



SHL

## 2020 Report on Hiring the **Best Tech Talent**

Whitepaper

# 2020 Report on Hiring the Best Tech Talent

Insights into the coding skills of candidates in the U.S. and skill gaps directly impacting recruitment and on-the-job performance

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# Executive Summary

Digital transformation has taken the center stage for almost all businesses, especially due to COVID-19, leading to a strong demand for tech talent in almost every sector. Despite this, organizations still find it difficult to identify qualified tech candidates and align them with the core business, making tech talent hiring challenging. This study presents several key insights on candidates' coding skills in the U.S. and identifies skills gaps that can impact on-the-job performance, which can be useful for decision makers who are in the process of building a future-proof tech talent acquisition program and for hiring managers or recruiters in the tech industry.

This study used a sample 165,000 candidates in the U.S. who applied for entry to mid-level positions (0-6 years of experience). They undertook SHL's Coding Simulations, which was conducted in a virtual environment. Based on the study, it was found that:

## **1. Using hiring tools that can identify logically correct code will increase the tech talent pipeline into 65%.**

Most candidates were found to be more comfortable in solving simple coding problems. Moreover, on average, 40% of candidates were able to write completely correct code, while another 25% were able to write logically correct code with some syntactical errors. These 25% would normally get filtered out in traditional coding assessment. However, in the real world minor syntactical errors do not matter that much. Hence these candidates still deserve a chance and the right tool can include them and eventually increase the talent pipeline. Furthermore, organizations also needed to consider non-traditional talent sources such as coding bootcamps and massive open online courses to increase the number of hire prospects.

## **2. There is a skills gap in writing optimized codes, which can be an area for development.**

To reduce this gap, organizations need to partner with educational institutions to prepare young talent for the skills they need for future job roles. For existing employees,

invest in regular training and development programs to ensure that they stay productive and up-to-date with the latest advancement.

## **3. There are three most common code readability errors.**

The most common code readability error found was not following the character limit when writing variable names, followed by writing too long lines of codes, and poor code formatting. Organizations need to invest in continuously training the selected candidates to maintain the code quality.

## **4. Java is the most preferred programming language.**

Java was the most preferred programming language among all candidates, followed by Python and C++. This is driven not only by the demand in the job market, but also due to the ease of using those programming applications.

In conclusion, recruiters and hiring managers must revisit the way they look at their hiring and talent development strategies and put the right processes and tools in place to attract and nurture the best tech talent. Use tools that are based on the latest technology and provide data-driven insights to help you make objective hiring decisions.

## Introduction

Digitalization and technology are an integral part of all businesses. According to the Bureau of Labor Statistics, software development jobs are projected to grow 21.5% by 2029<sup>1</sup>. Furthermore, 80% of revenue growth in 2022 is expected to come from digital products and solutions<sup>2</sup>. COVID-19 has also accelerated digital initiatives, leading to an increasing demand for tech resources across many industries.

Despite this overwhelming demand, on average it takes 23 more days to hire a new tech employee compared to all other types of hires<sup>3</sup>, because the majority of organizations find it challenging to identify qualified tech candidates and align them with the core business<sup>4</sup>. Meanwhile, to also stay relevant in the new world of work, organizations need to quickly build a high-quality tech workforce. However, the massive growth in the tech industry in contrast with the long recruitment process, make tech talent hiring cumbersome.

In the end, digital transformation is not only about digital initiatives and technology, it is about your people—how to close the gaps between the talent demand and supply and how to find talent that are skillful and fit with your organization's values. This study presented several key insights on candidates' coding skills in the U.S. and identified skill gaps that can impact on-the-job performance—all of which can serve as a foundation in tech talent recruitment. The findings are useful for decision makers who are in the process of building a future-proof tech talent acquisition program and for hiring managers or recruiters in tech companies in general.

<sup>1</sup> <https://www.bls.gov/emp/tables/occupations-most-job-growth.htm>

<sup>2</sup> <https://www.cio.com/article/3237066/5-things-that-are-dragging-down-your-digital-transformation.html>

<sup>3</sup> <https://www.zdnet.com/article/us-companies-facing-a-huge-tech-talent-deficit-in-2020/>

<sup>4</sup> <https://hbr.org/2018/07/the-barriers-to-recruiting-and-employing-digital-talent>



## Research Methodology

A random sample of 165,000 candidates was used for the study. These candidates were either fresh graduates or young professionals with less than six years of professional experience. The candidates undertook SHL's AI-powered Coding Simulations assessment. (See appendix to learn more about SHL Coding Simulations).

The assessment was conducted in a virtual environment where candidates were given 40 minutes to solve a set of coding problems. The scores were then analyzed by SHL's Research & Development team, subject matter experts, and IT industry experts.

## Key Findings

### Coding Skills of Candidates

Our study found that:

#### 1. Accuracy

- On average, **40%** of candidates were able to write completely correct codes (i.e. one that is logically correct, compiles and passes all test cases).
- Another **25%** of candidates were able to write logically correct code, with some syntactical errors.

#### 2. Difficulty

- Candidates were more comfortable in solving **simple** coding problems. Around half of them could write the correct codes for Sort/Search, math-based and HashMap data structure problems.
- When it comes to solving **more complex** coding problems like tree search and dynamic coding, only 25% of the candidates could do it.

Most companies require proficiency in solving complex coding problems and they often find it hard to identify highly skilled developers, making tech talent hiring challenging and time-consuming. With that being said, there are many educational institutions, aside from universities, that are found to have students with sound coding skills such as coding bootcamps and massive open online courses (MOOCs).

In 2019, the number of coding bootcamp graduates in the U.S. alone grew 4.4% and it was expected to grow at a steady rate<sup>5</sup>. On average, about 45% of bootcamp graduates are already employed before they even follow a bootcamp<sup>6</sup>, which means that at least half of

them can be hire prospects. Expand your hiring horizon beyond a computer science degree as university is not the only place where people learn coding. There are many people with a non-tech background who learn how to code from online courses, and they are good at it.

*Gartner's Recruiting for Tech Talent* 2019 report explained that the key to increasing your talent pool is to expand your hiring criteria which better locates and attracts top tech talent<sup>7</sup>. Organizations that want to quickly and fairly identify best-fit talent must move away from traditional hiring and focus less on formal requirements. Moreover, they also need to look beyond the usual recruitment sources to fill the huge demand gap for tech resources.

### Shortcomings of Traditional Coding Assessments

Traditional coding assessments evaluate candidates' coding skills in a rudimentary way. They work as a Boolean system: giving a score only when a candidate codes correctly and a straight 0 to candidates with logically correct but uncompileable code due to minor mistakes. Limited assessment time often contributes to an increase in minor errors for most candidates. If candidates are given more time it is quite likely that they will not make these mistakes.

As mentioned in the previous section, 25% of the candidates possessed strong coding skills, but a traditional coding assessment would have rejected them due to the restricted capabilities of the

<sup>5</sup> <https://careerkarma.com/blog/bootcamp-market-report-2020/>

<sup>6</sup> <https://insights.stackoverflow.com/survey/2018>

<sup>7</sup> <https://www.gartner.com/en/documents/3909099/recruiting-for-tech-talent>

assessment. In the real world, minor syntactical errors will not make a big difference. Hence, these candidates are still deserving candidates who were filtered out due to trivial mistakes. Using the right hiring tools that can identify logically correct code will increase the tech talent pipeline up to 65%.

Coding assessments should focus on evaluating coding skills, which rests heavily on the logical correctness of the code (i.e. whether the candidate was able to apply the right logic to solve the problem at hand), but traditional assessments are often not equipped to score candidates' coding ability.

## Skills Gaps

Due to COVID-19, business models have changed rapidly from traditional, in-person testing to digital-first approaches. Social distancing has forced people to stay indoors and work remotely. This has led to a surge in demand for video software, online movie streaming, and remote working tools; there has also been a huge demand for resources in tech areas like data science, analytics, cloud computing, mobile developing and software engineering.

By 2022, STEM jobs in the U.S. are also predicted to grow between 20 to 37%<sup>8</sup>. Although the demand is high, there is a huge shortage of skilled talent on the supply side. In recent research by Korn Ferry, the U.S. may potentially lose out on \$162 billion by 2030 due to this shortage<sup>9</sup>.

Our data and analysis also indicate a similar situation:

- Only **20%** of candidates were able to write a readable and maintainable code.
- Only **6%** of the code written were functionally correct, maintainable, and of optimized complexity.

Code **reability**, **maintainability**, and **correctness** are key metrics that directly impact speed and performance of any software solution. In the ever-increasing digital age, our study found that there is a clear gap in the ability to write optimized code, which can be an area for development.

To close this skill gap, organizations need to work at grassroot level and align with educational institutions to ensure that the graduating computer science students possess job-ready skills to quickly become productive. And for the existing workforce, it is important to cultivate a continuous learning culture and invest in regular training and development programs.

## Most Common Code Readability Errors

Code readability refers to a code that is easily comprehensible by other developers and directly impacts the maintainability of the code (i.e. the ease of maintaining and enhancing the code). Code with poor readability makes it hard to understand, debug, maintain and extend. All software needs to be constantly updated and maintained to support new features and improve performance. Hence, it is critical for developers to follow language best practices to write quality code.

Our study found that some of the most common errors made by candidates were (See Table 1 for more details.):

1. **Variable names that are too long or too short**—28% of the candidates who undertook the coding assessment did not follow the recommended character limits for variable names. This was the most common error made by candidates across all languages, with 67% of candidates coding in JavaScript made the error, followed by Java, C, and C++.
2. **Lengthy lines of code**—when the length of the code exceeds the recommended number of characters. Around 20% of candidates made this error. Most candidates coding in JavaScript made this error, followed by Python.
3. **Poor code formatting**—candidates that were coding in Java were more likely to write poorly formatted code compared to the other languages, followed by Ruby, C#, and JavaScript.

<sup>8</sup> <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/financial-services/us-fsi-it-worker-of-the-future.pdf>

<sup>9</sup> <https://www.kornferry.com/insights/articles/talent-crunch-future-of-work>

Table 1: Most common code readability errors made by candidates

Readability errors	Java	C	C#	C++	JavaScript	Python	Ruby	Overall
Poor variable name	34%	30%	8%	30%	67%	10%	7%	<b>28%</b>
Line over maximum character limit	14%	4%	22%	12%	37%	36%	13%	<b>20%</b>
Poor code formatting	11%	2%	6%	3%	5%	4%	7%	<b>8%</b>

Organizations often assume that candidates already possess the skills to write a good, maintainable code. However, research has found that teaching these skills was not a top priority for colleges.<sup>10</sup> Thus, organizations need to invest in continuously training the selected candidates to maintain high quality coding skills.

### Language Preference

Java has shown to be the most preferred programming language among all candidates, followed by Python and C++ (See Table 2 for more details). This corresponds

with the job market, as Java is one of the most sought after coding skills as most enterprise solutions, mobile apps, etc. are written in Java language. It frequently figures in the list of Top Programming Languages and many reports claim it to be the most popular primary programming language available.<sup>11</sup> Popular mobile apps like Twitter, Spotify, Pinterest, Uber and more have built their Android applications using Java.<sup>12</sup>

Python was a close second. It was one of the most in-demand programming languages in the U.S., with the highest number of jobs posting in January 2020.<sup>13</sup>

Python is extensively used in artificial intelligence (AI), machine learning, big data, and robotics which has led to its immense popularity amongst the developer community and employers. Leading software giants like Google use Python for almost all solutions including their AI algorithms and App Engine Cloud<sup>14</sup>.

Over the past 5 years, we have seen a number of new programming languages appear in the coding arena, like React, Typescript, Kubernetes, Docker and more. Moreover, according to the World Economic Forum, 50% of new technical knowledge acquired by students will be outdated by graduation<sup>15</sup> and by 2022 around 54% of the workforce will need a major reskilling to be future ready<sup>16</sup>.

Therefore, recruiters and hiring managers should not only evaluate knowledge of the desired programming language required for the job role, but also the candidate's ability to cross-skill from one programming language to another. You can rely on a technical skills assessment to evaluate a candidate's knowledge of other programming languages and use the technical interview as an opportunity to also evaluate a candidate's aptitude and approach towards learning a new language. This way, organizations can reduce the skill gap in new and existing workforce.

<sup>10</sup> [https://www.researchgate.net/publication/299412540\\_Code\\_Readability\\_Testing\\_an\\_Empirical\\_Study](https://www.researchgate.net/publication/299412540_Code_Readability_Testing_an_Empirical_Study)

<sup>11</sup> <https://www.jetbrains.com/lp/devecosystem-2020/>

<sup>12</sup> <https://techbullion.com/the-5-most-popular-mobile-apps-built-with-java/>

<sup>13</sup> <https://towardsdatascience.com/top-10-in-demand-programming-languages-to-learn-in-2020-4462eb7d8d3e>

<sup>14</sup> <https://towardsdatascience.com/10-world-class-companies-using-python-26cde24919a8>

<sup>15</sup> [www3.weforum.org/docs/WEF\\_Future\\_of\\_Jobs.pdf](http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf)

<sup>16</sup> <https://www.weforum.org/reports/the-future-of-jobs-report-2018>

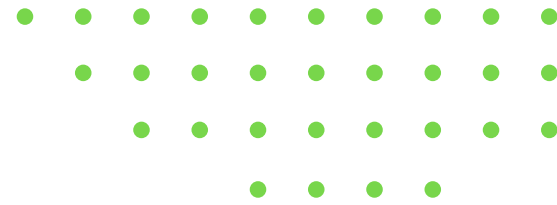


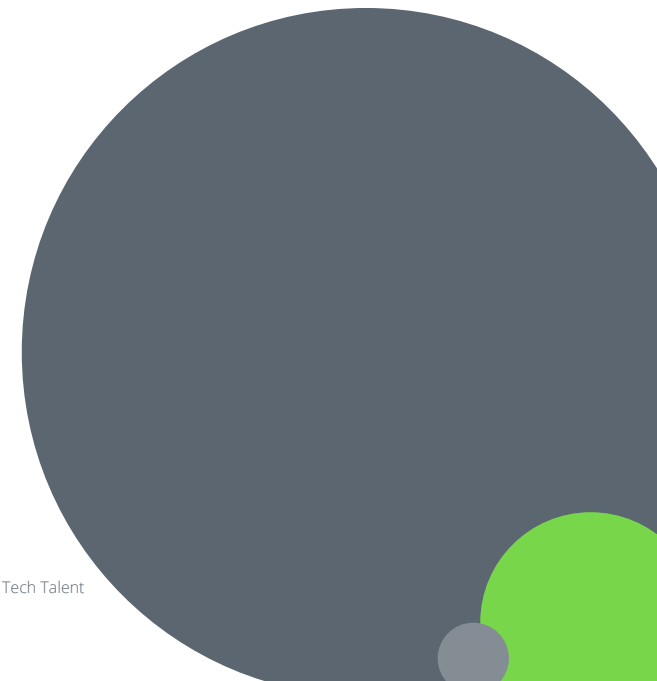
Table 2: Programming languages used by candidates for coding assessments

Language	Number of code	Percentage
Java	88889	53.75%
Python	23221	14.04%
C++	20911	12.64%
C#	18184	11.00%
JavaScript	9537	5.77%
C	2658	1.61%
Ruby	1331	0.80%
Swift	639	0.39%
<b>Total</b>	<b>165370</b>	<b>100.00%</b>

### Ease of Use of Different Languages

Candidate's preference to use Java or Python to solve coding problems over other languages is driven not only by the demand in the job market, but also to the ease of using those programming applications. Languages like C do not come with ready-to-use data structures that make it easier to write code, as opposed to languages like Python which provides lots of ready-to-use functionalities to developers.

Java provides the best Integrated Development Environment, which makes it enjoyable for developers to code in. C and C++ are also considered to be complex programming languages by software engineers. As a result, we observe a high number of candidates opting for Java, Python, and C# to write their code.





## Conclusion

Digital transformation has taken the center stage for almost all businesses, especially due to COVID-19, leading to a strong demand for tech talent in almost every sector. Despite this, organizations still find it difficult to identify qualified tech candidates, making tech talent hiring challenging. This study presented several key insights on candidates' coding skills in the U.S. and identified skill gaps that can impact on-the-job performance, which can be useful for decision makers, hiring managers, and recruiters in tech industries.

Organizations that want to succeed in quickly identifying best-fit tech talent and building a world-class tech team must use a different approach to source talent. Focus less on formal requirements and resumés and consider non-standard educational institutions such as coding bootcamps and MOOCs. Invest in scientifically-proven and objective assessments that can help you evaluate coding skills and competencies to increase your talent funnel.

Code readability, maintainability and correctness are key metrics that directly impact on-the-job performance. Despite this, there is a clear skill gap in writing optimized code. To reduce this gap, organizations need to partner with educational institutions to prepare young talent for the skills they need for future jobs. Moreover, it is also important to evaluate a candidate's aptitude and approach towards learning new programming languages. Furthermore, invest in reskilling your existing employees through regular training and development programs to ensure that they stay productive and up-to-date with the latest advancement.

Finally, HR and talent acquisition professionals must revisit the way they look at their hiring and talent development strategies and put the right processes and tools in place to attract and nurture the best tech talent. The tool also should use the latest technology and provide rich data insights to help you make the best hiring decisions.

SHL's Technology Hiring Solution delivers a highly fair, scientific, and fast tech evaluation process. It uses the power of AI to score code that are not compilable but logically correct. By identifying such additional candidates, we are able to increase the talent pipeline by at least 60%. This results in reducing talent shortage and building a high-quality and diverse tech workforce within half the time. Our Technology Hiring Solution is used by leading organizations across sectors to identify top class developers.

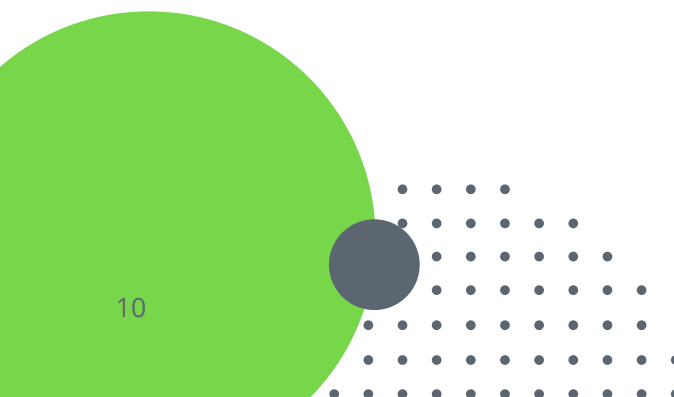


# Appendix

## SHL Coding Simulations

SHL's Coding Simulations<sup>17</sup> is an immersive, AI-powered coding assessment that evaluates candidate's programming skills in 50+ languages using real world coding problems. It is the first and world's only coding assessment that uses highly validated AI to score candidate's incomplete or uncompileable code on logical correctness and quality - that are strong indicators of job success and performance. This helps to reduce false rejects and improve throughput for recruiters by identifying more developers compared to traditional coding assessments.

Multiple variants of Coding Simulations are available to evaluate candidates across wide range of roles and technologies like Full Stack, Data Science, Front End, SQL, Selenium, DevOps, Diagram & Architecture and more.



<sup>17</sup> <https://www.shl.com/en/solutions/recruit-select-candidates/tech/coding-simulations/>



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SHL brings powerful and transparent AI technology, data science, and objectivity to help companies attract, develop, and grow the workforce they need to succeed in the digital era.

We empower talent strategies to unlock the full potential of your greatest asset—people.