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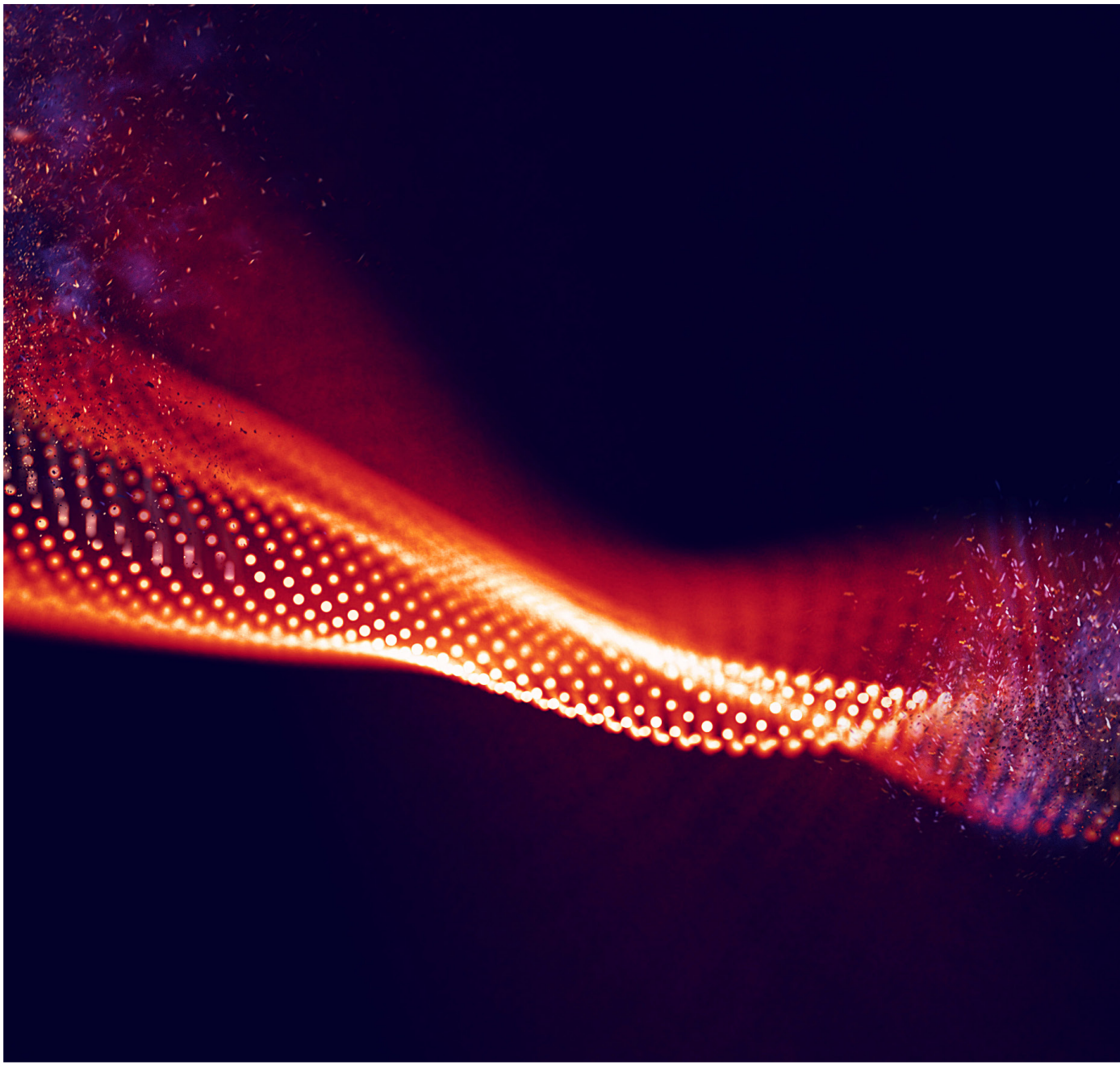
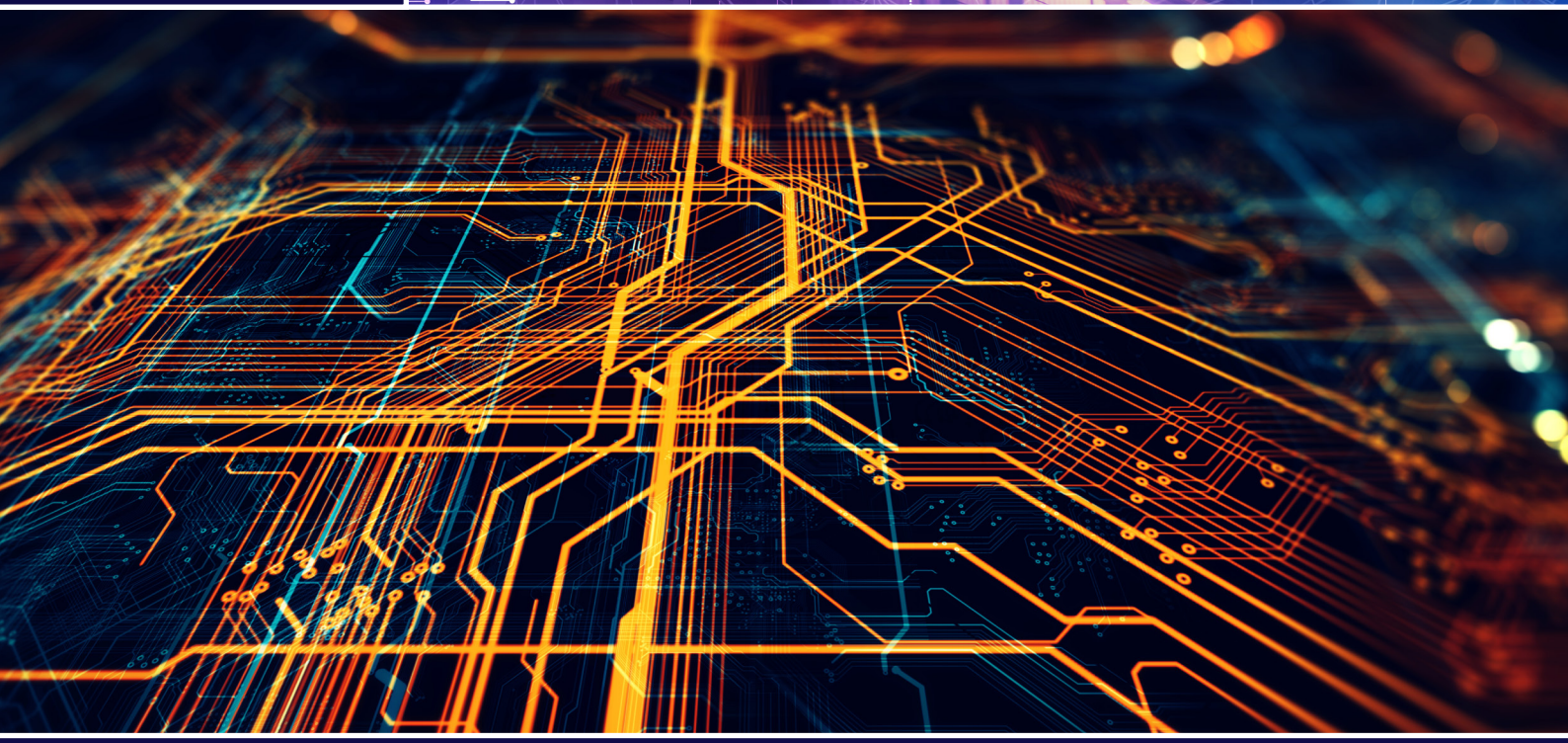


BlueOptima Global Benchmark Report

January to March 2022

Key Trends in the Global Software development Industry



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Welcome

Welcome to the BlueOptima Global Benchmark (BGB) Report which provides insights into key trends from across the software development industry.

This quarters key insights are:

- **Global productivity has continued to decrease this quarter.**
- **Every sector experienced a drop in productivity, except Technology.**
- **Consumer Cyclicals was the most productive industry however, interestingly it demonstrated the lowest quality of code.**
- **Eastern Europe saw a large drop in productivity yet it was still the second most productive region.**
- **India saw an improvement in code quality.**
- **The cost per hour of Coding Effort has risen significantly in first world countries over the last 12 months.**

The Report consists of data extracted from hundreds of thousands of software developers located in more than 30 countries, providing a quantitative analysis of their performance. This Report is published quarterly with each Report containing data from the preceding 12 months. The data is analysed using BlueOptima's Developer Analytics platform to calculate Coding Effort (CE), which sets a global standard for measuring software developer productivity. Coding Effort is a metric derived from objectively measuring a software developer's work outputs, specifically changes in static source code metrics, and the context within which that output was delivered then benchmarking that against all other developers.

Coding Effort is used by large global enterprises to compare the productivity of software engineers across technologies and software development methodologies to deliver actionable insights to optimise the software development lifecycle.

Alongside productivity, the maintainability of source code changes delivered by software developers are measured using BlueOptima's Analysis of Relative Thresholds (ART). Analysis of Relative Thresholds is an objective measure of source code maintainability obtained by using static source code metrics to evaluate how easy it is for a developer unfamiliar with the source code to deliver change into that source code. ART is described as 'quality' in this report. It is the proportion of Billable Coding Effort (BCE) hours spent delivering maintainable source code change.

The analysis within this report deliberately excludes part-time and hobbyist software developers. For example, those contributing to open source projects, as the economic cost and impact of their participation in these projects are indirect and unclear. The data employed in this analysis represents an approximated 2% sampling of the global enterprise software developer population.

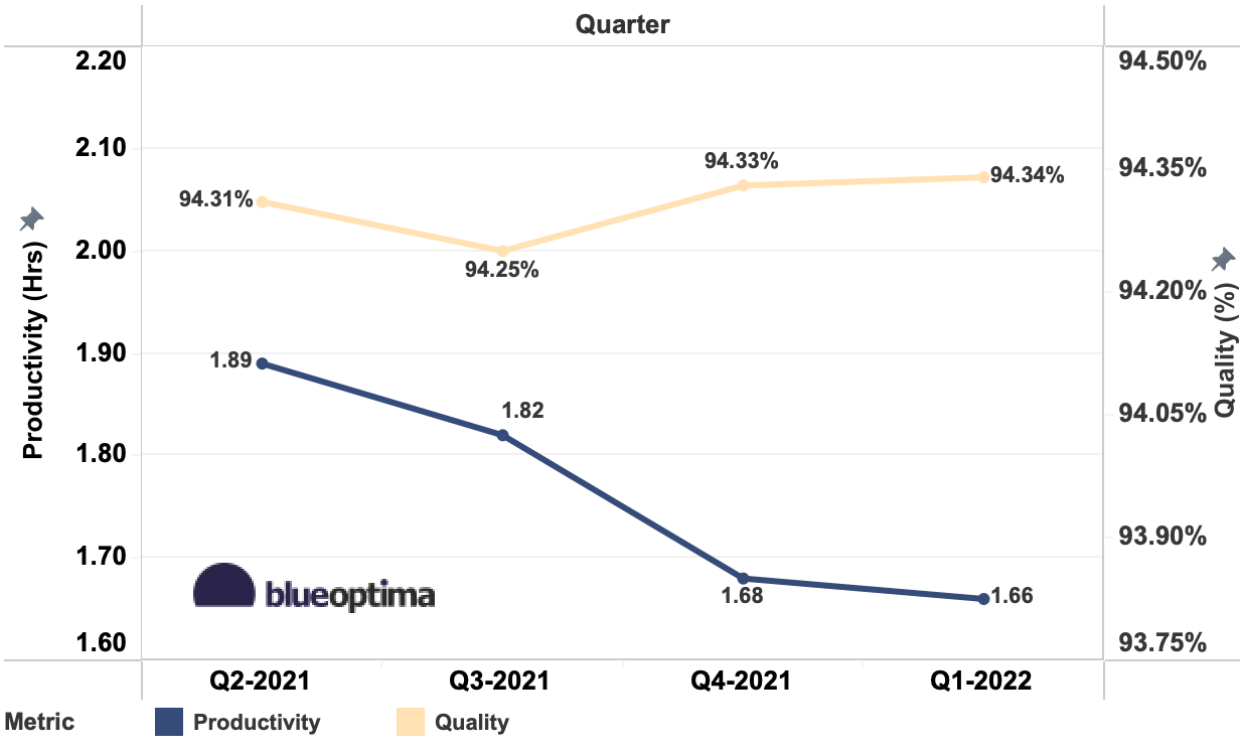
About BlueOptima

BlueOptima's analytics platform empowers software developers and their companies to create better software in the most time and cost-efficient way.

The first solution of its kind, BlueOptima provides insight based on the world's only objective software developer productivity metrics: Coding Effort. It's a breakthrough for software development.

BlueOptima's SaaS platform facilitates analysis of productivity, together with quality, in enterprise software development, in terms of individuals, teams, tasks, projects, divisions, and outsourced suppliers. Understanding variations in performance across an enterprise empowers managers to optimise efficiency. BlueOptima is proven to identify savings of up to 20% for software budgets.

BlueOptima's further offerings around benchmarking and recruiting allow organisations to cost-optimise as early as possible in software initiatives.



Global Benchmark Trends

Overall, global trends are showing a downward slope in productivity, albeit the rate of decline has markedly slowed this quarter. For this quarter in particular we can see a global drop of -1.2% in productivity between Q1 2022 to Q4 2021.

Global quality has remained steady for this quarter with roughly a ~0.01% increase suggesting this is starting to stabilise.

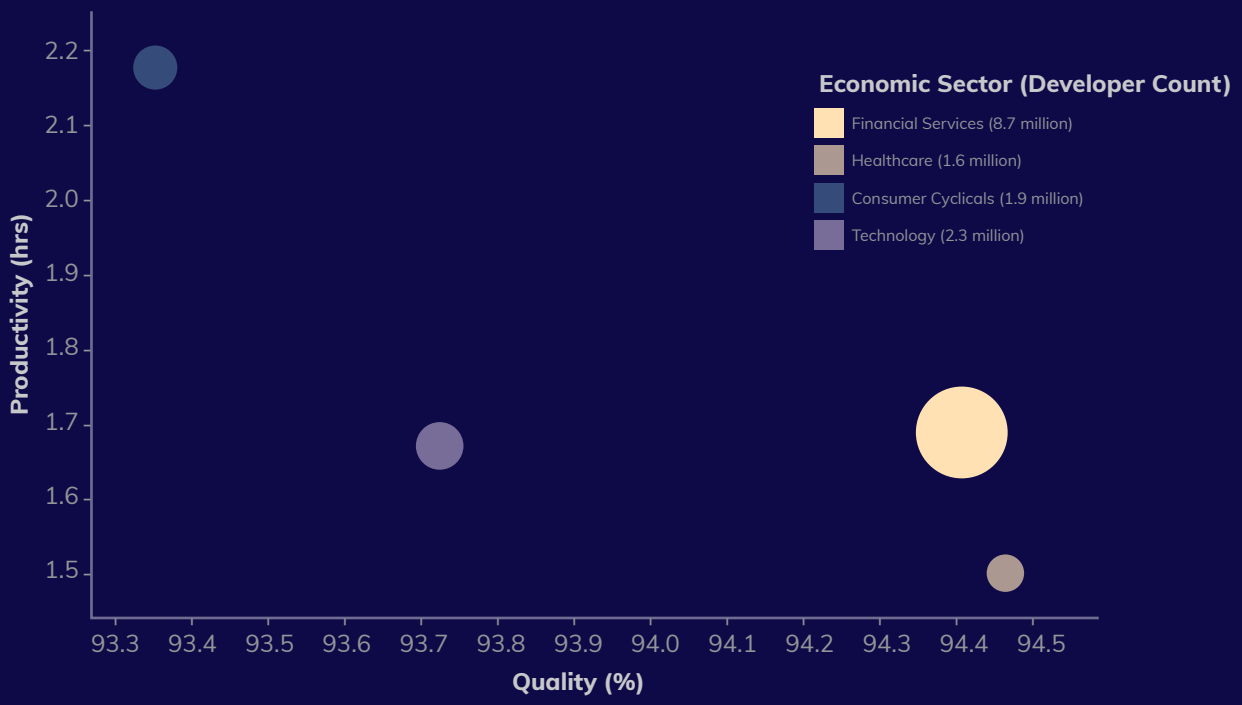
Take a look at our Special Report to discover more insights and just how much the Great Resignation has affected the developer community in recent years. In that report we go back to 2017 and look at the journey that quality and productivity have taken since then and discuss how heavily correlated the two measurements are.

Top three most Productive Economic Sectors

Q1
2022
RESULTS >

94.34%
QUALITY

1.69
BCE / day
PRODUCTIVITY



Economic Sector Performance

This quarter, almost every sector experienced a drop in productivity compared to the previous quarter. The exception to this trend was Technology where there was roughly a ~2% increase.

We saw Consumer Cyclicals become the most productive economic sector for the quarter with a 2.18 BCE per day. However, these results were still a drop of roughly ~0.8% from the previous period. Although Consumer Cyclicals ranked as the most productive area, they held the lowest quality at 93.36% for their coding outputs and ranked as the least maintainable for the period.

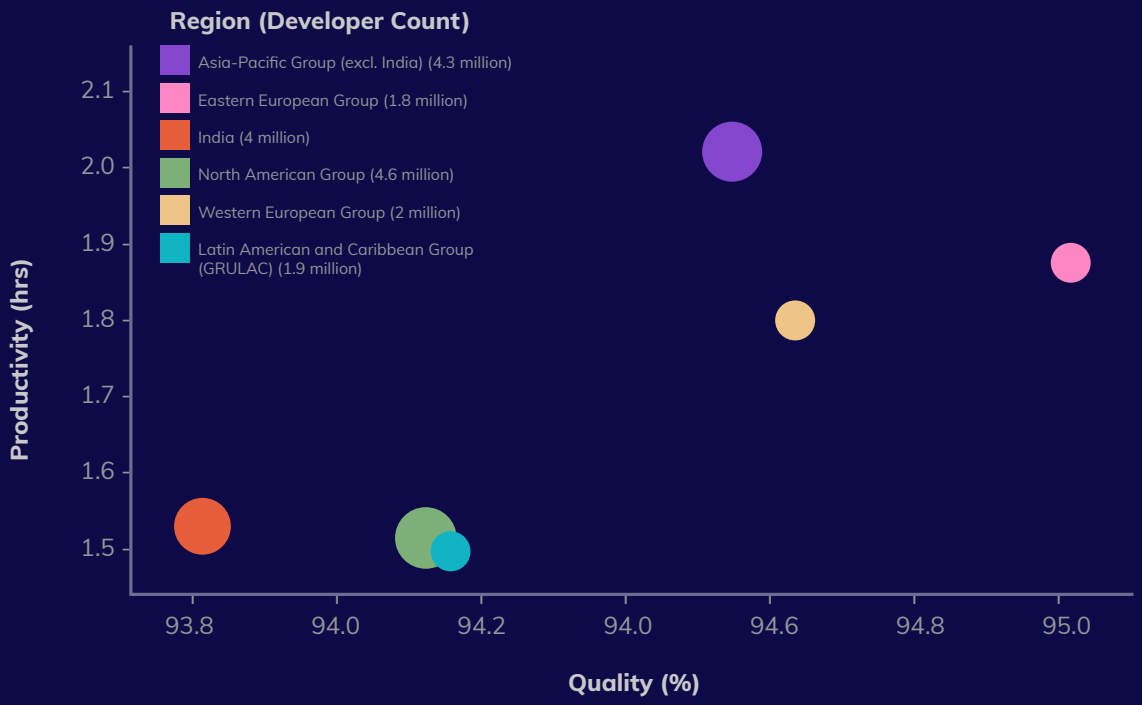
Whereas it was the opposite story for Healthcare, which presented the highest quality of code at 94.45% but the least productive developers at 1.5 BCE per day.

Top three most Productive Economic Sectors

2.18
BCE / day
CONSUMER CYCLICALS

1.69
BCE / day
FINANCIAL SERVICES

1.67
BCE / day
TECHNOLOGY



Regional Performance

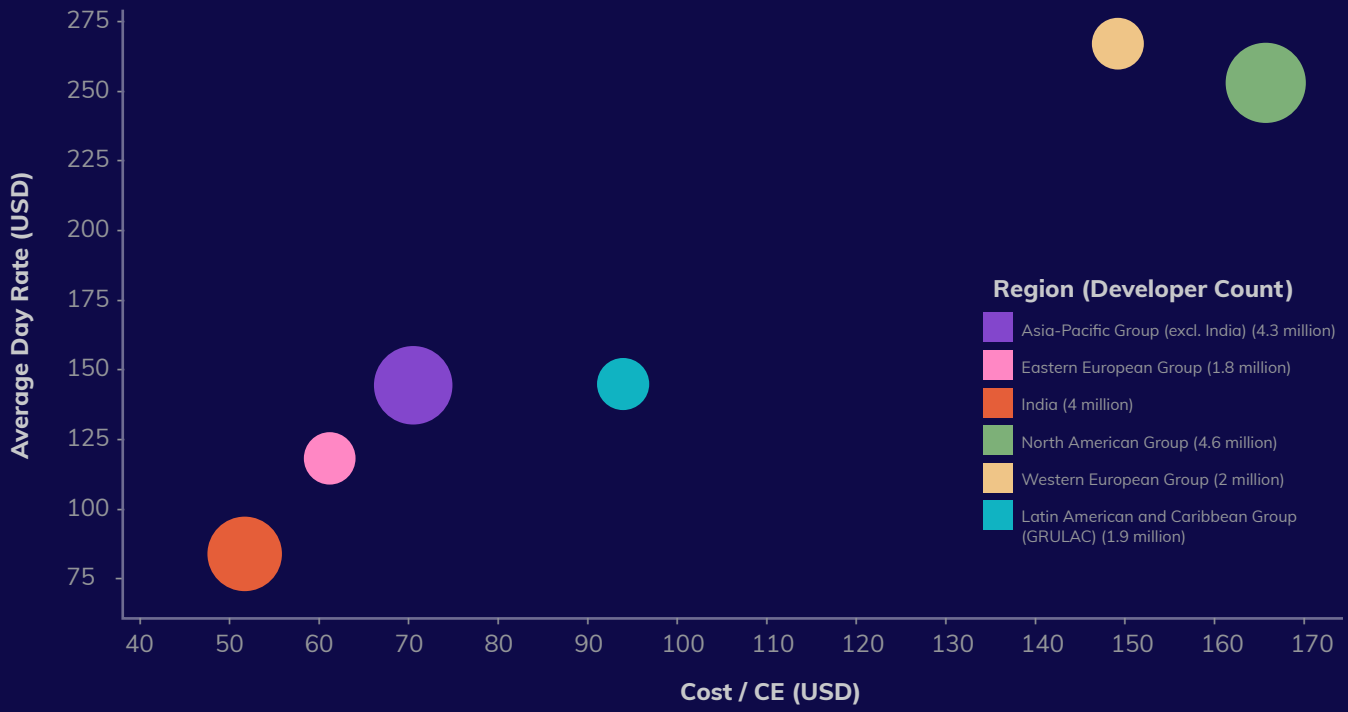
After looking at the averages for the last 12 months, we can see little movement when it comes to the productivity of developers and the quality of code produced based on geographical regions.

We found the Asia-Pacific Group (excl. India) to be the most productive region for this quarter with a BCE per day of 2.02. This region was approximately 21% more productive than the average across the other economic sectors. Whereas its quality of code ranked third place at 94.54%.

The time period covered by this benchmark report includes 36 calendar days of the impact of the operational and economic disruption wrought by the Russian invasion of Ukraine on Feb 24 on the Eastern Europe geography. Eastern Europe saw a large drop in productivity by approximately 7%, down to 1.89BCE per day, yet it is still the second most productive region. The quality of Eastern Europe's code saw an improvement of roughly ~0.1% for the quarter reaching 95.01%.

Unlike other sectors, Western Europe showed a slight improvement in productivity of roughly ~0.1% but there was a minor drop in quality from 94.68% in Q4 2021 to 94.63% in Q1 2022.

India saw an improvement in code quality from 93.70% in Q4 2021 to 93.82% in Q1 2022. Whereas their productivity score remained consistent from the previous quarter at 1.57BCE per day. Although it is worth noting that this was a drastic drop from Q2 and Q3 2021 which came in at 1.80 BCE/day and 1.77BCE/day respectively.

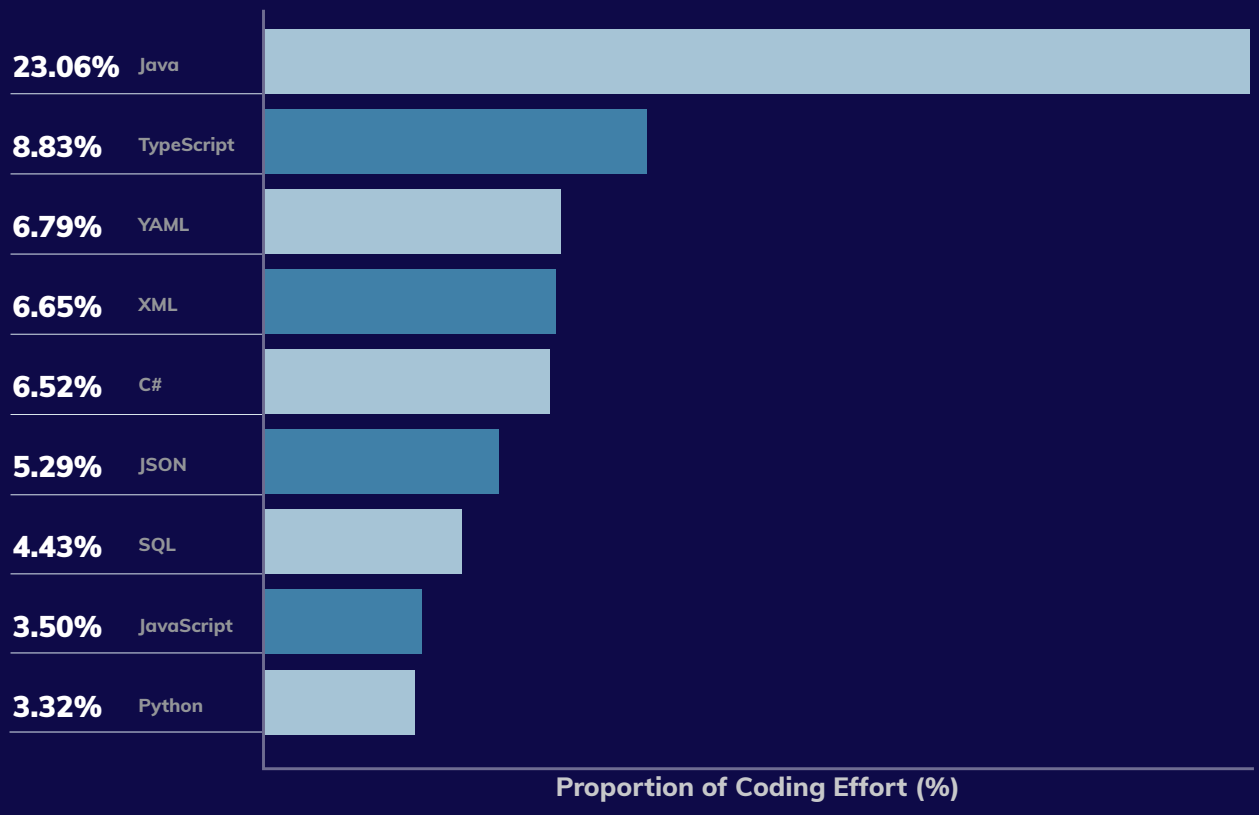


Regional Cost Efficiency

The cost per hour of Coding Effort has risen compared to last year. The two regions with the lowest cost to deliver an hour of Coding Effort remain the same, which were Eastern Europe at $62.12 (USD) and India at $52.99 (USD) per hour of Billable Coding Effort. It is interesting to see that India remained at a similar level to Q4 2021 whereas Eastern Europe, although remaining as a lower cost region, saw an increase from $57.60 (USD) to $62.12 (USD) per hour of Billable Coding Effort. It is noted that the apparent cost rise in Eastern Europe is largely attributable to the drop in productivity coinciding with the Russian invasion of Ukraine.

The two most expensive regions remained consistent with previous quarters, which were North America at $162.65 (USD) and Western Europe at $146.65 (USD) per hour of Billable Coding Effort. Even though North America experienced a drop in both productivity and quality, it was the region with the highest average day rate at $162.62 (USD) per hour of Billable Coding Effort in comparison to other geographical regions. Whereas Western Europe saw very little movement from the previous quarter.

It is worth noting, that although there might have been little movement between quarters, when looking back over the past 12 months we can see a significant change in costs. The regions with the highest cost per coding hour have had the largest cost increases. For example, North America has seen a $25.55 (USD) increase, and Western Europe saw a $15.18 (USD) increase. Latin America and Caribbean Group went up by $12.54 (USD). These are significant increases, especially compared to India which only increased by $6.67 (USD) and Eastern Europe by $9.13 (USD).



Top Enterprise Technologies

Source code language families employed in enterprises move slowly, Java continues to top the charts as the most commonly used language in enterprise software development, as it has for several years. This equates to over a quarter of Coding Effort (CE) delivered globally within our sample.

Software configuration mark-up conventions such as YAML move more quickly. YAML has become the third highest investment of Coding Effort across the global sample of enterprises included in the benchmark, accounting for approximately 6.8% of the Coding Effort delivered globally. In 12 months, YAML has moved from fifth position to third.

Top three languages

23.06% development done using **JAVA**

8.83% development done using **TYPESCRIPT**

6.79% development done using **YAML**

More about the Report's Data

Proration Methodology Changes

BlueOptima has made significant improvements to our proration logic, particularly when handling infrequent committers or those with an extended break from the code base, this change considerably reduces the instance of underreported productivity due to extended absences from working with a codebase. In order to ensure the comparison between the two quarters is statistically justifiable the previous quarters data has been recalculated in this report so both quarters are using the same proration methodology and hence a comparison on productivity can be made.

Coding Effort

Coding Effort is calculated by statistically evaluating every source code change made by developers in terms of 36 static source code metrics measuring various aspects of Volume, Complexity, and Inter-relatedness while considering the context worked in e.g. a complex legacy software component or a brand new project.

Analysis of Relative Thresholds (ART)

ART is a measure of the quality (specifically: maintainability) of source code. It is calculated by evaluating the proportion of code which is aberrant, relative to the codebase in which it sits. Code is flagged as aberrant when it violates certain internally benchmarked statistical thresholds, across a number of static source code metrics.

BlueOptima Population Sample

This report leverages models and analysis built on the BlueOptima dataset which contains activities of over 400,000 developers and more than 126 Billion static metrics changes. Detailed location, employment, and organisational data is available for more than 38,000 based in India, 12,000 based in North America, 10,000 based in Western Europe, 4000 based in Eastern Europe, 4,000 based in the APAC region (excl. India & China), 3,000 based in China, and 3,000 based in Latin America and the Caribbean. The regions of Africa and the Middle East, which represent an estimated 6.8% of the global developer population, have been omitted from this analysis due to insufficient sample size. All data used is anonymised and aggregated.

Global Software Developer Population

BlueOptima uses a sampling technique in calculating the performance of software engineers across various geographical regions and industries globally. BlueOptima has estimated the global software developer population using a combination of accredited sources and predictive modelling.

The global population of software engineers across various geographical regions according to the BlueOptima Global Benchmark are 3,966,219 in India, 4,642,058 in North America, 1,834,578 in Eastern Europe, 1,962,108 in Western Europe, 4,317,893 in the APAC region (excl. India), and 1,898,734 in Latin America and the Caribbean. Africa and the Middle East, which represent an estimated 6.8% of the global developer population, have been omitted from this analysis due to insufficient sample size. All data used is anonymised and aggregated.

Estimates of the total number of developers per region are derived from the following sources using a process of harmonising the data sources and arriving at a best-estimate across all sources: IDC Worldwide Developer Census, Evans Data Global Developer Population and Demographic Study, Stack Overflow State of European Tech, Statista, and World Bank Open Data.

Business Classification

The classification of organisations into Economic Sectors, Industry Groups, and Industries is done using The Refinitiv Business Classification. Estimates of the numbers of enterprise software developers in Economic Sectors, Industry Groups, and Industries is done by measuring various proxies of software developers in a firm (e.g. annual revenue, profit, assets, and headcount of each organisation) on a per industry basis and optimising estimation of this against the known developer population in a subset of the those organisations that are known to BlueOptima. Once this industry level estimate is arrived at, constituents of the Global 2000 are evaluated and their developer populations estimated. The relative proportions of developers in Economic Sectors are then applied on a pro rata basis to the global software developer population.

This analysis is provided as a source of information in good faith based on sound underlying data. However, BlueOptima accepts no liability for any actions taken in reliance on this analysis.

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