Analysis of Productivity of Agile versus Traditional Projects

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)[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, the difference in productivity between traditional and agile projects is analyzed.

Agile and Traditional development methods

During the last decades, many different development methods have been used to produce software and the ISBSG Development & Enhancement (D&E) repository contains data of over 20 different methods. For the analysis for this short paper, the methods that are used to develop iteratively, incrementally or via timeboxing, are considered agile methods. Traditional methods used the waterfall development methods, where the requirements are specified upfront and the project then delivered the specified requirements phase by phase. Unfortunately, the development method used is not a mandatory field when submitting data, therefore this information is missing for many projects. In the next table the number of agile, traditional and unknown projects in the 2020 D&E release is given.

Method	Number	%
Agile	1157	12%
Traditional	3577	37%
Unknown	4858	51%
Total	**9592**	**100%**

---

[1] 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.

Table 1: Number of Agile and Traditional projects in the ISBSG 2020 D&E repository

Average Project Delivery Rate (PDR)

Tin the next table the average Normalized[2] Project Delivery Rate is given for the Agile and Traditional projects per size category for the programming languages Java and .Net. Only projects measured in IFPUG 4+ and Nesma are selected, as these two methods are very similar. Also, outlier results have been removed.

Size Category	N	Agile	Traditional
XXS (0-10 FP)	5		3,8
XS (10 - 30 FP)	6	10,5	9,6
S (30 - 100 FP)	152	16,5	12,5
M1 (100 - 300 FP)	223	12,5	10,6
M2 (300 - 1000 FP)	221	8,2	8,1
L (1000 - 3000 FP)	53	6,3	10,1
XL (3000 - 9000 FP)	4		12,0

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

For the XXS and XL categories, there is no data for agile projects. For XXL (9000 – 18000 FP) and XXXL (> 18000 FP) projects, there is no data for both categories. When viewed in a bar chart, it shows that only in large projects, the agile method seems more productive.
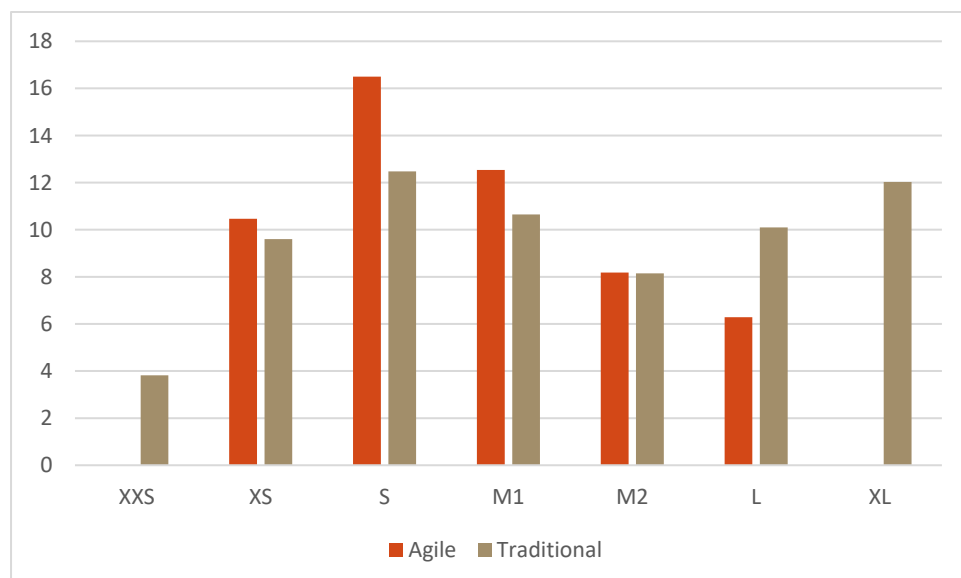
Figure 1: Average normalized PDR per size category in the ISBSG 2020 D&E repository (Java and .Net)

[2] The Normalized PDR shows the PDR for all development phases ISBSG acknowledges: Plan, Specify, Design, Build, Test and Implement.

Average Project Delivery Rate (PDR) through time

In the next graph, the average normalized PDR for agile and traditional projects (.Net and Java) is given per year from 2010 to 2019. It shows that the average PDR in traditional projects is quite stable through time, although suddenly rising in 2019. It will be interesting to see how this trend will continue once the 2021 D&E release is available. Agile PDR's were higher in the years 2012-2016 but since then seem to be lower than the traditional PDR's. This may support the claims from the agile community that agile projects are delivered more productively than traditional projects. However, the research carried out for this short paper is not carried out in a methodological sufficient way to really support this claim.
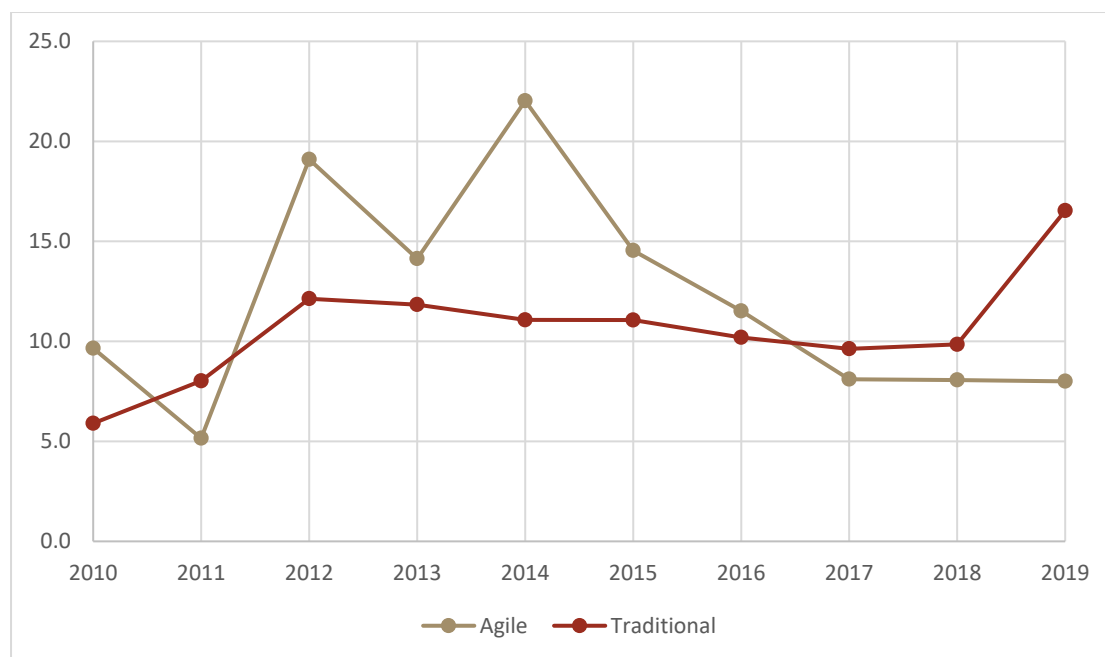

Figure 2: Average normalized PDR per year 2010-2019 in the ISBSG 2020 D&E repository (Java and .Net)

Conclusion

One of the important public debates in the industry is around the development method to use. With every release of the ISBSG Developments & Enhancements repository, more industry data becomes available to compare agile and traditional software development methods. In this short paper, only high-level results are shown for Java and .Net projects, where the average normalized PDR is given per size category and per project year. Those who are interested and who want to do more thorough research are advised to subscribe to the ISBSG 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/