SPOTLIGHT

SOFTWARE

Measuring the "logical" or "functional" size of software projects and software application

By Carol A. Dekkers, US Delegate to ISO/IEC SC 7, IFPUG Representative to ISO/IEC SC 7

Function points in a nutshell is "square meters for software". In other words, user requirements are the floor plan and function points is the size of that floor plan.

ISO/IEC and the International Function Point Users Group (IFPUG) are now publishing ISO/IEC 20926: IFPUG Function Point Counting Practices 4.1 unadjusted *as an International Standard* *(see p. 9).*

This standard reflects a collaborative effort of industry and formal standardization within IFPUG and ISO/IEC to bring what was already the defacto world standard for functional size measurement to the ISO

stage. The initiative has included a wide spectrum of participants from industry, academia, government, and the software development community. To facilitate this event, IFPUG followed the formal ISO/IEC JTC1 Publicly Available Specification (PAS) process which was set up to bring standards already established and in widespread industry usage to ISO publication.

The publication of ISO/IEC 20926 represents a landmark in both ISO/IEC history and in the recognition of Functional Size Measurement in the software industry because it brings a solid Functional Sizing methodology to the ISO marketplace. Long before Alan Albrecht of IBM first introduced the basic concepts of what is now known as "Functional Size Measurement" in 1979, the software industry has struggled with the problem of quantifying project or base application (installed software) size when developing or maintaining software. While other established engineering-based disciplines such as building construction and manufacturing are able to objectively assess project size when estimating or comparing projects, the software industry has long been challenged to find suitable measures for quantifying the various aspects of software.

Functional Size quantifies the functionality dimension of software, and is a component along with quality and technical requirement measures on which one can base project size. Susan Burgess, Corporate Vice-President of Software and Systems Quality of Veridian Inc.and a key contributor to ISO/IEC 15288 (*System Life Cycle Processes*), ISO/IEC 12207, and others, heralded the announcement of ISO/IEC 20926 : " The publication of ISO/IEC 20926 (2003) at last recognizes the importance of Functional Size Measurement to the IT industry. IFPUG 4.1 unadjusted has assumed its rightful place alongside key ISO/IEC Measurement standards including ISO/IEC 15939, 14598 and the 9126 suite of standards. ISO/IEC 20926 was sorely needed to satisfy measurement concepts of ISO/IEC 15504, and also to facilitate progress indicators for ISO/IEC 12207, among others."

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The phrase ' Functional Size Measurement ' is defined in ISO/IEC 14143-1 : 1998 *Functional Size Measurement – Definition of Concepts* as " the process of measuring Functional Size ". " Functional Size " is, in turn defined as " a size of the software derived by quantifying the Functional User Requirements ". IFPUG Function Points are the most widely accepted units of Functional Size Measurement in use today as demonstrated by their usage in myriad countries throughout the world including : Argentina, Australia, Austria, Barbados, Brazil, Canada, China, Denmark, Finland, France, Germany, Holland, India, Ireland, Italy, Japan, Korea, Mexico, New Zealand, Portugal, Saudi Arabia, South Africa, Spain, Sweden, the United Kingdom, the United States, Venezuela, and others. In fact, any country where its software industry has embraced Functional Size Measurement is likely to be using IFPUG Function Points or a variant thereof. Mauricio Aguiar, principle of ti Metricas, a leading measurement consultancy in Brazil heralded the news about ISO/IEC 20926 by stating : " The publication of ISO/IEC 20926 is an important step to foster the adoption of IFPUG Function Points by governments around the world. This has happened to a large extent in Brazil, Australia, and Korea. It will certainly happen in many more countries in the future."

IFPUG Function Points

IFPUG Function Points measure the " logical " or " functional " size of software projects and software applications based on the Functional User Requirements (FUR). FUR represent the processes and

procedures performed by the software – in other words, "WHAT" the software will do – and can be sized by IFPUG Function Points. Functional Size is independent of how the software will operate (i.e., the quality and performance requirements) and also of how it will be developed. ISO/IEC 20926 applies to all domains or types of software without exclusion, and has been successfully applied to measure functional size for software ranging from missile defense systems to financial reporting software. Since 1986, the International Function Point Users Group, a not-for-profit organization headquartered in the USA with members worldwide, has maintained the IFPUG Function Point rules through a rigorous change management process and a balanced committee of measurement practitioners representing a variety of industries and software development organizations. Capers Jones cited in 1999 that "IFPUG counting rules are used by at least twice as many people as all other counting methods put together." The International Software Benchmarking Standards Group (ISBSG) database Version 7 (2002), demonstrates an even higher margin of usage – an overwhelming number of its projects are sized in IFPUG function points.

What is Functional Size?

A couple of definitions can help with the understanding of how ISO/IEC 20926 measures the functional size of software. The word "User" in the context of Functional Size Measurement means any person, thing, other software, department – anything outside the boundary of the application, which has a need to interface (i.e., interact) with the software. This definition of user is analogous to "actor" in object-oriented development, and is an expansion of what the Information Technology community might typically describe as a "user" to include other software applications and things besides physical persons.

The software development community urgently required the IFPUG 4.1 Unadjusted (ISO/IEC 20926) to facilitate software sizing for project estimating, productivity

How does the ISO/IEC 20926 measure software functional size ?

ISO/IEC 20926 evaluates the software to be sized by breaking its Functional User Requirements down into five types of Base Logical Components (BLC) :

Internal Logical Files (ILF), which are the persistent logical groupings of data (entities) that are maintained through one or more standardized elementary processes of the software. In plain English, the ILFs of a software application are the maintained data groupings/objects/entities that are maintained through a standardized process or procedure. (Historically, maintained means one or more of the Create or Update or Delete of a traditional CRUD matrix). Once an entity is classified as an ILF, there is a weighting step that objectively rates each ILF as Low, Average or High and subsequently assigns a function point "weight" of 7 FP for Low, 10 FP for Average and 15 FP for High category ILFs.

External Interface Files (EIF) which are the persistent logical groupings of data that exist within another software's boundary and which are reference only (but not maintained) by the software being sized. This means that an EIF must be (or would be) an ILF within another software application. Once an entity is classified as an EIF, there is a weighting step that objectively rates each ILF as Low, Average or High and subsequently assigns a function point "weight" of 5 FP for Low, 7 FP for Average and 10 FP for High category EIFs.

External Inputs (EI) which are the elementary functional processes whose primary intent is to either maintain one or more ILFs OR control the behaviour of the application (i.e., trigger an event to occur that might otherwise not occur). Each unique, standalone, self-contained elementary process with the primary intent as just described counts as an EI and is rated through the IFPUG method into Low, Average or High and scores 3,4 or 6 FP respectively.

External Outputs (EO) which are the elementary functional processes whose primary intent is to present data to a user and include one or more of the following criteria within the process: calculations, derived data, updating of an ILF, modification of application behavior. Each unique, standalone, self-contained elementary process with the primary intent as just described counts as an EO and is rated through the IFPUG method into Low, Average or High and scores 4, 5 or 7 FP respectively.

External Queries (EQ) which are the elementary functional processes whose primary intent is to present data to a user from one or more ILFs/EIFs and the process cannot include any of the following criteria: calculations, derived data, updating of an ILF, modification of application behavior. Each unique, standalone, self-contained elementary process with the primary intent as just described counts as an EQ and is rated through the IFPUG method into Low, Average or High and scores 3, 4 or 6 FP respectively.

Once the base logical components (BLC's in the Functional Size Measurement terminology) have been identified, evaluated and scored, the total Function Points are summed and the resultant integer number represents the functional size of the software

and quality analysis, and to support other project and portfolio decision-making. Capers Jones, chief scientist of Artemis, Inc. and a prolific author of software engineering, estimating and measurement books, stated: "Function Points provide the only metric capable of measuring the economic productivity of software products… no other metric can handle all of the non-coding tasks associated with software."

What is the ISO/IEC JTC 1 PAS process and what does the publication of ISO/IEC 20926 mean to my organization?

John Phippen, US Technical Expert to ISO/IEC JTC 1/SC 7, a key contributor to ISO/IEC 15504 (SPICE), and the former Australian Head of Delegation to ISO/IEC JTC 1/SC 7, summed up the IFPUG experience in the PAS process by stating: "The PAS process facilitated the realization of a dream first established in 1993 to publish IFPUG Function Points as an ISO/IEC standard. I was part of the core ISO/IEC team that created the Functional Size Measurement project, and at that time its goal was to publish the IFPUG Function Point standard already in widespread usage – as an ISO.standard. Along the way, other goals such as framework and concept standards took precedence on the project. It is a credit to the ISO community, and the IT world, that the PAS process exists – it became the conduit to bring the publication of IFPUG Function Points to fruition as ISO/IEC 20926."

The ISO/IEC JTC1 Publicly Available Specification (PAS) process itself is a two-step process consisting of two separate ISO/IEC ballots. The PAS process facilitates and "fast tracks" existing industry standards already in widespread usage to become International Standards. Unlike the regular ISO/IEC standard development process where countries participate in the development of new International Standards, the PAS process brings to the ISO/IEC marketplace those specifications already established and accepted by industry. In addition, only those specifications supported by a stable and established organization can be considered for PAS processing. When IFPUG completed the first step of becoming an ISO PAS Submitter in 1999, the whole process appeared to be daunting at first glance; however, with the cooperative and eager assistance of both the JTC 1 secretariat and the ITTF office in Geneva, the process was made easier to navigate and understand. The first step to becoming an ISO/IEC standard requires that the organization that owns the Publicly Available Specification (the PAS) be formally recognized and accepted as a bonafide PAS submitter organization by a voting majority of P member countries to ISO/IEC JTC 1/SC 7. This involves filling out a submitter application and a formal explanation of longevity, cooperation with ISO standards work, and proof of stability by the candidate submitter organization. Once an organization has been accepted as a PAS Submitter Organization, it must prepare and format the specification for the JTC1 ballot of the standard itself. This is a six-month ballot that again must be approved by the majority of JTC1 voting countries. IFPUG passed this ballot with a majority vote in late 2000 and has since been preparing for ISO publication through resolution of dissenting countries comments. In the same way that the ISO/IEC standard development process seeks to ensure as much consensus as possible in the development and publication of ISO standards, the PAS process also seeks to achieve unanimity (in so far as is possible) with standards that progress through PAS processing. This means that standards already in widespread industry usage that your company or your country may have embraced could become ISO standards by utilizing the PAS process.

James Moore, former Chair of the US Delegation to ISO/IEC JTC 1's SC 7 stated: "When operating at its best, the ISO/IEC PAS process serves to take existing technically excellent products, remove cultural biases towards the industrial practices of the originating country, and broaden their exposure and usage on the global stage. In this case, the IFPUG specification already had broad usage around the world. The minor changes demanded by the ISO/IEC adoption process reaffirm the role of the IFPUG specification as the wellspring of functional size measurement methods."

After several years of hard work, it is an outstanding achievement to bring IFPUG 4.1 Unadjusted to the world stage as ISO/IEC 20926 – particularly as it is the leading Functional Size Measurement method in use today, and supported by hundreds of organizations that belong to the International Function Point Users Group.

For further information on the IFPUG 4.1 Unadjusted standard (ISO/IEC 20926) or Functional Size Measurement as an emerging software engineering practice, visit the IFPUG website at www.ifpug.org. □

About the author

Carol A. Dekkers is an acknowledged expert in the area of functional size measurement and has implemented successful software measurement programmes for clients since 1991. She has been a key Category C Liaison representative for IFPUG (www.ifpug.org), a member of the IFPUG ISO task force, and a US delegate to ISO/IEC's JTC 1/SC 7/WG 12 since 1994. She is a past president of IFPUG, and is also active in the American Society for Quality (ASQ), and the Project Management Institute (PMI). Professionally, Ms. Dekkers is President of Quality Plus Technologies, Inc., where she is in demand as a consultant, instructor, advisor, author, and mentor for companies truly interested in achieving breakthrough process improvement through measurement. Visit the IFPUG website at www.ifpug.org for more information about Function Point Analysis. Carol can be contacted by email at dekkers@qualityplustech.com