



# TECH SKILLS OF TOMORROW

The tech landscape is changing fast.

With a seemingly endless number of programs, languages and frameworks at your disposal, it can be difficult to know what tool is a flash in the pan, and what has the power to shape the future of your technology organization. But it doesn't have to be a mystery.

We asked four experts in **software development, data, machine learning and cloud computing** about which hard and soft skills companies will need to thrive in the 2020s. Here's what to pay attention to and invest in as you map out your tech strategy for the next year (and the next decade).

# TECH SKILLS OF TOMORROW: SOFTWARE DEVELOPMENT



BY MAUREEN MAKES

Software is ubiquitous. Everything from your smartwatch to your fancy new VR rig to your thermostat relies on software. So it's not surprising that the number of software development jobs is projected to grow at a rate of [21% through 2028](#), compared to a rate of 5% across all jobs.

With this influx of new developers and new types of software comes shifts in practices, tools and tech stacks. Keeping up with the pace of change is a challenge for junior and senior developers alike.

Many trends have come and gone (anyone remember Knockout.js?), and many of the cool kids on the tech skills block likely won't withstand the test of time. With an increasing number of activities per day being driven by software, the demand for secure, reliable software is growing faster than ever before.

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## The state of modern software development

With essentially infinite options to capture our attention, performance is becoming a key differentiator for products. Google has even begun factoring site speed into how it ranks search results. We want our information quickly and with high levels of availability.

Performance-minded programming language Rust is growing in popularity, particularly for embedded systems and applications. [Beloved by developers](#), Rust provides greater safety than the most common low-level programming language (C++) through allowing protected abstractions, and greater speed over Java through automatic garbage collection.

Performance and scalability were also central to the development of .NET Core. Unlike its big brother .NET, .NET Core is cross-platform and open source. Though there is a learning curve for developers who traditionally worked in .NET, in the three years since .NET Core launched, it has been growing in popularity, both for individuals and in large enterprises, providing more flexible options for hosting and development. .NET Core has seen a 7% growth rate from July to October 2019 alone on the [Pluralsight Technology Index](#).

With almost [half of all web traffic](#) in the world coming from mobile devices (up from 31% in 2015), it is no longer enough to build for the desktop. Progressive web apps (PWAs) are growing in popularity. PWAs allow for an app-like experience for users in the web browser, including functionality such as offline experiences and push notifications.

“Lots of software promises to democratize access and information, but that only scales to people who are able to use the products. Almost everyone will be impacted by a permanent, temporary or situational disability at some point in their life. Accessibility needs to be baked in to everything that we build.”

Finally, with major data breaches becoming a regular occurrence in the news, consumers are more aware than ever of what data they are giving away and what risk that could potentially bring. Implementing security by design through principles like [OWASP's Top Ten](#) is becoming a necessity for companies that store user data. It is no longer a question of if there will be a security incident, but when and what the scope and impact will be. Legislation like GDPR has also shaped the conversation around personally identifiable information, pushing companies to build software that has privacy as the default operating assumption.

### **What's hot in software development**

A few companies are increasingly willing to invest in overhauling significant pieces of their systems to take advantage of modern development technologies — and are showing what rewards can be reaped in the process.

For Figma, performance is critical to facilitating web-based, real-time collaboration for design. As the tool grew in popularity, the backend (written in Typescript) didn't scale, so the company embarked on a [full rewrite to Rust](#). The company was able to realize massive, 10x decreases in average file serve time. For Pinterest, [using a PWA](#) as a primary experience improved mobile SEO and time spent on the site significantly.

Showing their commitment to their customers, the DevOps lifecycle company GitLab has pushed boundaries when it comes to providing transparency and an opportunity to collaborate to their community, allowing their users to inform policies around data access and use. A week after introducing a change to the terms of service that allowed for telemetry tracking in their product, GitLab rolled back the change, citing a lack of collaboration with users and contributors in the decision-making framework. GitLab is pushing boundaries in allowing users to be part of software decisions, giving them a voice in what data is collected and how that data will be used.

### **What you need to succeed in software development**

With the pace of technological change, there is no one silver bullet framework, tool or technology that will take you from here to 2030. Instead, a focus on the principles and practices behind the software can inform the right tools and frameworks for the project. Here are three factors to consider as you architect your projects for the future:

#### **Scalability**

Can your project handle a large increase of users, transactions or workload the way that it is currently designed? We cannot always predict what our software will need to do in the future, but we can build in a way that allows us to scale. This includes decisions like what languages and frameworks to use, what design patterns to implement and which hosting solutions we choose. Understanding the tradeoffs involved in each choice can create resilience.

## Security

The core principles of information security are confidentiality, integrity and availability. What this means for your system is that data is only available to users who are permitted, data is not altered by unauthorized users and data is available to users when they need it. You can't maintain user trust without all three.

## Accessibility

Lots of software promises to democratize access and information, but that only scales to people who are able to use the products. Almost everyone will be impacted by a permanent, temporary or situational disability at some point in their life. Accessibility needs to be baked in to everything that we build, both to allow access to the greatest number of people and to reduce our risk. As the [Domino's Supreme Court case](#) showed us, creating accessible products is not a "nice-to-have" — it's a core requirement.

Regardless of what kind of software you are creating or considering, odds are the needs and requirements will evolve over time. To ensure you are successful for the long haul, first focus on access. We expect software to work seamlessly in our lives, which means it's fast, intuitive and accessible.

Second, engage your community. They want to be part of the conversation of what you are building and how. Build for the customer — not just in the products you ship, but also in the processes you use to ship them.

And finally, be aware of the impact you are having. We can't *not* use software in our society. Consider the impact you want to have on the world through your code. Find ways to innovate and create solutions to the problems we face, and be aware of the problems you could be creating along the way.

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## MAUREEN MAKES

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# TECH SKILLS OF TOMORROW: **DATA**

**BY JORDAN MORROW**

Over the past five to 10 years, we've seen unprecedented gains in the sheer amount of data being produced on a daily basis. And organizations of all sizes are trying to capitalize on it.

As software, tools and algorithms get more advanced at not only producing data but also at gathering, governing and analyzing it, the skills needed to succeed are going to evolve. It doesn't take a long search on Google or Indeed to see that data, analytics, storytelling and business intelligence skills are in high demand. The ability to utilize data effectively makes employees indispensable for organizations.

As individuals build their personal prowess in data skills, they will help not only their own personal careers, but embolden and empower organizations to truly succeed with data and analytical strategies.

“A majority of people aren't going to school to become data scientists or statisticians, so it's important that we push for data literacy as much as we promote data science.”

## **The state of data science**

Data science skills are in hot demand, and will continue to be, but there's an issue with only focusing on data science: a majority of people are not going to school to become data scientists or statisticians. We need to give just as much importance to skills in the broader realm of data literacy, which includes the ability to read, analyze and communicate with data.

One particular aspect of data literacy that's gaining steam is the role of data storyteller. The data storyteller (sometimes called a data translator or data interpreter) is the person who can bridge the gap between the data and business sides of a company. This role has become more common with the growing realization that the data and analytics world needs people with skills in the arts and humanities.

There is also a large opportunity right now for individuals with the skills to take the data an organization produces, translate it back to the organization's goals and make a strong decision with the information. This field of data-informed decision-making — combined with data literacy skills — encompasses a unified approach to data, allowing the human and scientific elements to work in tandem.

“The healthcare industry by nature generates a lot of data, so the ability of that workforce to have data literacy skills that allows them to provide effective treatment can literally mean life and death.”

### **What's hot in data**

There are many companies and industries that are already tapping into the data revolution and finding success.

One major industry making great steps to evolve and embrace data is healthcare. The healthcare industry by nature generates a lot of data, so the ability of that workforce to have data literacy skills that allows them to provide effective treatment can literally mean life and death. For example, when hospitals are looking at bed turnover rates, utilizing data is a great way to follow trends and put in place solutions for improvement. Another way data can be used is when testing and treating sepsis. Studying trends, symptoms and outcomes through data helps doctors and hospitals improve solutions.

Much of physical retail has taken a blow from the digital revolution, but some organizations are transforming and succeeding by embracing data head-on. Forward-thinking retailers are transforming their business by using data and information to improve processes, from online grocery shopping and door-side delivery to inventory management.

### **What you need to succeed in data in the future**

I hope I'm not the first one to tell you this, but we're not going back to the days of the VCR or dial-up internet any time soon, so we need to embrace the future. Here are three things we need to do to succeed in the future of data:

#### **Be a very curious person**

There's power in simply asking questions of the data and information in front of you, and good questions are the catalyst to analytic success.

#### **Develop the ability to effectively communicate with data**

How many of us have ever had conversations at work with individuals in other departments and been met with a blank stare? If you have, there's a good chance it was during a conversation around data. But here's the thing: The onus is actually on you to make sure you are understood, and that takes a wide range of soft skills. Data is a science, but sometimes we forget that it's also an art, so practice and refine your craft.

## Embrace the data revolution

The world of data is not slowing down. We aren't suddenly going to stop producing and collecting data. If we want to make clear-eyed business decisions and make products that are going to impact customers in meaningful ways, we have to embrace the fact that data is often messy and then put in the work to sift through it, understand it, and use it.

Not everyone is going to be (or even needs to be) a data scientist. But we all need to be data literate.

For organizations to succeed in data, it won't take a mass hiring of PhDs to get you out in front, but rather upskilling your existing workforce to have a good combination of soft and hard skills. Data professionals do need hard skills, like Tableau, Qlik, Domo or other BI tools for data visualization. But the soft skills — the ability to communicate effectively, ask good questions of data and make well-supported decisions — are the secret sauce for data success.

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## JORDAN MORROW

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# TECH SKILLS OF TOMORROW: MACHINE LEARNING

BY SIMON ALLARDICE

A few years ago, it was still possible to argue whether machine learning would end up becoming a transformative technology in the general business world.

There's simply no debate anymore.

It can be easy to dismiss certain styles of short-term predictions — like articles that would breathlessly pronounce 2019 (or 2018, or 2017) as “The Year of Machine Learning.” But what we've seen in machine learning is a similar progression as with other revolutionary technologies: It may not completely transform your business or life in any given year, but viewed in the long-term, machine learning's constant, inexorable progress and impact cannot be ignored.

As this field matures, what we're seeing now is a greater understanding of what skills are truly valuable — allowing us to shift our focus from the specific implementation details of the technologies themselves, and into how we can use them to provide greater understanding and greater insights.

The concerns are less “What technologies are important?” but rather “Now what?”

“What's far more important is treating technical skill in machine learning as an accelerator for existing business acumen.”

## The state of machine learning

In past years, there were misconceptions about what skills are required for organizations to make inroads in machine learning and data science, leading to a frantic scramble to recruit PhD-level experience without asking if that level of expertise was necessary or even desirable. But just as most organizations don't need their developers to write database management systems, cryptography libraries or video decoders (but rather programmers who can implement and extend existing platforms and functionality), most organizations don't need their own unique battery of PhDs in computer science and computational statistics who can write machine learning algorithms.

What's far more important is developing the interdisciplinary ability to know when and how to use algorithms, treating technical skill in machine learning platforms and frameworks as an accelerator for existing business acumen and domain-specific knowledge. So rather than accreting these insights and expertise only around explicit “data scientist” roles, we see a movement towards a democratization of data science itself — a more widespread uptake of machine learning skills and abilities.

“Microsoft has recently committed to upskilling and reskilling 15,000 workers in AI and machine learning skills by 2022.”

For example, over the last two decades, it's become common for business users in various roles to use tools like Excel or PowerPoint to construct and present graphs and charts of historical data. It's so common that it's now considered a “general business skill,” instead of a specialized capability limited to analysts. But it's still rare for the average business user to present forward-looking, predictive data — the type of analysis that machine learning can provide. That's the next step. We'll hit a new frontier in the democratization of machine learning skills once the use of predictive data is as accessible and common as the use of historical data is right now.

### **What's hot in machine learning**

There's been a significant focus on new and improved tools to simplify the workflow of creating, testing and deploying machine learning models, including improvements in Microsoft's Azure Machine Learning Studio, Amazon SageMaker and IBM Watson Studio.

In addition, the recent progress in automated machine learning functionality — or AutoML — helps enable greater usage of machine learning by accelerating workflow and automating tasks previously only feasible with the typical “data scientist” skill set, like developing neural nets. Web-based development tools like Project Jupyter increase access to machine learning capabilities by decreasing time of initial setup and enabling scaffolded development and experimentation, making the machine learning onboarding process easier than it's ever been.

The companies pushing the boundaries of machine learning and AI are not just focusing on technology. They're heavily focusing on people, and on the large-scale democratization of machine learning skills.

For example, Microsoft has recently committed to upskilling and reskilling 15,000 workers in AI and machine learning skills by 2022. Similarly, Amazon's 2025 initiatives include their “Machine Learning University” to help their existing technologists add machine learning experience to their skill set.

### **What you need to succeed at machine learning in the future**

If you're still in the early stages of machine learning (as an individual, team or company), it can be confusing to know where to begin. Here are a few focus areas that will help you capitalize on machine learning over the next 10 years:

#### **Technology-agnostic skills**

It's less important you're an expert on a specific technology like TensorFlow, or a specific machine learning cloud platform, and far more important to be familiar with the general skillset, vocabulary and concepts of machine learning.

## Python

Recommending a particular programming language is always a contentious task, but for anyone looking to get started with machine learning and AI, my default suggestion is straightforward: learn Python. Yes, there are other languages popular in the machine learning community, and if you're already working in an environment or using a specific technology that favors another language — R, for example — then of course use that. Otherwise, Python is never a bad choice, even for those not intending to be hands-on practitioners.

## Internal upskilling

One hurdle is the incredible difficulty in hiring and retaining employees with machine learning skills. If you can find external candidates, they lack the internal business knowledge and contextual background to generate insights. Upskilling your existing employees is not a luxury — it's a necessity.

## Data collection

Concentrate on enterprise-level data collection. You can't analyze what you haven't tracked.

It's important to remember that machine learning insights should supplement and inform your people, not serve as a replacement for their knowledge, context and experience. As we see machine learning hold an increasingly important seat at the table of business strategy, we need to be prepared to rapidly upskill our teams — and ourselves.

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TECH SKILLS OF TOMORROW:

# CLOUD COMPUTING



BY JANANI RAVI

The technology sector has generated more opportunities, and more wealth, than any other sector in the last couple of decades. As of October 2019, the top five most valuable companies in the world are technology companies. So it's no coincidence or surprise that the "Big Three" cloud providers — Amazon, Google and Microsoft — are firmly entrenched in that top five. Amazon's enormous effort to turn AWS into a market-leading platform, and Microsoft's decision to reposition itself as cloud-first company, represent an "all-in" investment and dedication to the cloud that's paying off in spades.

The world is dominated by cloud computing and cloud providers, and it certainly will stay that way over the next 10 years. So where is there left to go? Here are some tips to help answer this very question.

“The world is dominated by cloud computing and cloud providers, and it certainly will stay that way over the next 10 years. So where is there left to go?”

## The state of cloud computing

One trend we are seeing is that big, horizontal cloud platforms are flourishing, while smaller, independent players are struggling. AWS is the undisputed market leader. A reenergized Microsoft Azure is also growing marketshare. Technologies such as Cloudera, Hortonworks and even Docker are struggling to stay relevant. Having a thorough, all-round knowledge of every different major cloud platform is essential.

This is even more relevant because enterprises are increasingly choosing [multi-cloud solutions](#) to avoid being locked into just one of these platforms. Consequently, technologists need to make sure they know each market-leading technology. This is easier than it sounds because all of the major cloud platforms are actually very similar, but getting familiar with each will increase your efficiency if your cloud strategy does change.

Cloud providers are keenly aware of increased interest from enterprise in multi-cloud strategies. Before, early adoption of the cloud platforms was driven by small enterprises (often startups) that were willing to take on the significant risks associated with being cloud-first, and often tied themselves to a single platform. As the cloud market has matured, the biggest remaining prospective customers are from highly regulated sectors such as finance, healthcare and defense. Such customers are hesitant to shift entirely to the cloud, and are wary of dependence on a single provider, because they're eager to retain control of critical portions of their infrastructure. Hybrid and multi-cloud solutions solve for these concerns.

“In a strange way, the dominance of the big cloud platforms has made cloud computing somewhat more stable than other “hot” areas in tech today. But the fact remains that we have to focus way more effort today than even 10 years ago on staying current and learning new cloud technologies.”

### **What's hot in cloud computing**

Everyone is moving (or has moved) to the cloud, but that doesn't mean enterprises can junk their existing on-premise infrastructure. That's where containers come in handy. Docker containers offer a simple, portable way to have applications run anywhere — on the cloud, on your local machine or in an on-prem data center.

Ironically, while Docker containers have exploded in popularity, there's still not a whole lot that individual, isolated Docker containers can accomplish on there. You need an orchestration layer to get those containers to work together, and that's why Kubernetes is on the rise. Every tech professional today ought to be spending the time to learn Kubernetes, because container orchestration is here to stay.

### **What you need to succeed at cloud computing in the future**

Nostalgia for the late '90s runs rampant nowadays, so it's only appropriate that the functions of networking and load-balancing are just as ubiquitous as Seinfeld reruns. While not groundbreaking in any sense, these two critical tools should be some of the first things in a cloud professional's toolbelt for two reasons.

First, networking and load-balancing are no longer the exclusive domain of network engineers. Everyone needs to know how to configure a VPC and rig up a load balancer. The second and more important reason is that we live in a dangerous world full of cyber attacks and malware where misconfigured networks and load balancers are one of the biggest points of vulnerability. Many recent high-profile data breaches were caused by misconfigured network settings on an application. Everyone needs to understand the security-related “fine print.”

Perhaps the greatest opportunities (as well as the greatest threats) in our cloud today arise from the speed at which new technologies emerge, explode in popularity and then fizzle. For example, in 2017, data professionals were stampeding into TensorFlow and out of scikit-learn; just two years later the stampede is headed the other way, into PyTorch from TensorFlow. In a strange way, the dominance of the big cloud platforms has made cloud computing somewhat more stable than other “hot” areas in tech today. But the fact remains that we have to focus way more effort today than even 10 years ago on staying current and learning new cloud technologies.

To apply the words of famous economist Tyler Cowen to the current cloud boom: Average is over. Cloud is moving fast, so the more you can gain diversified expertise in as many of the big platforms as possible, the more set you'll be for the future.



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