(CFP) = 0,75(FP) – 2.6 (Abran 2005)
    - >200 FP: Y(CFP) = 1,2(FP) – 108 (Abran 2005)

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Earlier conversion studies

- **Desharnais & Abran (2005)**
  - > Y(CFP) = 0,84(FP IFPUG) + 18
  - > R^2 = 0.91

    Transactions only: Y(CFP) = 1,35 (FPTX) + 5.5

    R^2 = 0.98

- **Desharnais & Abran (2006)**
  - > N=14
  - > Y(CFP) = 1,0(FP IFPUG) – 3
  - > R^2 = 0.93

    Transactions only: Y(CFP) = 1,36 (FPTX) + 0

    R^2 = 0.98

Sogeti Study (2006)

- **Purpose**
  - > To be able to size clients' requirements in COSMIC and use the results of these measurements in estimation tools based on FPA
  - > Learn from the differences and similarities so that we can advise clients on their FSM
- **Method**
  - > Double measurements of a number of projects by experienced analysts in both methods
- **Projects**
  - > 26 projects for a variety of clients
  - > New developments
  - > Business applications
  - > Variety of branches
  - > Early requirements
  - > Often low quality documentation

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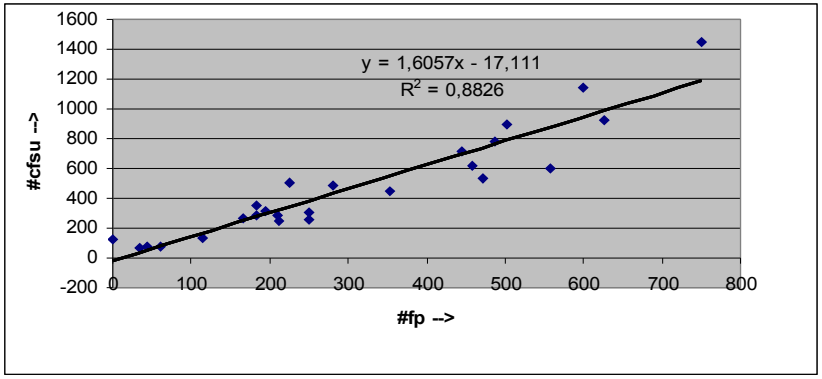
Division of the data set?

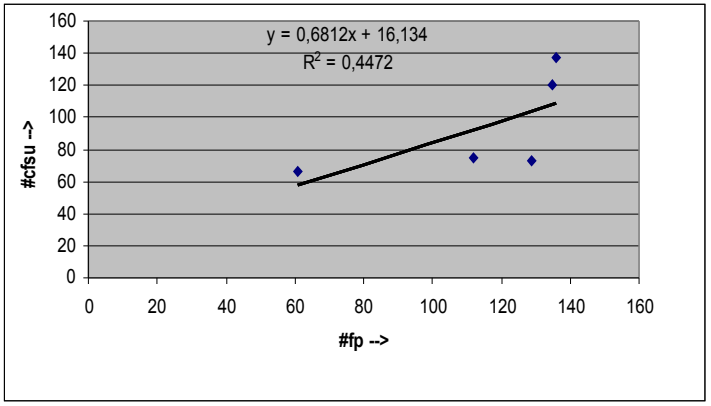
- Only transactions (Abran 2006)



CFP = 1,6 (FP NESMA-TX) -17

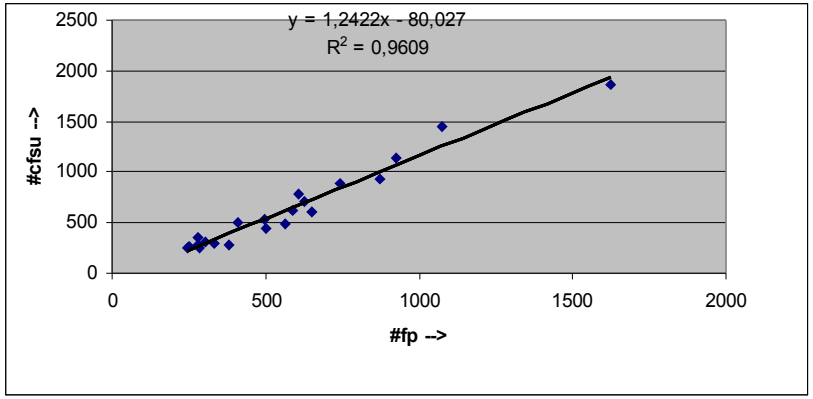
R^2 = 0.88

- Division in datasets greater and smaller than 200 (Abran 2005)



CFP = 0.68 (FP NESMA) +16

R^2 = 0.45



CFP = 1.24 (FP NESMA) -80

R^2 = 0.96

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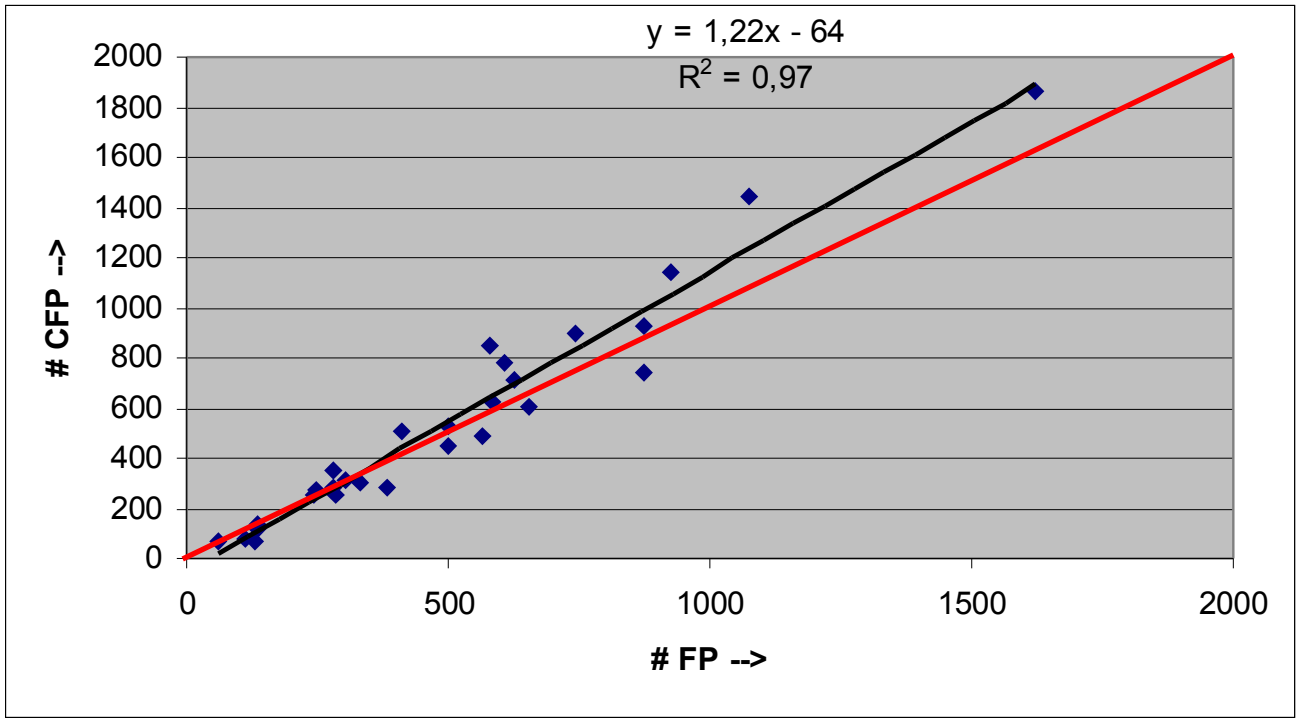
Sogeti 2006

N=26

Y(CFP) = 1,22(FP NESMA) – 64

R^2 = 0.97



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Results

- Sogeti – Use one formula for the conversion
  - > CFP = 1.22 FP (Nesma) – 64
  - → FP (Nesma) = 0.82 (CFP) + 52
  - > Projects > 200 FP

Input

Development tools	Java		
Distribution of work	**Onshore**	**Offshore**	
Construction	0%	100%	
System test	0%	100%	
System test strategy	TMap Medium		
Delivery test	Yes		
Complexity	Medium		
Size	1235	FP	
Start date	01-08-07		

Input

Development tools	Java		
Distribution of work	**Onshore**	**Offshore**	
Construction	0%	100%	
System test	0%	100%	
System test strategy	TMap Medium		
Delivery test	Yes		
Complexity	Medium		
Size	1500	COSMIC	**=1282 FP**
Start date	01-08-07		

Duration in weeks	15	17	19	**21**	23	25	27
Delivery for acceptance	14-11-07	28-11-07	12-12-07	**26-12-07**	9-01-08	23-01-08	6-02-08
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Data randomly altered

- Advising clients: Use Transition framework

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Transition framework

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A Transition Framework

- **Change FSM:**
  - > **Technical change (Metrics database)**

    Convert metrics in experience base from FPA to COSMIC (or the other way around)

  - > **Organizational change**

    Convert the organization knowledge and procedures from FPA to COSMIC

Technical change

1) Identify a data set to be analyzed in COSMIC

> Enough variation

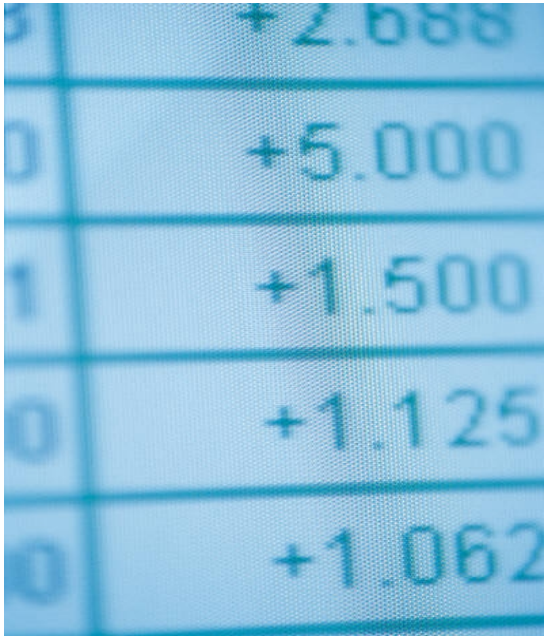
> At least 15 projects

> Recent projects with good documentation

> At least 2 'very large' projects

> Avoid very small projects (<150 FP)

> Avoid likely outliers (lot of codetables / listboxes)



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Technical Change

2) Measure the projects in COSMIC

> Experienced COSMIC analyst

> Peer reviews

> Detailed method

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Technical Change

3) Create local statistically based conversion formula

- > Use MS-Excel or other spreadsheet
- > Insert scatter diagram
- > Display the R^2 and the regression formula
- > If regression is low (<0.90), try to explain this by analyzing the outliers

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Technical Change

4) Apply the formula to convert FPA sizes to COSMIC

> When the formula is there, this is the easy part

5) Recalculate the metrics database

> Recalculate PDR (hours/FP), quality (defects/FP) and other metrics to their COSMIC equivalents

Organizational change

After conversion → COSMIC analysis

> Organizational awareness
> Revision of processes and procedures
> Communication to stakeholders
> Training of analysts / outsourcing FSM
> Revision of calculation instruments
> Possibly change the tool to administrate analysis and/or metrics

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Conclusion & Discussion

- Conversion is a highly relevant topic for very different kind of reasons. Most important is the need to size 'un-FPA-able' documentation, while using estimation tools based on FPA
- It is possible to migrate your FSM without too many 'problems'. The proposed transition framework can help
- Changing FSM also means an organizational change!

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COSMIC v3.0

- COSMIC v3.0 is now published and available for download
  - > Documentation Overview and Glossary of Terms
  - > Method Overview (→ beginners)
  - > Measurement Manual (→ main reference document)
- http://www.cosmicon.com/

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ISBSG

- And please, submit your projects with size measured in FPA and COSMIC to ISBSG.

- www.isbsg.org

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