What Function Points Are and Are Not

Presented by

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Topics of Discussion

- **Software Measurement Goals**

- **What are Function Points?**

- **FP Overview**

- **FP Uses**

- **Misconceptions About FP**

- **Q & A**

Software Measurement Goals

- Monitor performance year to year, project to project.
- Determine relative productivity of platforms, languages, etc.
- Identify tools that give the best ROI.
- Identify areas offering the greatest improvement to potential.
- Support decision making process for environment changes.
- Illustrate the contribution of IS to the strategic goals.
- Build historical data for estimating & forecasting.
- Aid in project prioritizing.
- Communicate results.

Mary Bradley, MSB2

Software Measure vs Metric MEASURE

■ **"The result of counting or otherwise quantifying an attribute of a process or product...numerical values assigned to software attributes..."** *PSM P.382*
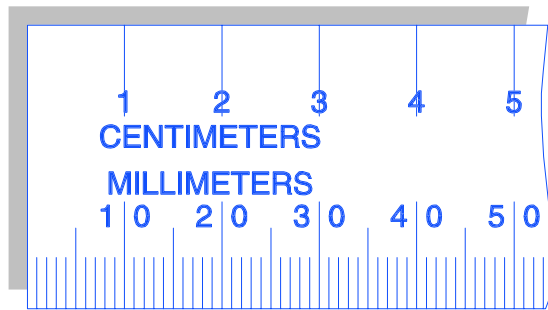
Examples

Work Effort (Hours)

Cost (Labor, Resources)

Size (FP, KLOC)

Defects (#, Criticality, Fix $)

```
      1     2     3     4     5
    CENTIMETERS
    MILLIMETERS
    1 0   2 0   3 0   4 0   5 0
```

PSM July 21, 1997

Software Measure vs Metric
PSM: INDICATOR

- **"A measure or combination of measures that provides insight into a software issue or concept..."** *PSM P.381*

.

$$E = MC^2$$

Examples

Productivity = Size / Effort (FP / hr)

Quality = Defects / Size (# / FP)

Labor Rate = $ / Time ($ / hr)

What are Function Points?

"A software size measure. They measure the amount of information processing functionality contained within a software product. They are derived early in the software life cycle from requirements or design specifications, and are applied across diverse application domains and technology platforms." *PSM P.381*

What Are Function Points?

- FP represent the size of the software's Logical User Requirements (like Square Feet).

- Developers take Requirements to Installation via hundreds of tasks (like Builders).

- To FP count, we need Logical User requirements (like a Blueprint).

History of FP

- **1979** - *Concept introduced by Alan Albrecht of IBM at Guide/Share conference.*

- **1984** - *IBM CI/S&A Guideline 313 "AD/M Productivity Measurements & Estimate Validation".*

- **1986-87** *International Function Point Users Group (IFPUG) organized. MIT Study by Chris Kemerer*

- **1993** -*Certification for FP Specialists. Joint QAI/IFPUG Study.*

- **1994** - *CPM 4.0, Guidelines to S/W Measurement 1.0*

- **1995-1997**- *ISBSG Involvement, S/W Certification, ISO/IEC JTC1 SC7 WG12 Functional Size Measurement*

- **June 1997** - *ISO/IEC 14143-1 published, 4 other proj.parts...*

FP Objectives
Source: IFPUG CPM 4.0

■ Measure functionality the user requests and receives

■ Measure independent of implementation technology

■ Provide a normalization factor for software measurement

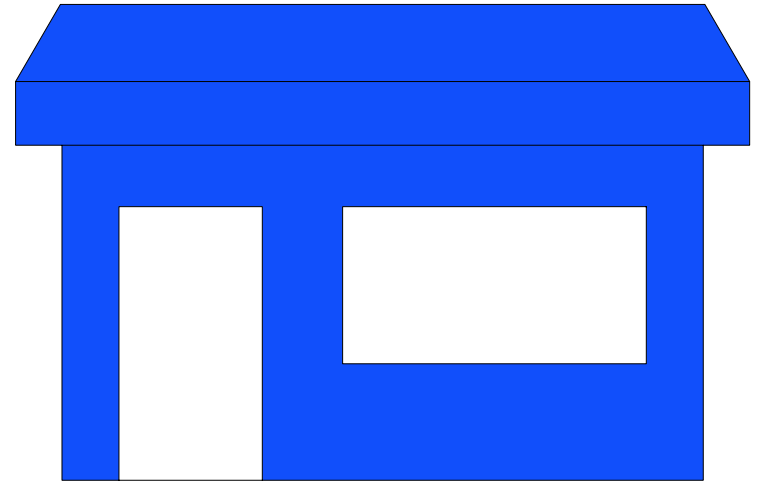# Types of Counts Development (Project) FP

- Associated with initial installation of software

- Measures the functionality provided to the users by the project

- Less conversion FP, it is the Application FP count once installed.
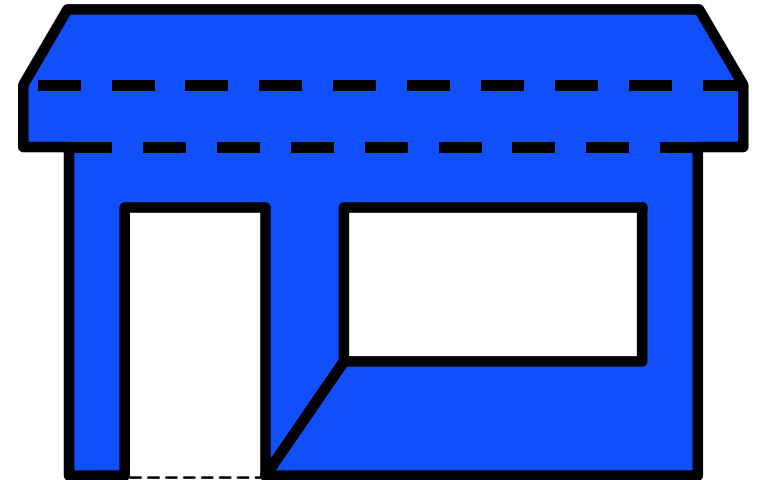
Types of Counts Application (Base) FP

- Static (point in time) size of an installed application

- Measures the current functions provided by the application

- The base count should be analyzed after enhancement

Types of Counts
Enhancement (Project) FP

- Associated with the enhancement of existing software

- Measures the modifications to the existing application

- Includes new (added FP), changed, and removed functions, plus conversion functionality
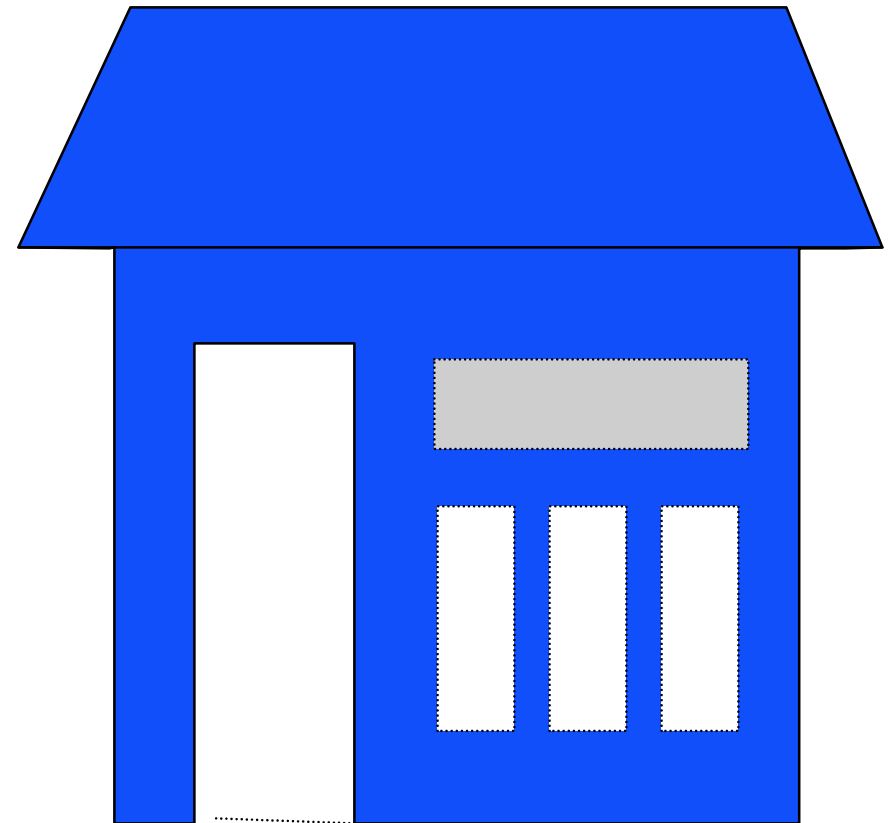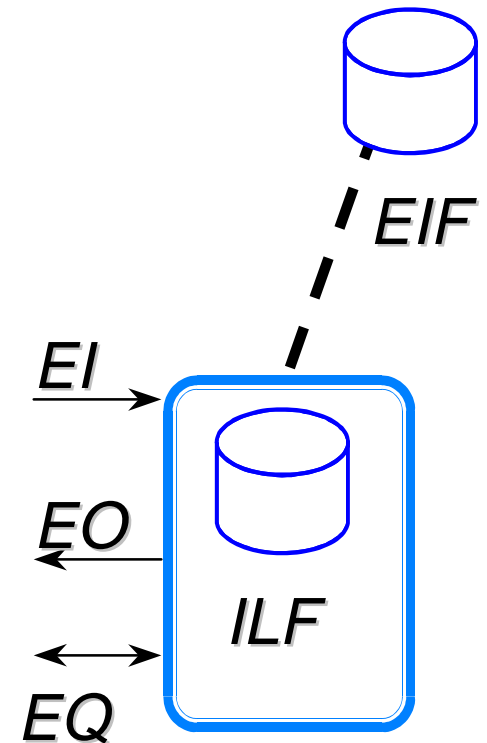
FP Overview

Source: IFPUG CPM 4.0

Customer's view based on 5 function types:

Data Functions:

- **Internal Logical File**   **ILF**
- **External Interface File**   **EIF**

EIF

EI

Transactional Functions:

- **External Input**   **EI**
- **External Output**   **EO**
- **External Query**   **EQ**

EO

ILF

EQ

Function Point Terms

Source IFPUG CPM 4.0

■ **Data Element Type - DET**

Unique, user recognizable, non-repeated field.

■ **Record Element Type - RET**

User recognizable subgroup of data elements within a logical file. (ILF or EIF)

■ **File Type Referenced - FTR**

A logical file (ILF or EIF) read or maintained by a transaction.

FP Overview

■ What is the Function Point Counting Process?

   1. Determine type of count

   2. Identify boundary

   3. Count data function types

   4. Count the transactional function types

   5. Determine the value adjustment factor

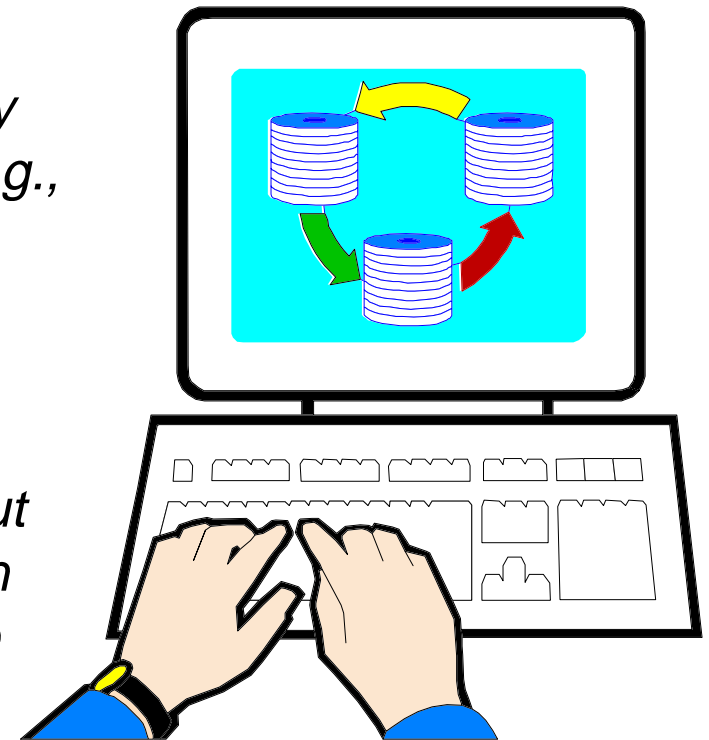   **6. Calculate the final adjusted FP count**

FP Overview
Source: IFPUG CPM 4.0

Internal Logical File (ILF)

Logical group of data maintained by the application being counted (e.g., Employee file)
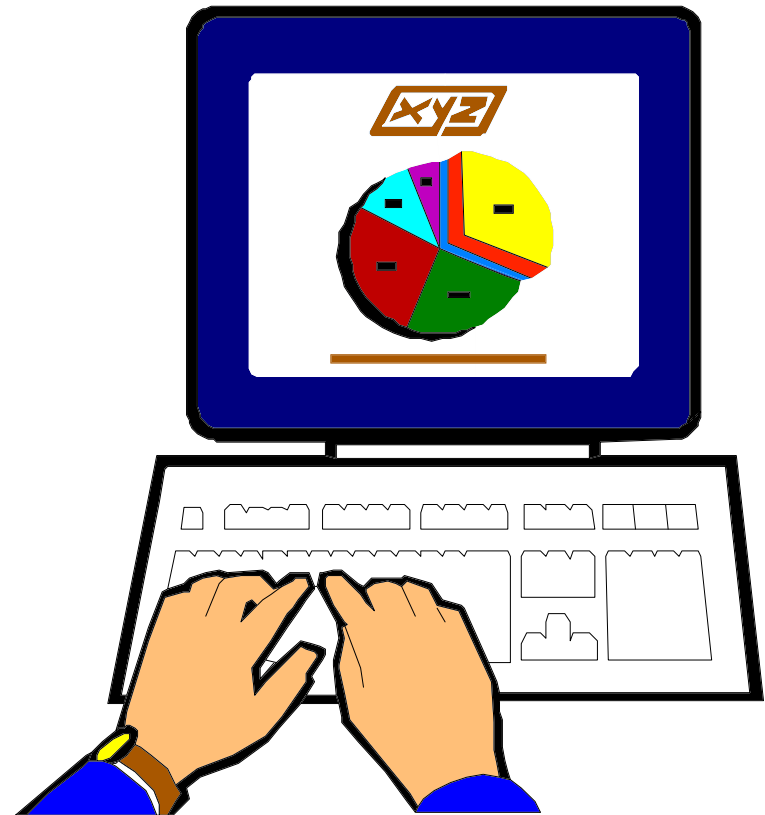

External Interface File (EIF)

Logical group of data referenced but not maintained by the application being counted (e.g., Global state table)

FP Overview
Source: IFPUG CPM 4.0

■ **External Input (EI)**

Maintains ILF or passes
control data.

■ **External Output (EO)**

Calculated or derived data
exits the application.

■ **External Query (EQ)**

Presentation of data from
logical file(s).

FP Overview

Source: IFPUG CPM 4.0

File (ILF, EIF) Complexity

RET's	1-19 DET's	20-50 DET's	51+ DET's
1	Low	Low	Average
2- 5	Low	Average	High
6 +	Average	High	High

Input (EI, EQ in) Complexity

FTR's	1 - 4 DET's	5 - 15 DET's	>15 DET's
0 - 1	Low	Low	Average
1	Low	Average	High
3+	Average	High	High

Output (EO, EQ out) Complexity

FTR's	1 - 5 DET's	6 - 19 DET's	>19 DET's
0 - 1	Low	Low	Average
2 - 3	Low	Average	High
>3	Average	High	High

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FP Overview
Source: IFPUG CPM 4.0

■ Function Weights

Function Type	Low	Average	High
EI	x 3	x 4	x 6
EO	x 4	x 5	x 7
EQ	x 3	x 4	x 6
ILF	x 7	x 10	x 15
EIF	x 5	x 7	x 10

FP Overview

■ After the application's functions are counted: the unadjusted FP (UFP), is adjusted for other User /Business Constraints (tech.indep)

■ This adjustment is made via the Value Adjustment Factor (VAF). It is based on:

- *Sum of 14 General System Characteristics (GSC) Questions, each rated 0 to 5*

- *Average application sum = approx. 35*

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FP Overview

Source: IFPUG CPM 4.0

General Systems Characteristics

- Data Communication
- Distributed Data Processing
- Performance
- Heavily Used Configuration
- Transaction Rate
- On-Line Data Entry

- End User Efficiency
- On-Line Update
- Complex Processing
- Reusability
- Installation Ease
- Operational Ease
- Multiple sites
- Facilitate change

FP Overview
Source: IFPUG CPM 4.0

- **The Value Adjustment Factor (VAF):**

  VAF = (Sum GSC x .01) + .65
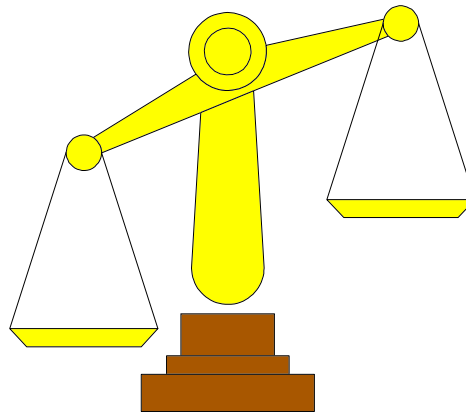
Adjusts UFP count by up to + / - 35%

FP Overview
Source: IFPUG CPM 4.0

■ **Adjusted FP Counts:**

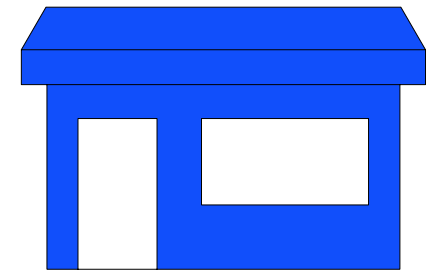● **Development Project Count**
  DFP = (UFP + CFP) x VAF
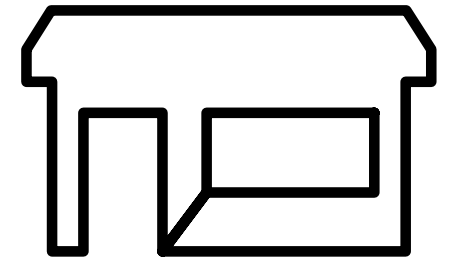
● **Application Count**
  AFP = UFP x VAF
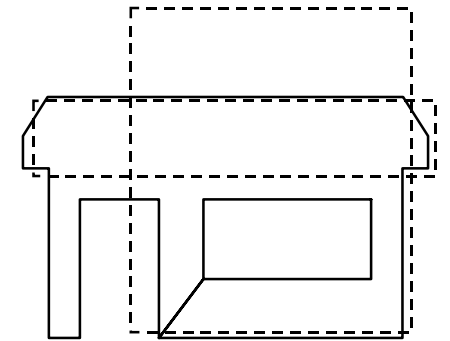
FP Overview
Source: IFPUG CPM 4.0

■ **Adjusted FP Counts:**

Enhancement Count

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

New (Updated) Base Count

$$New\ AFP = [(UFPB + ADD + CHGA)$$
$$- (CHGB + DEL)] \times VAFA$$
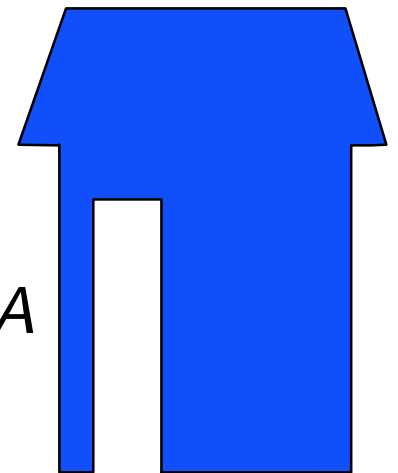
Logical versus Physical (Examples)

LOGICAL:

1. The application must store Employee information.

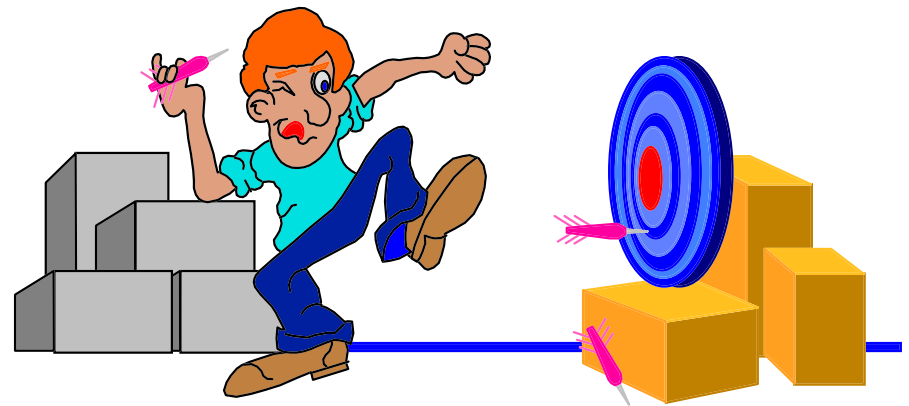2. Users need the ability to add, change and delete employees.

PHYSICAL:

1. Implemented using monthly Employee DB2 tables.

2. Payroll system sends in a TX file with new, updated & terminated employees to our application.

FP Uses

■ FP size can be used in conjunction with other measures to produce Software Metrics such as:

- *Productivity*
- *Delivery Rates*
- *Support Ratios*
- *. . . more . . .*

FP Uses - Productivity

- **Portfolio size**

  Sum of all FP's of all applications

- **Project delivery rate**

  FP's / work effort

- **Application support rate**

  FP's / work effort

- **Application maint load per person**

  FP's / # of maintenance people (FTE's)

FP Uses - Quality

- **Defect ratio**

  # of defects / Project FP's. Use with Mean Time to Repair ratio (Elapsed time / # of problems)

- **Repair cost ratio**

  *(Total hours to repair defects * hourly costs) / FP's*

- **Application reliability**

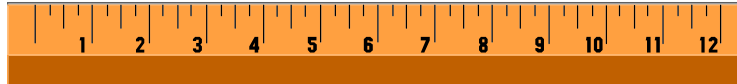 *1 - (Application failures / Application FP's)*

- **Stability ratio**

  1 - (# of changes / FP's)

Misconceptions about FP
FP *ARE*:

- A measure of application or project size based on quantification of user requirements

- Independent of technology, tools, and other physical project attributes
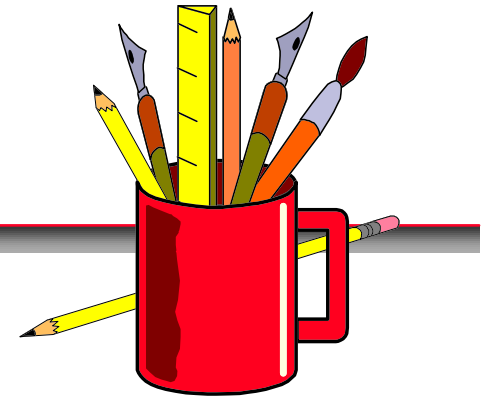
Misconceptions about FP
FP *ARE NOT*:

- Equal to Work effort, Productivity or the Internal Complexity of applications.

- A "silver bullet" measure

- A quick fix or a solution to problems

- A substitute for Project Attributes
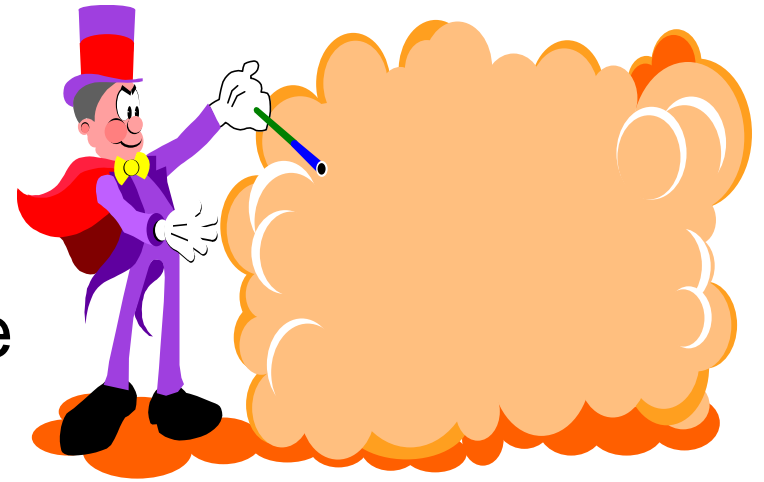
FP Counting Aids

As many as possible from this list:

- Requirement Documents
- Data Models
- Data Flow Diagrams (DFD)
- Entity Relationship Diagrams (ERD)
- Flow Charts
- Interface Descriptions
- Live Application

- Report Layouts
- Screen Layouts
- On-line Tutorial
- System expert (for the system at hand)
- File Layouts
- User Manual

Summary Quotes

- "Without relationships, metrics are not very useful . . ." *

- "Over time, metrics need not be perfect to be useful. . .In metrics, just as in most fields, imperfect does not mean invalid." *

- ** Jerome B. Landsbaum*
  from Measuring & Motivating Maintenance Programmers,
  Prentice Hall 1992

- "Without a common denominator such as function points, comparative metrics are not possible."

- "It should be considered professional malpractice when managers make decisions based on data they haven't taken the time to understand."

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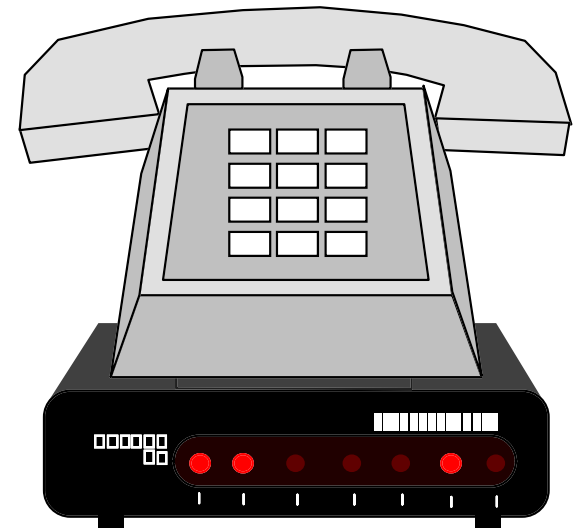
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Q & A

THANK YOU