

# Analysis of Productivity of Projects developed in the Java programming language



## Introduction

As the ISBSG repository contains more data of projects carried out in an agile way of working, analysis of differences between traditional projects and agile projects becomes more significant. The ISBSG collects industry data, where output is measured using ISO/IEC standardized and therefore objective, repeatable, auditable methods, such as Nesma, IFPUG and COSMIC function points. Typical key metrics based on function points are:

- Project Delivery Rate (PDR)<sup>1</sup>: Hours spent per function point
- Cost efficiency: Cost (or Price) per function point
- Quality: Defects per function point (in test and/or 1<sup>st</sup> 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 this industry data for fact-based understanding and decision making. In this short paper, the difference in productivity between traditional and agile projects is analyzed.

## Java

Java is a high-level, class-based, object-oriented programming language that is designed to have as few implementation dependencies as possible<sup>2</sup>. It has been used for over 25 years and therefore there is a lot of available data of Java projects. The 2021 ISBSG Development & Enhancement repository contains over 2000 projects developed in the Java language.

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<sup>1</sup> The PDR is actually 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.

<sup>2</sup> [https://en.wikipedia.org/wiki/Java\\_\(programming\\_language\)](https://en.wikipedia.org/wiki/Java_(programming_language))

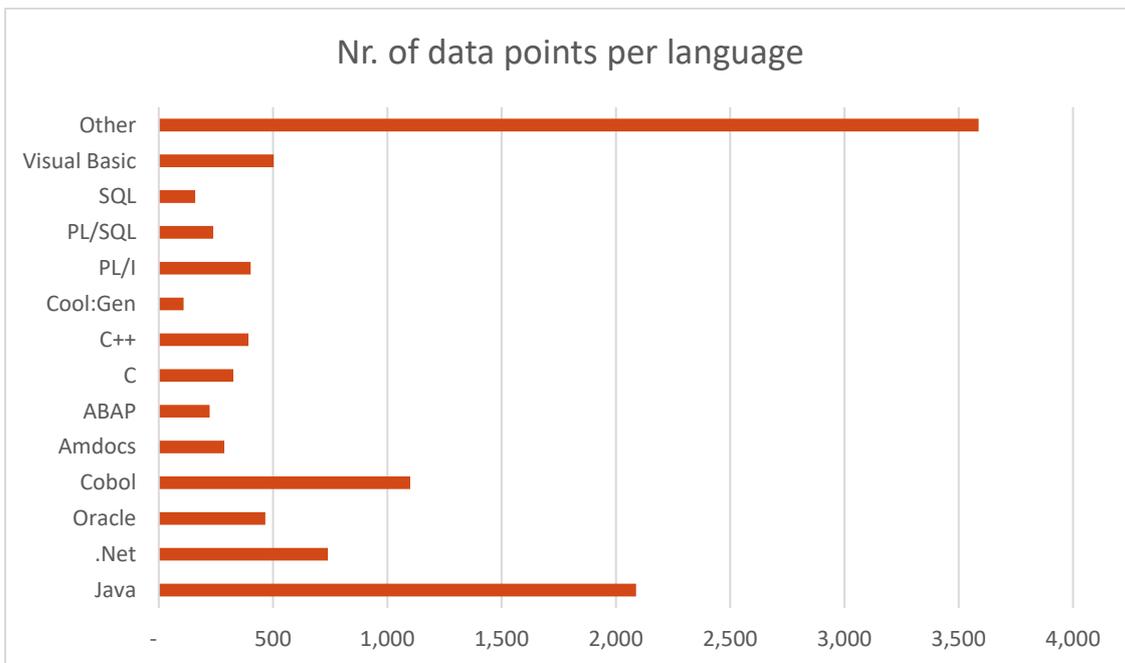
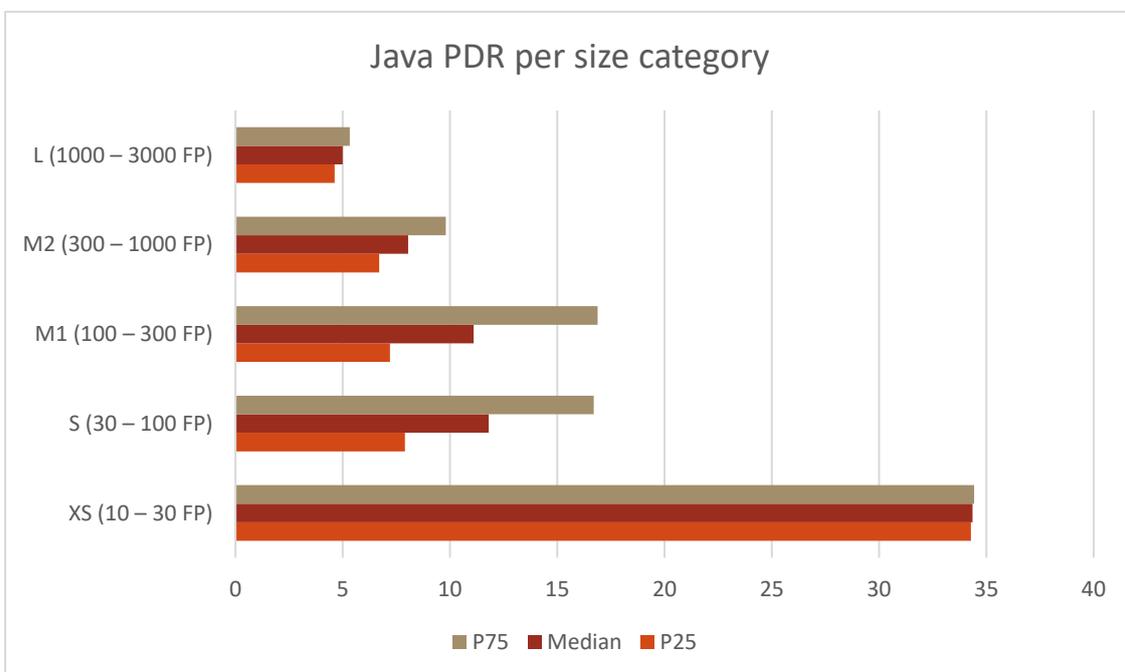


Figure 1: Number of Agile projects per programming language in the ISBSG 2021 D&E repository

### Average Project Delivery Rate (PDR)

In the next figure the average Normalized<sup>3</sup> Project Delivery Rate is given for the Java projects per size category for the programming language Java. Only projects measured in IFPUG 4+ and Nesma and delivered after 2014 (Data quality rating A or B) are selected.



<sup>3</sup> The Normalized PDR shows the PDR for all development phases ISBSG acknowledges: Plan, Specify, Design, Build, Test and Implement.

**Figure 2: Average normalized PDR per size category in the ISBSG 2021 D&E repository (Java)**

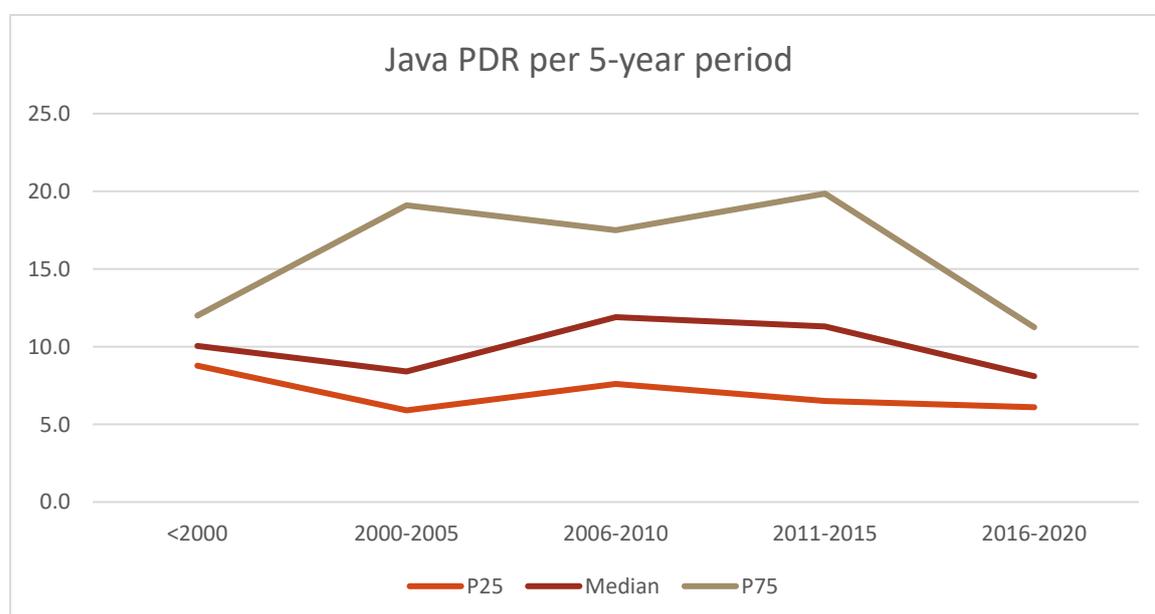
It shows very clear that as the project size gets larger, the PDR is getting smaller and also the variance around the median is getting smaller. For the XS projects, only 2 data points were selected, so those PDR's may be less accurate than the PDR's of other size categories.

**Table 2: Average normalized PDR per size category in the ISBSG 2020 D&E repository (Java and .Net)**

For the XXS, XL and XL categories, there is no data for Java projects.

### Average Project Delivery Rate (PDR) through time

In the next graph, the P25 (25<sup>th</sup> percentile), the median and the P75 (75<sup>th</sup> percentile), normalized PDR for Java projects is given in 5-year period blocks. It shows that Java projects are delivered more productive over time.

**Figure 3: Average normalized PDR per 5-year period in the ISBSG 2021 D&E repository (Java)**

## Conclusion

Java is still a popular programming language and there is a lot of available data in the 2021 ISBSG Developments & Enhancements repository: over 2000 data points. In this short paper an analysis is made of the Project Delivery Rate of Java per size category and over time. The analysis shows that larger projects have lower PDR's and also the PDR is more predictable (lower variance), which is good news for software cost estimators of larger Java projects. The analysis also shows that Java projects are getting more productive over time, also showing a lower variance in PDR, and therefore increased predictability.

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/project-data/](http://www.isbsg.org/project-data/)

### *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:

<http://isbsg.org/meet-isbsg-partners/>