Part 4 – Appendices and Glossary

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Appendix A: Calculation Tables

Introduction Appendix A includes tables to facilitate counting function points.

Contents This appendix includes the following tables:

Unadjusted Function Point Count Calculation Table

The following table is provided to facilitate the calculation of the contribution to the unadjusted function point count.

Function Type	Functional Complexity		Complexity Totals	Function Type Totals
ILFs	_____	Low	X 7 = _____	
	_____	Average	X 10 = _____	
	_____	High	X 15 = _____	
				_____
EIFs	_____	Low	X 5 = _____	
	_____	Average	X 7 = _____	
	_____	High	X 10 = _____	
				_____
EIs	_____	Low	X 3 = _____	
	_____	Average	X 4 = _____	
	_____	High	X 6 = _____	
				_____
EOs	_____	Low	X 4 = _____	
	_____	Average	X 5 = _____	
	_____	High	X 7 = _____	
				_____
EQs	_____	Low	X 3 = _____	
	_____	Average	X 4 = _____	
	_____	High	X 6 = _____	
				_____
		Total Unadjusted Function Point Count		_____

Value Adjustment Factor Calculation Table

The following table is provided to facilitate the calculation of the value adjustment factor.

General System Characteristics (GSCs)	Degree of Influence (DI) 0 - 5
1. Data Communications	_____
2. Distributed Data Processing	_____
3. Performance	_____
4. Heavily Used Configuration	_____
5. Transaction Rate	_____
6. Online Data Entry	_____
7. End-User Efficiency	_____
8. Online Update	_____
9. Complex Processing	_____
10. Reusability	_____
11. Installation Ease	_____
12. Operational Ease	_____
13. Multiple Sites	_____
14. Facilitate Change	_____
Total Degree of Influence (TDI)	_____
Value Adjustment Factor (VAF)	_____
	VAF = (TDI * 0.01) + 0.65

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Appendix B The Change from CPM 4.1.1 to 4.2

Introduction This appendix includes information about the changes and enhancements included in CPM 4.2, the decision making process, and recommendations to users of the new manual.

Contents This chapter includes the following:

Introduction

Since the release of IFPUG Counting Practices Manual (CPM) 4.1 in January 1999, the Counting Practices Committee (CPC) has received requests from the membership to clarify existing rules or to include topics the members believed were not adequately covered by CPM 4.1 including:

- Identification and counting of code data
- Better identification of logical files (ILFs and EIFs) and the better counting of RETs and DETs within a logical file
- The application of function point analysis (FPA) in an enhancement environment
- Identification and counting of shared data

In creating CPM 4.2, following the CPM revision process, the CPC reviewed all requests for support and, where appropriate, existing rules were clarified for practical use in the form of counting practices. To assist the worldwide users of FPA in a timely manner, the CPC initially published the results of its research as separate publications, which were considered to be logical parts of the CPM:

- Practical Guidelines for Counting Logical Files (September 2001)
- FPA in an Enhancement Environment (April 2002)
- Practical Guidelines for Counting Code Data (September 2003)
- Practical Guidelines for Counting Shared Data (November 2003)

When revising the CPM, the CPC process is as follows:

1. The issue is submitted to the CPC by the membership.
2. The issue is assigned to CPC members for research.
3. The CPC reviews and discusses the issue.
4. The CPC presents the proposed solution to the membership.
5. An impact study is initiated.
6. The final decision is made.
7. The IFPUG membership is informed of the decision through MetricViews and IFPUG conference presentations.
8. Changes become effective in a new CPM.
9. Case Studies are revised to reflect the new CPM.

Although the publications above were available to counters, the CPC believed that by physically incorporating them into the CPM, the additional guidelines would be more visible and accessible and thus support more consistent counts between Certified Function Point Specialists worldwide.

The FPA process and rules themselves are quite concise and easy to use. To reflect that, and to make the CPM even more practical as a reference manual, the CPC decided to restructure the CPM into four parts:

- Process and Rules
- Counting Practices
- Examples
- Appendices

Major Functional Change Areas in CPM 4.2

The major functional change areas in CPM 4.2 are:

- Restructuring the CPM into four parts
  - Process and Rules
  - Counting Practices
  - Examples
  - Appendices and Glossary
- Incorporating the CPC addendums and white papers as four chapters in Counting Practices:
  - Code Data
  - Logical Files
  - Shared Data
  - Enhancement Projects and Maintenance Activity

Version Control

The CPC has chosen to name this version of the IFPUG CPM 4.2 rather than 4.1.2 or 5.0 for two reasons:

- A version of 4.1.2 would suggest some corrected typos only; version 4.2 draws more attention to the extensions to the rules.
- A version of 5.0 would suggest major rule changes. The rules themselves allow some scope in their application that has promoted inconsistency. While the overall rules have not changed, this version of the CPM provides more detailed guidance on interpreting the rules with the intent of improving consistency in their application.

Structure of CPM 4.2 Compared to CPM 4.1.1

CPM 4.2		CPM 4.1 and 4.1.1
Intro		Ch 1
Part 1	**Process and Rules**	
Ch 1	Introduction	Ch 1
Ch 2	Overview of Function Point Analysis	Ch 2
Ch 3	User View	Ch 3
Ch 4	Determine Type of Count	Ch 4
Ch 5	Identify Counting Scope and Application Boundary	Ch 5
Ch 6	Count Data Functions	Ch 6, pages 6-1 thru 6-14; for the rest see Part 3, Examples
	Definitions: ILF and EIF Counting Rules	
	ILF/EIF Counting Procedures	
	Hints to Help with Counting	
Ch 7	Count Transactional Functions	Ch 7, pages 7-1 thru 7-26; for the rest see Part 3, Examples
	Definitions: EIs, EOs and EQs	
	EI/EO/EQ Counting Rules	
	EI, EO, and EQ Counting Procedures	
	Hints to Help with Counting EIs, EOs, and EQs	
Ch 8	Determine Value Adjustment Factor	Ch 8
Ch 9	Calculate Adjusted Function Point Count	Ch 9
	Review of Steps for Function Point Analysis	
	Development Project Function Point Calculation	
	Enhancement Project Function Point Calculation	
	Application Function Point Calculation	
Index		Index

Part 2	**Counting Practices**	
Ch 1	Code Data	New
Ch 2	Logical Files	New
Ch 3	Shared Data	New
Ch 4	Enhancement Projects and Maintenance Activity	New
Index		Index

Part 3	**Examples**	
Ch 1	Data Function Counting *Examples*	Pages 6-15 thru 6-86
	ILF Counting *Examples*	
	EIF Counting *Examples*	
Ch 2	Transactional Function Counting *Examples*	Pages 7-27 thru 7- 157
	Elementary Process Identification *Examples*	
	EI/EO/EQ Counting *Examples*	
	EI Counting *Examples*	
	EO Counting *Examples*	
	EQ Counting *Examples*	
Index		Index

Part 4	**Appendices and Glossary**	
Appendix A	Calculation Tables	A-1 thru A-3
	Unadjusted Function Point Count	
	Value Adjustment Factor Calculation	
Appendix B	The Change from CPM 4.1 to 4.2	B-1 thru B-10
Appendix C	Reader Request Form	Reader Request Form
Glossary		Glossary

Overview of Changes

Except for the restructuring and the incorporation of the Counting Practices chapters, very few changes have been made to CPM 4.1.1. To facilitate users, who wish to align their existing CPM written in a foreign language, all changes have been listed below. For the corresponding reference to CPM 4.1.1, refer to the section above: "Structure of CPM 4.2 compared to CPM 4.1.1". All indices have been revised to reflect the new organization structure of the manual; each individual part has its own index.

Part 1: Process and Rules

Chapter 1: Introduction

- Updated Organization of the Counting Practices Manual to reflect the new structure
- Updated Related IFPUG Documentation

Chapter 2: Overview of Function Point Analysis

- No changes

Chapter 3: User View

- A new section was added to provide a summary of the philosophy extensively described in the IFPUG paper: "A Framework for Functional Sizing;" this paper explains that product size contains two dimensions: functional size and technical size
- The IFPUG FPA method can be used to measure the functional size

Chapter 4: Determine the Type of Count

- No changes

Chapter 5: Identify Counting Scope and Application Boundary

- No changes

Chapter 6: Count Data Functions

- The examples have been moved to Part 3, Examples
- Slight wording changes

Chapter 7: Count Transactional Functions

- The examples have been moved to Part 3, Examples
- Slight wording changes

Chapter 8: Determine Value Adjustment Factor

- The definition and descriptions of the general system characteristics have been updated to facilitate their application in modern IT environments
- Hints for the Degrees of Influence have been added as presented to the members at the 2003 IFPUG Fall Conference

Chapter 9: Calculate Final Adjusted Function Point Count

- Slight wording changes

Part 2: Counting Practices

All chapters are new; they were previously published as individual papers.

Part 3: Examples

Chapter 1: Data Function Counting Examples

- The Application Data, HR System Security, and Suspended Jobs Examples have been removed. Similar examples are included in Part 2, Counting Practices.
- The "Summary of ILFs, RETs, and DETs Counted," "ILF Complexity and Contribution," "Summary of EIFs, RETs, and DETs Counted," and "EIF Complexity and Contribution" have been removed. The examples in the CPM are meant to stand on their own and a summary may cause confusion by implying otherwise.

Chapter 2: Transactional Function Counting Examples

- The "Summary of EIs, FTRs, and DETs Counted," "External Input Complexity and Contribution," "Summary of EOs, FTRs, and DETs Counted," "External Output Complexity and Contribution," "Summary of EQs, FTRs, and DETs Counted," and "External Inquiries Complexity and Contribution" have been removed. The examples in the CPM are meant to stand on their own and a summary may cause confusion by implying otherwise.

Part 4: Appendices and Glossary

Appendix A: Calculation Tables

No changes

Appendix B: The Change from CPM 4.1.1 to 4.2

This new chapter includes the following:

- The major functional change areas in CPM 4.2
- Version control information
- A comparison of the structure of CPM 4.2 with 4.1.1
- An overview of the changes by chapter
- The background of the change process
- The impact study process
- The impact of the changes on 4.2 users
- Conversion from CPM 4.1.1 to 4.2
- Recommendations for users changing from 4.1.1 to 4.2

Appendix C: Reader Request Form

No changes

Glossary

The following new terms have been added to the glossary:

- Adaptive Maintenance
- Business Data
- Code Data
- Copy
- Corrective Maintenance
- Data Entity
- Entity Dependence
- Entity Independence
- File System
- Functional User Requirements
- Image
- Load
- Logical File
- Merge
- NESMA
- Perfective Maintenance
- Quality Requirements
- Reference Data
- Refresh
- Technical Attribute
- Technical Requirements
- Transaction
- User Perspective
- User Recognizable

Background

The CPC internal decision making process is governed by a set of CPM characteristics (meta rules) selected and voted on by the IFPUG board and the CPC. Those guiding principles in order of importance are:

1. It should be possible to model the correlation of software size (derived using the CPM) with other attributes (e.g., effort, defects, cost, etc.).
2. The CPM contains a consistent set of rules.
3. Function Point Analysis results are consistent between different counters using the CPM.
4. The CPM provides rules on how to size a functional need that is defined and agreed upon by user(s) and IT.
5. Function Point Analysis results using the CPM can be a contributing factor in estimation.
6. The CPM is an Albrecht based method.
7. Function Point Analysis using the CPM is easy.
8. Function Point Analysis using the CPM is fast.

The Impact Study

This version of the CPM provides more detailed guidance on interpreting the existing rules. They are intended to improve consistency in application of the rules. The impact on your organization's counting practices will depend on the extent to which they already conform to these practices. For some organizations there will not be any changes to existing counting practices, while for others the magnitude of changes will vary. For this reason, it is not possible to conduct a generic impact study that would be widely applicable.

Conversion from CPM 4.1 and 4.1.1 to 4.2

Since existing practices vary, each organization must analyze its own practices to determine how it is impacted. Some organizations may find a conversion factor that is applicable across their portfolio. Others may find that the conversion factor varies across different types of systems, and in some cases systems will need to be recounted.

Impact on 4.1 Users Changing to 4.2

The new CPM will result in the need for IFPUG committees to review the following documents to assure the conformance of the documents to CPM 4.2:

A. All IFPUG documents related to the CPM,
B. Case Studies 1, 2, 3, and 4, which will begin in 2004, and
C. Management Reporting Guides.

Although certification tests will be updated to reflect the newly added Counting Practices, recertification from 4.1 to 4.2 will not be required.

Recommendations

The CPC recommends the following actions for users switching from CPM 4.1.1 to 4.2:

- Update all in-house developed training materials for conformance.
- Ensure all counters within your organization have been appropriately trained in the differences between 4.1 and 4.2.
- Check all vendor offered training materials for version certification.
- Notify anyone in your organization involved with function point counts of the change and make the new manual available to them.
- Review all counting tools for your users, both automated and manual, for IFPUG 4.2 version certification, if applicable, and modifications to conform to 4.2 counting rules.
- Although an additional certification will not be required for counters for CPM 4.2, the certification tests will be updated for conformance to 4.2 during 2004.
- Specify on the documentation for each function point count done, and with the results, which version of the CPM was used for the count.
- Make sure to specify which version of the IFPUG CPM was used for counting when submitting data for benchmarking either to your own benchmark database, the IFPUG Benchmarking committee, or ISBSG.
- Update all internal guidelines and other local documents related to 4.1 to version 4.2.

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Appendix C Reader Request Form

Introduction

The CPC accepts:

- Standards-related requests to the Counting Practices Committee
- Comments about this publication, its organization, or subject matter.

Comments and requests can be submitted using this Reader's Request Form or on the IFPUG website (www.ifpug.org).

If your request is for clarification of standards, include specific situations which you believe are not clearly presented. If your request is for revision to current practices, include a well-grounded rationale and any references to research results, surveys, other metric standards, etc. Please indicate specific paragraph references. Enclosures or attachments are encouraged.

Note: IFPUG may use or distribute the information you supply in any way it believes appropriate without incurring any obligation to you.

Please provide the following information to permit IFPUG to process your request:

Name: _____ Date: _____

Email Address: _____

Company: _____ Phone: _____

Street: _____ City: _____

State: _____ Zip/Postal Code: _____

Country: _____ Fax: _____

Fold Along the Line and Tape Closed

_____

_____

_____

IFPUG
191 Clarksville Road
Princeton Junction, NJ 08550

Attn: Counting Practices Committee

Fold Along the Line and Tape Closed

IFPUG Glossary

This is a comprehensive glossary of terms used across IFPUG publications.

Adaptive maintenance. Includes modifications to either meet new or changing business requirements or to add functionality not accommodated in a previous release. It also may include modifications required to meet changing technical requirements. Adaptive maintenance is initiated by business requests to add, change and/or delete business functionality. It is synonymous with the concept of an "enhancement", as defined in Part 1.

Adjusted function point count (AFP). The function point count based on the unadjusted function point count multiplied by the value adjustment factor. The adjusted function point count is calculated using a specific formula for development project, enhancement project, and application. The adjusted function point count is commonly called the function point count.

Albrecht 1984. Original document of the function point concept, written by Allan J. Albrecht in November 1984. Also known as "313" from its document number.

Application. A cohesive collection of automated procedures and data supporting a business objective. It consists of one or more components, modules, or subsystems. Frequently used synonymously with System, Application System, and Information System.

Application area. A general term for a grouping of applications that handle a specific business area. It corresponds to an administrative level for management purposes.

Application area level. The management level responsible for managing maintenance activities as well as new development or major enhancement projects for one or more applications.

Application Boundary. The application boundary indicates the border between the software being measured and the user.

Application function point count. A count that provides a measure of the current functionality the application provides to the user. It is also referred to as a baseline or installed function point count.

Application manager. A person responsible for managing projects and support activities for one or more application areas.

Asset. (1) A capital asset of the enterprise. (2) An advantage or resource.

Associative entity type. An entity type that contains attributes which further describe a many-to-many relationship between two other entity types. See also Entity type.

Attribute. See Project/application attribute and Data attribute.

Attributive entity type. An entity type that further describes one or more attributes of another entity type. See also Entity.

Baseline function point count. See Application function point count.

Budget. A planned sequence of expenditures over time with monetary costs assigned to specific tasks or jobs. Often used also to refer to work effort as well as, or instead of, money.

Business data. May also be referred to as Core User Data or Business Objects. This type of data reflects the information needed to be stored and retrieved by the functional area addressed by the application. Business Data usually represents a significant percentage of the entities identified.

Capital expenditure. A form of spending in which an enterprise trades money (capital) for acquisition of tangible objects such as furniture, computers, and the like.

Code data. The user does not always directly specify Code Data, sometimes referred to as List Data or Translation Data. In other cases it is identified by the developer in response to one or more technical requirements of the user. Code Data provides a list of valid values that a descriptive attribute may have. Typically the attributes of the Code Data are Code, Description and/or other 'standard' attributes describing the code; e.g., standard abbreviation, effective date, termination date, audit trail data, etc.

Copy. (1) To read data from a source, leaving the source data unchanged, and to write the same data elsewhere in a physical form that may differ from that of the source. For example, to copy data from a magnetic disk onto a magnetic tape. (2) The result of a copy process as in above. For example, a copy of a data file. (IEEE)

Complex processing GSC. One of the 14 general system characteristics describing the degree to which processing logic influences the development of the application.

Contribution. The function type's (ILF, EIF, EI, EO, EQ) contribution to the unadjusted function point count.

Control information. Control Information is data that influences an elementary process of the application being counted. It specifies what, when, or how data is to be processed.

Conversion. Those activities associated with mapping data or programs from one format to another, for example, converting an application from COBOL to VS COBOL II. The assumption is that functionality remains the same.

Conversion functionality. For a development project, functions provided to convert data and/or provide other user-specified conversion requirements, such as special conversion reports. For an enhancement project, functions delivered because of any conversion functionality required by the user.

Corporate executive level. The management level responsible for the enterprise, including the Board of Directors.

Corrective maintenance. Includes modifications to repair defects. It does not involve changes to business functionality but ensures that previously delivered functionality performs as required. The effort related to these activities should be attributed to the original development or enhancement project that introduced the defect.

Counting Practices Committee (CPC). The working committee that maintains the IFPUG Counting Practices Manual.

Counting Scope. The counting scope defines the functionality which will be included in a particular function point count.

Data attribute. A characteristic of an entity. Data attributes are generally analogous to data element types (DETs).

Data communications GSC. One of the 14 general system characteristics describing the degree to which the application communicates directly with the processor.

Data element type (DET). A *data element type* is a unique user recognizable, non-repeated field.

Data entity. See entity.

Data functions. The functionality provided to the user to meet internal and external data requirements. Data functions are either internal logical files (ILFs) or external interface files (EIFs).

Defect. A problem which, if not corrected, could cause an application to either fail or to produce incorrect results. The absence of functionality that was specified or required is also considered a defect.

Defect removal. See Repair.

Degree of influence (DI). A numerical indicator of the amount of impact of each of the 14 general system characteristics, ranging from zero to five. These indicators are used to compute the value adjustment factor.

Delivery rate. The productivity measure for creating or enhancing an application. It is expressed by the Project Function Points divided by the Work Effort for the development or enhancement project.

Derived data. Data that requires processing other than or in addition to direct retrieval and validation of information from internal logical files and/or external interface files.

Development. The specification, construction, testing, and delivery of a new information system.

Development project function point count (DFP). A count that measures the functions provided to the users with the first installation of the software delivered when the project is complete.

Distributed data processing GSC. One of the 14 general system characteristics describing the degree to which the application transfers data among components of the application.

Effectiveness. Producing the intended or desired result.

Efficiency. Producing a result with a minimum of extraneous or redundant effort.

Elementary process. An *elementary process* is the smallest unit of activity that is meaningful to the user(s).

End-user efficiency GSC. One of the 14 general system characteristics describing the degree of consideration for human factors and ease of use for the user of the application measured.

Enhancement. The modification of an existing application.

Enhancement project function point count (EFP). A count that measures the modifications to the existing application that add, change, or delete user functions delivered when the project is complete.

Entity (or entity type). A fundamental thing of relevance to the user, about which a collection of facts is kept. An association between entities that contains attributes is itself an entity.

Entity Dependence. An entity is not meaningful, significant in and of itself without the presence of another entity linked to it via a relationship.

Entity Independence. An entity is meaningful, significant in and of itself without the presence of other entities linked to it via a relationship.

Entity subtype. A subdivision of an entity type. A subtype inherits all the attributes and relationships of its parent entity type, and may have additional, unique attributes and relationships. See also Entity type.

External input (EI). An external input (EI) is an elementary process that processes data or control information that comes from outside the application's boundary. The primary intent of an EI is to maintain one or more ILFs and/or to alter the behavior of the system. See also External inquiry and External output.

External inquiry (EQ). An external inquiry (EQ) is an elementary process that sends data or control information outside the application boundary. The primary intent of an external inquiry is to present information to a user through the retrieval of data or control information from an ILF or EIF. The processing logic contains no mathematical formulas or calculations, and creates no derived data. No ILF is maintained during the processing, nor is the behavior of the system altered. See also External input and External output.

External interface file (EIF). An external interface file (EIF) is a user identifiable group of logically related data or control information referenced by the application, 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 in an ILF in another application. See also Internal logical file.

External output (EO). An external output (EO) is an elementary process that sends data or control information outside the application's boundary. 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, or create derived data. An external output may also maintain one or more ILFs and/or alter the behavior of the system. See also External input and External inquiry.

Facilitate change GSC. One of the 14 general system characteristics describing the degree to which the application has been developed for easy modification of processing logic or data structure.

File. For data functions, a logically related group of data, not the physical implementation of those groups of data.

File system. Is composed of records and data items.

File type referenced (FTR). A *file type referenced* is

- An internal logical file read or maintained by a transactional function or
- An external interface file read by a transactional function

First normal form. Result of a normalization process that transforms groups of data so they have a unique identifier, one or more attributes, and no repeating attributes.

Foreign key. Data in an ILF or EIF that exists because the user requires a relationship with another ILF or EIF.

Function. The features or capabilities of an application as seen by the user.

Functional user requirements. A subset of the User Requirements, the Functional User Requirements represent the user practices and procedures that the software must perform to fulfill the users' needs. They exclude Quality Requirements and any Technical Requirements. (ISO 14143-1)

Functionality. See Function.

Function point (FP). A measure which represents the functional size of application software.

Function point analysis. A standard method for measuring software development and maintenance from the customer's point of view.

Function point count. The function point measurement of a particular application or project.

Function type. The five basic information services provided to the user of an application and identified in function point analysis. The five function types are external input, external output, external inquiry, internal logical file, and external interface file.

Functional complexity. A specific function type's complexity rating which has a value of low, average, or high. For data function types, the complexity is determined by the number of RETs and DETs. For transactional function types, the complexity is determined by the number of FTRs and DETs.

General system characteristics (GSCs). The *general system characteristics* are a set of 14 questions that evaluate the overall complexity of the application.

Heavily used configuration GSC. One of the 14 general system characteristics describing the degree to which computer resource restrictions influenced the development of the application.

IBM CIS & A Guideline 313. See Albrecht 1984.

IFPUG. The International Function Point Users Group is a membership governed, non-profit organization committed to promoting and supporting function point analysis and other software measurement techniques.

Image. Set of related records treated as a unit. For example, a file could consist of a set of invoice records.

Installation ease GSC. One of the 14 general system characteristics describing the degree to which conversion from previous environments influenced the development of the application.

Installed function point count. See Application function point count.

Internal logical file (ILF). An internal logical file (ILF) is a user identifiable group of logically related data or control information maintained within the boundary of the application. The primary intent of an ILF is to hold data maintained through one or more elementary processes of the application being counted. See also External interface file.

Load. to copy computer instructions or data from external storage to internal storage. (IEEE)

Logical file. A logical group of permanent data seen from the perspective of the user. It is an internal logical file or an external interface file. See also data function.

Maintained. The term *maintained* is the ability to modify data through an elementary process.

Maintenance. The effort to keep an application performing according to its specifications, generally without changing its functionality (or function point count). Maintenance includes repair, minor enhancement, conversion, user support and preventive maintenance activities. Activities include defect removal (see repair), hardware or software upgrades (see conversion), optimization or quality improvement (see preventive maintenance), and user support.

Maintenance (support) rate. The productivity measure for maintaining an application. It is expressed as the Work Effort by category of maintenance divided by 1000 Application Function Points in a period of time.

Mandatory subgroup. One of the two types of subgroups for record element types (RETs). Mandatory subgroups mean the user must use one of the subgroups during an elementary process that creates an instance of the data.

Measure. As a noun, a number that assigns relative value. Some examples may include volume, height, function points, or work effort. As a verb, to ascertain or appraise by comparing to a standard.

Measurement. Assigning relative value. Usually, in the improvement process, measures gained from this activity are combined to form metrics.

Media/Medium. A channel of communication or information, for example, a report issued on paper or in microfiche.

Merge. Multiple files with the same data elements consolidated into a single file. (IEEE)

Metric. There is no single universal definition of a metric. In the context of this document, a metric is a combination of two or more measures or attributes. Examples include (1) defect density (defects per function point) and (2) delivery rates (function points per hour).

Multiple sites GSC. One of the 14 general system characteristics describing the degree to which the application has been developed for multiple locations and user organizations.

NESMA. The Netherlands Software Metrics Association (www.nesma.org). A membership governed, non-profit organization in the Netherlands, committed to promoting and supporting function point analysis and other software measurement methods.

Normalization. The process by which any data structure can be transformed by a database designer into a set of *normalized* relations that have no repeating groups.

Online data entry GSC. One of the 14 general system characteristics describing the degree to which data is entered through interactive transactions.

Online update GSC. One of the 14 general system characteristics describing the degree to which internal logical files are updated online.

Operational ease GSC. One of the 14 general system characteristics describing the degree to which the application attends to operational aspects, such as, start-up, back-up, and recovery processes.

Optional subgroup. *Optional subgroups* are those that the user has the option of using one or none of the subgroups during an elementary process that adds or creates an instance or the data.

Organization level. The management level or levels responsible for managing one or more data processing or information systems organizations.

Perfective maintenance. May include modifications to support platform or system software upgrades, performance optimization and other activities related to maintaining agreed service levels. There are no changes to business functionality associated with this work. Although Function Point Analysis is not useful for estimating these activities, the GSCs may be affected and should be reviewed for changes.

Performance GSC. One of the 14 general system characteristics describing the degree to which response time and throughput performance considerations influenced the application development.

Preventive maintenance. Changes to hardware or software performed to prevent future defects or failures. For example, restructuring programs or data to improve maintainability or to prevent defects.

Process measures. Information captured about the development process.

Processing logic. Any of the requirements specifically requested by the user to complete an elementary process, such as validations, algorithms, or calculations, and reading or maintaining a file.

Product measures. Information captured about the developed software application.

Productivity. The ratio of work product to work effort. See also Delivery rate.

Project. A collection of work tasks with a time frame and a work product to be delivered.

Project/application attribute: Characteristics of a project or an application that may have a significant impact on productivity. Examples include hardware platform, personnel experience, tools, and methodology. The project/application attribute is used to categorize project data during analysis.

Project leader. A person who manages or leads projects. May be a synonym for Project Manager.

Project level. The management level responsible for managing individual new development or major enhancement projects.

Project manager. A person who manages one or more projects or groups of projects.

Purpose of the Count. The purpose of a function point count is to provide an answer to a business problem.

Quality. Quality includes: conformity to user expectations, conformity to user requirements, customer satisfaction, reliability, level of defects present. Context and policy will decide the best definition for a given situation.

Quality requirements. Any requirements relating to software quality as defined in ISO 9126:1991. (ISO 14143-1)

Ratio. In the context of this document, ratio is defined as the result of dividing one measured quantity by another.

Record. A group of related items that is treated as a unit.

Record element type (RET) A *record element type* (RET) is a user recognizable subgroup of data elements within an ILF or EIF**.**

RECUP. Acronym for Repair/Enhancement/ Conversion/User support/Prevention. See also Maintenance (support) rate.

Reference data. This type of data is stored to support the business rules for the maintenance of the Business Data; e.g., in a payroll application it would be the data stored on the government tax rates for each wage scale and the date the tax rate became effective. Reference Data usually represents a small percentage of entities identified.

Refresh. The process of recreating a set of data to make it current with its source.

Relationship. An association of interest between two entities. A relationship does not have attributes and does not count as a RET when counting function points.

Release. A delivered version of an application which may include all or part of an application.

Repair. The correction of defects that have resulted from errors in external design, internal design, or code. Examples are missing functions that do not result in application failure (external design error) or errors resulting in a stop-run situation (code error).

Reusability GSC. One of the 14 general system characteristics describing the degree to which the application and the code in the application have been specifically designed, developed, and supported to be usable in *other* applications

Scope creep/gallop. Additional functionality that was not specified in the original requirements, but is identified as the scope is being clarified and the functions defined.

Second normal form. Result of a normalization process that transforms groups of data so that each non-key attribute depends on the key attribute(s) of the group of data and all parts of the key attribute(s).

Software Engineering Institute (SEI) Maturity. The ability of an organization to achieve a controlled and measured process as the foundation for continued improvement (Humphrey). The level of experience of an organization or project with a particular tool, resource, technique, or methodology.

Subtypes. See Entity subtypes.

Support. See Maintenance.

System. See Application.

Technical attribute. Not user-recognizable attribute that is a result of a design or implementation consideration.

Technical requirements. Requirements are related to the technology and environment, for the development, maintenance, support and execution of the software.

Third normal form. Result of a normalization process that transforms groups of data so that each non-key attribute does not depend on any other non-key attribute.

Total degree of influence (TDI). The sum of the degrees of influence for the fourteen GSCs.

Transaction. See transactional function

Transaction rate GSC. One of the 14 general system characteristics describing the degree to which the rate of business transactions influenced the development of the application.

Transactional functions. The functionality provided to the user to process data by an application. Transactional functions are defined as external inputs, external outputs, and external inquiries.

Trend. A time analysis showing repeated occurrences of a particular measure or metric.

Unadjusted function point count (UFP). The measure of the functionality provided to the user by the project or application. It is contributed by the measure of two function types—data and transactional.

User. A *user view* represents a formal description of the user's business needs in the user's language. Developers translate the user information into information technology language in order to provide a solution.

User identifiable. The term *user identifiable* refers to defined requirements for processes and/or groups of data that are agreed upon, and understood by, both the user(s) and software developer(s).

User perspective. See user view.

User recognizable. See user identifiable.

User view. A *user view* represents a formal description of the user's business needs in the user's language. Developers translate the user information into information technology language in order to provide a solution.

Value adjustment factor (VAF). The factor that indicates the general functionality provided to the user of the application. The VAF is calculated based on an assessment of the 14 general system characteristics (GSCs) for an application.

Work effort. Labor resources required for the production of a specified output. Here referring to the effort required to develop or maintain an application. Labor resources are usually expressed as work hours.

Work product. The product that is created by information systems work, here the result of a software development effort.

313. See Albrecht 1984.