Trends in

Software Quality (Defect Density)

Introduction

As the ISBSG repository contains more data from projects carried out in an agile way of working, analysis of differences between traditional and agile projects is 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)[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)
- 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, we look at the Defect Density metric. The number of defects per 1000 FP developed indicates the effectiveness of the development and testing process.
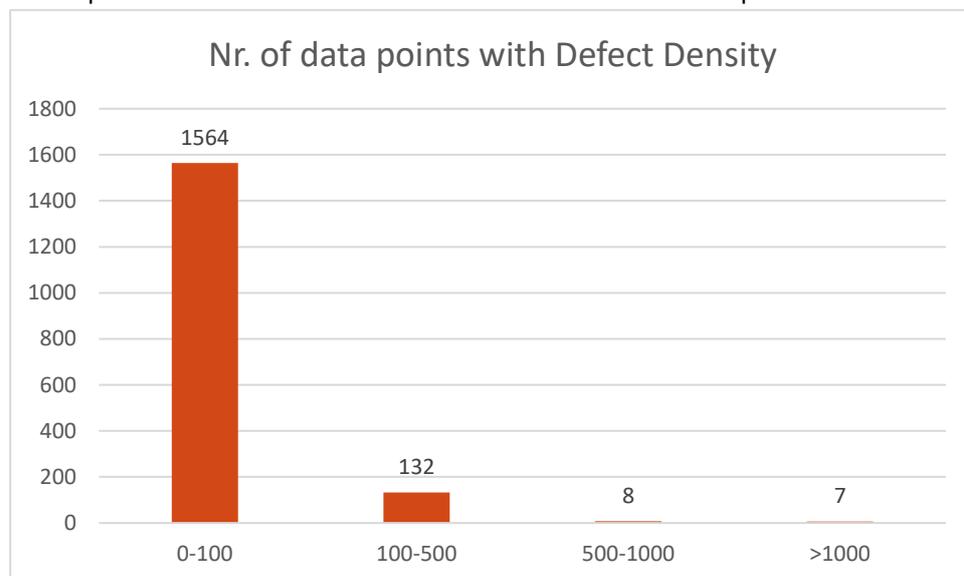

Figure 1: Number of data points with defect density data (delivered defects/1000 FP) per defect density range in the ISBSG 2021 D&E repository

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[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.

Most of the projects reported a defect density of less than 100 defects per 1000 delivered function points.

Defects density per period

In this paragraph we look at the trends in defect density over time. In this section, only Nesma and IFPUG 4+ data is analyzed.

The Defect Density field in the repository often is empty, indicating no defect data was submitted for that project. Many projects in the repository reported a defect density of 0, which happens when 0 defects were delivered into production. For this analysis the projects with defect density 0 have been included in the analysis, while the projects with an empty field defect density were excluded.

In the following figure, the average defect density is shown per time-period. As the data is very skewed to the right, also the median is shown.
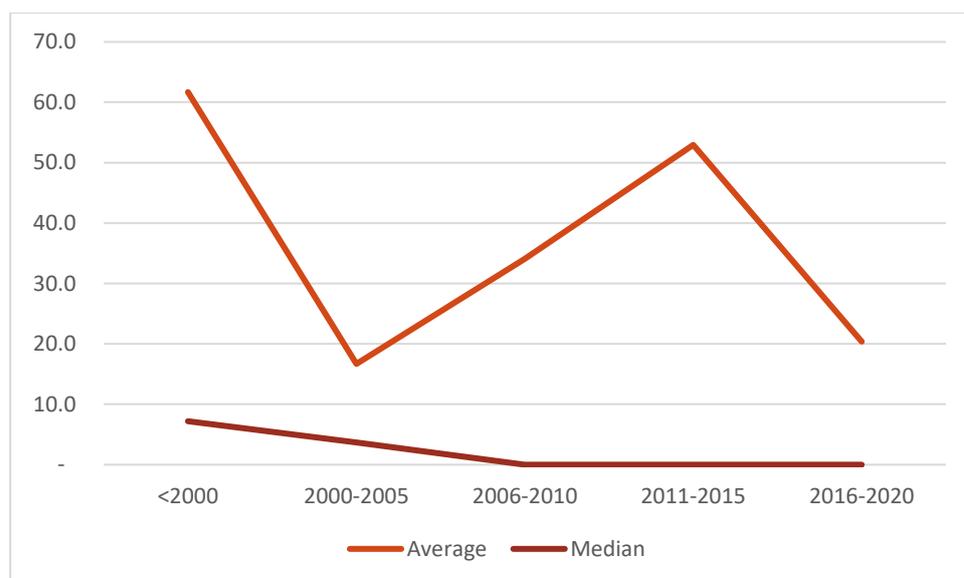

Figure 2: Average and Median Defect Density per time period.

After 2005, there are so many projects with a 0-defect density that the median is 0. The average shows ups and downs but shows a downward trend since 2015.

Defect Density per language type

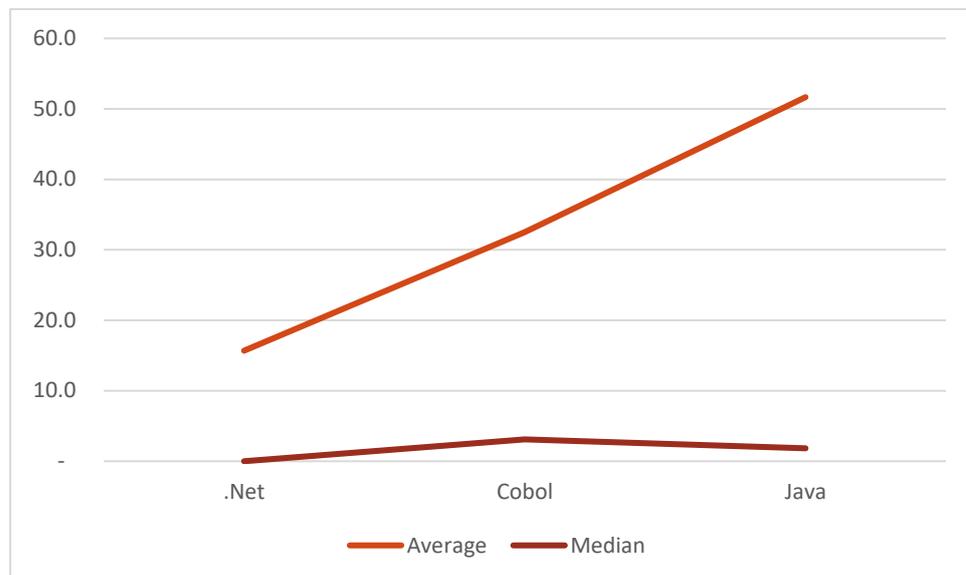For 3 programming languages, the average and median defect density are analyzed. The results are in the next table.

Figure 3: Average and Median Defect Density for 3 programming languages

The median defect density for .Net is 0, which means that at least half of the projects reported a defect density of 0. For Cobol and Java, the median is slightly above 0. However, the average shows a somewhat larger difference between programming language. Of course, this is a high-level analysis, and solid conclusions can't be taken based on this.

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/

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/