

The use of function points in the industry



Introduction

Functional size (function points) is universally considered to be the square meter of the software industry: the only international standard to measure the size of software in a standardized, objective, repeatable, verifiable and therefore defensible way. However, software buying and software producing organizations need a certain level of maturity to understand they need to measure the size of software, calculate key metrics and use these in project estimation, project control, (supplier) performance measurement and benchmarking. Typical key metrics based on function points are:

- Productivity: Hours spent per function point
- Cost efficiency: Cost (or Price) per function point
- Quality: Defects per function point (in test and/or 1st month of production)
- Speed: Function points delivered per calendar month.

The ISBSG repository 'New Developments & Enhancements' contains thousands of completed projects for which these metrics are calculated, enabling organizations to use industry data in their analysis and decision making. There are currently 5 international methods that comply to the ISO/IEC standard for functional size measurement (14143): IFPUG, Nesda, COSMIC, FiSMA and Mark II.

Adoption of function points in the industry

While the use of international standards for size is mainstream in almost all other industries, the software industry has been struggling with this since its beginning. The most obvious size measure, the number of lines of code (LOC) produced, are next to useless for many of the activities mentioned, as there is no international accepted standard available. Also, the number of lines of code is easy to manipulate and therefore this size measure can't be used in contracting. Strangely enough, in the USA many government organizations still use LOC, even for estimation purposes. This stems from the fact that these organizations (Department of Defense, Airforce, Navy, Nasa, etc.) produce a lot of real-time and embedded software, which traditionally were hard to measure with function points. Although the introduction of the COSMIC method solved most of the issues regarding the measurement of these type of systems, the US government seems unable to change from using an industry 'bad practice' to a 'best practice'. There may be many different reasons for this, the absence of professional **software** cost estimators and therefore lack of knowledge probably being the most important one.

In some countries, the governments have realized that using function points in contracting can bring them a lot of value. Contracting Application Development projects based on price per function point leverages project risk between the customer and the supplier. The supplier is incentivized to produce as productive and cost efficient as possible, hence making a profit on the price per function point agreed upon, while the customer needs to keep the scope under control to avoid overspending. The supplier is paid for any additional requirements requested, which is

fair. Function points are mandatory in many government contracts in countries like the Netherlands, Brazil, Japan, Malaysia and South Korea. Request for Proposals are often based on a price per function point, but the other key metrics are also used often in contracts. Nowadays, more focus is also given on metrics regarding the structural product quality and the quality in use of the product (ISO 25010), which should be addressed as well in supplier performance measurement processes.

Function points are traditionally used to measure administrative applications, which is why the adoption of function points is traditionally high in the banking and financial services industry. On the supplier side, most international system integrators use function points to measure their projects. This enables them to understand their capabilities and to estimate new projects (fixed price/fixed date and price/FP projects) in an accurate way, based on actual data instead of biased expert opinions. Although most of these system integrators know their productivity and cost efficiency in most of their technological environments, they usually don't use these metrics offensively in order to win a bid. Only customers that request transparency will get that insight, the others are kept in the dark, by using rate cards, fixed prices, and time and material for most agile projects instead.

What the data shows us

The following tables show the projects measured in functional size in the 2016 Release 1 of the ISBSG New Developments and enhancements repository. The IFPUG method is used most in the industry, FiSMA, COSMIC and Nesma following on a large distance.

Size Methods	N	%
IFPUG	5.793	77,1%
Nesma	379	5,0%
COSMIC	505	6,7%
FiSMA	580	7,7%
Mark II	37	0,5%
Lines of Code	188	2,5%
Other	33	0,4%
Total	7.515	100%

Table 1: distribution of size methods (all submissions in the 2016R1 release of the ISBSG D&E repository)

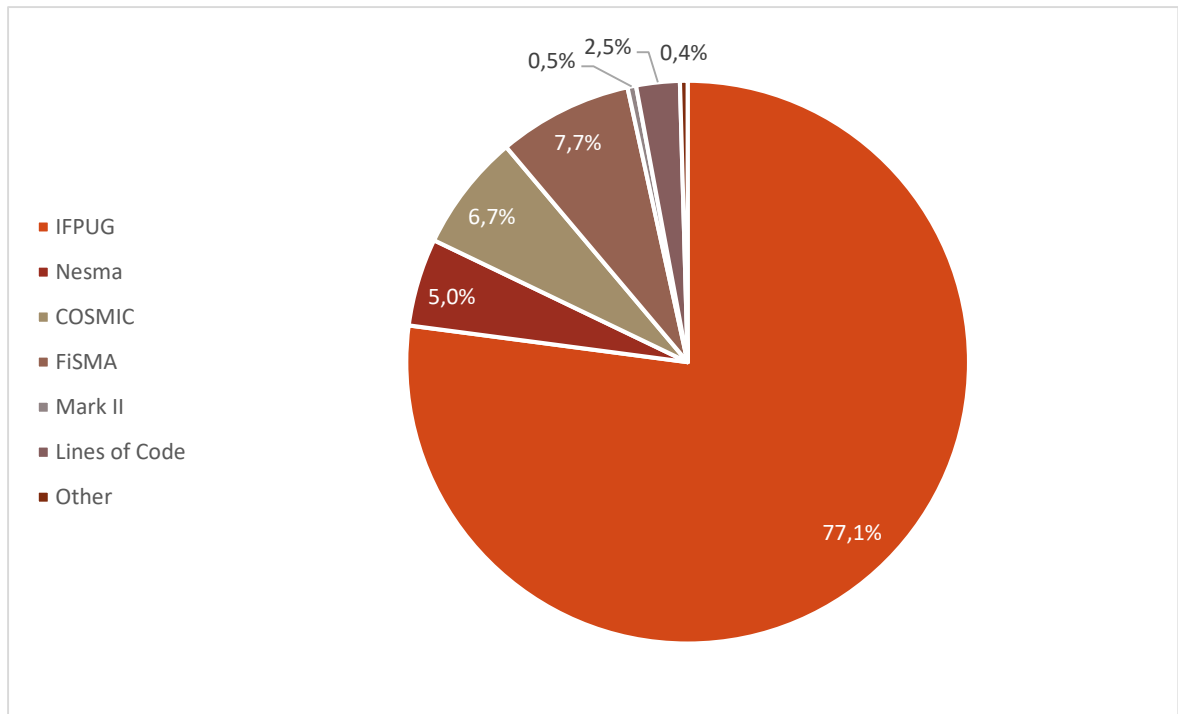


Figure 1: distribution of size methods (all submissions in the 2016R1 release of the ISBSG D&E repository)

When only the data after 2010 is considered, the distribution is as follows:

Size Methods	N	%
IFPUG	1.316	85,0%
Nesma	169	10,9%
COSMIC	64	4,1%
Total	1.549	100%

Table 2: distribution of size methods after 2010

Apparently the industry decided to consolidate the number of functional size measurement methods. IFPUG and Nesma are very similar methods, resulting in similar functional size when measuring the same requirements. COSMIC is often used to measure real-time and embedded software.

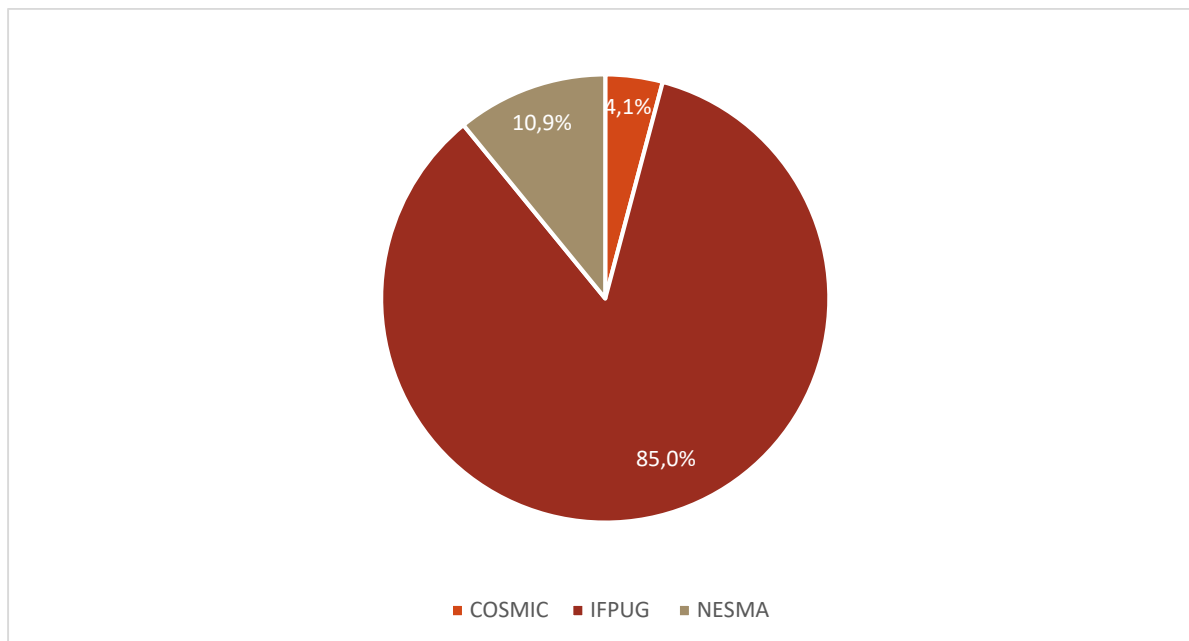


Figure 2: Distribution of size methods after 2010

The distribution of the methods used over the industries is given in the next table.

Industry Type	N	IFPUG	Nesma	COSMIC	FiSMA	Mark II	LOC
Banking	527	41%	5%	39%	11%	1%	2%
Communication	1.396	82%	9%	2%	2%	0%	5%
Construction	42	43%	2%	43%	7%	0%	5%
Defence	21	71%	0%	29%	0%	0%	0%
Education	23	39%	0%	61%	0%	0%	0%
Electronics & Computers	186	73%	0%	17%	1%	0%	10%
Financial	351	95%	2%	1%	0%	0%	3%
Government	618	65%	11%	6%	14%	2%	1%
Insurance	1.081	57%	9%	3%	31%	0%	0%
Manufacturing	773	81%	0%	10%	5%	1%	3%
Medical & Health Care	508	98%	0%	1%	0%	0%	1%
Professional Services	54	87%	2%	7%	4%	0%	0%
Service Industry	181	77%	3%	12%	2%	0%	5%
Utilities	43	84%	7%	5%	0%	0%	5%
Wholesale & Retail	131	79%	0%	5%	8%	0%	8%

Table 3: distribution of size methods per industry type

The IFPUG method is predominant in most industries, except for the banking, construction and especially the education domain where COSMIC is at least used with the same intensity.

Conclusion

Organizations in the software industry need a certain level of maturity in order to understand that, just like in other industries, it's important to measure the output of the work done as well as measuring the input and the quality of the output produced. To be able to use such a measure for output, it must be possible to measure in an objective, repeatable, verifiable and therefore defensible way. Only the ISO/IEC standard for functional size measurement can be used for such standardized measurement. Although the more mature organizations and governments in the world understand this and use functional size measurement, most of the industry have not adopted functional size measurement and therefore lack the understanding of their capabilities, and the capabilities of their suppliers compared to the industry. Just because the output of the work can't be compared.

There are 5 ISO certified methods for functional size measurement, but only 3 of them are being used intensively nowadays: IFPUG, Nesma and COSMIC. IFPUG is predominant in the industry, although in many cases people think they are applying IFPUG, while in fact they apply the global (estimated) or indicative functional size measurement methods that are part of the Nesma standard. Both methods are mainly used to measure administrative types of software. COSMIC is mainly used to measure realtime and embedded software, but is also perfectly suitable to measure administrative software as well.

The International Software Benchmarking Standards Group (ISBSG)

The ISBSG is a not-for-profit organization founded in 1997 by a group of national software metrics associations. Their aim was to promote the use of IT industry data to improve software processes and products.

ISBSG is an independent international organization that collects and provides industry data of software development projects and maintenance & support activities in order to help all organizations (commercial and government, suppliers and customers) in the software industry to understand and to improve their performance. ISBSG sets the standards of software data collection, software data analysis and software project benchmarking processes and is considered to be the international thought leader in these practices.

The ISBSG mission is to help YOU and your organization improve the estimation, planning, control and management of your IT software projects and/or maintenance and support contracts.

To achieve this:

ISBSG maintains and grows 2 repositories of IT software development/maintenance & support data. This data originates from trusted, international IT organizations and can be obtained for a modest fee from the website www.isbsg.org/project-data/

Help us to collect data

ISBSG is always looking for new data. In return for your data submission, you receive a free benchmark report that shows the performance in your project or contract against relevant industry peers.

Please submit your data through one of the forms listed on <http://isbsg.org/submit-data/>

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