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*Short paper*

# An Analysis of the Manpower Delivery Rate metric


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## Introduction

The International Software Benchmarking Standards Group's (ISBSG's) **2024 Development and Enhancement repository** has more than 12,500 data points for completed, new development projects, releases of existing applications and (series of) completed agile sprints.

Since most of the data points in the repository were measured using an ISO standard for functional size measurement (IFPUG, Nesma or COSMIC), the metrics derived from the data are objective and easy to compare. These metrics are:

- **Project Delivery Rate (PDR):** effort hours spent per functional size unit delivered.
- **Delivery Speed:** Number of functional size units delivered per calendar month.
- **Defect Density:** Defects delivered per 1000 functional size units delivered.
- **Manpower Delivery Rate (MDR):** number of functional size units delivered per person per elapsed month.

The first three metrics have been analyzed in many short reports, but Manpower Delivery Rate has not been analyzed. Therefore, in this short paper we focus upon the Manpower Delivery Rate metric.

## Data set

For this analysis, a data set, from the ISBSG Development and Enhancement repository, satisfying the following criteria was used. :

- Data Quality Rate: A or B
- Project Year: >2016
- Size Measurement Method: IFPUG 4+ or Nesma
- Manpower Delivery Rate = not blank.

This results in a dataset of 1,758 data points. The distribution of the Manpower Delivery Rate (MDR) is shown in Figure 1.

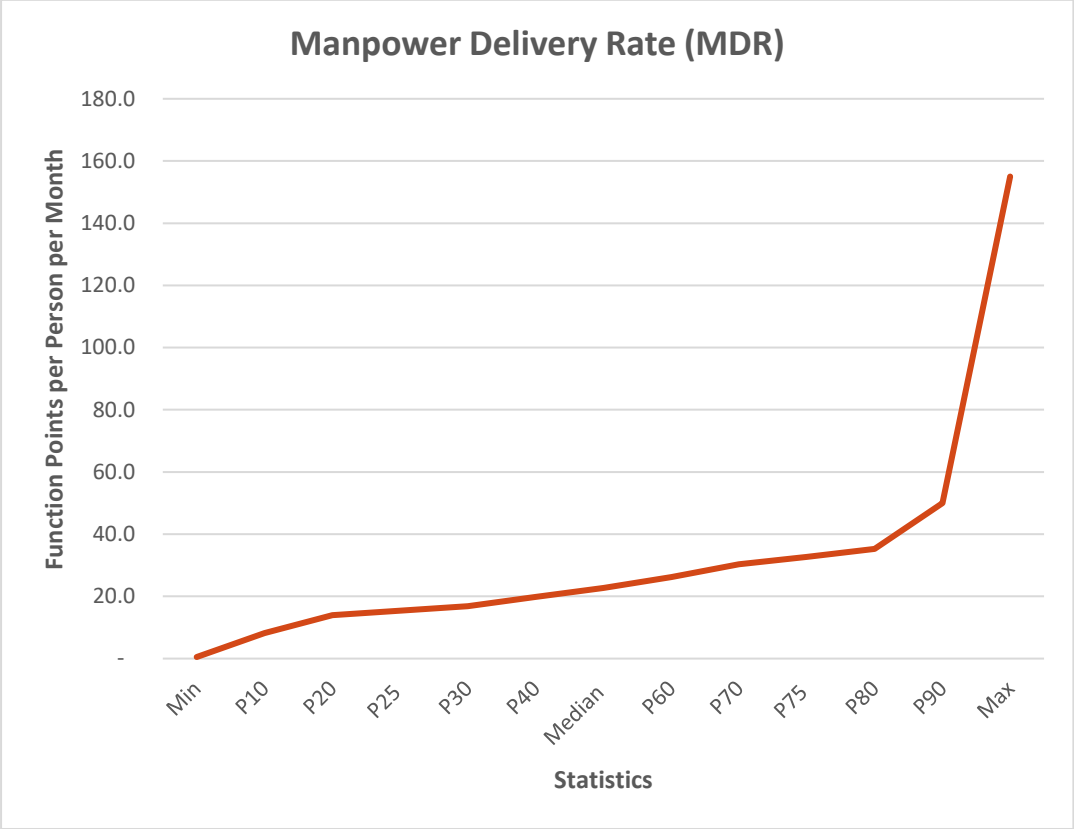


**Figure 1: Distribution of the MDR from the ISBSG Repository**

It seems that most projects from the ISBSG repository have an MDR of between 20 and 40 FP per person per month. However, about 10% of the projects have a higher MDR, even up to 160 FP per person per month. That means there can be a factor 6 productivity difference on a personal level between projects.

## The impact of programming language

In Figure 2, the average MDR is shown for the primary programming languages used in projects from the ISBSG repository.

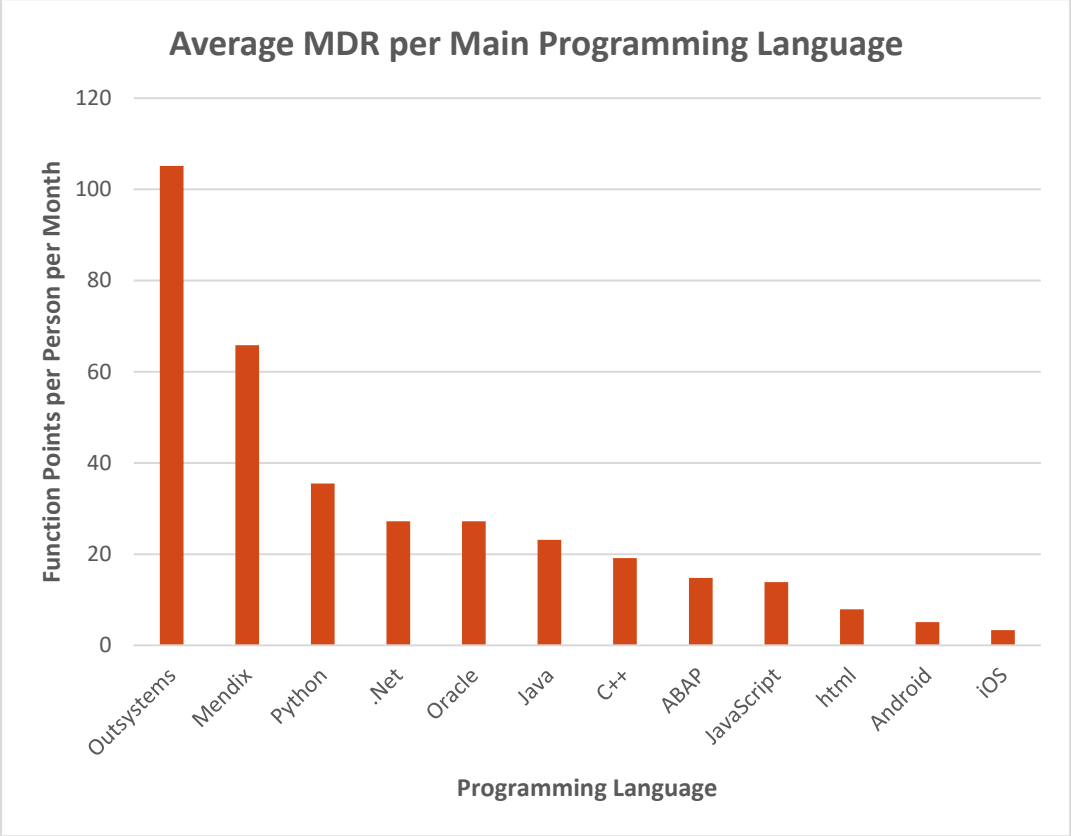


**Figure 2: Average MDR per main primary programming language**

Figure 2 shows that the low-code platforms Outsystems and Mendix are most productive when it comes to the MDR. It also shows that mobile application development in Android or iOS show the lowest MDR.

## The impact of development type

In Figure 3, the difference in MDR between agile and traditional projects, from the ISBSG repository, is shown.

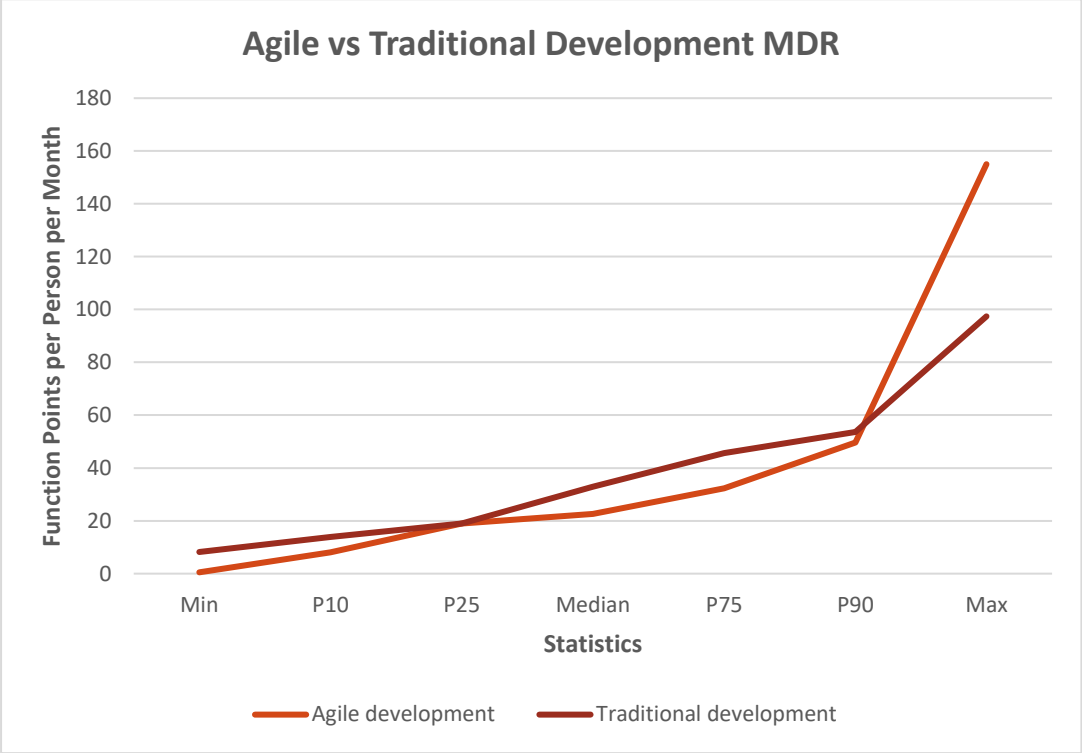


**Figure 3: Distribution of the MDR by development type**

Only 30 data points of the total data set were developed using the traditional (waterfall) way of working, all other data points are of agile projects.

Figure 3 displays the descriptive statistics of the MDR in the 2 data sets. It shows that there are very few differences between the two development methodologies. The maximum MDR for agile projects is higher, but this also reflects the fact that most low-code projects are carried out in an agile way of working. We have already seen that these methods show the highest MDR.

## The impact of project size

In Figure 4 we determine whether there is a correlation between the functional size of projects from the ISBSG repository and the MDR delivered.

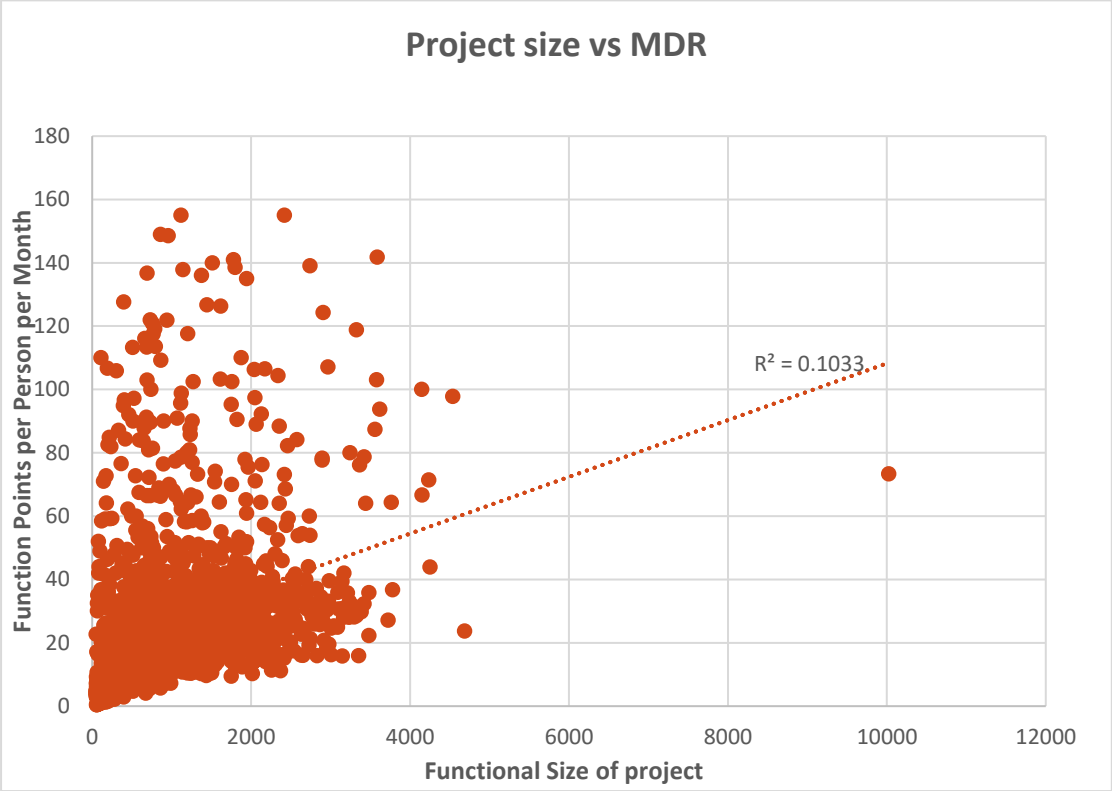


**Figure 4: correlation between project size and MDR**

In very simple terms, the Coefficient of Determination ($R^2$) indicates how well a set of data fits a model (i.e. in this case, a straight line). The value of $R^2$ ranges from 0 to 1 (or 0% to 100%). In Figure 4, $R^2$ was calculated as 0.1033. This low value indicates no correlation between the functional project size and the MDR. Therefore, there does not seem to be a ‚sweet spot' when it comes to functional size and the optimal, expected MDR.

## The impact of percentage effort spent on design

Many studies show that the overall productivity of projects is better when more effort is spent on design activities. The idea is that if the requirements are better understood by the developers and testers, less time is spent on rework later in the project.

In Figure 5, the percentage of project effort spent on design activities is shown combined with the average MDR of the projects in that category.

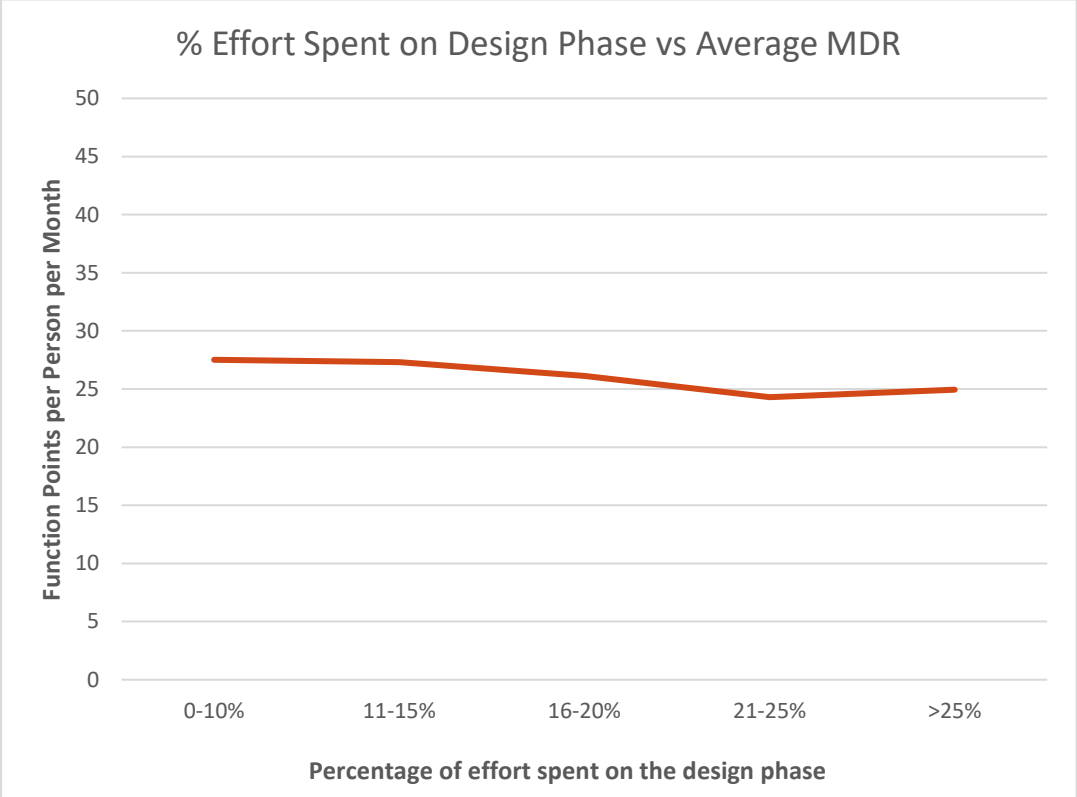


**Figure 5: Average MDR vs. Percentage effort spent on design**

Figure 5 shows that the average MDR is not higher when more effort is spent on design activities.

## Conclusion

The analysis of the Manpower Delivery Rate shows that most projects are delivered with an MDR between 20 and 40 FP per person per month.

The analysis shows that there are large differences between primary programming languages, where low code platforms Outsystems and Mendix show the highest MDR.

Other analysis of development type, functional size and percentage effort spent on design don't seem to have an impact on the average MDR.

In this paper, only the average MDR has been analyzed of a specific dataset. Other data sets and other statistics may lead to different results. Therefore, if you wish to do your own analysis, or if you are interested to use the ISBSG data for software cost estimation, benchmarking, performance measurement, procurement, etc., please get your copy of 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. This is 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 https://www.isbsg.org/data-subscription-2/

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