Use case: Independent estimate / supplier proposal review

Time and time again, the software industry struggles to come up with accurate estimates for software development projects, releases, or sprints. Lack of understanding of the performance of development teams in combination with low maturity estimation processes (not mitigating for human bias), often result in overly optimistic project estimates that are highly probable to result in failing projects and severe cost and schedule overruns.

Application Development Performance Measurement

Software Cost Engineering (or Estimation) of application development starts with the determination of the size of the software to be developed. Like a painter that needs to estimate a paint job would start with measuring the number of square meters to paint, a software cost engineer would measure the size of the software to be developed in an international standard unit of measurement, to be able to use relevant historical data in the estimate.

Function Point Analysis is the expertise that is used to quantify the amount of functionality offered to the user by an application in an international standard, and therefore objective, repeatable, verifiable and defensible way. Function points are independent of the technical requirements of the software. Software metrics based on function points, like productivity or delivery speed, are therefore very useful in software estimation and benchmarking. The most widely used standards for functional size measurements are IFPUG, Nesma and COSMIC.

In most software metrics communities, like IFPUG, Nesma or COSMIC, there is a lot of focus on measuring the functional size of software applications and software projects as accurately as possible. Of course this is important, as functional size is used in a lot of important areas, like software project estimation, IT supplier selection, benchmarking and supplier performance measurement. These are important disciplines for many organizations, or at least they should be as nowadays the cost efficient and productive development of new functionality is key in many business areas. So, now the question is… How can you carry out these activities once you have determined the functional size in an accurate way?

Project Delivery Rates (PDR)

For software estimation based on functional size, you need an accurate Project Delivery Rate (PDR) expressed in hours per function point to estimate the number of effort hours needed for the various project activities in scope of the project. If an organization has a professional Estimation & Performance Measurement (E&PM) process in place for application development projects, there may be relevant historical data available. Accurate historical data of completed projects is just as important for project estimation as determining the accurate size.

However, in many organizations the metrics teams are struggling to get all the relevant data from completed projects. In practice for instance, a lot of effort hours are not booked correctly (wrong project, wrong activity, overtime not recorded, etcetera). Also, the actual project size delivered may

be different from the size measured, as you need to be able to consider the changes in scope during the project, and these are not always clear, even when the 'E&PM process' measures the actual size after project completion.

Industry data

So, to base your estimates on incorrect historical data may still be just as dangerous for your project as to rely on low mature estimation processes (like for instance asking subject matter experts to come up with an estimate). That's why it's always recommend also to have an extra opinion 'from the industry', just to have a better understanding of the productivity that the industry peers have realized in the past in comparable projects.

Using the historical project data of the International Software Benchmarking Standards Group (ISBSG) helps organizations to better understand the reality value of their analysis. The data is provided in Excel, therefore easy to filter and analyze. An example of presenting the data that is always useful, for instance filtering on:

- Primary Programming Language: Java
- Size between 500 and 1000 FP
- Project type: Enhancement (release)
- Count approach: IFPUG 4+ or NESMA (the methods are almost the same nowadays)

This results in 31 projects. Just to understand the spread in the data, it's better to show some descriptive statistics, in this case for the Project Delivery Rate (hours per FP).

Metric	**PDR (hours/FP)**
Number of projects: 31	
Minimum	1.1
Percentile 10%	2.7
Percentile 25%	4.0
Median	9.9
Percentile 75%	15.3
Percentile 90%	21.8
Maximum	43.6
Average	11.2

Example

Let's assume you have made a project estimation for a Java enhancement project of 700 function points, or you got a proposal from a supplier to develop this release, and the PDR associated to the estimate is 7.2 hours per function point. The quick analysis of the industry data shows that this release would be estimated to be developed between the P25 and the median of the industry data.

This could be realistic if you know that your organization/supplier capabilities are usually in this zone compared to the industry. However, if your projects are usually developed with a productivity much better or much worse than industry average, this would possibly raise a red flag and you may want to

question your estimate. Maybe your PDR of 7.2 was calculated by using data that was not correctly collected?[1]

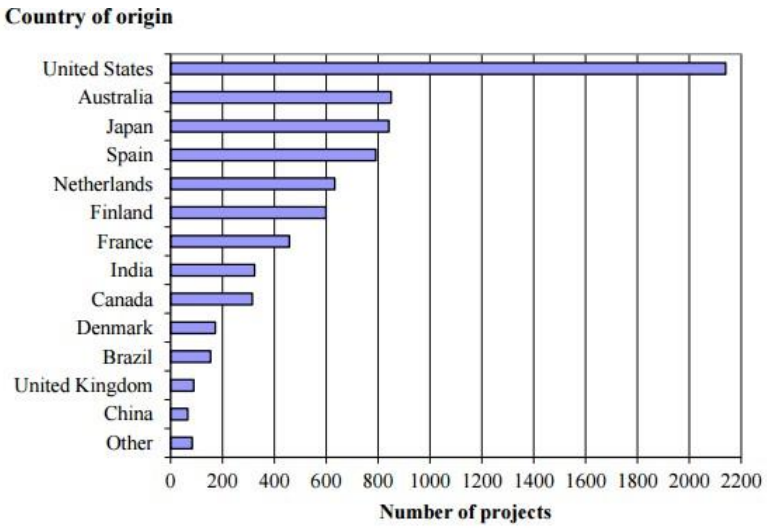
The same type of analysis can be done for the other activities where you need industry data to assess whether productivity for a specific (set of) projects or sprints is below or above market average. The data helps you to set the right peer group for benchmarking purposes. Also the data can help to set realistic targets with regard to metrics like productivity, cost efficiency and process quality for suppliers to reach in a specific period of time. Furthermore, it becomes possible to understand if the bidders on your RFP are trying to the buy the deal, or if they may not have professional software cost estimating processes in place, both resulting in metrics that are too good to be true compared to the industry.

Where to get the data

The industry data of ISBSG is therefore a cheap but valuable way to get an outside view on your analysis. The data is provided in MS Excel and can easily be purchased from www.isbsg.org.

Now it's also possible to subscribe to the online Productivity Data Query Tool (PDQ) to do this type of analysis. Information about the tool can also be found on www.isbsg.org.

Just to give an idea of what is in the 2016 version of the 'Development & Enhancement' repository: (>7500 projects), here are a few demographics.

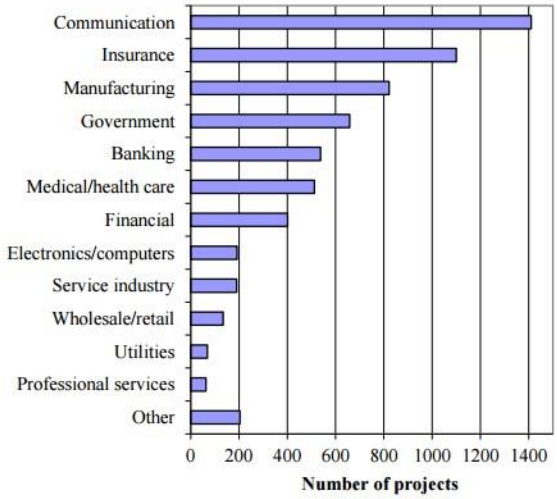


[1] To understand the way the estimate was constructed, it's always a good idea to use the Basis of Estimate for software services (BOE) document, published by the American Association for Cost

Engineering (AACE) in cooperation with Nesma. It can be downloaded for free from the Nesma website: www.nesma.org

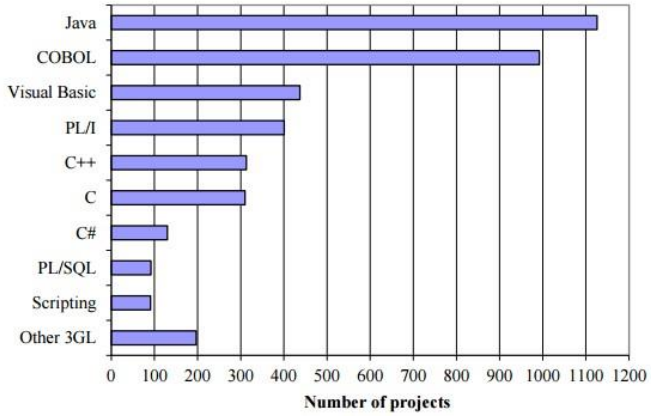
Industry Sector

The Industry Sector summarises the industry, or type of organisation, for which each project has been developed.



Primary programming languages – 3GLs

This is the programming language that has been nominated by the project submitter as the primary programming language.



Primary Programming Languages - 4GLs