

Benchmarking Application Development Projects/Teams



Introduction

The International Software Benchmarking Standards Group (ISBSG) plays a pivotal role in advancing the field of software cost estimation. It offers a treasure trove of data that holds immense value for organizations and professionals in the software development industry.

ISBSG data is a rich repository of historical project information, encompassing a wide array of software development endeavors across diverse industries and domains. This data allows for the extraction of invaluable insights. It enables more accurate and informed software cost estimation.

In this era of increasing technological complexity and with growing demand for precise project planning, the ISBSG data serves as an indispensable resource. It facilitates better decision-making, risk management, and cost optimization in the realm of software development.

The ISBSG collects industry data, where output is measured using ISO/IEC standardized and therefore objective, repeatable, auditable methods. These include Nesma, IFPUG and COSMIC function points. Typical key metrics based on function points are:

- Project Delivery Rate (PDR)¹: 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)
- Delivery Speed: Function points delivered per calendar month.

The ISBSG 'New Developments & Enhancements' repository contains thousands of completed projects for which these metrics are calculated. This enables organizations to use this industry data for fact-based understanding and decision making.

This short report explains why the benchmarking of application development projects and teams is an important activity to keep everybody focused on value creation.

In the previous short report, the main differences between story points and function points were discussed². This knowledge is important because it illustrates why ISBSG collects data of projects, releases, sprints, and applications based on standards of functional size, such as IFPUG, Nesma and COSMIC.

¹ The PDR is the inverse of the universal concept of Productivity (output/input) as it is easier to process for human minds, which usually struggles with metrics with many decimals.

² <https://www.isbsg.org/2023/12/22/story-points-versus-function-points/>

Advantages of benchmarking software projects and/or releases.

In the ISBSG Development and Enhancement (D&E) repository, there are now almost 12000 data points representing application development projects, releases and (agile) sprints.

As companies become more mature, they often wish to compare their performance against industry peers, particularly in the areas of productivity, cost, quality, speed, and for other metrics. The ISBSG D&E repository can be used to benchmark a starting, running and/or completed project.

Benchmarking enables comparisons between your project and projects produced by industry leaders. This allows you to understand your position and to learn how to improve.

Software project benchmarking offers several advantages:

- 1. Performance Comparison:** It allows you to compare the performance of your software project against similar projects in the industry. This comparison helps in understanding where your project stands in terms of productivity, efficiency, quality, and other metrics.
- 2. Identifying Best Practices:** Benchmarking helps in identifying and understanding best practices used by top-performing projects. This allows your team to learn from successful strategies and implement them in your own project.
- 3. Setting Realistic Goals:** By understanding industry standards and best-performing projects, benchmarking assists in setting realistic and achievable goals for your software project. It provides a reference point for setting performance targets.
- 4. Improving Processes:** It helps in pinpointing areas for improvement within your project processes. By analyzing the differences between your project and benchmarks, you can identify weaknesses and areas needing enhancement.
- 5. Enhancing Decision-Making:** Benchmarking provides valuable insights for decision-making. It assists you in making informed decisions about resource allocation, technology selection, process improvements, and project strategies.
- 6. Enhancing Competitiveness:** Understanding where your project stands, in comparison to competitors, enables your business to be competitive. It allows for the adaptation of new technologies and methodologies to improve the project's competitiveness.
- 7. Risk Mitigation:** Benchmarking can identify potential risks and issues early on by comparing your project's performance with industry standards. This proactive approach helps in mitigating risks before they escalate.
- 8. Measuring Progress:** It provides a quantitative way to measure progress over time. Regular benchmarking allows you to track improvements and assess the impact of changes made to the project.

Overall, **software project benchmarking serves as a valuable tool** for continuous improvement, providing insights into areas that need attention and guidance on how to achieve better project outcomes.

How to Benchmark a completed project, release or sprint?

While there are many advantages in benchmarking software projects, it is not done a lot in practice. Benchmarking is considered to be difficult to do, as many organizations don't have the process of functional size measurement in place. However, it is not difficult to benchmark, for example, the productivity (i.e. Project Delivery Rate or PDR) of a completed project using ISBSG D&E data. It takes the following few steps:

1. After the software project is completed, measure the functional user requirements delivered by using one of the main measurement standards: IFPUG, Nesma or COSMIC. In this example, the size of the functional user requirements implemented is 1000 IFPUG function points.
2. Analyze the total effort spent on the project per phase (i.e. plan, requirements, design, development, test, implementation). The total effort is, for example, 10000 effort hours.
3. Calculate the PDR: $10000/1000 = 10$ hours per function point.
4. Using the Excel spreadsheet of the ISBSG Development & Enhancement data, select the dataset you wish to compare to. In this example, the Filter function was used along with the following criteria:
 - a. Data Quality = A or B
 - b. Year of Project: after 2015
 - c. Count approach IFPUG or Nesma (these are almost the same and give similar results)
 - d. Primary Programming Language = Java
 - e. Relative Size Medium 2 (300-1000 FP) or Large (1000 – 3000 FP)

This gives a data set of 344 finished projects. A small sample of these projects is shown in Figure 1.

ISBSG D&E Corporate Release July 2023 V1														
ISBSG Project ID	Rating	Software Age	Software Age	Major Grouping	Major Grouping	Major Grouping	Major Grouping	Major Grouping	Major Grouping	Major Grouping	Major Grouping	Major Grouping	Major Grouping	Productivity
ISBSG Project ID	Data Quality	Year of Project	Year Range	Industry Sector	Application Type	Application Type Grouping	Development Type	Primary Programming Language	Count Approach	Functional Size	Relative Size	Normalized Level 1 PDR (ufp)		
10048	B	A	2018	2016-2020	Construction	Financial Transactions;	Financial transaction process/accounting	Enhancement	Java	NESMA	1323 L			5.5
10335	B	B	2018	2016-2020	Services	Business Intelligence;	Business Application	Enhancement	Java	NESMA	1782 L			7.2
10586	B	A	2020	2016-2020	Retail	Document management;	Document Management	Enhancement	Java	Nesma	1224 L			12.5
10638	B	B	2017	2016-2020	Manufacturing	Document management;	Document Management	Enhancement	Java	NESMA	366 M2			7.6
11058	B	B	2018	2016-2020	Manufacturing	Business Intelligence;	Business Application	Enhancement	Java	NESMA	889 M2			5.6
11119	B	B	2018	2016-2020	Construction	Workflow support & management;	Workflow support & management	Enhancement	Java	EFF	879 M2			8.9
11145	B	A	2020	2016-2020	Communication	Other: Service Order & Activation Management;	Other	Enhancement	Java	IFPUG 4+	322 M2			13.3
11266	B	B	2019	2016-2020	Finance	Database System;	Data Management	Enhancement	Java	NESMA	413 M2			10.3
11457	B	B	2019	2016-2020	Utilities	Report Generation;	Reporting	Enhancement	Java	NESMA	357 M2			6.7
12014	B	A	2019	2016-2020	Government	Financial Transactions;	Financial transaction process/accounting	Enhancement	Java	NESMA	2041 L			5.5
12041	B	B	2018	2016-2020	Manufacturing	Catalog/Inventory management;	Catalog/Inventory Management	Enhancement	Java	EFF	881 M2			6.7
12083	B	B	2018	2016-2020	Wholesale	Transaction Processing;	Transaction Processing	Enhancement	Java	NESMA	722 M2			8.0
12343	B	A	2022	2021-2025	Wholesale	Multimedia;	Multimedia	Enhancement	Java	NESMA	2200 L			3.2
12414	B	A	2020	2016-2020	Construction	Transaction Processing;	Transaction Processing	Enhancement	Java	Nesma	1035 L			9.7

Figure 1: Screenshot of the ISBSG D&E repository (2023 release) showing peer group

The PDR of the 344 ISBSG projects can be calculated and analyzed using descriptive statistics. This can easily be done in Excel. In Table 1, the results are shown below.

Metric	Description	PDR
N	Number of values in sample	344
Min	Minimum value in sample	1.9
P10	10% of values in the sample are less than the given PDR	4.2
P20	20% of values in the sample are less than the given PDR	4.9
P25	25% of values in the sample are less than the given PDR	5.2
P30	30% of values in the sample are less than the given PDR	5.4
P40	40% of values in the sample are less than the given PDR	6.0
Median	50% of values in the sample are less than the given PDR	6.7
P60	60% of values in the sample are less than the given PDR	7.1
P70	70% of values in the sample are less than the given PDR	7.8
P75	75% of values in the sample are less than the given PDR	8.2
P80	80% of values in the sample are less than the given PDR	8.9
P90	90% of values in the sample are less than the given PDR	9.9
Max	Maximum value in sample	16.4
Average	Represents a central value in the sample	6.9

Table 1: Results of the statistical analysis of the peer group

From the sample of projects shown in Table 1, we can see that 10 hours/FP lie between the 90th percentile (i.e. 9.9 hours/FP) and the maximum (i.e. 16.4 hours/FP). We consider the median to be the market average, so we know there is much room for improvement as more effort hours were spent compared to the peer group. Similar analysis can be done on other metrics like Delivery Speed (FP per month) and Project Quality (defects per 1000 FP).

This type of benchmark can be carried out for new application development projects, the development of new releases of applications and of (series of) agile sprints. Especially in the agile way of working, benchmarking new releases of sprints provide incredible insights as it is possible to analyze new data after every sprint and it's easy to create trends very quickly.

Conclusion

In this short paper, we have addressed the importance of benchmarking software projects and explained how easy it is to do this with the help of functional size measurement and the ISBSG data repository.

If you wish to do your own analysis, or if you are interested to use the ISBSG data for cost estimation, benchmarking, performance measurement, procurement, etc., please subscribe to the data here: <https://www.isbsg.org/project-data/>

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 and decision making. 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 support commercial and public organizations to improve the estimation, planning, control and management of 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/data-subscription-2/

Help us to collect data

ISBSG is always looking for new data. In return for your data submission, we issue 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/>

A specific Agile/Scrum data collections questionnaire can be downloaded here:

<https://cutt.ly/4vnuXVT>

Partners

This page will help you to find an ISBSG partner in your country: <https://www.isbsg.org/board/>