

EXTERNAL INPUT (EI)

An elementary process that processes data or control information that comes from outside the boundary. The primary intent of an EI is to maintain one or more ILFs and/or to alter the behaviour of the system.

Rules: All of the following must apply

- The data or control information is received from outside the application boundary. At least one ILF is maintained if the data entering the boundary is not control information that alters the behaviour of the system.
- For the identified EP, one of the three statements must apply:
 - Processing logic is unique from processing logic performed by other EIs for the application
 - The set of data elements identified is different from the sets identified for other EIs in the application.
 - The ILFs or EIFs referenced are different from the files referenced by the other EIs in the application.

The number of FTRs and DETs determines EI COMPLEXITY

FTR RULES FOR EI

- Count a FTR for each ILF maintained.
- Count a FTR for each ILF or EIF read during the processing of the EI.
- Count only one FTR for each ILF that is both maintained and read.

EI DET RULES FOR EI

- Count one DET for each unique user recognizable, non-repeated attribute that crosses (enters or exits) the boundary during the processing of the transactional function.
- Count only one DET per transactional function for the ability to send an application response message even if there are multiple messages
- Count one DET for the ability to initiate action(s) even if there are multiple means to do so.
- Do not count attributes that are generated and saved, retrieved or referenced if they do not cross the boundary.
- Do not count literals, paging variables, navigation aids or system-generated stamps.

	1 - 4 DET	5-15 DET	16 or more
0 -1 FTR	Low	Low	Average
2 FTRs	Low	Average	High
3 FTR or more	Average	High	High

EXTERNAL OUTPUTS (EO)

An elementary process that sends data or control information sent outside the application's boundary and includes additional processing beyond that of an external inquiry. The primary intent of an external output is to present information to a user through processing logic other than or in addition to the retrieval of data or control information. The processing logic must contain at least one mathematical formula or calculation, create derived data, maintain one or more ILFs, and/or alter the behaviour of the system.

Rules – All of the following must apply

- Sends data or control information external to the application's boundary.
- For the identified EP, one of the three statements must apply
 - Processing logic is unique from the processing logic performed by other EOs for the application.
 - The set of data elements identified are different from other EOs in the application.
 - The ILFs or EIFs referenced are different from files referenced by other EOs in the application.

In addition, one of the following rules must apply:

- The processing logic contains at least one mathematical formula or calculation.
- The processing logic maintains at least one ILF.
- The processing logic alters the behaviour of the system.

EXTERNAL INQUIRY (EQ)

An elementary process that sends data or control information outside the boundary. The primary intent of an external inquiry is to present information to the user through the retrieval of data or control information. The processing logic contains no mathematical formula or calculations, and creates no derived data. No ILF is maintained during the processing, nor is the behaviour of the system altered.

RULES – All of the following must apply:

- Sends data or control information external to the application's boundary.
- For the identified EP, one of the three statements must apply
 - Processing logic is unique from the processing logic performed by other EQs for the application.
 - The set of data elements identified are different from other EQs in the application.
 - The ILFs or EIFs referenced are different from files referenced by other EQs in the application.

In addition, all of the following rules must apply:

- The processing logic retrieves data or control information from an ILF or EIF.
- The processing logic **does not** contain mathematical formula or calculation.
- The processing logic **does not** alter the behavior of the system.
- The processing logic **does not** maintain an ILF.

EO / EQ COMPLEXITY is determined by the number of FTRs and DETs

FTR RULES FOR EO/EQ

- Count a FTR for each ILF or EIF read during the processing of the elementary process.
- Count a FTR for each ILF maintained during the processing of the elementary process.
- Count only one FTR for each ILF that is both maintained and read by the elementary process.

ADDITIONAL FTR RULE FOR EO

- Count one DET for each unique user recognizable, non-repeated attribute that crosses (enters or exits) the boundary during the processing of the transactional function.
- Count only one DET per transactional function for the ability to send an application response message even if there are multiple messages.
- Count one DET for the ability to initiate action(s) even if there are multiple means to do so.
- Do not count attributes that are generated and saved, retrieved or referenced if they do not cross the boundary.
- Do not count literals, paging variables, navigation aids or system-generated stamps.

	1 - 5 DET	6-19 DET	20 or more
0 -1 FTR **	Low	Low	Average
2 - 3 FTRs	Low	Average	High
4 FTR or more	Average	High	High

** EQ must have a minimum of 1 FTR

INTERNAL LOGICAL FILE (ILF)

User recognisable group of logically related data or control information maintained within the boundary of the application being measured. The primary intent of an ILF is to **hold data maintained** through one or more elementary processes of the application being counted.

Rules – All of the following must apply:

- The group of data or control information is logical and user defined.
- The group of data is maintained through an elementary process within the application boundary being counted.

EXTERNAL INTERFACE FILE (EIF)

User recognisable group of logically related data or control information which is referenced by the application being measured, but maintained within the boundary of another application. The primary intent of an EIF is to **hold data referenced through one or more elementary processes** within the boundary of the application counted. This means an EIF counted for an application must be an ILF in another application.

Rules -- All of the following must apply:

- The group of data or control information is logical and user defined.
- The group of data is referenced by, and external to, the application being counted.
- The group of data is **not maintained** by the application being counted.
- The group of data is maintained in an ILF of another application.

ILF / EIF Complexity is determined by the number of RETs and DETs.

DET RULES FOR ILF/EIF

- Count a DET for each unique user recognizable, non-repeated field maintained in or retrieved from the ILF or EIF through the execution of an elementary process.
- Count only those DETs being used by the application being measured when two or more applications maintain and/or reference the same data function.
- Count a DET for each attribute required by the user to establish a relationship with another ILF or EIF.
- Review related attributes to determine if they are grouped and counted as a single DET or whether they are counted as multiple DETs; grouping will depend on how the EPs use the attributes within the application

RET RULES FOR ILF/EIF

- Count one RET for each data function
- Count one additional RET for each of the following additional logical sub-groups of DETs
 - Associative entity with non-key attributes
 - Sub-type (other than the first sub-type)
 - Attributive entity, in a relationship other than mandatory 1:1

Internal Logical File/External Interface File Complexity Matrix

	1 - 19 DET	20 - 50 DET	51 or more
1 RET	Low	Low	Average
2 - 5 RETs	Low	Average	High
6 or more	Average	High	High



FUNCTION POINT BASICS IFPUG CPM 4.3

FUNCTION POINTS AWARDED

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

EQUATIONS

New Development FP Count

$$DFP = ADD + CFP$$

DFP = development project function point count

ADD = size of functions delivered to the user by the development project

CFP = size of the conversion functionality

Application FP Count

$$AFP = ADD$$

AFP = application function point count

ADD = size of functions delivered to the user by the development project (excluding the size of any conversion functionality), or the functionality that exists whenever the application is counted

Enhancement FP Count

$$EFP = ADD + CHGA + CFP + DEL$$

EFP = enhancement function point count

ADD = size of functions being added by the enhancement project

CHGA = size of functions being changed by the enhancement project

CFP = size of the conversion functionality

DEL = size of functions being deleted by the enhancement project

Revised Application FP Count

$$AFPA = (AFPB + ADD + CHGA) - (CHGB + DEL)$$

AFPA = application function point count after the enhancement project

AFPB = application function point count before the enhancement project

ADD = size of functions being added by the enhancement project

CHGA = size of functions being changed by the enhancement project – as they are/will be after implementation

CHGB = size of functions being changed by the enhancement project – as they are/were before the project commenced

DEL = size of functions being deleted by the enhancement project

PRIMARY INTENT OF EIs EO and EQs

Function	EI	EO	EQ
Alter the behaviour of the system	PI	F	N/A
Maintain one or more ILFs	PI	F	N/A
Present information to the user	F	PI	PI

PI the primary intent of the transactional function type

F function of the transactional function type, but is not the primary intent and is sometimes present

N/A the function is not allowed by the transactional function type

PROCESSING LOGIC USED BY EIs, EO and EQs

Form of Processing Logic	EI	EO	EQ
Validations are performed	c	c	c
Mathematical calculations are performed	c	m*	n
Equivalent values are converted	c	c	c
Data is filtered and selected using specified criteria to compare multiple sets of data	c	c	c
Conditions are analyzed to determine which are applicable	c	c	c
At least one ILF is updated	m*	m*	n
At least one ILF or EIF is referenced	c	c	m
Data or control information is retrieved	c	c	m
Derived data is created	c	m*	n
Behaviour of the application is altered	m*	m*	n
Information is prepared and then presented outside the boundary	c	m	m
Data or control information entering the application is accepted	m	c	c
A set of data is sorted or arranged	c	c	c

LEGEND:

m **mandatory** that the function type perform the form of processing logic

m* **mandatory** that the function type perform at least one of these (m*) forms of processing logic

c **can** perform the form of processing logic but it is not mandatory

n **cannot** perform the form of processing logic

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FPA MEASUREMENT PROCESS

1. Determine the *type* of function point count.
2. Gather the available documentation.
3. Determine counting scope & application boundary.
3. Measure data functions.
4. Measure transactional functions.
5. Calculate functional size.
6. Document and report.

IFPUG 4.3 DEFINITIONS

User – any person or thing that communicates or interacts with the software at any time.

User View – is a description of the business functions; can be verbal statements made by the user as to what their view is, is approved by the user; can be used to measure the functional size; can vary in documented physical form.

User Recognizable – refers to requirements for processes and/or data that are agreed upon, and understood by both the user(s) and the software developer(s).

Application Boundary – is a conceptual interface between the software under study and its users

- defines what is external to the application;
- Indicates the border between the software being measured and the user;
- acts as a 'membrane' through which data processed by transactions passes into and out from the application;
- encloses the logical data maintained by the application;
- assists in identifying the logical data referenced by but not maintained within this application;
- is dependent on the user's external business view of the application. It is independent of technical and/or implementation considerations.

Scope – defines a (sub) set of the software being sized; is determined by the purpose for performing the function point count; identifies which functions will be included in the functional size so as to provide answers relevant to the purpose for counting; could include one or more than one application.

Control information – is data that influences an elementary process by specifying what, when or how data is to be processed.