

A Comparison of the Key Differences between the IFPUG and COSMIC Functional Size Measurement Methods

IFPUG	COSMIC
<p>Origins and Current Usage The IFPUG method was the first FSM (Functional Size Measurement) Method. It was developed and heavily promoted by IBM in the early 1980's. It is therefore the most widely used FSM method.</p>	<p>The COSMIC method was developed by an international group of software metrics experts who had been members of the ISO Working Group on FSM. First published in 2000, it is now used all over the world. We do not know the number of users, but the current version and translations of the method definition have been downloaded over 1500 times.</p>
<p>Design The design is based on the concepts of an estimating method that IBM used in the late 1970's. It was calibrated using data from 24 business application (or 'MIS' – Management Information Systems) development projects in an IBM DP Services organization [1]. A consequence is that whenever new ways of constructing software are developed, new rules have to be invented to adapt the method.</p>	<p>The design is based on fundamental principles of software engineering and to conform to measurement theory. Consequently, the method is 'future-proof'. All COSMIC 'Guidelines', e.g. for sizing Data Warehouse or SOA software, or for sizing software in Agile projects, simply explain how to apply the existing principles and rules. The basic measurement rules have not changed since they were first published.</p>
<p>Applicability The method claims to be applicable to size any software, but note that no FSM Method can properly account for the size of pure mathematical algorithms. For the past 30 years, the IFPUG method has been of very little use outside the MIS world.</p>	<p>The method was designed to be applicable to business application, real-time and infrastructure software and hybrids of these, in any layer of a software architecture, at any level of decomposition. It is now widely used in all domains for which it was designed.</p>
<p>Measurement Scale The measurement scale allows only three sizes for any component – low, average or high. This very seriously limits the accuracy of size measurement for large and complex software processes.</p>	<p>The measurement scale is an open-ended ratio scale, as for any normal measurement method. Single functional processes (transactions) have been measured of over 70 CFP in MIS and over 100 CFP in avionics software. The smallest size for a single functional process is 2 CFP.</p>
<p>Measuring the size of changes to software It is not possible to measure the size of a change to a software component with the IFPUG method. It can only be used to measure the size of software components that are added, changed or deleted.</p>	<p>The COSMIC method can be used to measure the size of a change (addition, modification or deletion) to software of one CFP. It can also be used to measure the size of software that is added, changed or deleted.</p>
<p>Accounting for 'Non-Functional Requirements' (NFR) IFPUG has now made the 'Value Adjustment Factor' (which aimed to account for 14 'General Application Characteristics') an optional feature as it is irrelevant to modern software development. But IFPUG is now developing a replacement 'SNAP' (Software Non-functional Assessment Process) size index to account for a selection of 16 NFR. The SNAP index will be as meaningless and useless as the VAF.</p>	<p>COSMIC has always aimed that its FSM method should be based on fundamental software engineering principles. Research has now demonstrated [2] conclusively that the COSMIC method can be used to measure the size of software that results from NFR, e.g. maintainability, operability, usability, portability, etc. A separate size index for NFR is thus unnecessary.</p>

<p>Availability of Benchmark Data As the method has been available for many more years, there are many more IFPUG-measured projects in the ISBSG database than COSMIC-measured projects. However, relatively little of this data is from the last decade and almost all is from the MIS domain.</p>	<p>The ISBSG database now has data on well over 450 COSMIC-measured projects. A COSMIC-ISBSG joint report is available with comprehensive analyses of business, real-time and component software projects. We regularly encourage all users to submit more data.</p>
<p>Use for Project Effort Estimation Formal project estimation models often require a size of requirements to be given in units of Lines of Code or IFPUG Function Points. Researchers have found [3] that in spite of the fact that such estimation models have existed for many years, expert judgment is still the most widely used method of estimation. Further, available evidence suggests that using formal pre-defined estimation models does not improve estimation accuracy compared with using expert judgment.</p>	<p>There are now several reports of COSMIC users building estimating models, or adapting their existing models to use COSMIC sizes and obtaining extremely good estimates. Examples include Sogeti (Netherlands), CSC (India), Ericsson (Italy), Nokia (Finland), NTT (Japan), Rabobank (Netherlands), Renault (France) and Saab/GM, (Sweden). Others have reported excellent results from using COSMIC to estimate User Stories in Agile projects. (Several of the relevant papers are available on www.cosmicon.com).</p>
<p>Research & Development Over two decades, the IFPUG method has been exhaustively examined by researchers, who have identified a number of weaknesses, but most of the proposed improvements have not been accepted to update the IFPUG method.</p>	<p>There is much academic research now focussed on the use of the COSMIC method, e.g. for effort estimation, and for automatic COSMIC sizing of requirements.</p>
<p>The 'Bottom Line' – Costs To obtain the IFPUG documentation and to use the method, an organization must become an IFPUG member and pay an annual membership fee. A fee must be paid for taking a certification examination (ca 250 USD per individual); the exam must be re-taken and the fee paid again every three years to maintain the certification.</p>	<p>All COSMIC method standards and related publications are available for free download from www.cosmicon.com. There is no formal membership of COSMIC. Many users have joined the 'COSMIC Size Users' group on LinkedIn. A fee must be paid for taking a certification examination (ca 100 USD per individual), but the certification lasts indefinitely.</p>

Some Common Characteristics

Both methods share the following characteristics

- Both methods have been accepted as ISO standards. The IFPUG method followed the 'Publicly Accepted Specification' process which does not allow for any expert review. The COSMIC method followed all stages of the normal ISO process of development and review by experts and National Bodies.
- Both methods are endorsed by the US Government Accountability Office [4]

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References

- [1] Albrecht, A.J., Gaffney, J.E., 'Software Function, Source Lines of Code and Development Effort Prediction: a Software Science Validation', IEEE Transactions on Software Engineering, SE-9(6): 639-648, November 1983
- [2] Al-Sarayreh, Khalid T. and Abran, A., "A Generic Model for the Specification of Software Interface Requirements and Measurement of their Functional Size", In *Proceedings of the 8th ACIS International Conference on Software Engineering Research, Management and Applications - SERA 2010*, Montreal, May 24-26, 2010, IEEE-CS Press, Los Alamitos, pp. 217-222, (ISBN: 978-0-7695-4075-7), (This is an example of several related papers)
- [3] Jorgensen, M., Shepperd, M., 2007. 'A Systematic Review of Software Development Cost Estimation Studies'. IEEE Transactions on Software Engineering 33, no. 1: 33-53.
- [4] 'Cost Estimating & Assessment Guide: Best Practices for Developing and Managing Capital Program Costs', US Government Accountability Office, March 2009, GAO-09-3SP, obtainable from www.gao.gov/new.items/d093sp.pdf