Annex G - Measurement and Sizing

G.1 Function Point (FP) – An Introduction

Function points are a standard unit of measure that represent the functional size of a software application. In the same way that a house is measured by the square feet it provides, the size of an application can be measured by the number of function points it delivers to the users of the application.

i. Objectives of Function Point Analysis.

Most practitioners of Function Point Analysis (FPA) will probably agree that there are three main objectives within the process of FPA:

(a) Measure software by quantifying the functionality requested by and provided to the customer.
(b) Measure software development and maintenance independently of technology used for implementation.
(c) Measure software development and maintenance consistently across all projects and organizations.

ii. Five standard "functions"

In counting FPs there are five standard "functions" that you count.

(a) The first two of these are called Data Functions,
(b) The last three are called Transaction Functions.

These functions are illustrated in the diagram below.

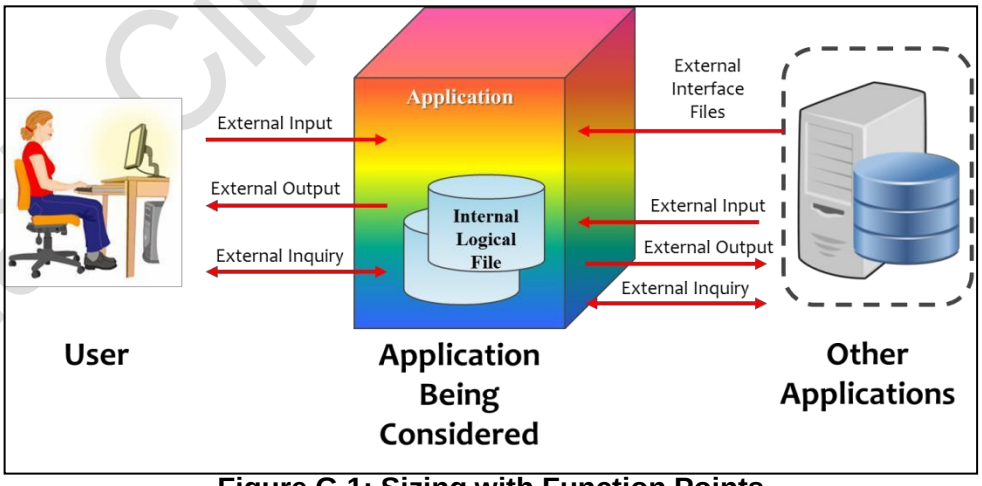

Figure G.1: Sizing with Function Points

Continued on the next page

iii. **The benefits of Function Point Analysis.**

Understanding the functional size of your applications leads to a goldmine of other information that will help you run a successful software development business, including:

(a) The ability to estimate:
- project cost
- project duration
- project staffing size
- number of test cases
- number of defects, etc.

(b) An understanding of other important metrics, such as:
- Project defect rate
- Project defect density
- Cost per FP
- FP's per hour (i.e., referred to as "velocity")
- Productivity benefits of using new or different tools (i.e., comparing defect density, “velocity”, etc.)
- Defect Removal Efficiency (DRE)

iv. **The counting process.**

As a quick review, the five steps in the process of counting FPs are as follows:

(a) Determine the type of count.
(b) Identify the scope and boundary of the count.
(c) Determine the unadjusted FP count.
(d) Determine the Value Adjustment Factor.
(e) Calculate the Adjusted FP Count.

v. **Function Point – An International Standard.**

IFPUG function point method is the most popular industry standard for functional sizing:

(a) ISO/IEC 20926:2009 Software and systems engineering - Software measurement - IFPUG functional size measurement method.
(b) Today, IFPUG is one of world’s largest software metrics organization and IFPUG has branches in more than 25 countries

vi. It is Governed by the International Function Point Users Group (IFPUG) for over 25 years:

(a) Formed in 1984, moved to US from Canada in 1986
(b) Counting Practices Committee (CPC) maintains the Counting Practice Manual (CPM)
(c) Latest CPM is version 4.3

Continued on the next page

G.2 Early and Quick Function Point (E&Q FP) – An Introduction

i. The Early & Quick (E&Q) technique was originally proposed in 1997 for IFPUG Function Points, to size software in early stages of the development process, when:
(a) Functional requirements are still to be established in a detailed form and/or
(b) When a rapid measure is needed for existing software from a high-level viewpoint, within limited time.

Typical lack of measurement details and requirements volatility in early project stages are overcome by the E&Q approach to provide a size estimate as a significant contribution to early project planning needs.

ii. Fundamental principles of the technique are classification by:
(a) analogy,
(b) functionality structured aggregation, and
(c) multilevel approach, with statistical validation of numerical ranges.

iii. The technique has evolved to fully comply with any functional size measurement method (ISO/IEC 14143:1998), to cover new generation methods (e.g., COSMIC Full FP 2.2) and updated releases of existing methods (e.g., IFPUG FP 4.1 and 4.2).

In 2004 version 2.0 is introduced. After three years of experience with the version 2.0 and ten years from the initial formulation, now, the latest evolution of the method, for the IFPUG FPA, identified as version 3.0.

G.3 Basic Concepts of E&Q FP for IFPUG Function Points

i. The Early & Quick (E&Q) functional size estimation method is a consistent set of concepts and procedures that,
(a) When applied to non-detailed system or project information, it maintains the overall structure and the essential concepts of standard functional size measurement methods.
(b) Combines different estimating approaches in order to provide better estimates of a software system functional size:
(c) Makes use of both analogical and analytical classification of function types (transactions and data).
(d) Allows the use of different levels of detail for different branches of the system (multilevel approach): the overall global uncertainty level in the estimate (which is a range, i.e. a set of minimum, most likely, and maximum values) is the weighted sum of the individual components' uncertainty levels.

Continued on the next page

ii. The "core driver" of the method is an analytically and statistically originated table of UFP (Unadjusted Function Points) values to be used in making functional size estimation. The method focuses on the fundamental principles reported in Table A1 below.

Principle	Explanation
Classification by analogy	Similarity in the overall functionality between new and existing known software objects.
Structured aggregation	Grouping of a certain number of lower level software logical objects in one higher level logical object.
Estimation flexibility	Data and transactional components are assessed autonomously. No predefined and fixed function/data ratio is assumed.
Multilevel approach	No discard of existent details, if available – no need of "invented" details, if unavailable.
Use of a derivation table	Each software object at each detail level is assigned a size value, based on an analytically / statistically derived table.

- **Table G.1: E&Q fundamental principles**

iii. **Early & Quick IFPUG Function Point (E&QFP 2.0).**
Release 2.0 of the E&Q technique, applied to the IFPUG Function Point method 4.x, is an evolution of the technique. Indications for such evolution came from:

(a) Statistics derived from the ISBSG (International Software Benchmarking Standards Group) benchmark, regarding projects measured with IFPUG 4.0 & 4.1
   - on the average Unadjusted FP values per function type, & the most frequent or most likely function breakdown (average profile).

(b) Experiences and results derived when applying the technique in several (compared) estimation and measurement tasks (N >> 30) in the last 18 months.

(c) The introduction of a new software object (extended typical process).

(d) Reviewed evaluation of the ranges of aggregated processes types ("small", "medium" and "large"), not excluding overlapping ranges.

(e) The extension of data object types, when it is possible to provide their exact type (internal or external).

iv. **E&Q Function Point vs IFPUG Function Point.**
Table A2 below shows the conceptual correspondences between the E&Q software objects and the IFPUG Function Point count methods.

E&Q FP	IFPUG FP
Application	Bounded application / Layer (*)
Macro Process	-
General Process	-
Typical Process	-
Functional Process	Elementary Process
Multiple Data Group	-
Logical Data Group	Logical File (External or Internal)

Table G.2: E&Q vs IFPUG Counting

Continued on the next page

G.4 Conclusions

i. The reliability of the E&Q technique, as any other human-based estimation method, is proportional to the estimator's ability to "recognize" the components of the system as part of one of the proposed classes. This ability may sharpen through practice by comparing the different counts obtained using standard versus E&Q practices.

ii. Practitioners have observed that, even the initial application of the technique by new users provides encouraging results, which can be taken as valid starting estimated values. In any case, the E&Q size estimation technique has been proved in practice to be quite effective, providing:
(a) a response within ± 10% of the real size in most real cases,
(b) savings in time (and costs) can be between 50% and 90% (depending on the comprised aggregation level - from Base Functional Processes to Macro Functional Processes) with respect to corresponding standard measurement procedures.

Further improvements are guaranteed by the continuous validation process (for IFPUG case) and further refinements (for IFPUG cases), while the overall E&Q technique can be easily extended to any further FSM method.