Function Point Estimation

Normalized software project metric

Application domain rather than technical domain

Application functions and data rather than code

International Function Point Users Group www.ifpug.org

References:

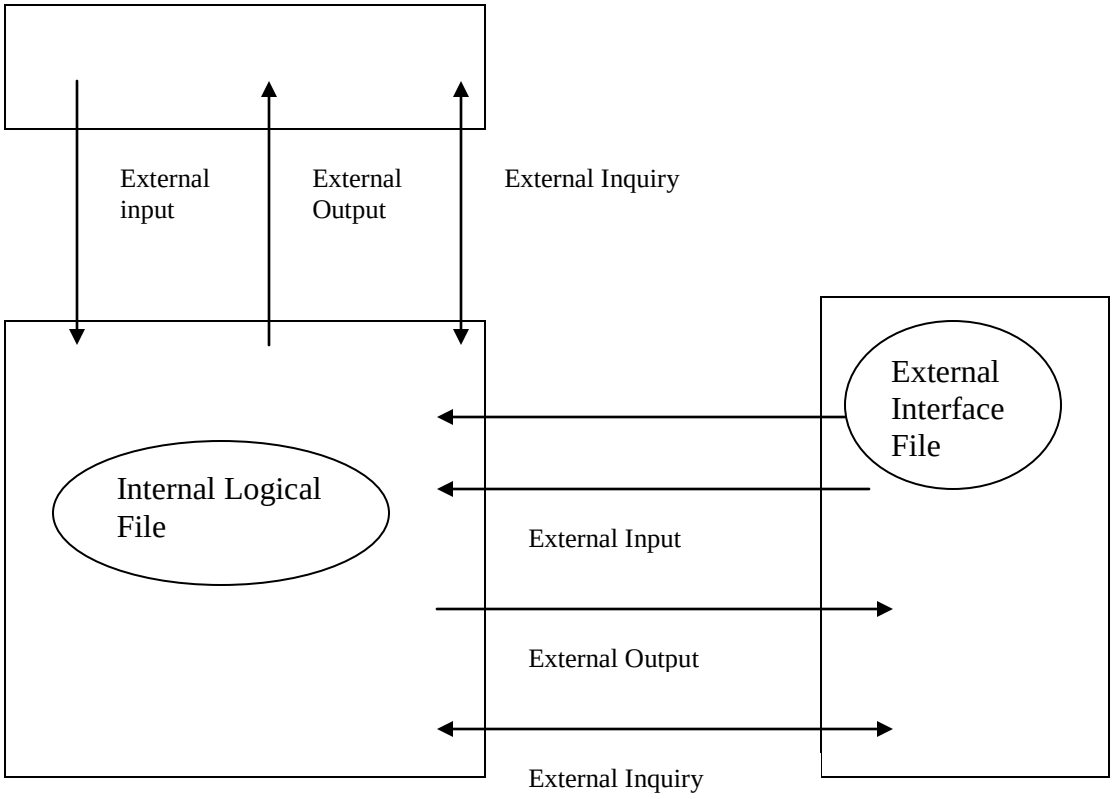
Capers Jones: *Applied Software Measurement* (1997)
Estimating Software Costs (1998)

Function Point Types

Transaction Function Types
- External Inputs
- External Outputs
- External Inquiries

Data Function Types
- Internal Logical Files
- External Interface Files

User Domain


External input
External Output
External Inquiry
External Interface File
Internal Logical File
External Input
External Output
External Inquiry

Internal Logical File (ILF)

Each major logical group of user data or application control information is one ILF. Include each logical file, or within a database, each logical group of data from the viewpoint of the user that is generated, used or maintained by the application. Count each logical group of data as viewed by the user and as defined by requirements analysis or data design rather than the actual physical files. Do not include files not accessible by the user through external output or inquiry and that are not independently maintained.

Description Count
1. Logical entity or group of entities from the user viewpoint. (1 ILF)
2. Logical internal file generated or maintained by the application. (1 ILF)
3. User maintained table(s) or file(s) (1 ILF)
4. File used by data or control by sequential (batch) application and maintained by the application (1 ILF)
5. Attributive entity maintained only through main entity (0 ILF)
6. Associative entity join or connection with only key attribute (0 ILF)
7. Intermediate or sort file (temporary file) (0 ILF)
8. File created only because of technology used (e.g. index file) (0 ILF)
9. A master file only read by the application (0 ILF and 1 EIF)

External Interface File (EIF)

Count each major logical group of user data or control information used by the application. This information must be maintained, however, by another application. Include each logical file or logical group of data from the viewpoint of the user. Count each major logical group of user data or control information that is extracted by the application from another application as an external interface file. The extract will not result in an update to any internal logical files. If an update occurs, count an EI not an EIF.

1. File or records extracted from another application (used for reference only) 1 EIF
2. Data base read from other application 1 EIF
3. Internal logical file from another application used as a transaction (0 EIF, 1 EI)
4. System HELP, security file, error file read/referenced by the application from another application where the files are actually maintained (2 EIFs)

External Input (EI)

Count each unique user data or user control input type that enters the external boundary of the application being measured, and adds, changes, deletes or otherwise alters data (e.g. assign, transfer, add, update) in an external logical file. Also count control information that enters the application boundary and assures compliance with business function specified by the user. An external input should be considered unique if the external logical design requires processing logic different from other external inputs.

1. Data screen with add, change and delete (3 EI)
2. Multiple screens accumulated and processed as one transaction (1 EI)
3. Two data screens with different order of data, but with the same processing logic (1 EI)
4. Two data screens with the same format, but different processing logic (2 EI)
5. Data screen with multiple unique functions (1 EI per function)
6. Automatic data or transactions from other applications (1 EI per transaction type)
7. User application control input (1 EI)
8. Input forms (OCR) with one transaction (1 EI)
9. An update function following a query (1 EI and 1 EQ)
10. Individual selections on a menu screen (0 EI)
11. Update of user maintained table or file (1 EI)
12. PF Key duplicate of a screen already counted as input (0 EI)
13. Light pen duplicate of a screen already counted as input (0 EI)
14. External input types introduced only because of the technology used (0 EI)
15. Selection of a field in a list box (0 EI)

External Output (EO)

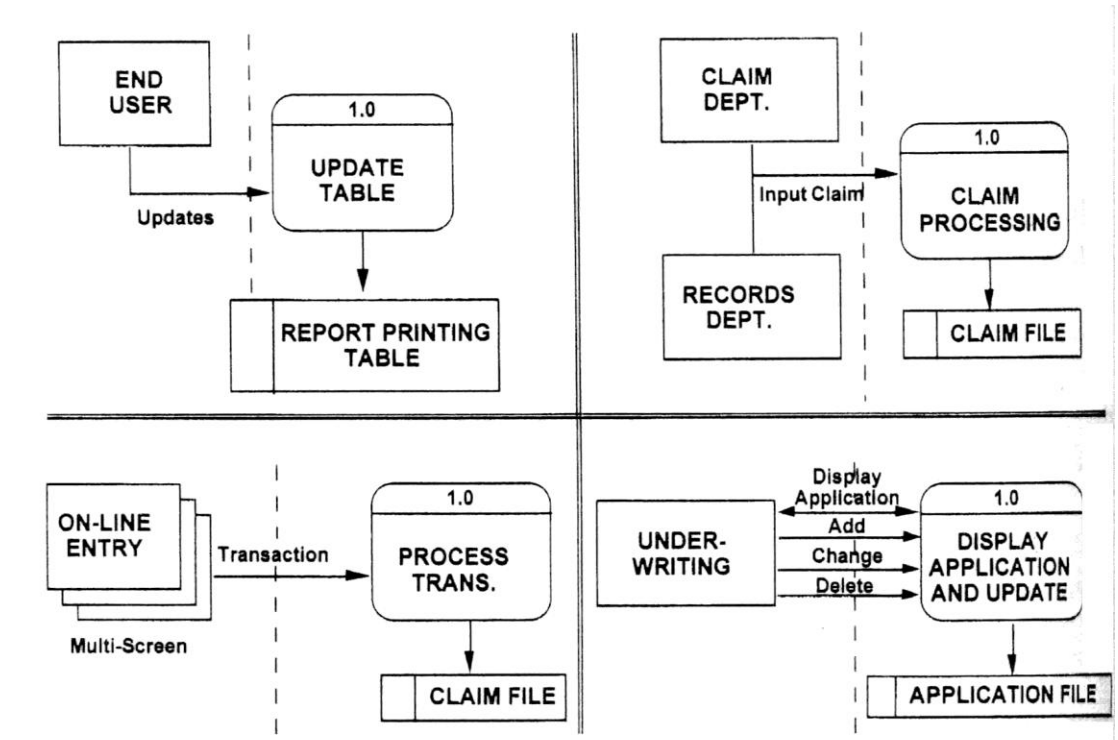
Count each unique user data or control data that leaves the external boundary of the application being measured. An external output should be considered unique if it has different data, or if the external design requires processing logic different from other external outputs. External outputs often consist of reports, outout files sent to other applications, or messages to the user.

1. Data screen output (1 EO)
2. Batch report (1 EO)
3,. Automatic data or transactions to other applications (1 EO)
4. Error messages returned as a result of an input transaction (0 EO)
5. Backup files (0 EO)
6. Output to the screen and to printer (2 EO)
7. Output files created for technical reasons (0 EO)
8. Bar chart as well as pie chart graphical output (2 EO)
9. Inquiry with calculated information (1 EO, 0 EQ)

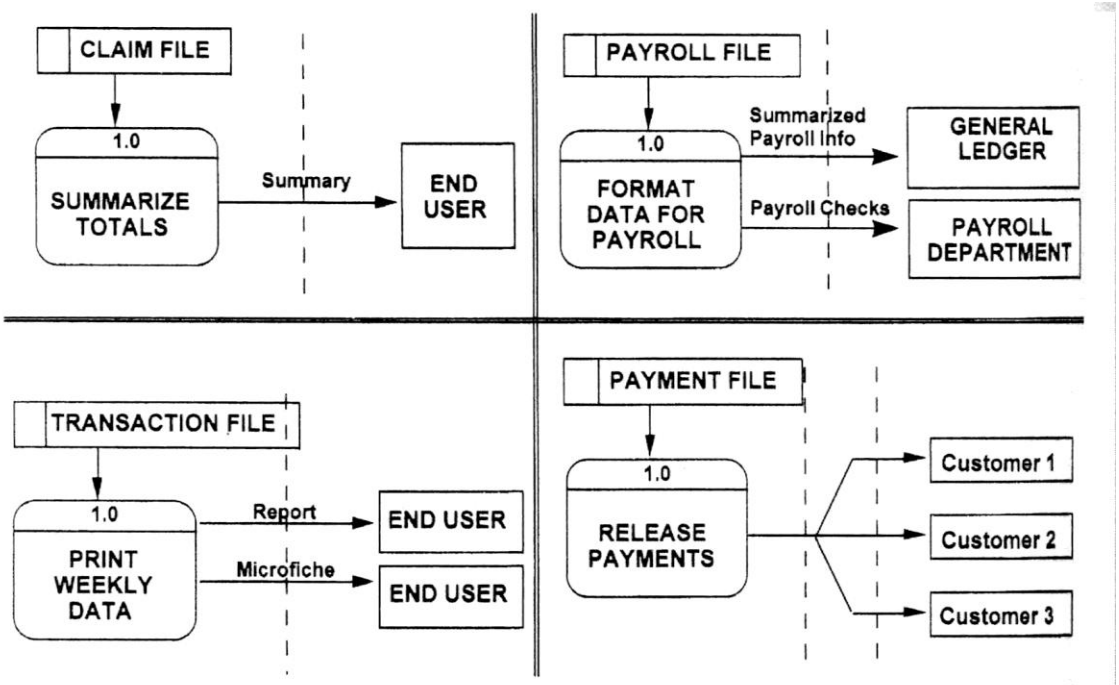
External Inquiry (EQ)

Count each unique input/output combination, where an input causes and generates an output, as an external inquiry. An external inquiry should be considered unique if it has different data elements from other external inquiry types in its output part, or if the external design requires a processing logic different from other external inquiries.

1. On-line input and on-line output with no update of data in files (1 EQ)
2. Inquiry followed by an update input (1 EQ/1 EI)
3. Help screen input and output (per level) (1 EQ)
4. On-line input with immediate printed output of existing data and no data update (1 EQ)
5. Pick list or Drop Down with dynamic data (1 EQ)
6. Pick list or Drop Down with static data (0 EQ)
7. Batch report request resulting in a report with no derived data (1 EQ)

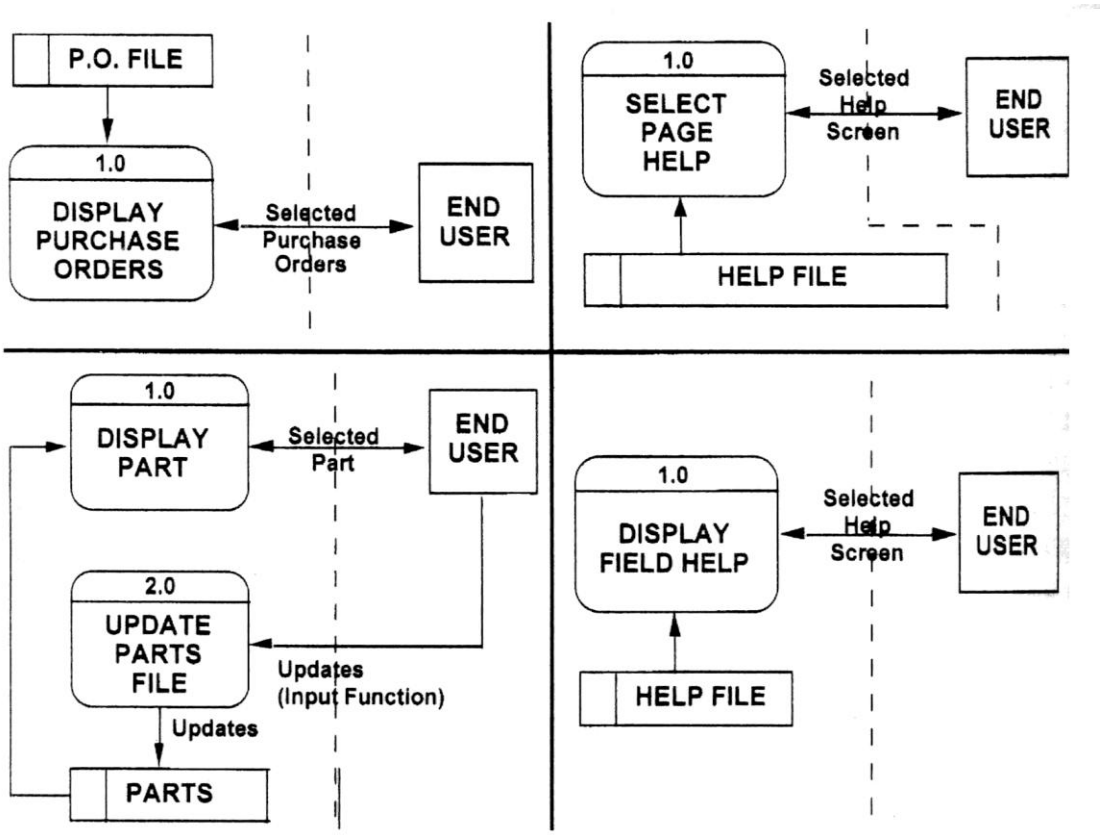


Examples of external input (EI) types.



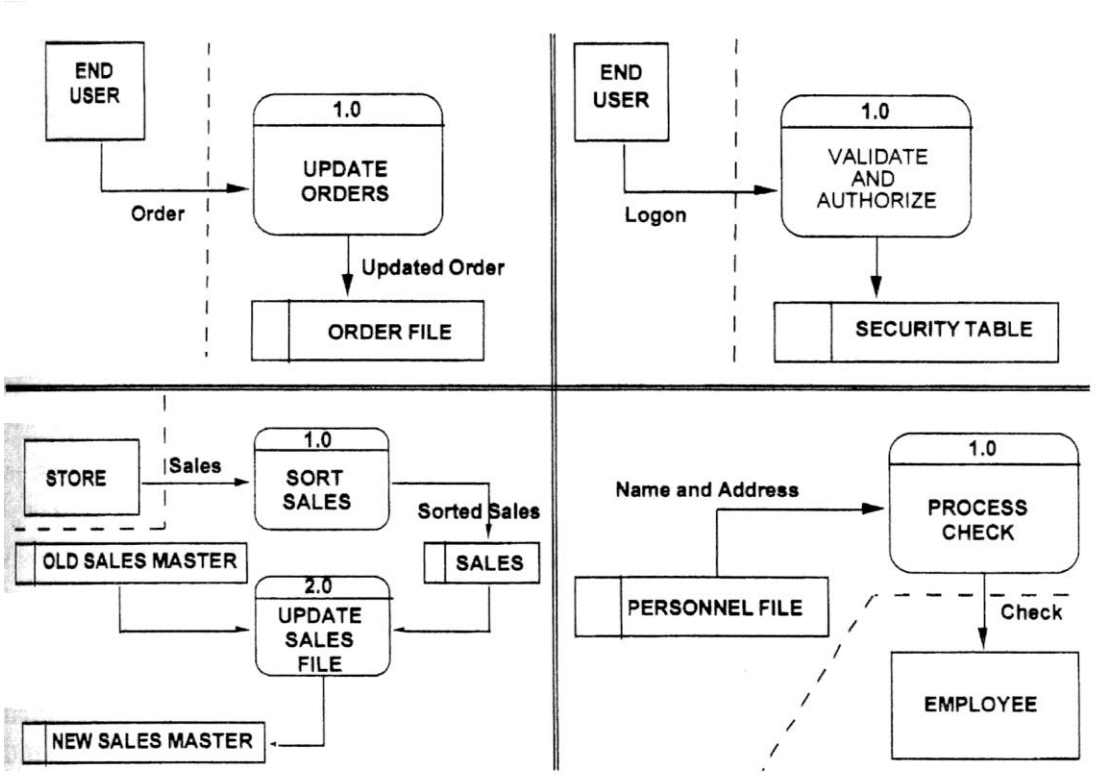
Examples of external output (EO) types.

(Source: Jones: *Estimating Software Costs*)

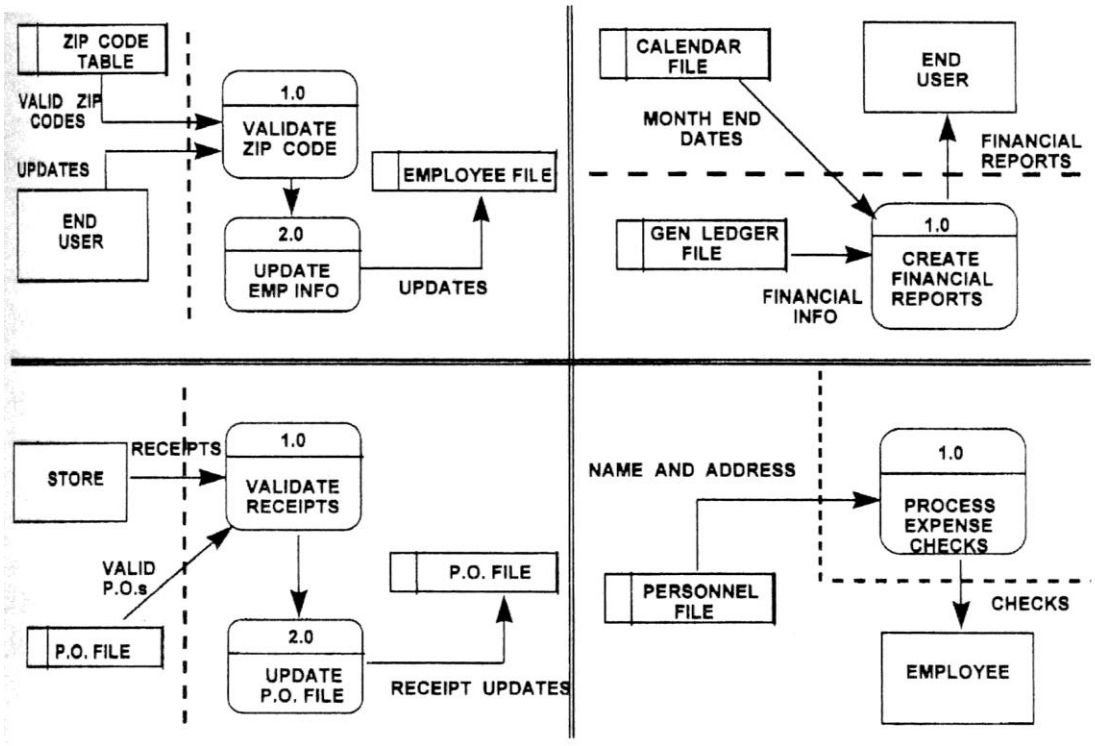


Examples of external inquiry (EQ) types.

(Source: Jones: *Estimating Software Costs*)



Examples of internal logical file (ILF) types.



Examples of external interface (EIF) files.

(Source: Jones: *Estimating Software Costs*)

Function Point Counting

Elements	Count Weights Low	Average	High	Total
External Input	___ x 3 +	___ x 4 +	___ x 6 =	_____
External Output	___ x 4 +	___ x 5 +	___ x 7 =	_____
External Inquiry	___ x 3 +	___ x 4 +	___ x 6 =	_____
ILF	___ x 7 +	___ x 10 +	___ x 15 =	_____
EIF	___ x 5 +	___ x 7 +	___ x 10 =	_____
	Total Unadjusted Function Points			_____

Input Complexity Matrix (EI, EQ)

FTRs	1-4 DETs	5-15 DETs	16+DETs
0-1	Low	Low	Average
2-3	Low	Average	High
4+	Average	High	High

Output Complexity Matrix (EO, EQ)

FTRs	1-4 DETs	5-15 DETs	16+DETs
0-1	Low	Low	Average
2-3	Low	Average	High
4+	Average	High	High

File Complexity Matrix (ILF, EIF)

RETs	1-19 DETs	20-50 DETs	51+ DETs
1	Low	Low	Average
2-4	Low	Average	High
5+	Average	High	High

FTR = File Types (User Data Groups) Referenced
DET = Data Element Type (Attribute)
RET = Record Element Type (User View)

General System Characteristics

14 characteristics rated based upon their degree of influence on the application

Rate each factor on a scale of 0 to 5
0 = No influence
1 = Incidental
2 = Moderate
3 = Average
4 = Significant
5 = Essential

1. Does with system require reliable backup and recovery?
2. Are data communications required?
3. Are there distributed processing functions?
4. Is performance critical?
5. Will the system run in an existing, heavily utilized operational environment.
6. Does the system require on-line data entry?
7. Does the on-line data entry require the input transaction to be built over multiple screens or operations?
8. Are the master files updated on-line?
9. Are the inputs, outputs,files or inquiries complex?
10. Is the internal processing complex?
11. Is the code designed to be reusable?
12. Are conversion and installation included in the design?
13. Is the system designed for multiple installations in different organizations
14. Is the application designed to facilitate change and ease of use by the user?

Total function point formula:

[0.65 + (.01 x total of General System Characteristics)] x [Unadjusted Function Point Count] = Total function points

Function Point Calculation Steps

1. Identify and count ILF, EIF, EI , EO and EQ
2. For each ILF and EIF, identify the number of RETs and the number of DETs
3. For each EI, EO and EQ, identify the number of FTRs and DETs
4. Using the complexity matrices, count the number of low, average and high EI, EO, EQ, ILF and EIF items.
5. Compute the total unadjusted function points
6. Determine the values of the fourteen general system characteristics
7. Sum the total characteristics
8. Determine the total function points with the Total Function Point Formula