

How to Avoid Traps in Contracts for Software Factory Based on Function Metric



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Introduction - Scenario

- There is an enormous demand for Information System.
- Information Technology Departments need more human resources to develop new software projects and to maintain the legacy software.
- Organizations establish contracts with external software factories to help them support the demand for software products and services.
- Function Point (FP) Metric has been used as a basis to software contracts, specially by Brazilian government organizations.

Introduction - FP Benefits

- FP measures the project function size, independently of technology used.
- FP makes possible the size estimation of the software project on the early phases of the software life cycle.
- There are objective rules to count FP. These counting rules are published on CPM (Counting Practices Manual).
- FP considers the user view.
- FP is independent of requirements modeling.

Introduction - Motivation

Problem: How do organizations establish contracts for software factories?

Solution: Establish a contract based on FP metric.
Define a contract clause: “The FP Counting must be performed according to CPM 4.2.1 (or the current release)”

Some contractor organizations establish their software contracts based on FP and have conflicts and problems with their contracted.

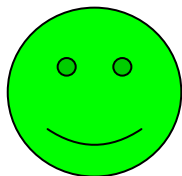


Introduction - Objectives

 **Presenting the use of FP in software contracts**

 **Showing some frequent errors in FP counting, observed in the counting validation.**

 **Discussing some common problems of software contracts based on FP and suggesting solutions.**

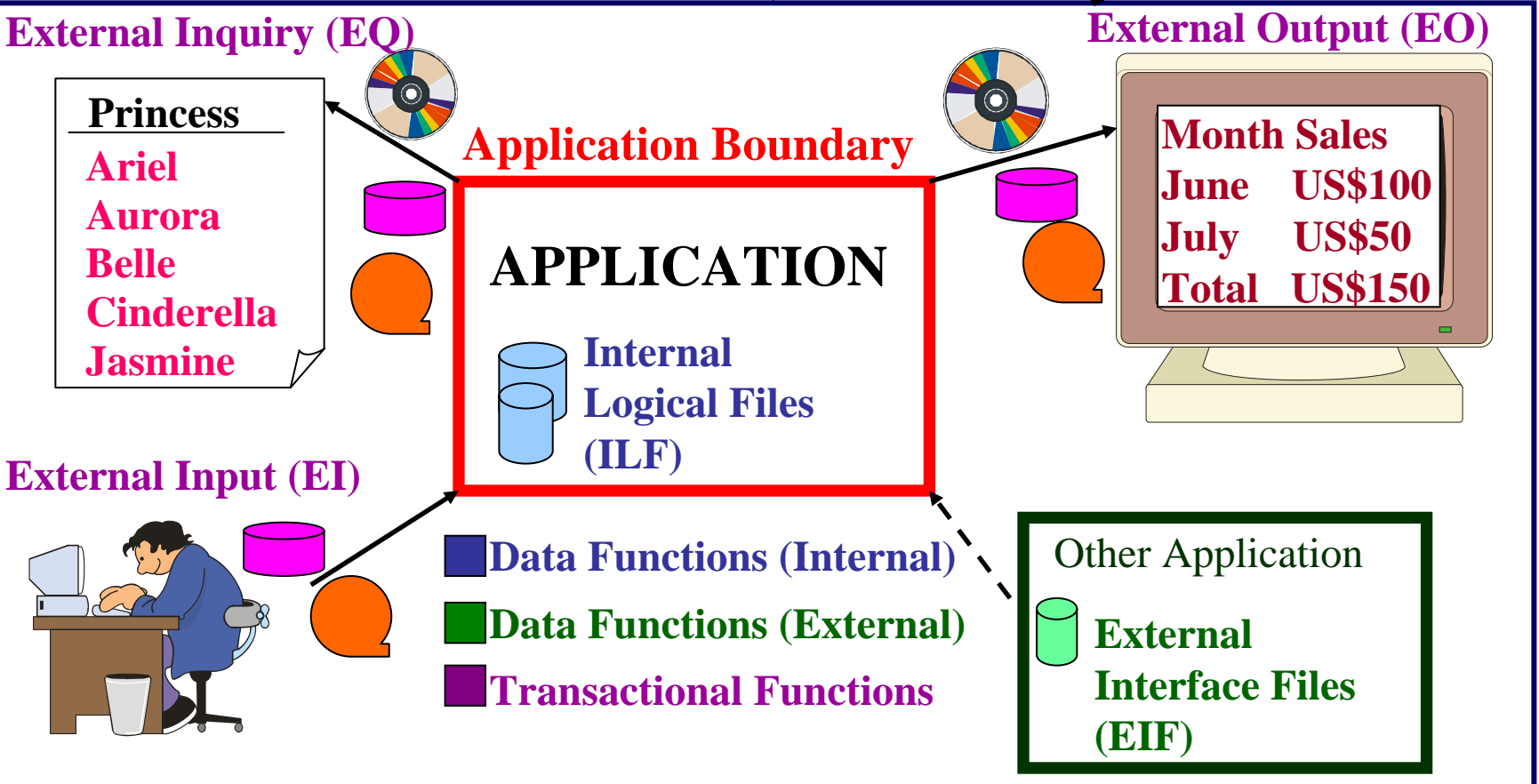
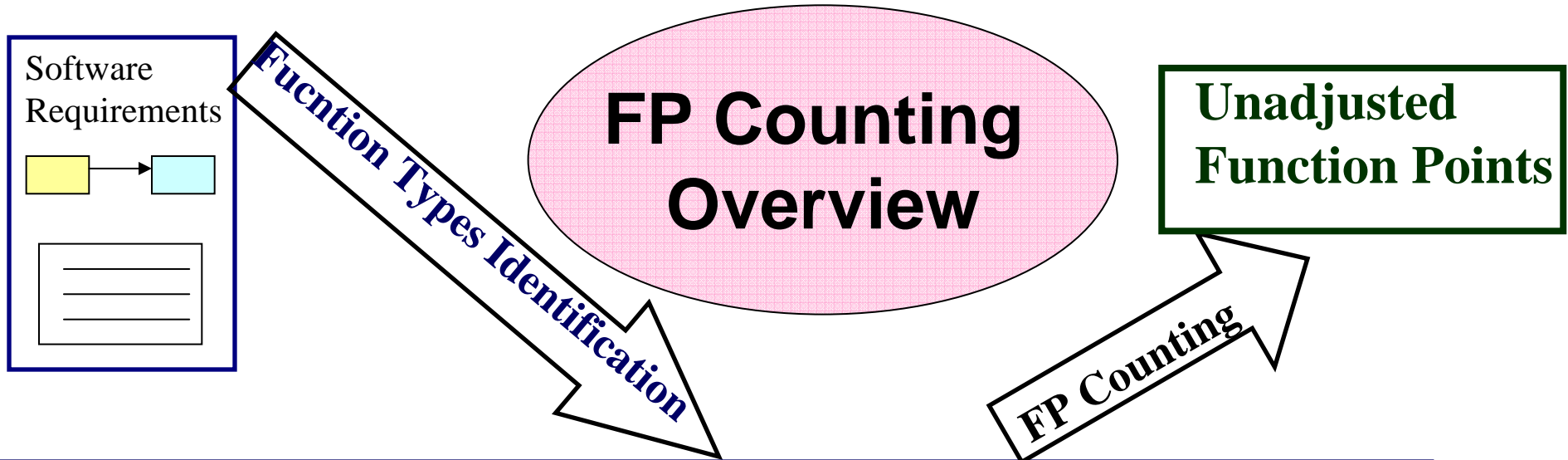
 **Purpose: Reducing the conflict between contractors and contracted**

Function Point Analysis (FPA)

FPA measures software projects by quantifying the functionality that the software provides to the user based on functional user requirements.

The main purposes of FPA:

- Measure the functionality that the user requests and receives**
- Measure software development and enhancement independently of technology used for implementation**



FP Counting Overview

Formulas

Software Development Projects

$$\text{DFP} = (\text{UFP} + \text{CFP}) \times \text{VAF}$$

Software Enhancement Projects

$$\text{EFP} = [(\text{ADD} + \text{CHGA} + \text{CFP}) \times \text{VAFA} + (\text{DEL} \times \text{VAFB})]$$

Ten Errors – FP Counting

1

Error in the Definition of Functional Size x Development Effort

FP: functional size metric based on functional requirements

Effort Estimation: considers size estimation and non-functional requirements. FP may be used as an input to cost and effort estimations.

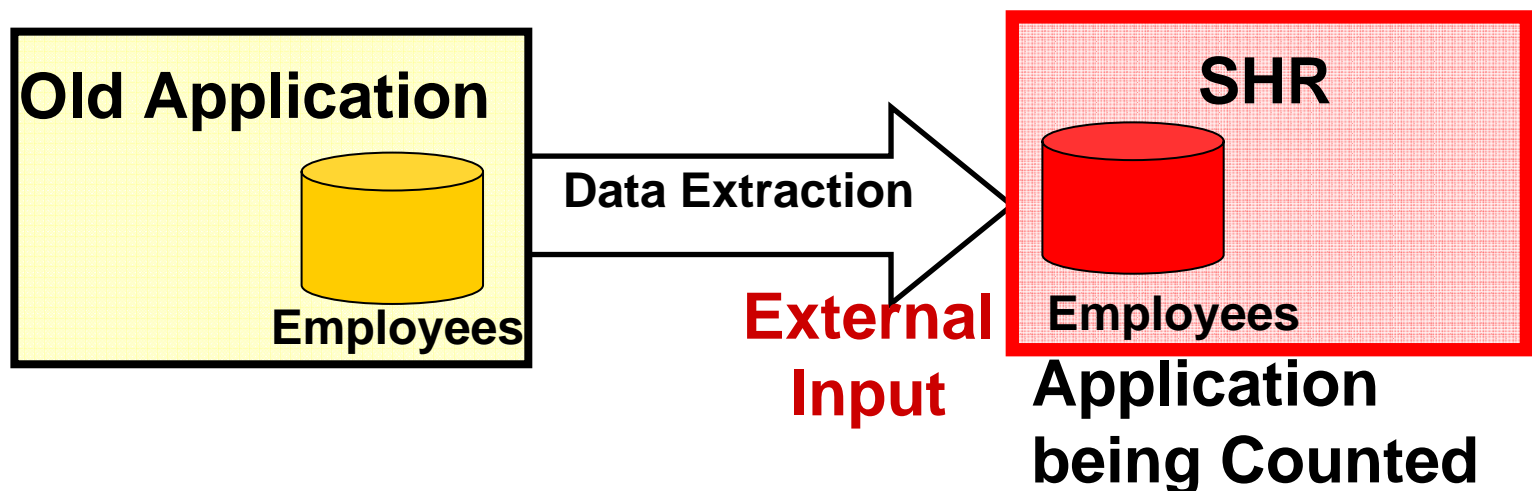
Ten Errors – FP Counting

2

Error in the Usage of FP Counting Formulas described in CPM

$$\text{DFP} = (\text{UFP} + \text{CFP}) \times \text{VAF}$$

CFP: Conversion Function Point



Ten Errors – FP Counting

3

Error: External Inquiries x External Outputs

Students Inquiry

calculated data	
Name	Age
David	11
Giselle	10
Nancy	11
Robert	11

External Output (EO)

Report of Students

retrieval data	
Name	Code
David	2008_1
Giselle	2008_2
Nancy	2008_3
Robert	2008_4

External Inquiry (EQ)

11

Ten Errors – FP Counting

4

Error in the Identification of Logical Files



- Some physical data are counted as ILF or EIF, for instance strong and independent entities.
- Some physical data may be a part of ILF or EIF, for instance weak entities.
- Some physical data are not counted, for instance Code Data.

Ten Errors – FP Counting

5

Error in the Elementary Process Identification

Input Data – Screen 1

Employee Code:

Output Data – Screen 2

Employee Details:

Name:
Phone:
E-mail:
Department:
Manager:

Only one Elementary Process

Ten Errors – FP Counting

5

Error in the Elementary Process Identification

“an elementary process must be self-contained and leave the business of the application being counted in a consistent state” CPM 4.2.1

Hint

Sequential functionalities make part of the same elementary process and independent functionalities make part of different elementary processes.

Ten Errors – FP Counting

6

Error in the Identification of Implicit Inquiries

Professor Data Update

Code: 2008_1_8

Name

Birth date:

e-mail:

Course:

Ten Errors – FP Counting

7

Error in the Determination of the Value of Adjustment Factor

The application being counted has:

- Reuse of components of another application
- Internal reuse

Reusability: 1

There is still much difficulty in identifying the degree of influence (DI) of the General System Characteristics (GSC)

Ten Errors – FP Counting

8 Error in the Calculation Formula Implemented in Spreadsheet of FP Counting

Function Type	Complexity Low	Complexity Average	Complexity High
Internal Logical File (ILF)	7 FP	10 FP	15 FP
External Interface File (EIF)	5 FP	7 FP	10 FP
External Input (EI)	3 FP	4 FP	6 FP
External Output (EO)	4 FP	5 FP	7 FP
External Inquiry (EQ)	3 FP	4 FP	6 FP

Ten Errors – FP Counting

9

Error in the Determination of Complexity of Changed Functions in Enhancement Projects

$$EFP = [(ADD + CHGA + CFP) \times VAFA + (DEL \times VAFB)]$$

CHGA: FP of the functions modified by the enhancement project

**Considers the new functionality available to the user by the application, for instance: add 1 DET to an EI – high – 6 FPs.
CHGA: 6 FPs**

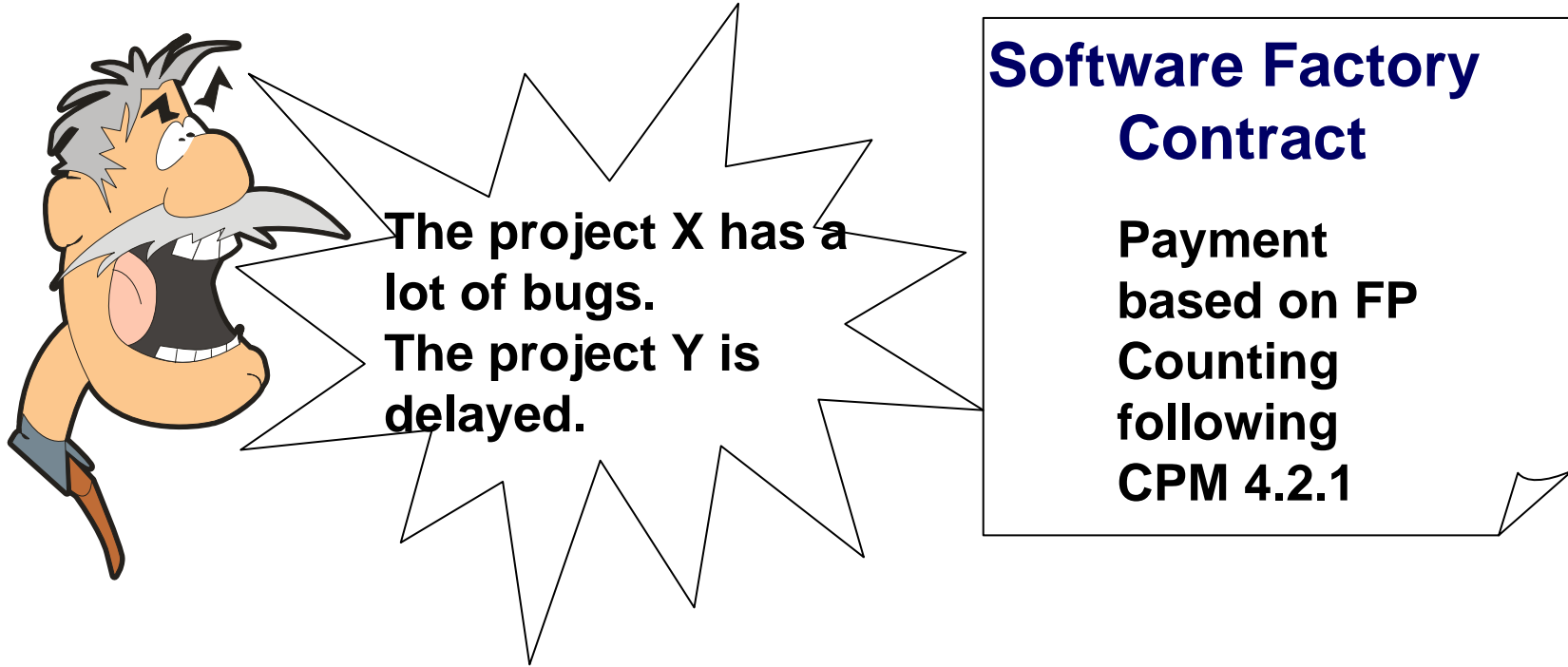
Ten Errors – FP Counting

10 Error in the CPM Use: FP Counting of Maintenance Projects

How do you count FP of software maintenance projects such as Corrective maintenance and Cosmetic maintenance in a software contract based on CPM 4.2.1?

Answer: Unfortunately, You can't count FP of these kinds of project according to CPM. They have zero FP. There aren't functional changes.

Software Contracts Problems



CPM doesn't consider all of the important aspects which must be observed in Software contracts in order to avoid conflicts between contractors and contracted .

Software Contracts Problems

How to avoid traps?

1 Getting a Software Requirement Document with Quality

The Requirements Document constitutes:

- the common agreement term of contractor and contracted;
- the basis for the FP Estimation;
- the basis for the software project construction.

It is essential the quality assurance of requirements document.



Bad Requirements Documents or a Nightmare ?

Software Contracts Problems

How to avoid traps?

1 Getting a Software Requirement Document with Quality

Suggestion:

inspect the requirement during the FP Estimation.

Hazan has applied the CEPF method to estimate FP.

As a side effect of this estimation, she finds defects in the requirements documents, e.g.,

- missing requirements,
- inconsistencies,
- incompleteness, and
- ambiguities.

HAZAN, C. et. al. É possível substituir processos de Engenharia de Requisitos por Contagem de Pontos de Função? 8th International Workshop on Requirements Engineering (WER2005), Porto, Portugal, June 2005.

Software Contracts Problems

How to avoid traps?

2 Establishing Rules to the Treatment of the Scope Creep

- Software Requirements don't remain "frozen".

Suggestion:

Establish a percentage to each software process task, e.g.:

Requirements: 20%, design: 10%, implementation: 50%, test: 15%, installation: 5%.

When a requirement is changed, identify the tasks performed.

Example: Report of Clients – EO –average – 5 FP was changed at the end the requirement phase.

Thus, the number of FP for the payment is:

New changed requirement: EO –average – 5 FP

+ 20% of the original requirement (1 FP)

Total: 6 FPs

Software Contracts Problems

How to avoid traps?

3 Establishing Clauses of Quality Assurance

CPM doesn't establish rules to ensure the quality of the software project received. However, the FP Counting considers the functionality required and received (without defects). Sometimes, the wait to the defects correction is too long. Then, it is important to establish contractual clauses to deal with Quality Assurance.

Suggestion:

Define a indicator defects/ FP and a clause of penalty. For instance, a penalty if the result of defects indicator is greater than 0,3 defects/FP.

It is important to define the considered defects in the contract.

Software Contracts Problems

How to avoid traps?

4 Establishing Clauses of Schedule and Assurance of a Delivery Rate

Some organizations have the following problem: “the contracted doesn’t deliver any software project”

Suggestion:

- Establish a monthly delivery rate, e.g.: 500 FP/month
- Define the estimation model used to estimate the schedule. You can use the “Capers Jones formula”

$$T_d \text{ (in months)} = V^{**}t$$

JONES, C. Estimating Software Costs – Bringing Realism to Estimating. 2nd Edition, Mc Graw Hill, New York, 2007. New York.

Software Contracts Problems

How to avoid traps?

5 Establishing the CPM as a basis to count FP instead conversions

Common Situation: Some organizations establish the use of the CPM on the Contract., however they don't count FP following CPM.

Sometimes, the FP Counting is based on FP conversion formula, e.g. Use Case Points (UCP) to FP. There isn't a formula to convert UCP to FP with accuracy.

Sometimes, the contract is based on FP, however the contract is administrated as a contract related hours allocated (timesheet). The contracted reports the allocated hour without the contractor management. These reported hours are converted to FP, based on a productivity rate defined based on FP price.

Count FP according to CPM only.

Software Contracts Problems

How to avoid traps?

6 Establishing rules to addressing maintenance projects

FP counting is applied only to development and enhancement projects according to CPM.

How to address the other maintenance projects in contracts based on FP counting?

Suggestion:

- Define the kinds of maintenance projects common in your organization.**
- Define formulas based on CPM enhancement project formula in your software contract.**

Software Contracts Problems

How to avoid traps?

6 Establishing rules to addressing maintenance projects

Cosmetic Maintenance: when the contractor requests the contracted to change static text in screens, such as screen captions or organization logotype.

Suppose the contractual clause considering the percentage of 10% for changed functionality in a cosmetic maintenance project.

Thus, if the contractor requests a change in the caption of a screen, which is contained within inquiry functionality, identified as: EQ – Low – 3 FP. Then, the size of this project, supposing the VAF = 1, is: $(3 \times 1) \times 0.10 = 0.3$ Adjusted FPs.

Conclusion

- **It is important to count FP correctly according to CPM rules.**
- **FP is the best metric to be considered by Software Factory contracts.**
- **Software contracts based on fixed price by FP, for instance US\$500/ FP, is not a good practice. Because the effort and the cost of software projects depend on non-functional requirements too.**
- **Define a contract based on price by work hour. The work hour must be calculated based on FP Counting. Establish a model to derive hours by FP.**

THANKS

Contact and Questions



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“Dreams come true”