T.C. SANAYİ VE TEKNOLOJİ BAKANLIĞI

#MİLLİ TEKNOLOJİ HAMLESİ

TÜBİTAK

2023

TÜRKİYE SOFTWARE TECHNOLOGIES

USAGE REPORT

BİLGEM

SOFTWARE TECHNOLOGIES RESEARCH INSTITUTE

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TÜBİTAK
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SOFTWARE TECHNOLOGIES RESEARCH INSTITUTE

Software Technologies Research Institute (YTE) carries out R&D activities in the field of software technologies that our country needs and provides software development, digital transformation, software quality monitoring and consultancy services. It is especially involved in strategic, sensitive and critical projects of our country. It uses its R&D studies in software technologies in the projects it develops and shares its experienced knowledge with the sector.

> YTE continues to work with the vision of contributing to the development of the informatics ecosystem in order to lead research that makes our country a reference point in the field of software and to implement effective digital transformation strategies.

It is the only public institution in Türkiye to have received CMMI 5 certification.

INTRODUCTION

One of the most critical core competencies essential for realizing our national technology initiative is software development capability. Being proficient in software technologies is essential for pioneering in a rapidly digitizing world shaped by software and artificial intelligence, as well as for delivering better services and maintaining competitiveness.

> As TÜBİTAK BİLGEM Software Technologies Research Institute, we conduct research in many areas, ranging from the planning to the proper implementation of digital transformation, and provide support to our institutions in their critical and sensitive projects.

The Türkiye Software Technology Usage Report, which we prepared with the support of the Ministry of Industry and Technology of the Republic of Türkiye, General Directorate of National Technology, aims to guide our institutions aiming for transformation in terms of the technologies they can use and their training plans, and to identify the areas that require investment and development. We prepared our report, which was supported by a significant participation from the private sector and public institutions, with the answers to the questions covering the areas in the software life cycle.

- **CURRENTLY USED:** Technologies currently in use
- **INTENDED TO BE USED:** Technologies desired to be used in the future
- **SATISFIED:** Individuals who currently use a technology and would like to continue using it in the future
- **WILLING:** Individuals who have not previously used a technology but would like to experience it in the future

A total of **240 managers** and **725 employees** in various roles in the IT sector participated in our survey. We directed **24** questions to managers and **17** questions to employees, allowing them to choose multiple options. The study, evaluated from 14 different perspectives, focused on the areas participants aim to pursue in the future.

MANAGER

GENDER

- 24 — FEMALE
- 216 — MALE

EDUCATION

- 9 — HIGH SCHOOL
- 14 — ASSOC. DEGREE
- 134 — BACH. DEGREE
- 60 — MASTER
- 23 — DOCTORATE

EXPERIENCE

- 3 — <2 YEARS
- 24 — 2-9 YEARS
- 41 — 10-14 YEARS
- 39 — 15-19 YEARS
- 50 — 20-24 YEARS
- 83 — ≥25 YEARS

AGE

- - — <20 YEARS
- 1 — 20-24 YEARS
- 15 — 25-29 YEARS
- 72 — 30-39 YEARS
- 101 — 40-49 YEARS
- 51 — ≥50 YEARS

EMPLOYEE

GENDER

- 200 — FEMALE
- 525 — MALE

EDUCATION

- 28 — HIGH SCHOOL
- 52 — ASSOC. DEGREE
- 493 — BACH. DEGREE
- 138 — MASTER
- 14 — DOCTORATE

EXPERIENCE

- 156 — <2 YEARS
- 256 — 2-9 YEARS
- 123 — 10-14 YEARS
- 101 — 15-19 YEARS
- 44 — 20-24 YEARS
- 45 — ≥25 YEARS

AGE

- 5 — <20 YEARS
- 76 — 20-24 YEARS
- 172 — 25-29 YEARS
- 305 — 30-39 YEARS
- 137 — 40-49 YEARS
- 30 — ≥50 YEARS

PROGRAMMING LANGUAGES AND SOFTWARE FRAMEWORKS

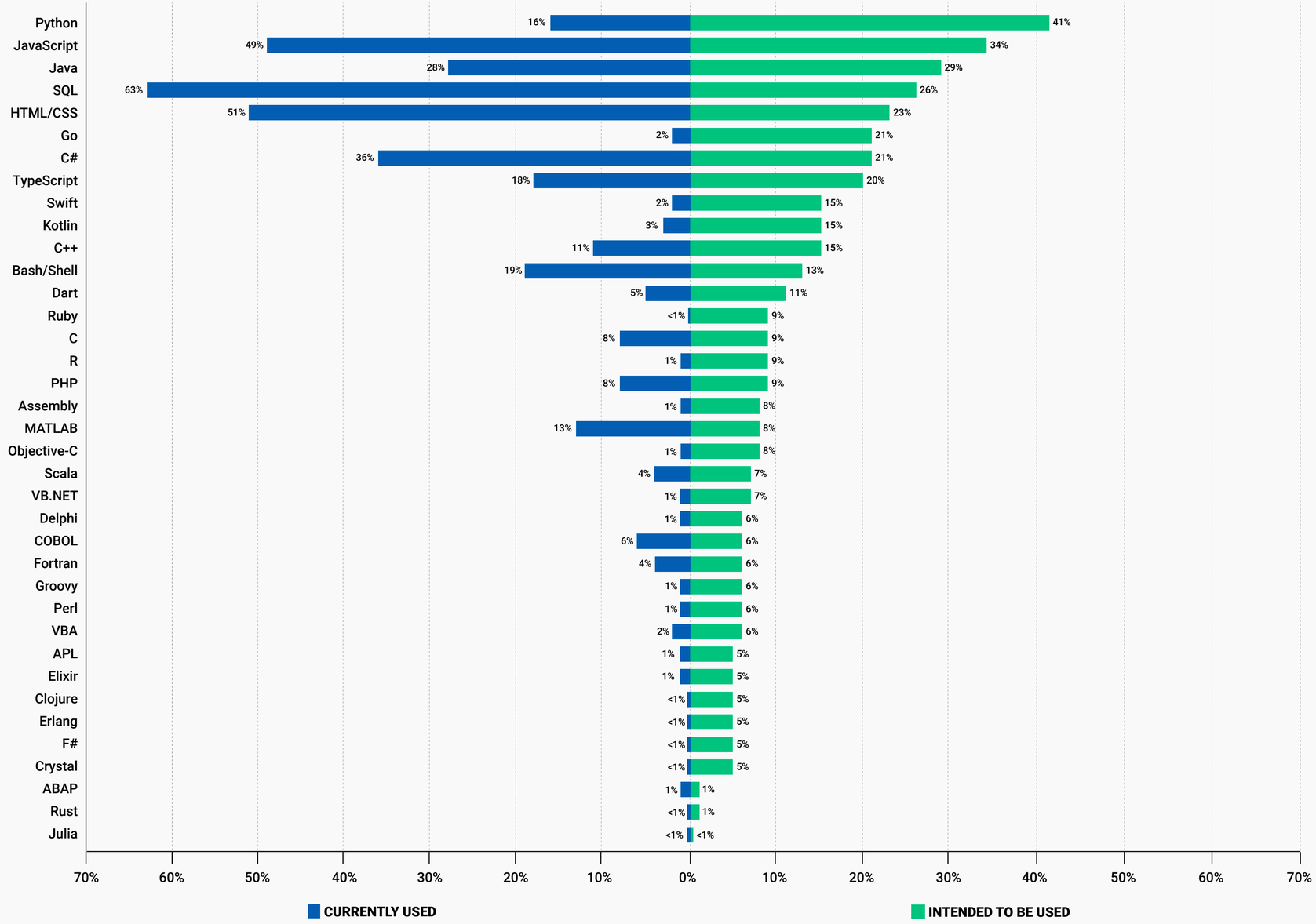
With the advancement of technology and increasing demand for software solutions, the development in programming languages continues. The growing needs have led to efforts to enhance developer experience and increase diversity in programming languages. Newly emerging languages or new versions of existing languages generally focus on meeting modern needs faster and more reliably.

When we examine the programming languages used in our country, we see parallels with those used worldwide. When evaluating the trend in programming languages and the usage trend in software frameworks, we can say that there is a tendency towards open-source technologies in our institutions.

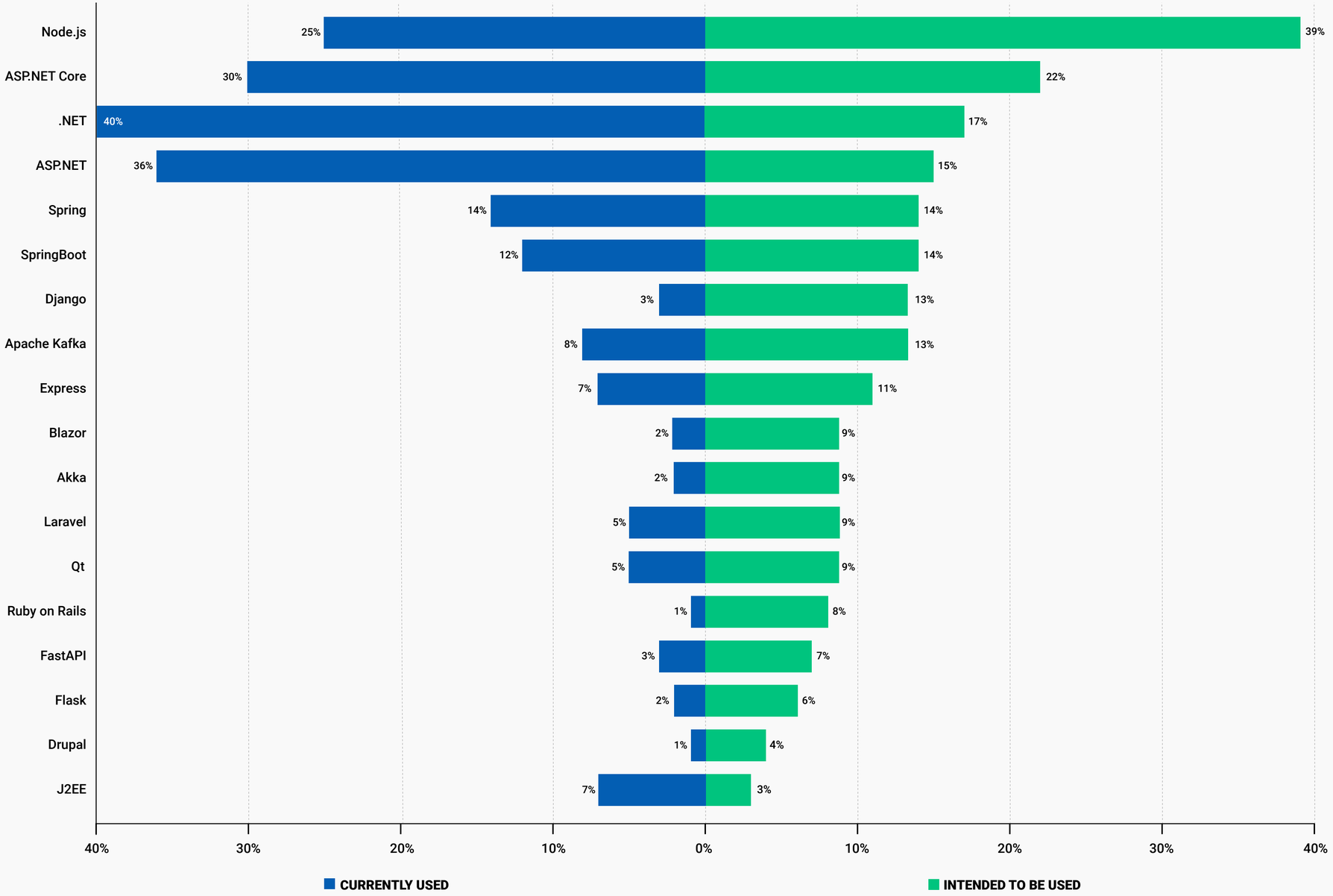
We observe that **SQL** is the most commonly used language by developers. For developing enterprise applications, **Java** and **C#** are more widely used. When comparing worldwide usage, we can say that **JavaScript** usage is slightly more common in our country.

In comparison to international usage rates, we see that **Python** is less preferred in our country.

It can be anticipated that time is needed for new languages such as Kotlin, Go, Dart, Rust to become more widespread in our country.

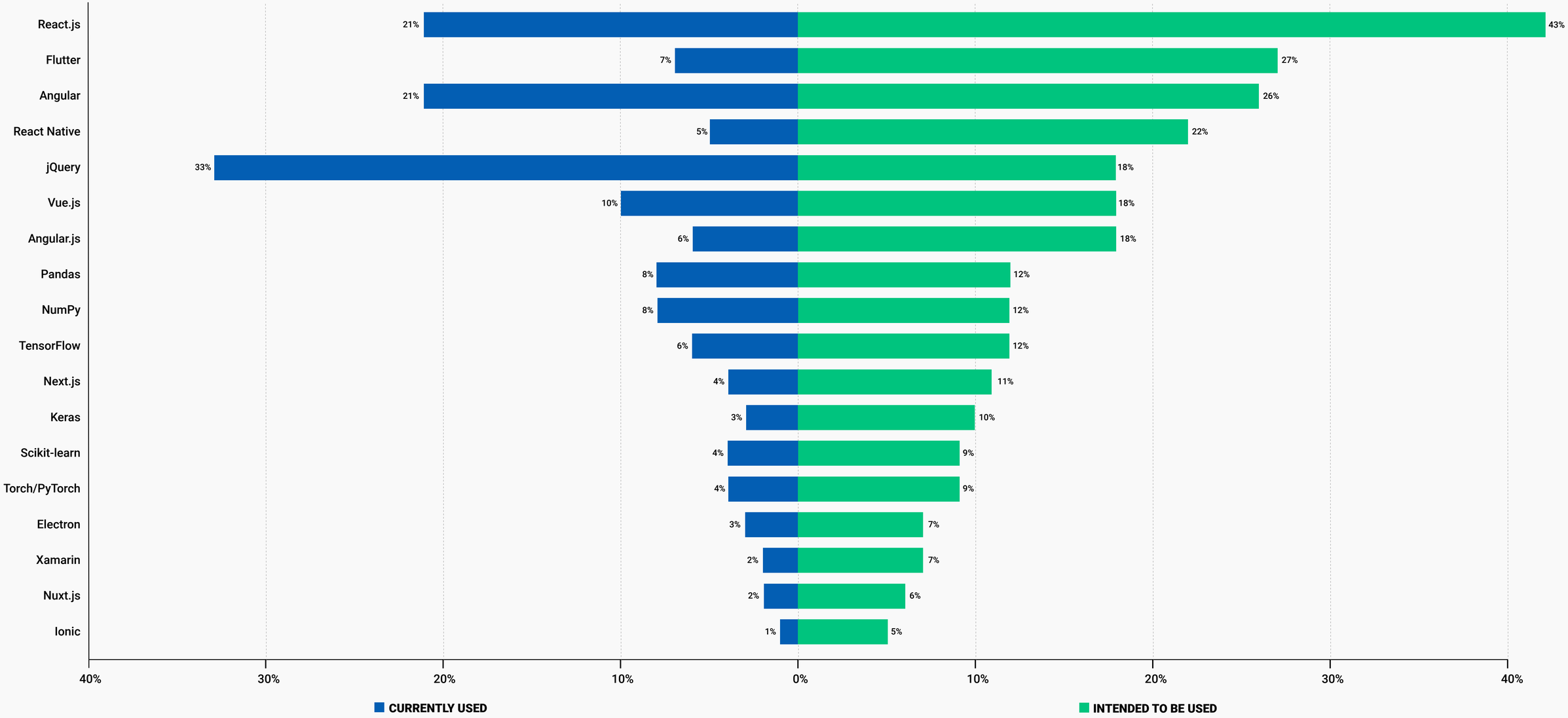


FRAMEWORKS AND LIBRARIES

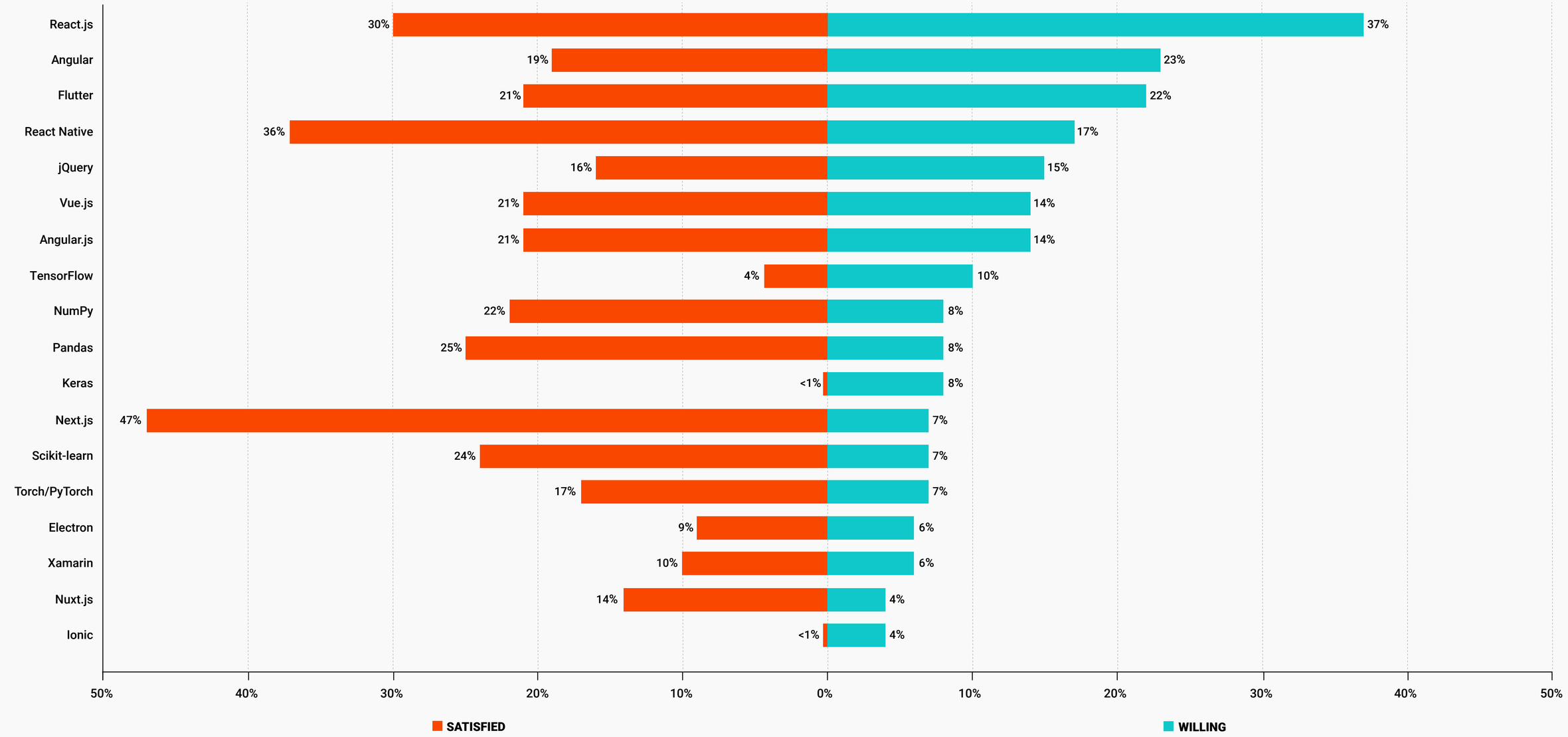


We observe that .NET technologies stand out among the web frameworks used for enterprise applications. However, we understand that those using Microsoft technologies will increasingly gravitate towards the **ASP.NET Core** framework. The fact that ASP.NET Core offers a platform-independent and open-source framework is the main reason for this development. We can say that the **Spring** framework, which is standard in the Java ecosystem, is also widely used in our country.

We see that the use of Node.js for back-end development is widespread, and it is the most desired framework for the future. Since the majority of those who want to use **Node.js** have not used it before, we can say that it will be preferred more in the future.

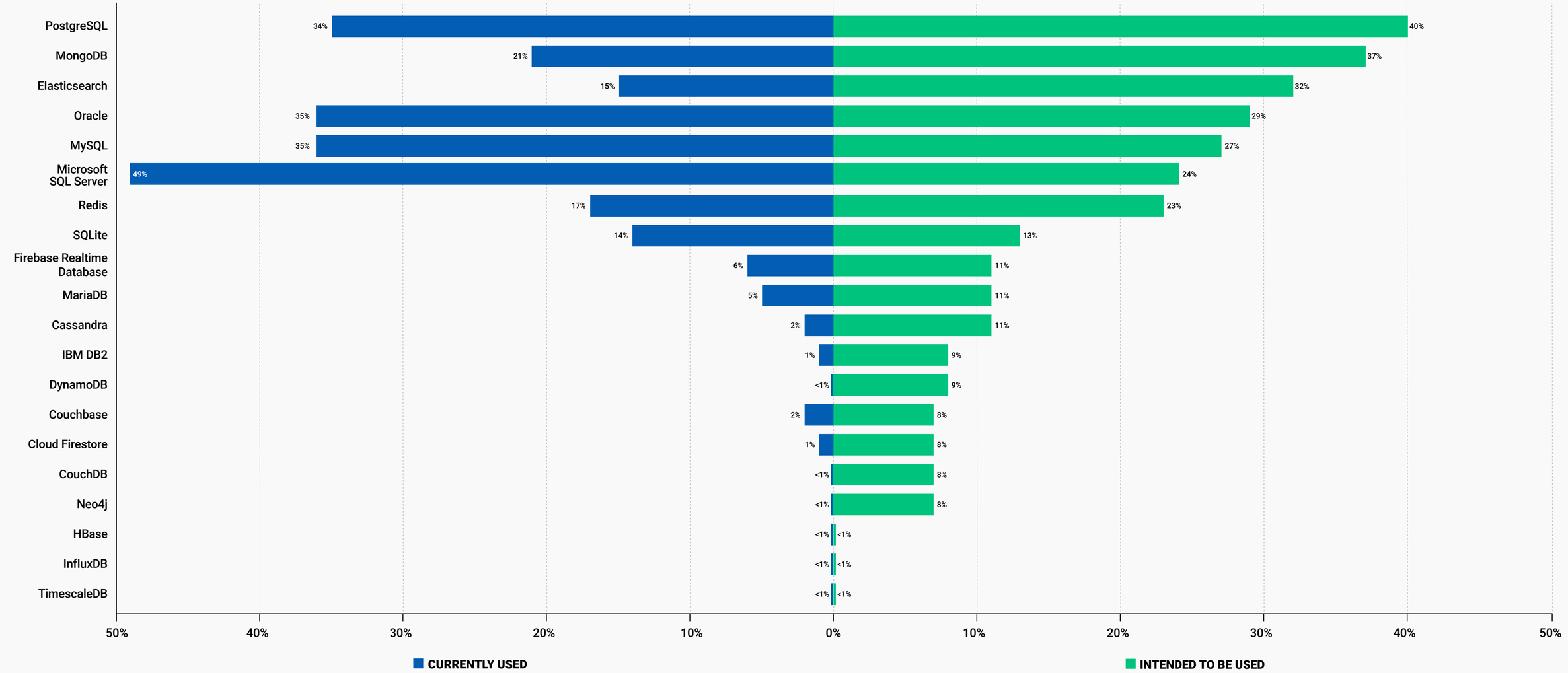


In frontend development, while **Angular** and **React.js** are equally used at present, it can be said that the transition to **React.js** will increase in the future. It is possible to say that the usage trend in both frontend and data science in our country continues parallel to the usage worldwide.

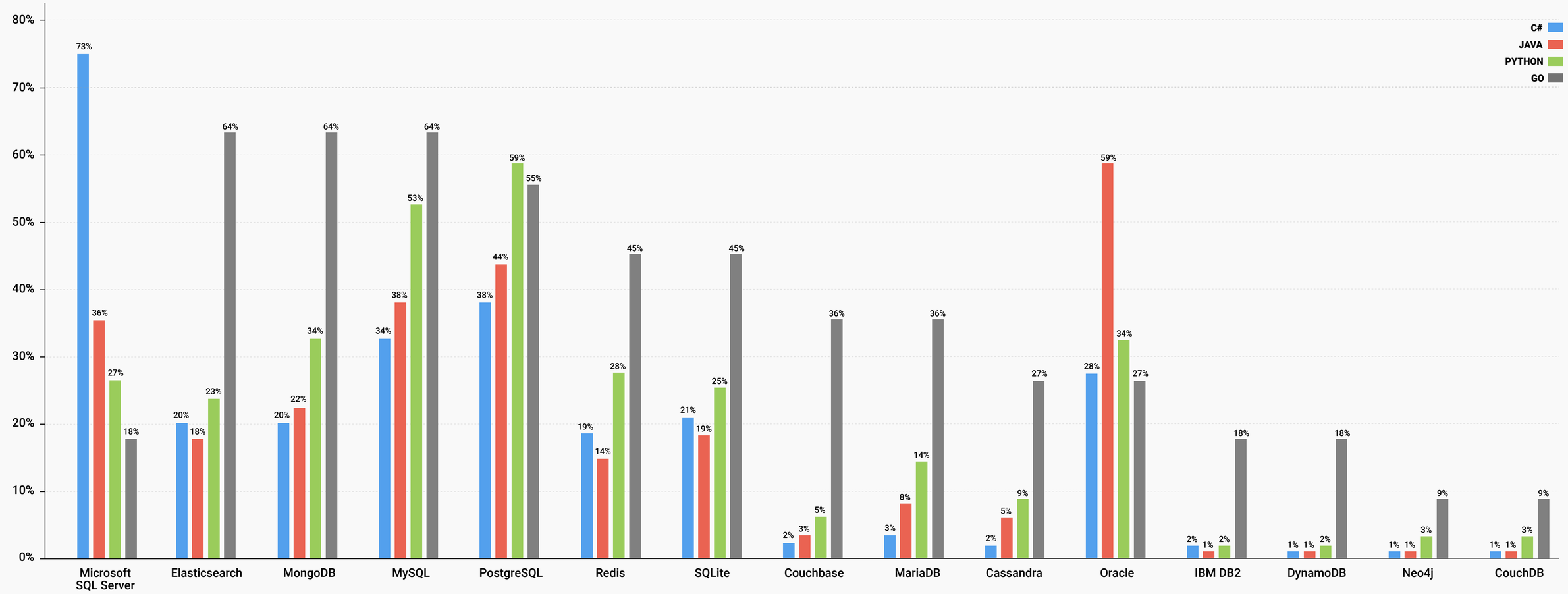


Users of **Next.js** and **React Native** are the most satisfied with the frameworks and libraries they currently use. The growth of React.js, on the other hand, is expected to be driven by those who have not yet used it.

DATABASE TECHNOLOGIES



In the realm of database technologies, **Microsoft SQL Server** stands out as the most preferred database. However, it is encouraging to see that our institutions are leaning more towards open-source solutions, with **PostgreSQL** being the most desired database for the future. We can say that **MariaDB** has not gained as much attention in our country as it has globally. Among **NoSQL** database technologies, **MongoDB** and **Cassandra** are currently the most preferred databases. Participants have expressed their intention to continue using MongoDB in the future and to utilize solutions such as **Elasticsearch** and **Redis** more extensively.

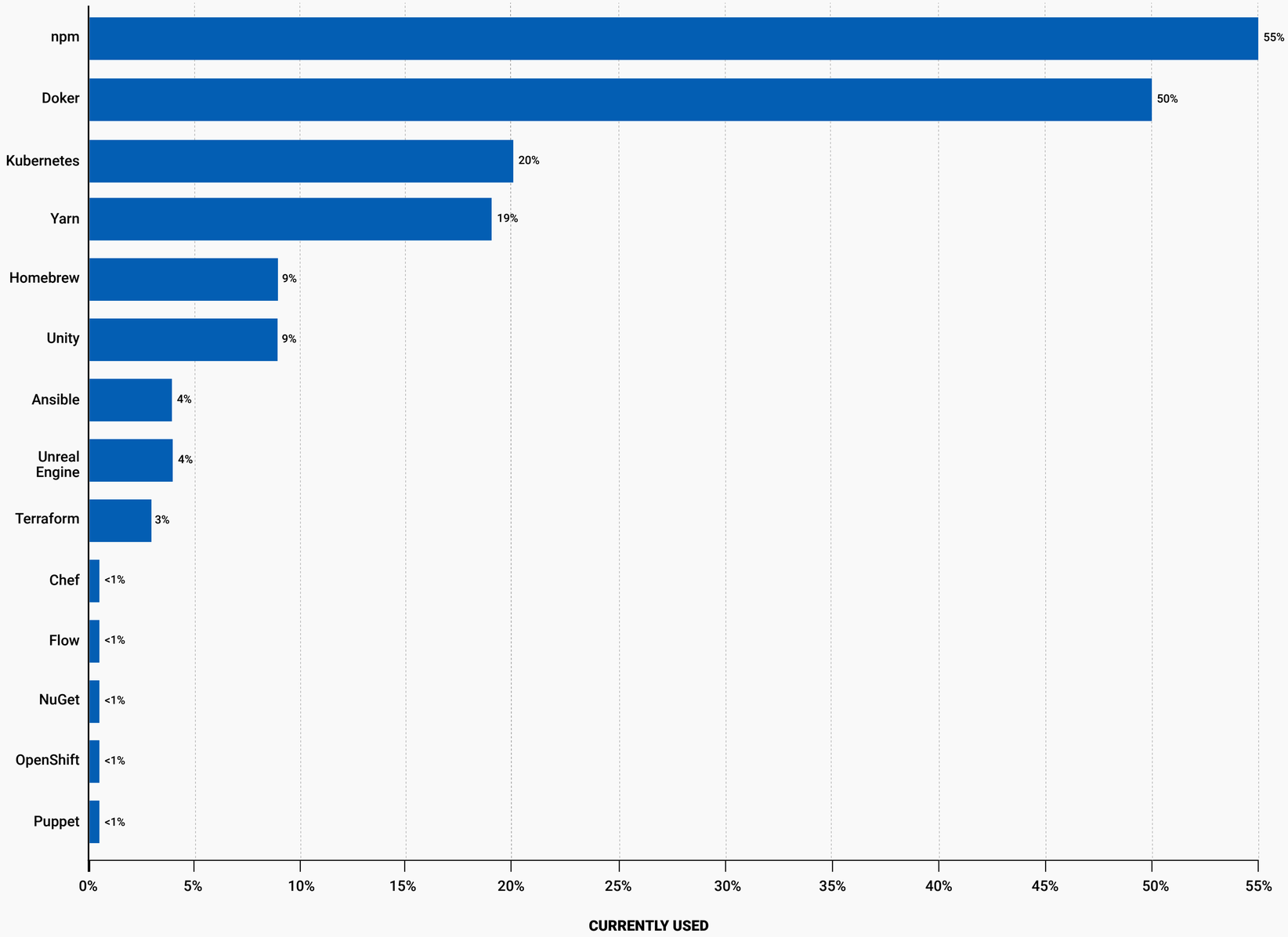


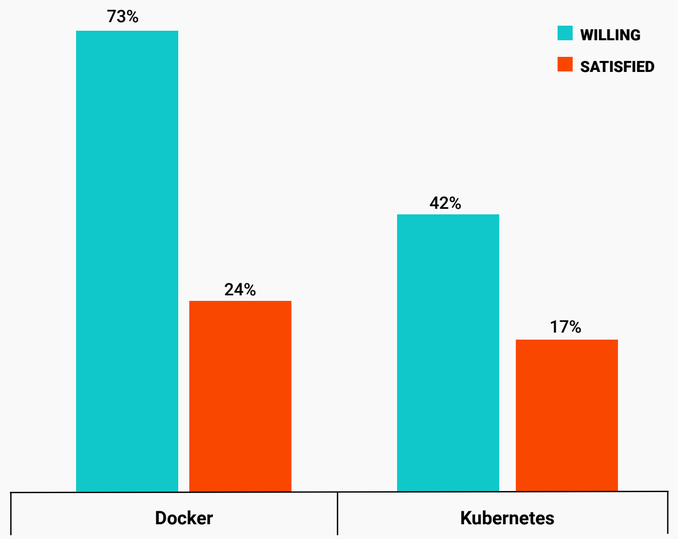
RELATIONSHIP BETWEEN PROGRAMMING LANGUAGES AND DATABASE TECHNOLOGIES

When examining the relationship between the programming languages used by our institutions and the database technologies:

- **Java** users predominantly prefer **Oracle** as their database, followed by open-source databases like PostgreSQL and MySQL.
- Among those who develop software using **C#**, 73 out of every hundred also use Microsoft SQL Server.
- **Python** users show a higher preference for open-source databases such as **PostgreSQL, MySQL**, and MongoDB.
- **Go** developers predominantly work with NoSQL databases like Elasticsearch and MongoDB, while their relational database preferences are MySQL and PostgreSQL.

DEVELOPMENT
TOOLS

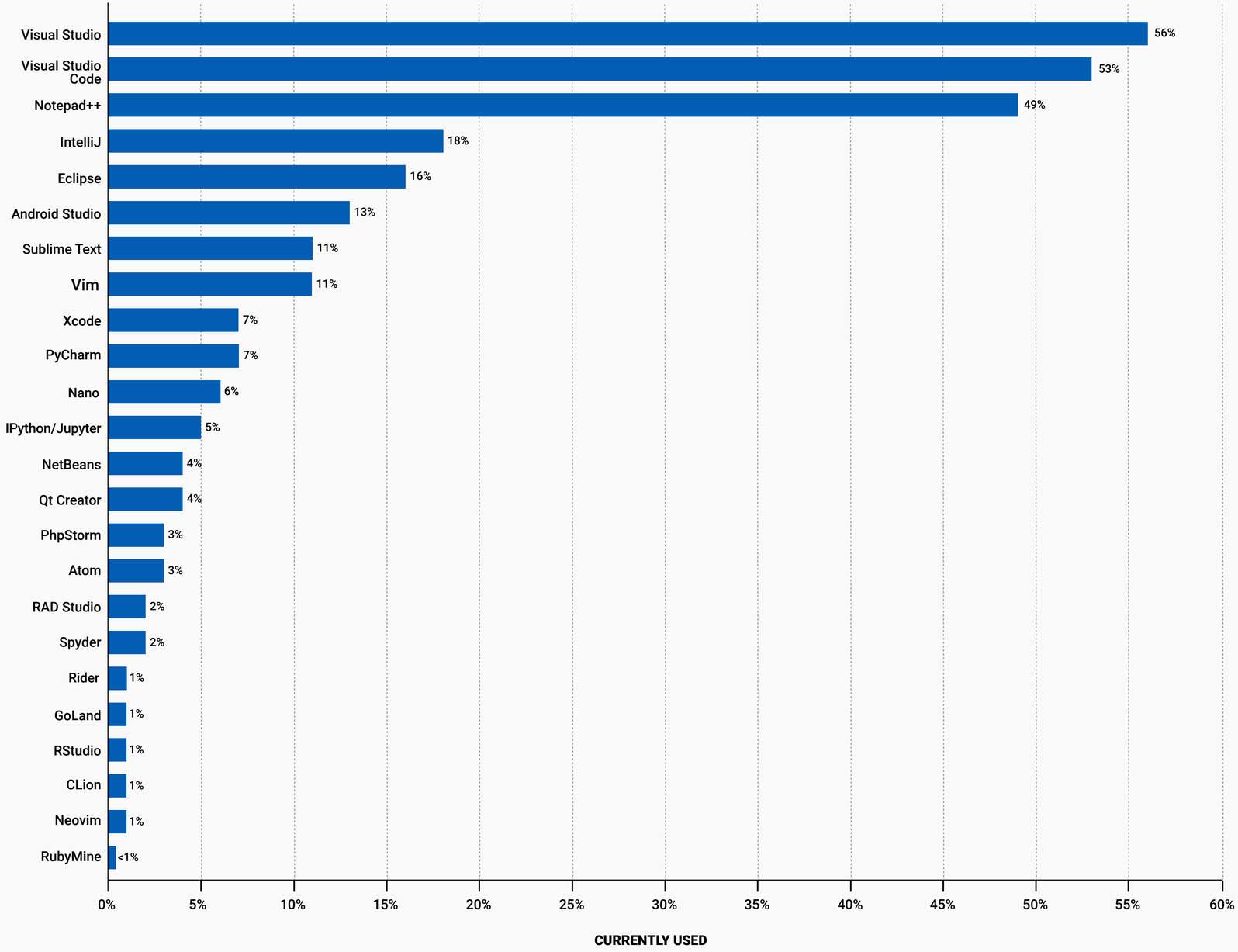


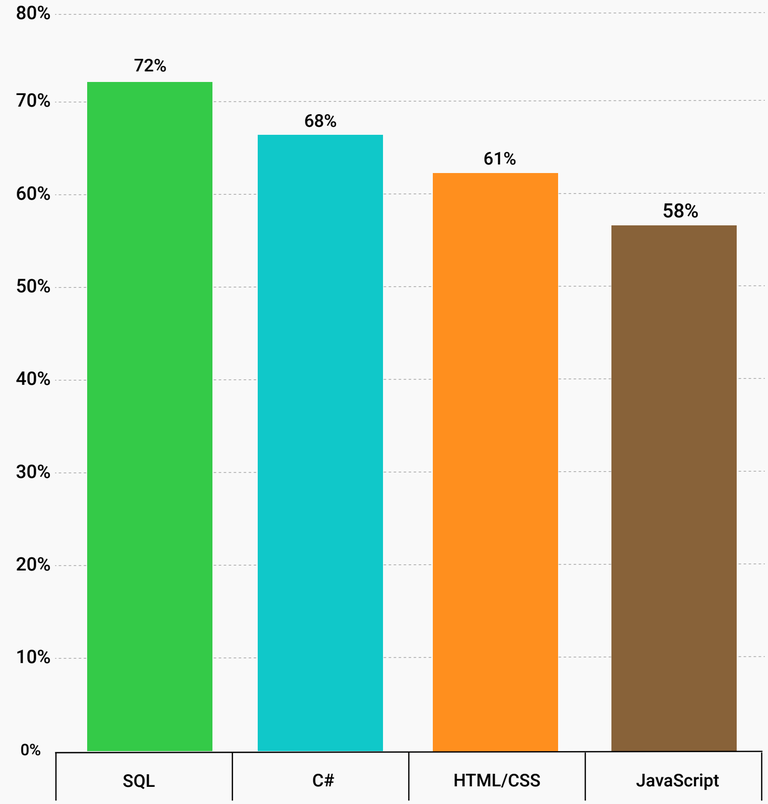


Among development tools, **npm** stands out as the most used and desired tool, with approximately one out of every two developers using **Docker**. We can say that these ratios are similar to the usage rates globally. Additionally, the widespread desire to experience these technologies in the future can be interpreted as the proliferation of virtualization technologies.

Among game developers, **Unity** is observed to be more widely used than **Unreal Engine.** Furthermore, when evaluated alongside Development Environments results, we see that **Visual Studio** is the most preferred environment among Game Developers.

DEVELOPMENT ENVIRONMENTS



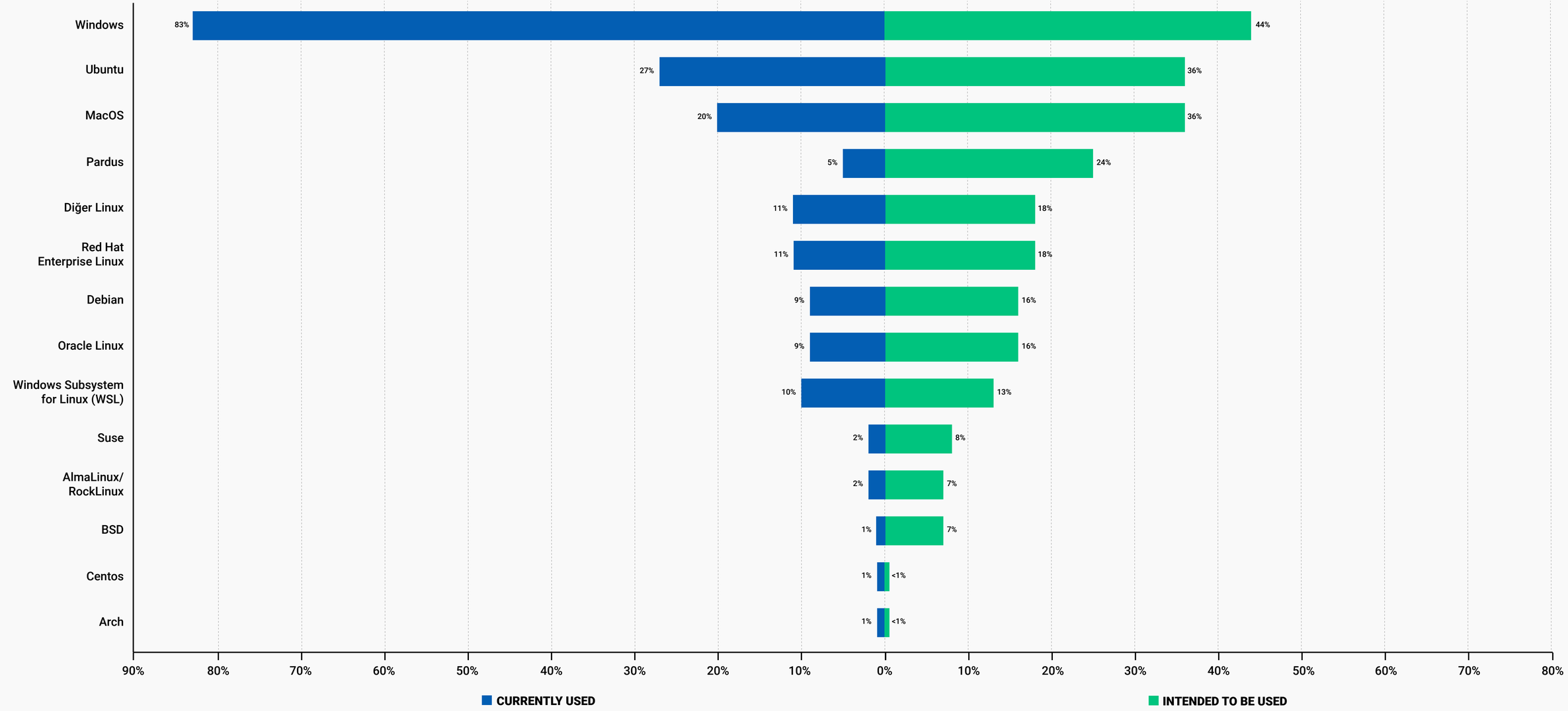


PREFERRED PROGRAMMING LANGUAGE OF VISUAL STUDIO USERS (TOP 4 PREFERENCES)

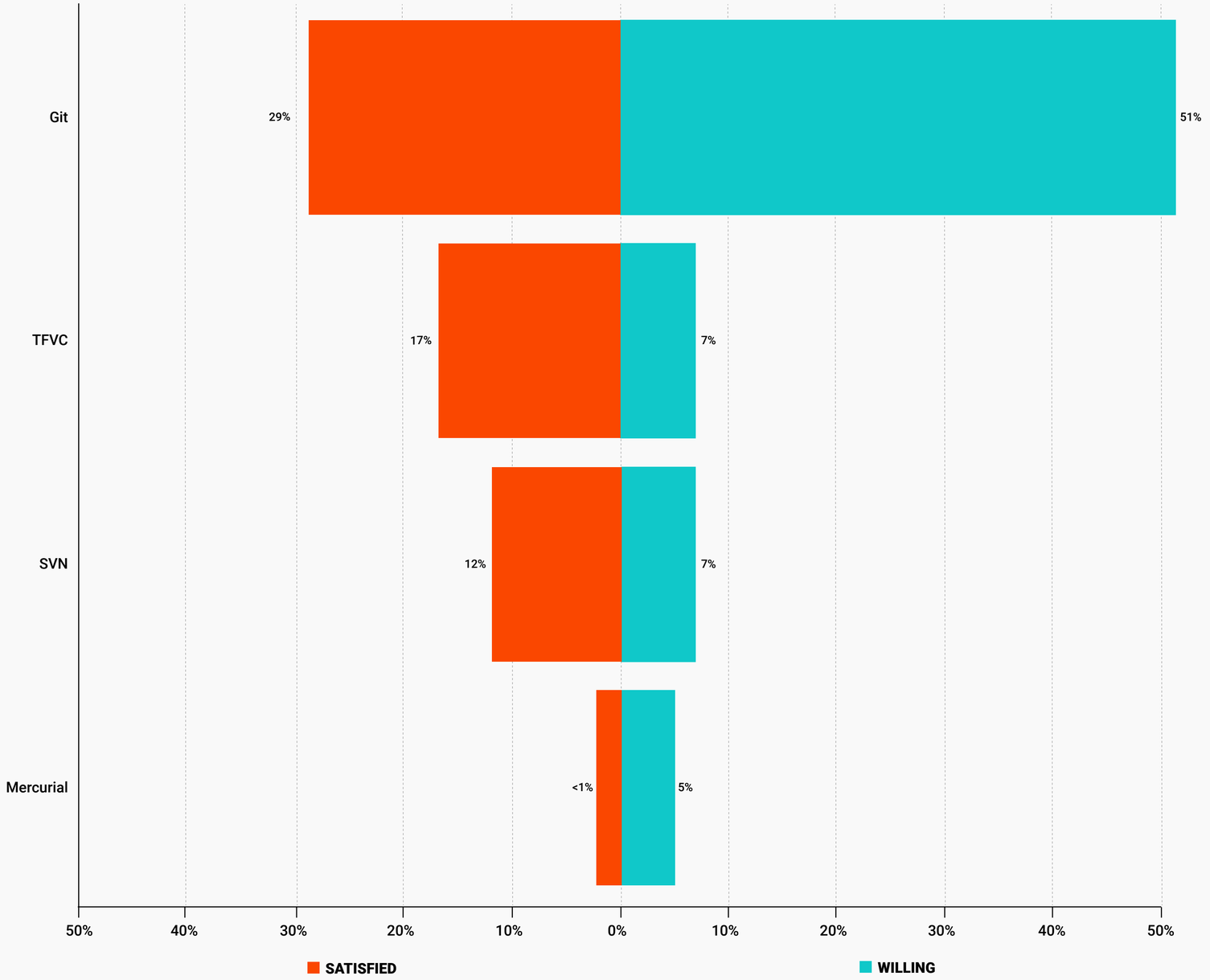
We observe that **Visual Studio** is the most widely used development environment in the software industry. It can be said that the vast majority of users of this tool use **SQL, C#,** and **JavaScript** languages. Particularly, a significant majority of those who write code in **C#** use **Visual Studio.**

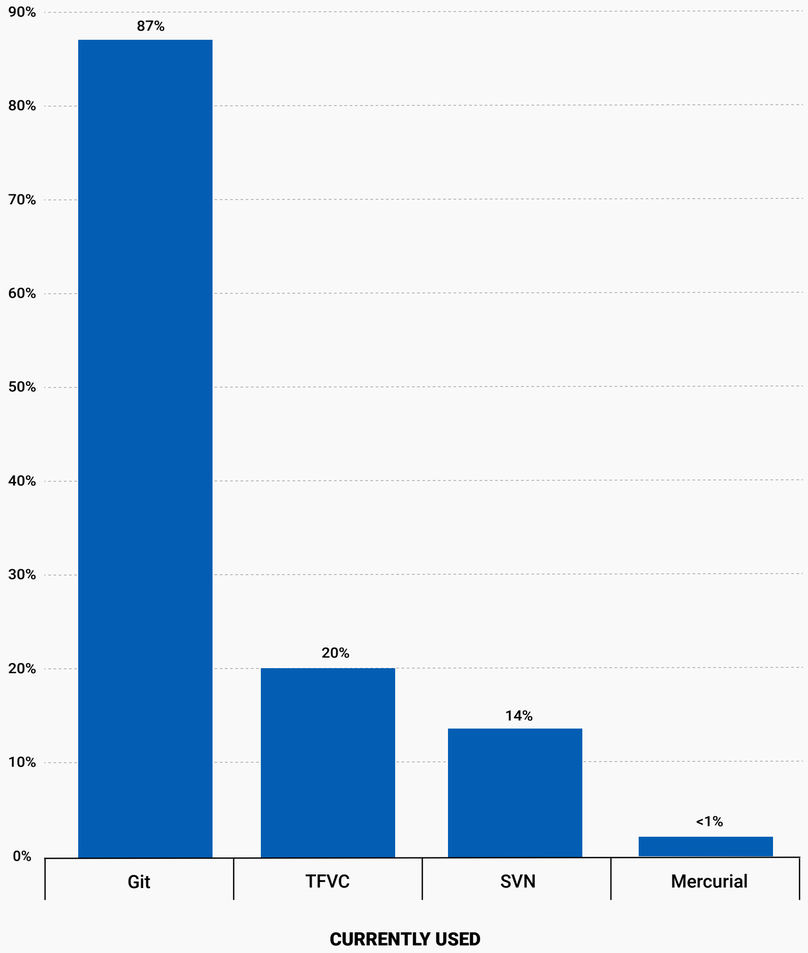
OPERATING SYSTEMS

We see that **Windows** continues to hold the title of the most widely used operating system among software developers. However, there is a strong demand for transitioning to **MacOS** and **Linux** distributions. While the current usage of **Pardus**, developed by **TÜBİTAK**, is at 5 %, the desire to use it is at 24 %. Although our current usage of open-source operating systems is below the world average, the future usage desire of our software developers demonstrates their inclination towards and trust in open source.

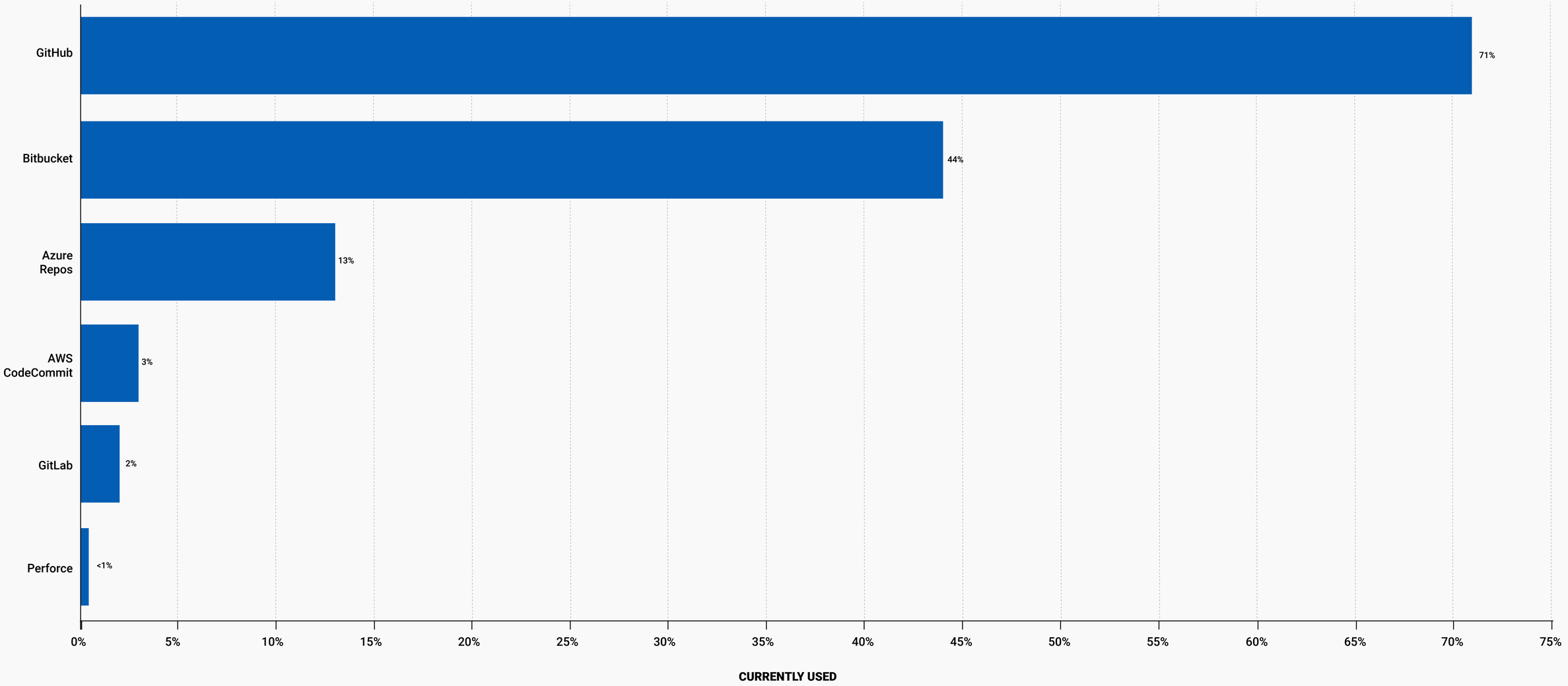


VERSION CONTROL SYSTEMS



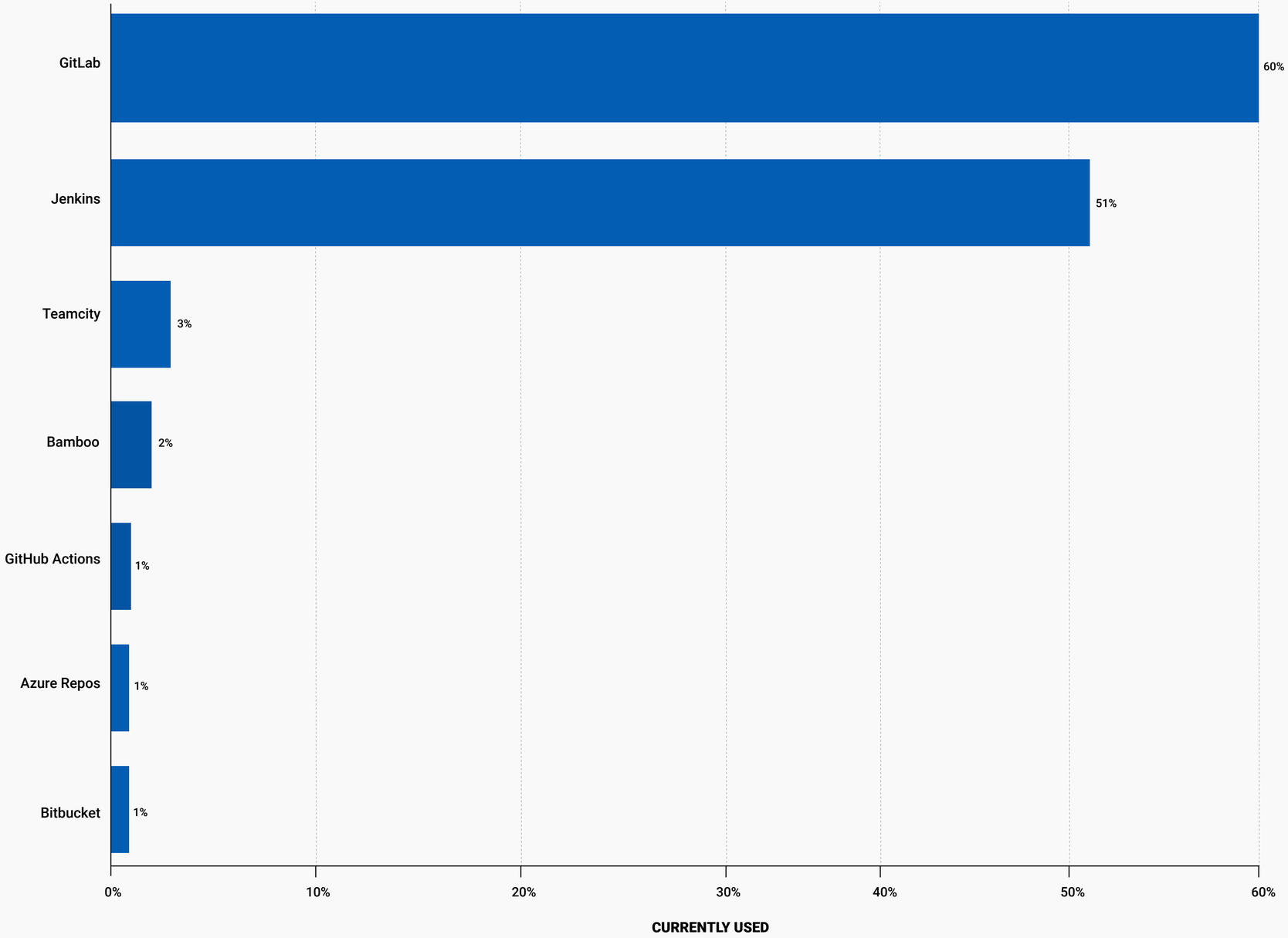


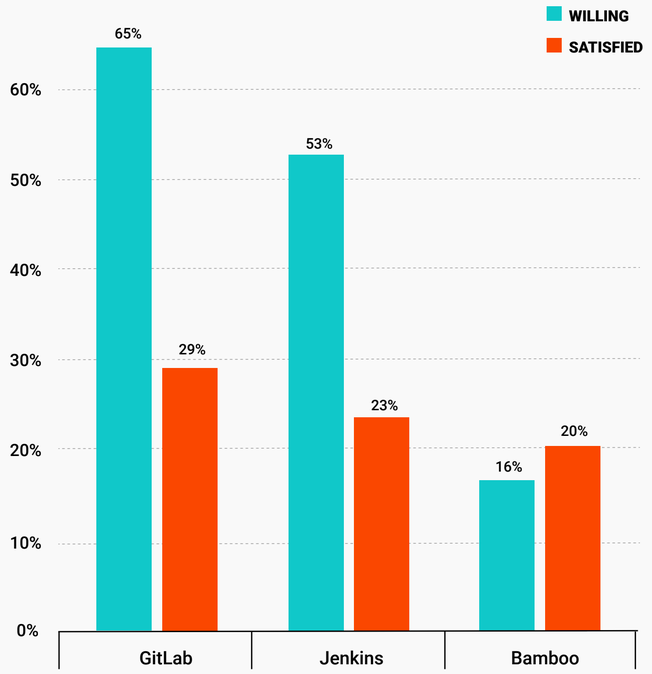
We observe that **Git** has practically become the standard among version control systems. Considering its widespread usage in the past, we can say that users have gradually preferred **Git** over time.



We see that **GitHub** is heavily preferred as a source code repository management tool. **Bitbucket**, from the **Atlassian** product family, is the second popular tool, used by 44 out of every hundred users. GitLab, which is mostly considered as an open-source solution, shows low performance in current and future usage. From the feedback received, we understand that commercial solutions dominate in this area, while interest in solutions like **Gitea** and **Gogs** is very limited.

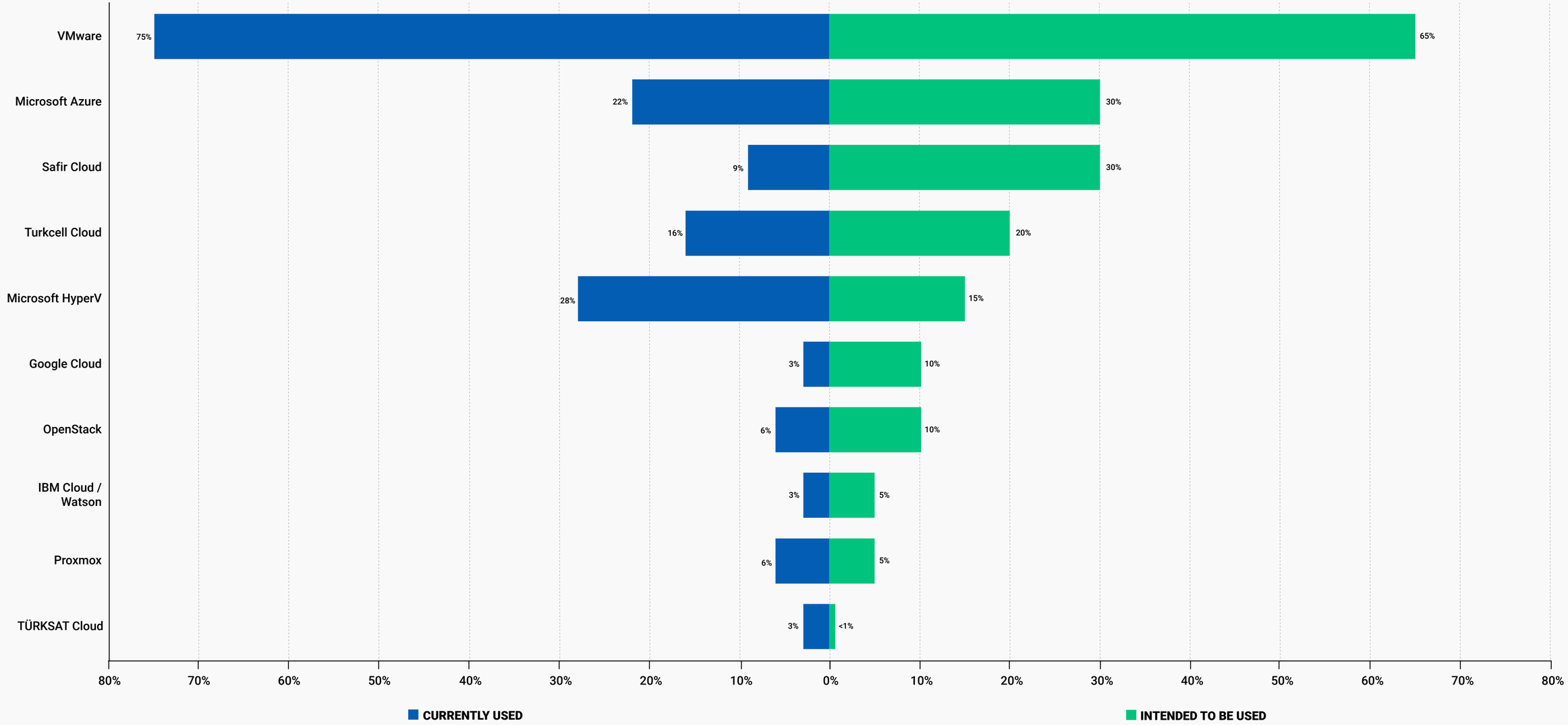
CONTINUOUS INTEGRATION AND CONTINUOUS DELIVERY TOOLS



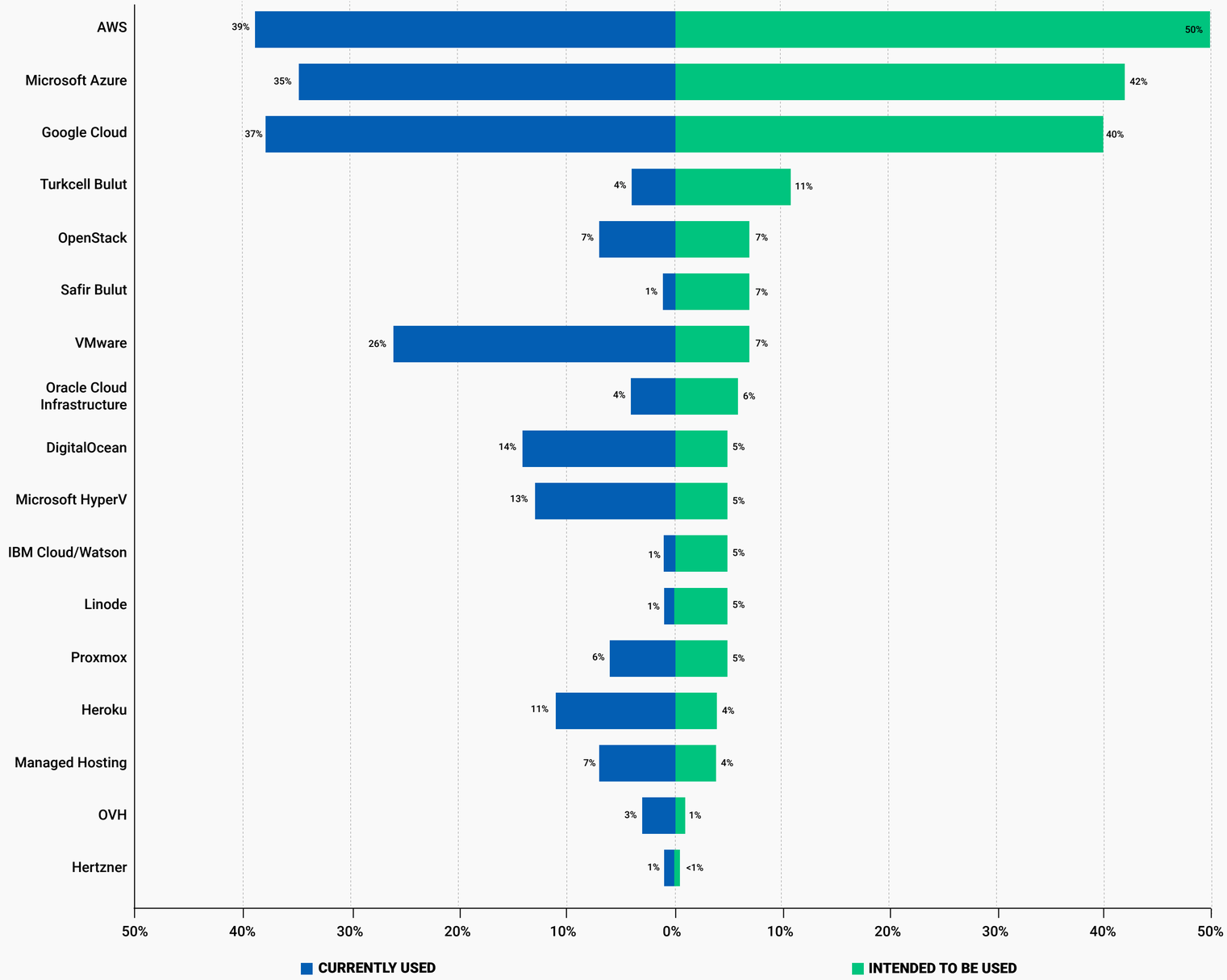


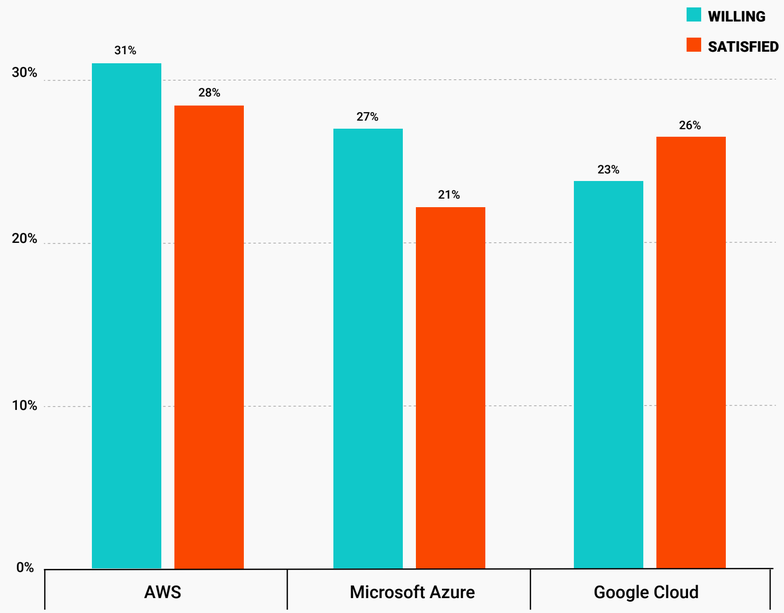
When we examine the usage rates of continuous integration and continuous delivery tools, we see that **GitLab** is the most preferred tool. Jenkins follows GitLab with a high usage rate. We can say that the popularity of GitLab and **Jenkins** is high, and those who have not yet used these products are considering trying them in the near future. Additionally, we predict that solutions such as **GitHub Actions, Azure DevOps,** and **AWS DevOps,** which are emerging in 2023, will increase in usage rates in the future.

CLOUD AND VIRTUALIZATION
USAGE



It is known that our public institutions limit their use of cloud services due to security concerns and prefer virtualization on on-premises servers. In this area, we see that **VMware** is predominantly used, followed by **Microsoft HyperV.** We can say that the usage of **Safir Cloud** solution developed by TÜBİTAK BİLGEM is increasing and has gained significant importance in the future plans of our institutions. Overall, we can speak of a limited but growing trend towards cloud solutions in the public sector.

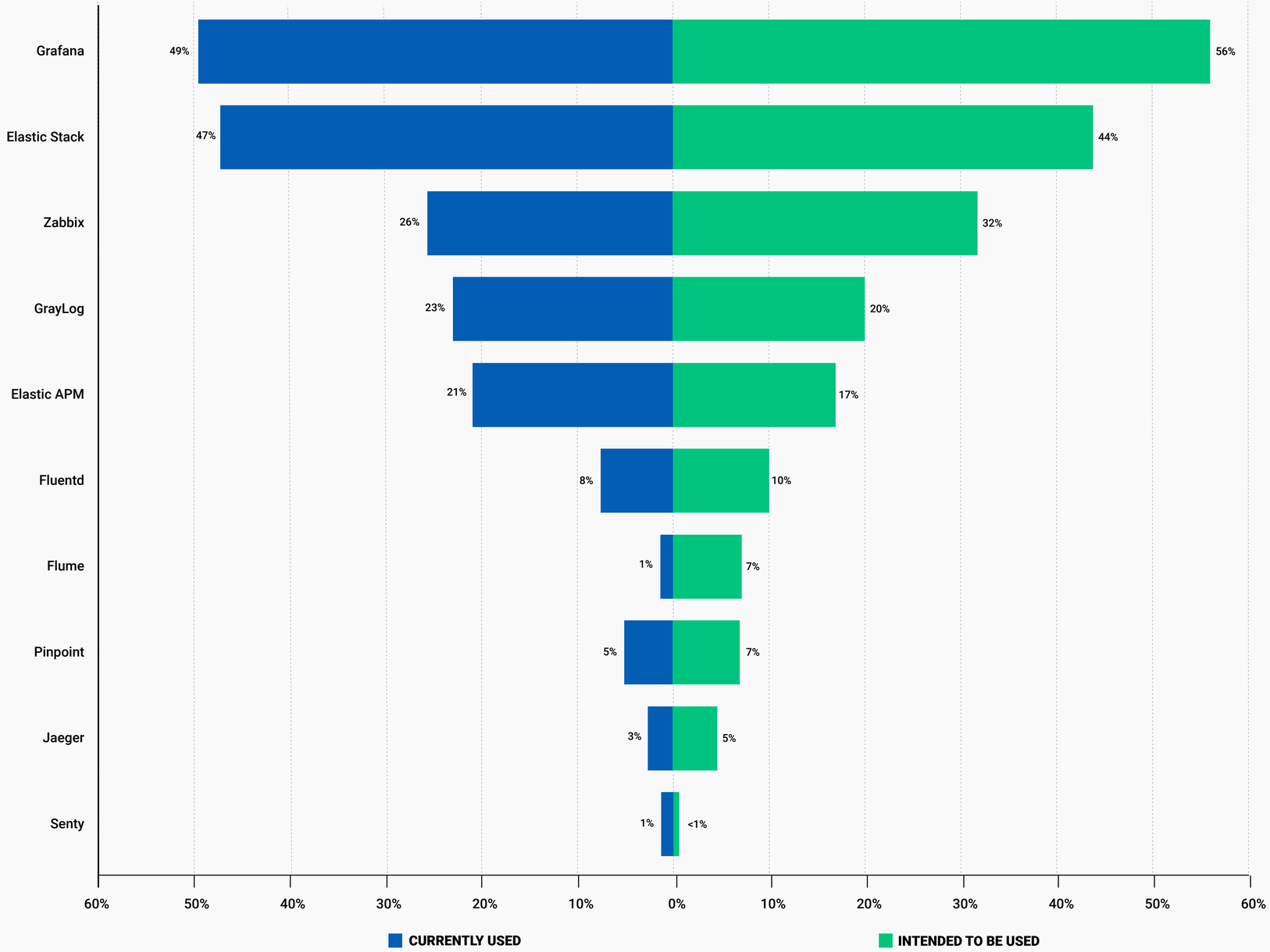


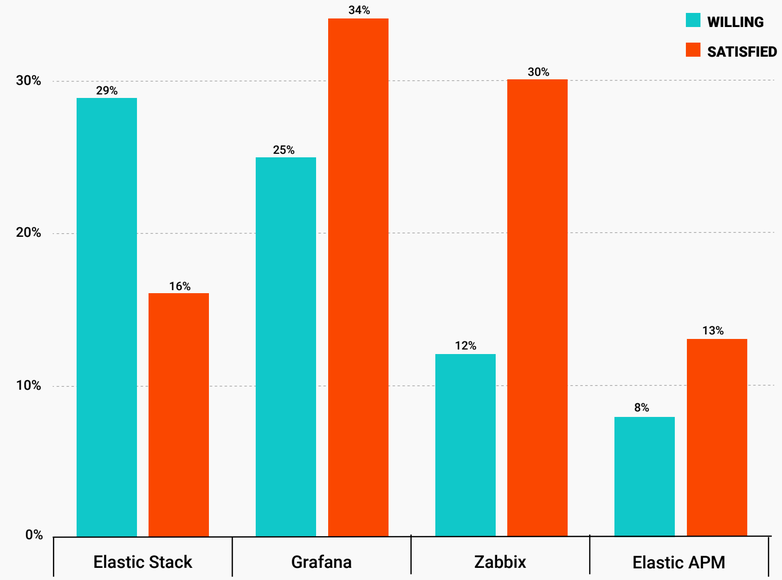


In the cloud and virtualization preferences of our private sector companies, we see that there are many small and large cloud providers currently being used. Among these cloud providers, **AWS, Google Cloud,** and **Microsoft Azure** are both currently heavily preferred and desired for future use.

In terms of future perspective, we can say that AWS and Microsoft Azure are the most popular solutions among those who will experience them for the first time. From this perspective, we see that **VMware** and **Microsoft HyperV** will lag behind in the private sector. Additionally, we can express that T**urkcell Cloud,** a domestic cloud provider, and **Safir Cloud,** developed by **TÜBİTAK BİLGEM,** will be more preferred in the future.

LOGGING AND
MONITORING TOOLS

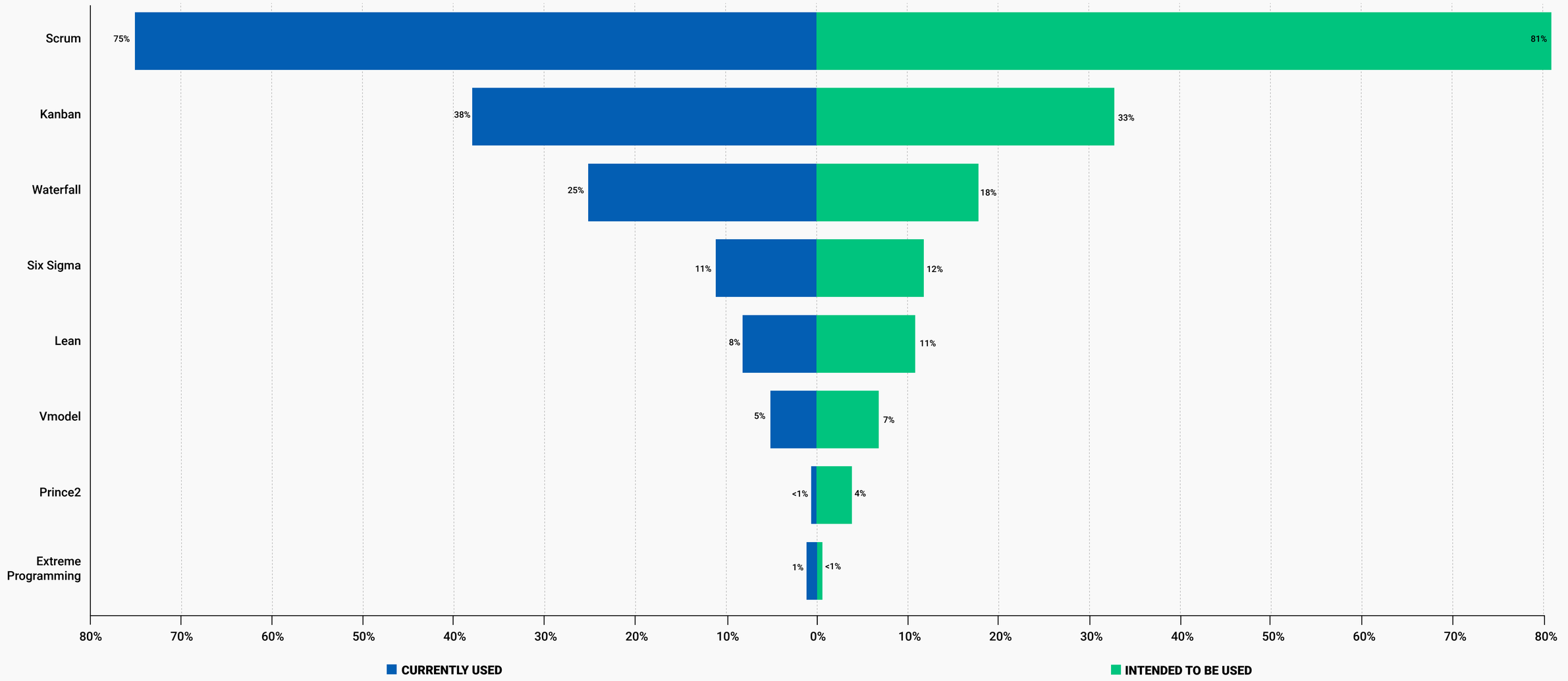




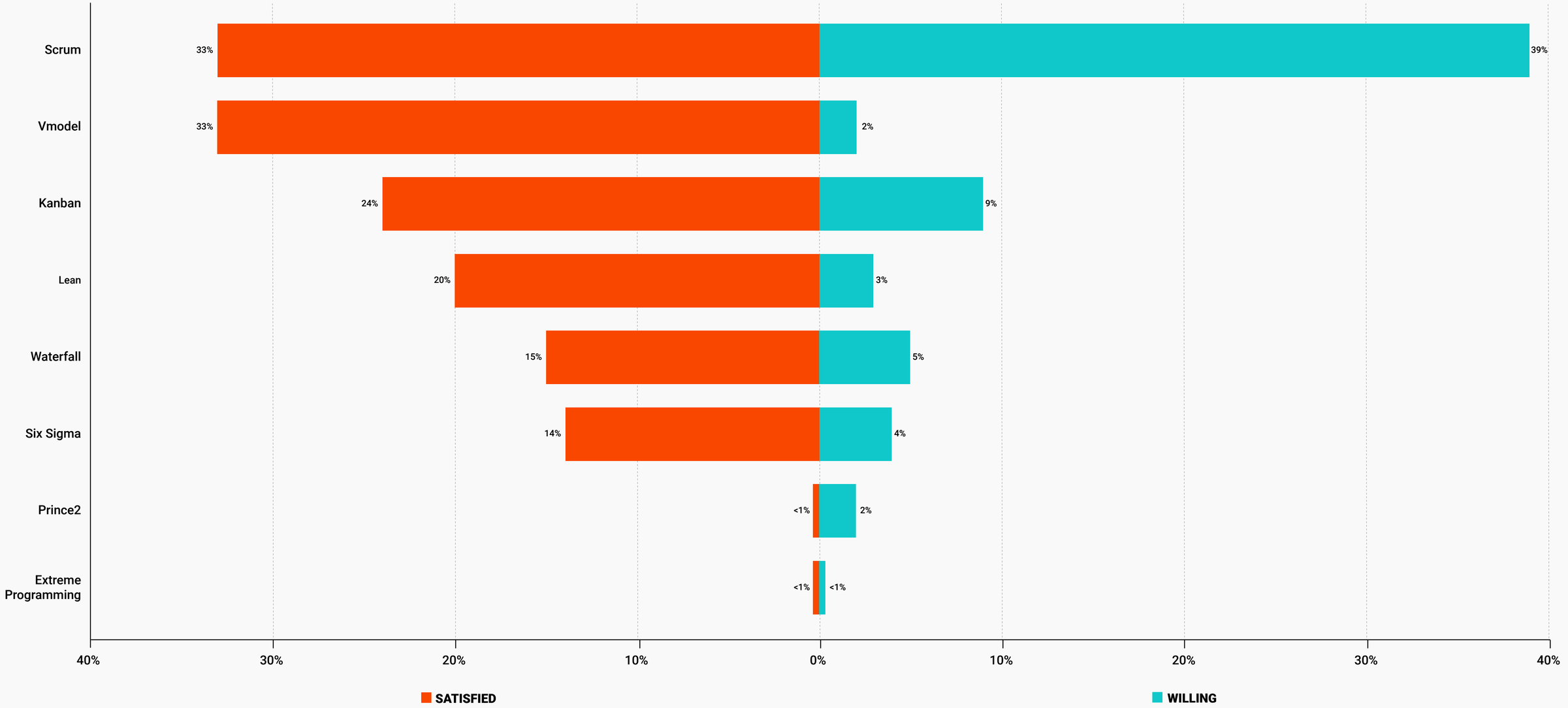
Among logging and monitoring tools, we see that **Grafana** and **Elastic Stack** are widely used. Both systems offer a flexible and customizable structure to provide solutions tailored to different needs. It can be said that **Grafana** will continue to be the most heavily used monitoring tool in the future among these tools. Additionally, we can say that **Elastic Stack** is more popular among those who will use it for the first time and is desired to be experienced more.

We observe that the usage of tools such as **Pinpoint** and **Sentry**, used as application performance monitoring tools, remains low. Similarly, Jaeger, which offers an open-source solution for distributed tracing, has not achieved widespread usage.

PROJECT MANAGEMENT METHODOLOGIES

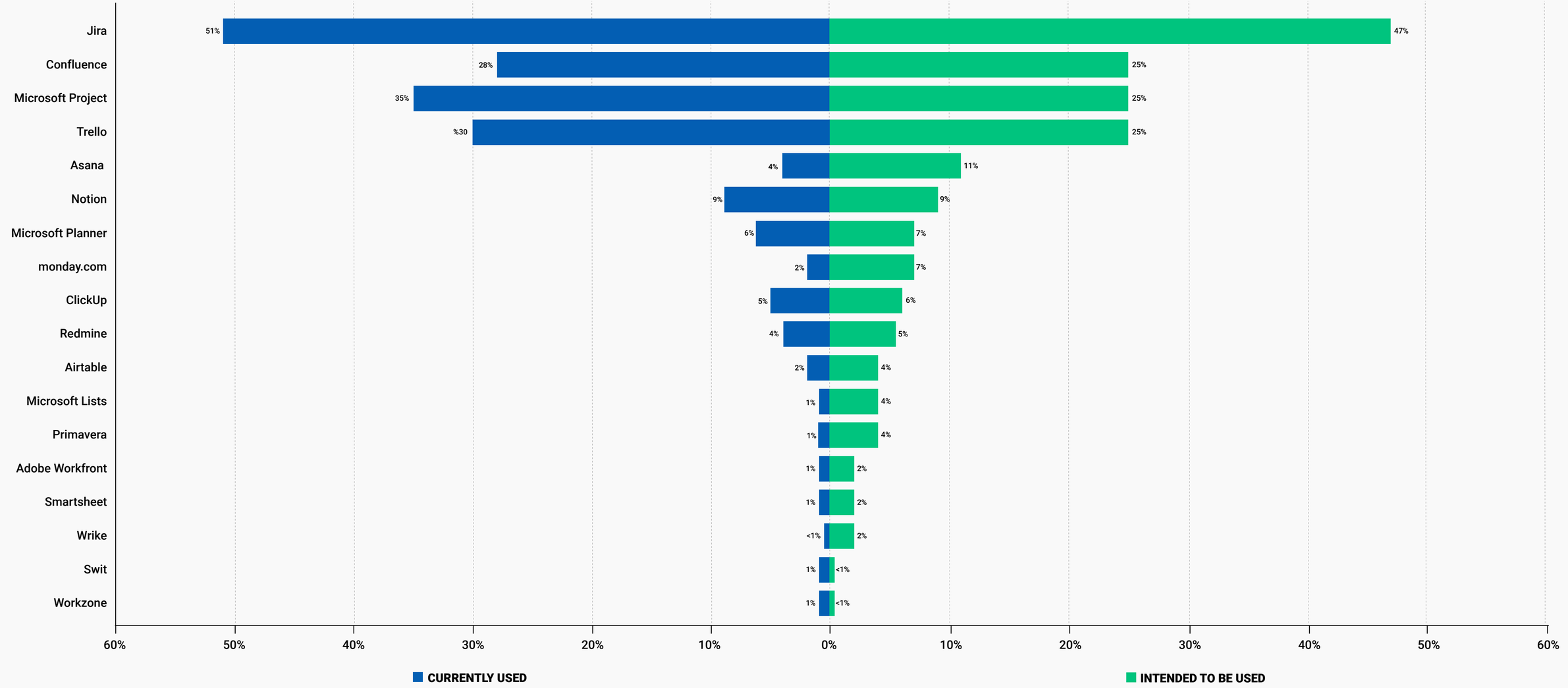


The usage of Project Management Methodologies has evolved from comprehensive approaches like the **Waterfall** method to **agile approaches.** Scrum stands out as the most widely used methodology, while 25 out of every hundred people continue to use the Waterfall method. When we look at the cross-relationship between experience and methodology usage, we can say that individuals with over 25 years of experience prefer the **Waterfall** method more.



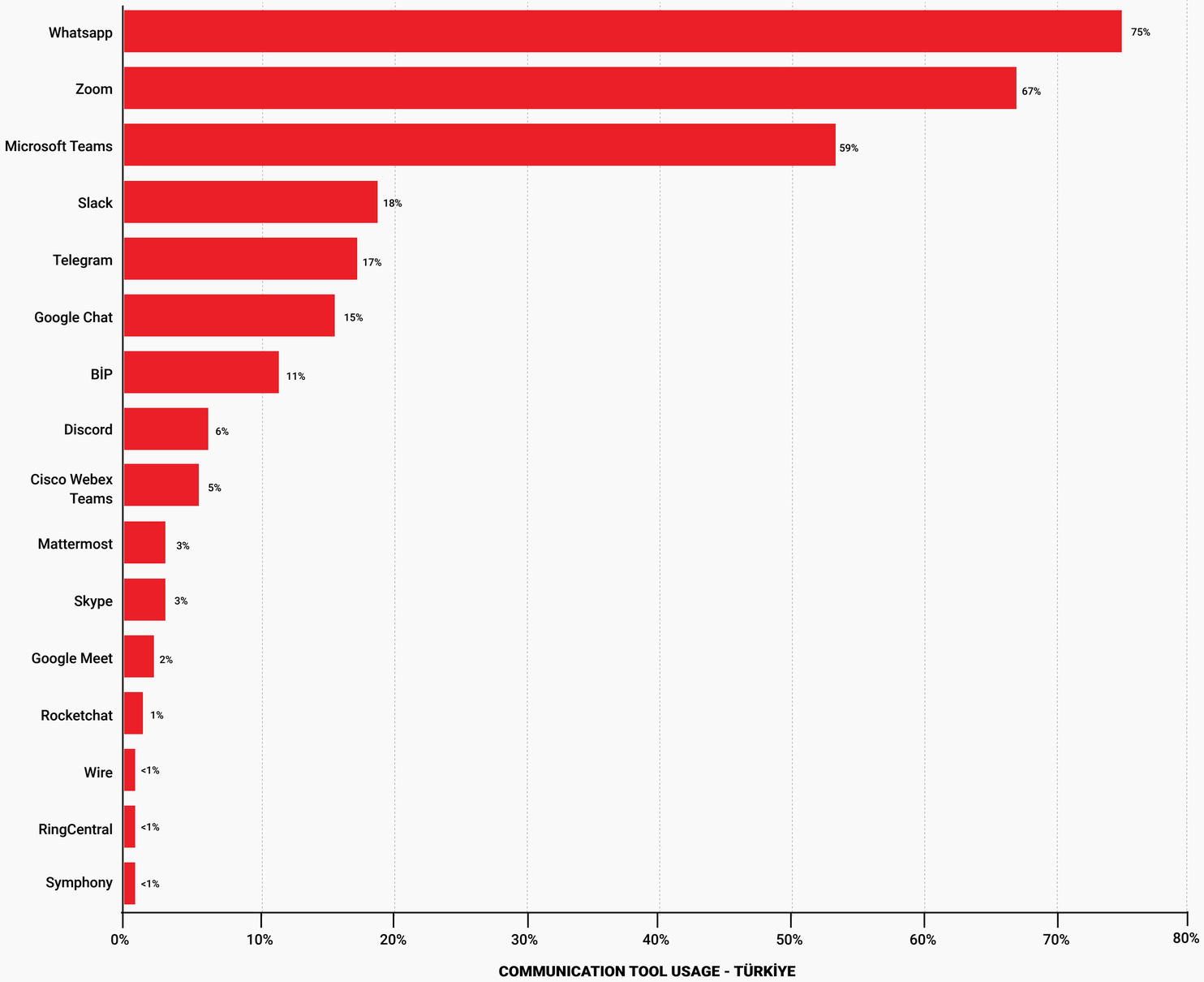
In the future perspective, we foresee that there will not be a significant change, with agile approaches continuing to strengthen, but approaches like **Waterfall** and **V-model** will also persist. When we look at the percentages of those who want to use them in the future, we can say that the adoption of Scrum will increase.

PROJECT MANAGEMENT
TOOLS



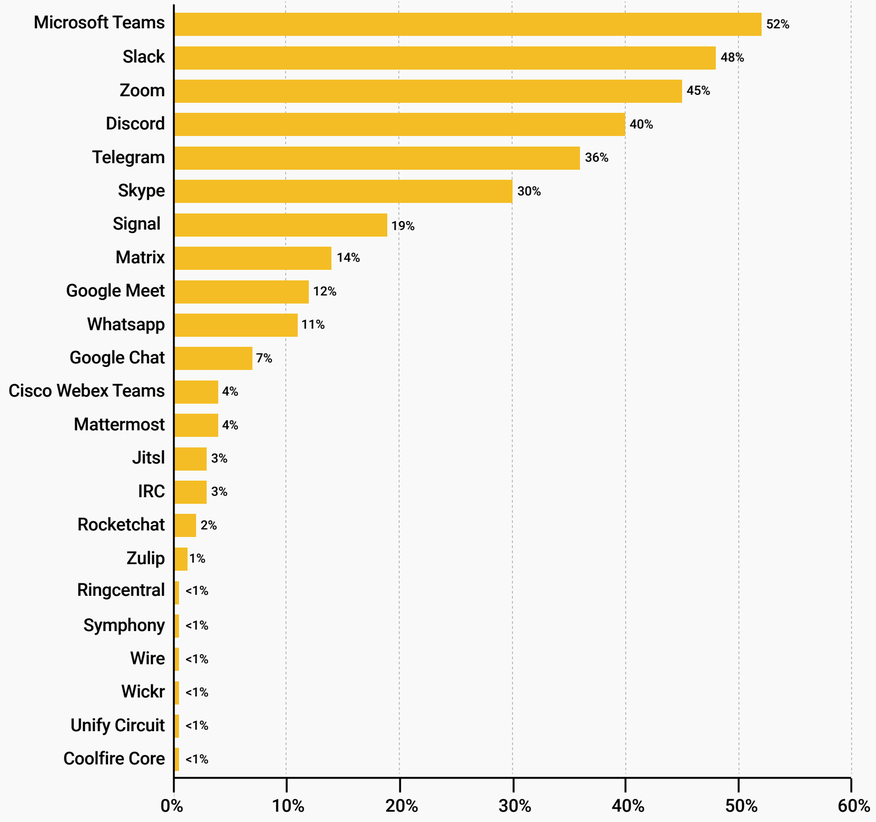
In project management, **Jira, Microsoft Project, Trello** and **Confluence** emerge as commonly used tools. When we examine the tools that participants want to use in the future, we can say that **Microsoft Project** may lose a significant number of users, and innovative tools like **Asana** may become more prominent. This situation can be considered as a result of the rising trend towards agile methodologies. We also see that among users of agile methodologies such as **Kanban and Scrum; Jira** stands out as the most desired tool to experience.

COMMUNICATION
TOOLS



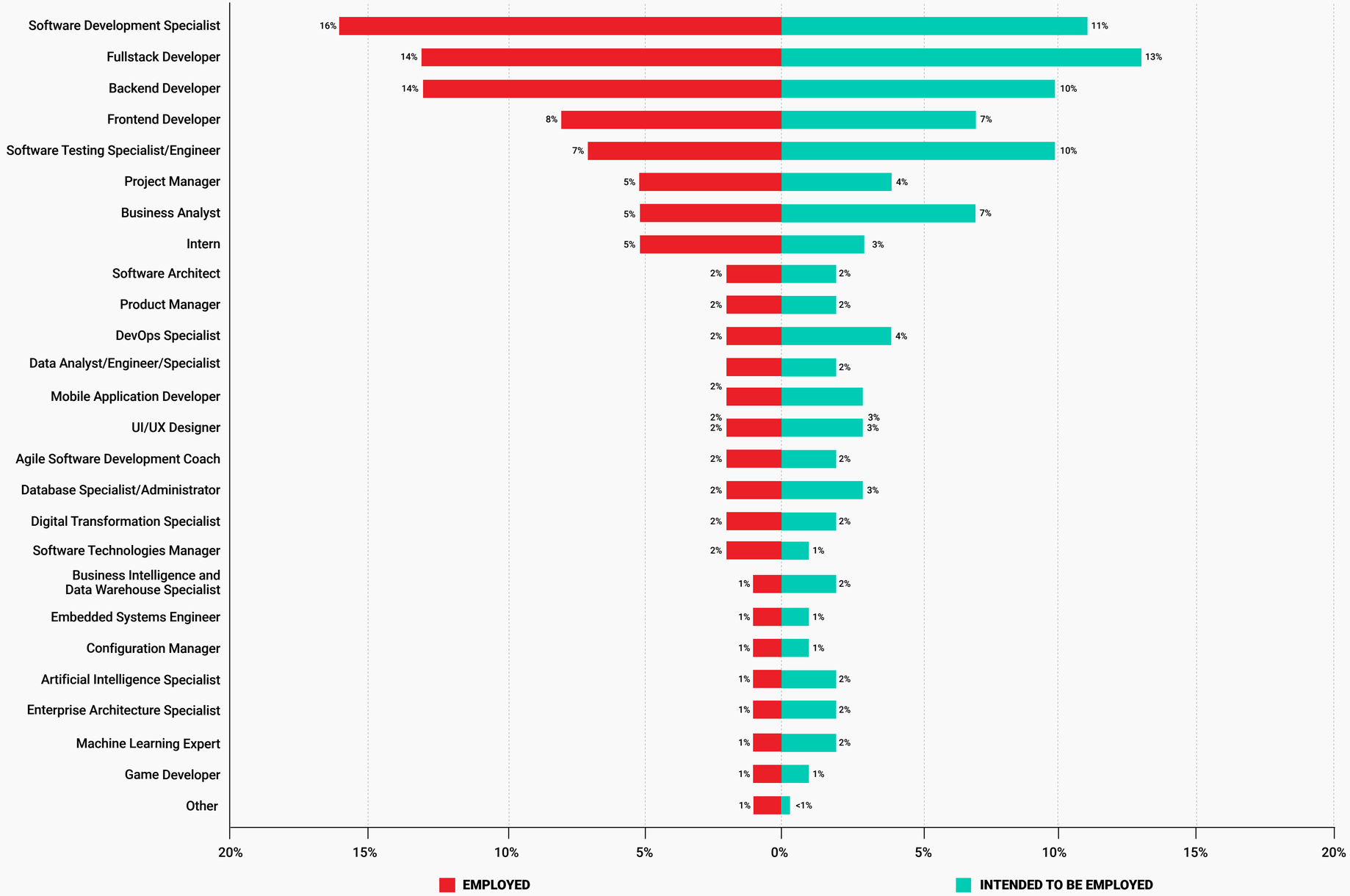
COMMUNICATION TOOL USAGE - TÜRKİYE

We asked our participants about their preferences for communication tools in terms of current usage and future usage. In all examined perspectives, we can say that **Whatsapp, Zoom** and **Microsoft Teams** are among the top three tools, without a specific ranking. In the global preference of communication tools, we can note that **Whatsapp** is less preferred compared to our country, especially with **Slack, Discord** and **Google Meet** being more widespread. Our domestic application, **BİP**, has a user base of 11%.



COMMUNICATION TOOL USAGE - GLOBAL

CURRENT AND NEEDED ROLES IN THE SOFTWARE INDUSTRY



In our research, we asked participants in managerial roles about how many developers they currently employ in their organizations and how many developers they will need in the future. When we examine the top five developer roles in the graph, we can see the need for **Fullstack** (Frontend and Backend), **Backend, Frontend, Software Testing Specialist,** and generally Software Development Specialist roles. When we look at the roles needed in the future, we see that the **Fullstack** Developer is in the first place. Additionally, the total number of employees in the top five roles is higher than the total of other roles. Therefore, we can say that there will be an increasing trend towards these roles. We can also say that there is a shortage of employment in 10 out of 26 roles. In this context, specializing in the specified roles for those who will enter employment or want to direct their careers towards software technologies can provide benefits both in meeting the employment needs in the relevant roles and in the job search efforts of individuals.

T.C. SANAYİ VE
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TÜBİTAK

İşçi Blokları Mahallesi Muhsin Yazıcıoğlu Caddesi No:51/C 06530 Çankaya/ANKARA

+90 (312) 289 92 22 - yte.bilgi@tubitak.gov.tr

TÜBİTAK - BİLGEM Software Technologies Research Institute (YTE)