

Effort and Cost estimation techniques**Step 1: Determine the Type of Count**

There are three types of function point counts –

- Development Function Point Count
- Application Function Point Count
- Enhancement Function Point Count

Development Function Point Count

Function points can be counted at all phases of a development project from requirement to implementation stage. This type of count is associated with new development work and may include the prototypes, which may have been required as temporary solution, which supports the conversion effort. This type of count is called a baseline function point count.

Application Function Point Count

Application counts are calculated as the function points delivered, and exclude any conversion effort (prototypes or temporary solutions) and existing functionality that may have existed.

Enhancement Function Point Count

When changes are made to software after production, they are considered as enhancements. To size such enhancement projects, the Function Point Count gets Added, Changed or Deleted in the Application.

Step 2: Determine the Boundary of the Count

The boundary indicates the border between the application being measured and the external applications or the user domain.

To determine the boundary, understand –

- The purpose of the function point count
- Scope of the application being measured
- How and which applications maintain what data
- The business areas that support the applications

Step 3: Identify Each Elementary Process Required by the User

Compose and/or decompose the functional user requirements into the smallest unit of activity, which satisfies all of the following criteria –

- Is meaningful to the user.
- Constitutes a complete transaction.

- Is self-contained.
- Leaves the business of the application being counted in a consistent state.

For example, the Functional User Requirement – “Maintain Employee information” can be decomposed into smaller activities such as add employee, change employee, delete employee, and inquire about employee. Each unit of activity thus identified is an Elementary Process (EP).

Step 4: Determine the Unique Elementary Processes

Comparing two EPs already identified, count them as one EP (same EP) if they –

- Require the same set of DETs.
- Require the same set of FTRs.
- Require the same set of processing logic to complete the EP.

Do not split an EP with multiple forms of processing logic into multiple Eps.

For e.g., if you have identified ‘Add Employee’ as an EP, it should not be divided into two EPs to account for the fact that an employee may or may not have dependents. The EP is still ‘Add Employee’, and there is variation in the processing logic and DETs to account for dependents.

Step 5: Measure Data Functions

Classify each data function as either an ILF or an EIF.

A data function shall be classified as an –

- Internal Logical File (ILF), if it is maintained by the application being measured.
- External Interface File (EIF) if it is referenced, but not maintained by the application being measured.

ILFs and EIFs can contain business data, control data and rules based data. For example, telephone switching is made of all three types - business data, rule data and control data. Business data is the actual call. Rule data is how the call should be routed through the network, and control data is how the switches communicate with each other.

Consider the following documentation for counting ILFs and EIFs –

- Objectives and constraints for the proposed system.
- Documentation regarding the current system, if such a system exists.
- Documentation of the users’ perceived objectives, problems and needs.
- Data models.

Step 5.1: Count the DETs for Each Data Function

Apply the following rules to count DETs for ILF/EIF –

- Count a DET for each unique user identifiable, non-repeated field maintained in or retrieved from the ILF or EIF through the execution of an EP.
- Count only those DETs being used by the application that is 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.

Step 5.2: Count the RETs for Each Data Function

- Apply the following rules to count RETs 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.

Step 5.3: Determine the Functional Complexity for Each Data Function

RETS	Data Element Types (DETs)		
	1-19	20-50	>50
1	L	L	A
2 to 5	L	A	H
>5	A	H	H

Functional Complexity: **L** = Low; **A** = Average; **H** = High

Step 5.4: Measure the Functional Size for Each Data Function

Functional Complexity	FP Count for ILF	FP Count for EIF
Low	7	5
Average	10	7
High	15	10

Step 6: Measure Transactional Functions

To measure transactional functions following are the necessary steps –

Step 6.1: Classify each Transactional Function

Transactional functions should be classified as an External Input, External Output or an External Inquiry.

External Input

External Input (EI) is 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 behavior of the system.

All of the following rules must be applied –

- 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 behavior 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.
- ILFs or EIFs referenced are different from the files referenced by the other EIs in the application.

External Output

External Output (EO) is an Elementary Process that sends data or control information outside the application's boundary. EO includes additional processing beyond that of an external inquiry.

The primary intent of an EO 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.
- Alter the behavior of the system.

All of the following rules must be applied –

- 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.
- ILFs or EIFs referenced are different from files referenced by other EOs in the application.

Additionally, 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 behavior of the system.

External Inquiry

External Inquiry (EQ) is an Elementary Process that sends data or control information outside the boundary.

The primary intent of an EQ 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 behavior of the system altered.

All of the following rules must be applied –

- 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 the files referenced by other EQs in the application.

Additionally, 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.

Step 6.2: Count the DETs for Each Transactional Function

Apply the following Rules to count DETs for EIs –

- Review everything that crosses (enters and/or exits) the boundary
- Count one DET for each unique user identifiable, non-repeated attribute that crosses (enters and/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 only one DET per transactional function for the ability to initiate action(s) even if there are multiple means to do so.

Do not count the following items as DETs –

- Attributes generated within the boundary by a transactional function and saved to an ILF without exiting the boundary.
- Literals such as report titles, screen or panel identifiers, column headings and attribute titles.
- Application generated stamps such as date and time attributes.
- Paging variables, page numbers and positioning information, for e.g., ‘Rows 37 to 54 of 211’.
- Navigation aids such as the ability to navigate within a list using “previous”, “next”, “first”, “last” and their graphical equivalents.

Apply the following rules to count DETs for EOs/EQs –

- Review everything that crosses (enters and/or exits) the boundary.

- Count one DET for each unique user identifiable, non-repeated attribute that crosses (enters and/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 only one DET per transactional function for the ability to initiate action(s) even if there are multiple means to do so.

Do not count the following items as DETs –

Attributes generated within the boundary without crossing the boundary.

- Literals such as report titles, screen or panel identifiers, column headings and attribute titles.
- Application generated stamps such as date and time attributes.
- Paging variables, page numbers and positioning information, for e.g., ‘Rows 37 to 54 of 211’.
- Navigation aids such as the ability to navigate within a list using “previous”, “next”, “first”, “last” and their graphical equivalents.

Step 6.3: Count the FTRs for Each Transactional Function

Apply the following rules to count FTRs for EIs –

- 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.

Apply the following rule to count FTRs for EO/EQs –

- Count a FTR for each ILF or EIF read during the processing of EP.

Additionally, apply the following rules to count FTRs for EOs –

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