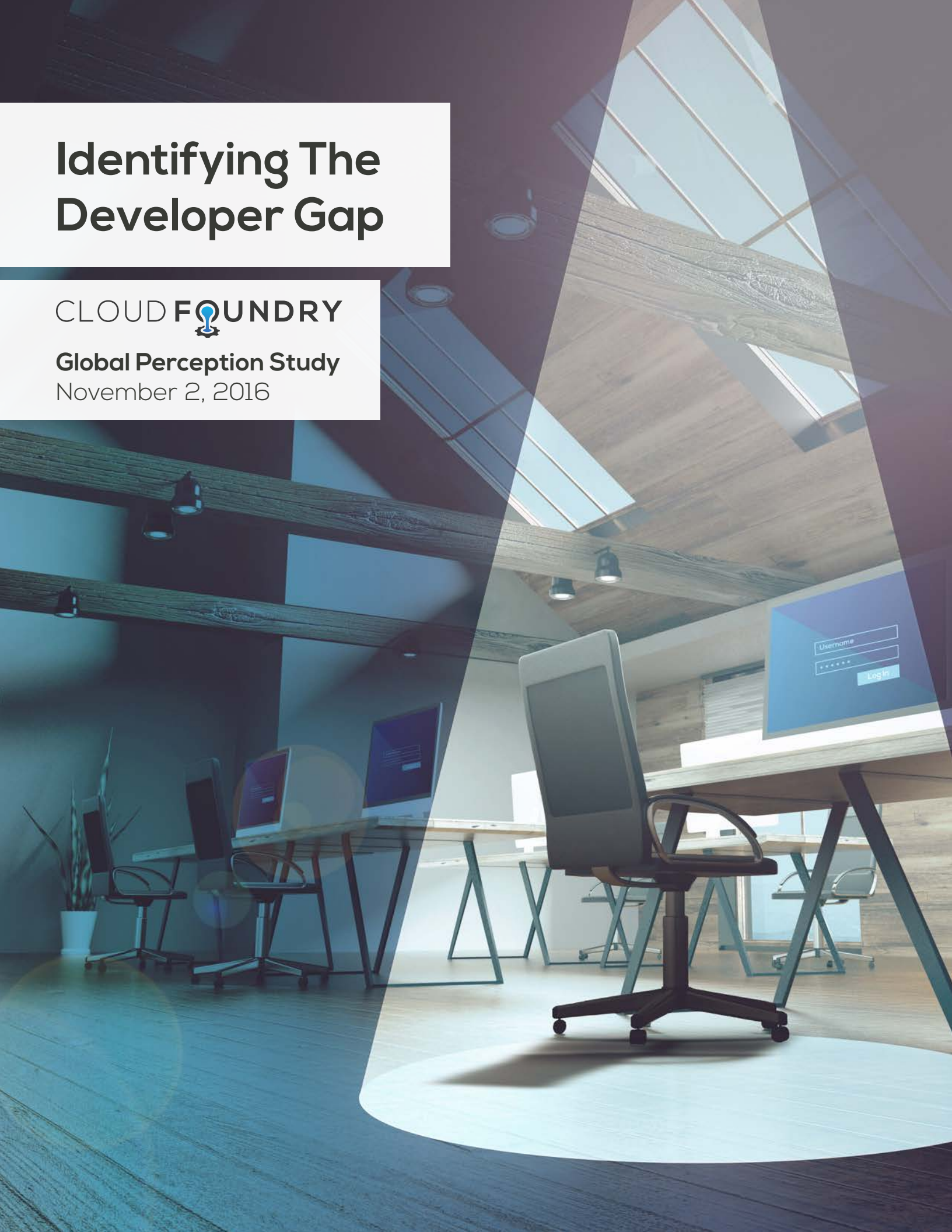# Identifying The Developer Gap

CLOUD FOUNDRY

Global Perception Study
November 2, 2016

Key Findings

①   **There is a looming shortage of developers.** The majority (64%) of IT professionals and executives agree that the developer shortage is a real threat. Most respondents (57%) state that this shortage has already impacted their ability to hire skilled people. The developer shortage is most acutely felt by companies just beginning to take advantage of the cloud or starting digital transformation—the "early majority" or "pragmatists" (51%). Those companies further along the journey—the "early adopters" or "visionaries" who are out front on cloud technology adoption—are less likely to feel the impact of the developer shortage (32%).

②   **Discrete technology skills are in the greatest demand.** Companies are prioritizing specialized skills. Mobile app development, coding in specific languages, and deploying on specific platforms are the most in demand. Fundamental cloud skills, such as continuous delivery, continuous integration, test-driven development and 12-factor application architecture, are currently in lesser demand. As companies move further along their cloud journey, however, their demand for these fundamental skills increases.

③   **Training is the preferred solution to address the skills shortage.** Companies are predominantly choosing to train existing staff over hiring or outsourcing. Leveraging a broad array of techniques, companies use training to ensure their workforce is able to keep up-to-date on ever-changing technologies.

Background

Cloud Foundry, the industry standard open source cloud application platform, works with ClearPath Strategies, a strategic consulting and public opinion research firm for the world's political and technology leaders, to conduct research on a periodic basis. The latest is the first-of-its-kind, multi-national study of qualitative and quantitative research focused on the availability of people with cloud-native skills.

The study, conducted in the third quarter of 2016, investigated whether there is a shortage of developers with cloud skills; which specific skills are lacking in the modern enterprise; and how companies are addressing this gap. This report details the current state of cloud skills that were unveiled in that study.

Introduction

We find ourselves in the midst of a technology revolution in which businesses are changing the way they operate and even how they see themselves. More and more companies seek to transform themselves digitally, effectively becoming software companies—rather than shoe companies or shipping companies or financial services companies. In order to achieve this, they rely on an ever-increasing number of skilled developers with an ever-increasing variety of skills.

Cloud Foundry's latest Global Perception Study, our fourth such survey, reveals that we are beginning to see the early stages of a skills shortage. The majority of respondents say there is already, or will soon be, a shortage of skilled developers. Most already feel the impact of this shortage, as is reflected in their difficulty hiring and retaining skilled people.

The skills in greatest demand today are focused on addressing specific technology needs—mobile app development, coding with a specific language, and deploying on a specific platform. However, foundational skills like continuous integration, continuous delivery, and test-driven development are ranked lower, with 12-factor application architecture ranked lowest in demand.

Companies looking for developers with discrete skills do not appear to have hit upon a shortage yet. However, as more companies move to become cloud-native, they will suffer more acute shortages, as there is a smaller pool of developers available. We see evidence of this already as the reported shortage of most of these fundamental skills doubles or even triples for most of these skills at nearly each stage along the cloud journey.

To minimize the impact of these shortages or to avoid the shortage altogether, companies are prioritizing training. By a nearly 2:1 margin, they are choosing training over hiring or outsourcing as the preferred method for addressing a shortage of skills in their own companies. Companies are making use of all manner of training, from formal external vendor-driven training, to informal internal employee-driven training. This research suggests a major increase in the demand for training to keep up with quickly changing technologies.
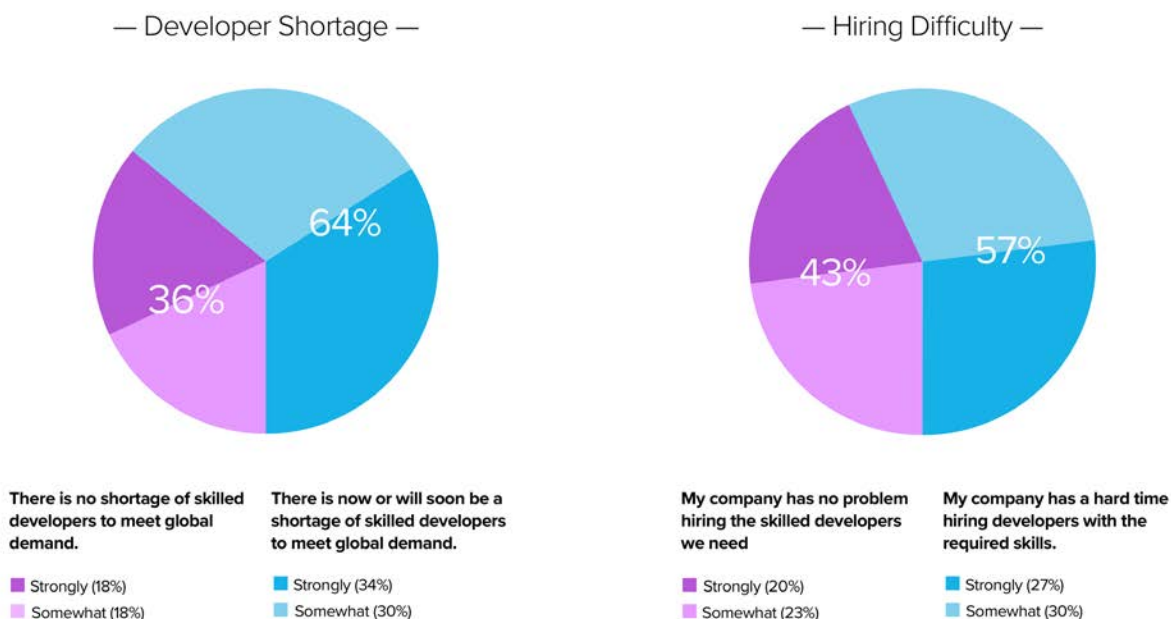
Finding 1: There is a looming shortage of developers.

The looming crisis in software—and therefore for modern enterprises—is a shortage of skilled developers. This survey focuses on identifying and understanding the skills shortage for those organizations moving to take advantage of the "cloud." In other words, is there now or will there soon be a shortage in developer skills? If so, how acute is the shortage, what skills are most lacking and how do companies cope with any current or impending shortages?

To put it plainly: yes, a shortage in developer skills is coming. The majority (64%) of IT professionals and executives agree that there is now or will soon be a developer shortage. Of that majority, 34% feel strongly that there "is now or will soon be a shortage of skilled developers to meet global demand."

Which statement do IT pros agree with more?

— Developer Shortage —

64%

36%

There is no shortage of skilled developers to meet global demand.

■ Strongly (18%)
■ Somewhat (18%)

There is now or will soon be a shortage of skilled developers to meet global demand.

■ Strongly (34%)
■ Somewhat (30%)

— Hiring Difficulty —

57%

43%

My company has no problem hiring the skilled developers we need

■ Strongly (20%)
■ Somewhat (23%)

My company has a hard time hiring developers with the required skills.

■ Strongly (27%)
■ Somewhat (30%)

When you look at the impact on the company, more than half (57%) of respondents say they have a "hard time hiring developers with the required skills." This data indicates that while people see the problem globally, they do not see the impact within their company at this time.

The shortage is currently felt most acutely among industries that are often described as "older" or "established"—government, manufacturing and business services. These sectors, mainly companies with vast, legacy IT infrastructures and processes, are more likely to see a developer shortage.

More broadly, we can divide the respondents into four groups:

1. Those who see the gap and feel the impact 44% ■
2. Those who see the gap, but don't feel its effects 20% ■
3. Those who don't see the gap, but have difficulty hiring 13% ■
4. Those who don't see the gap, and don't have issues hiring 23% ■

Is there a gap, and does your company feel it?

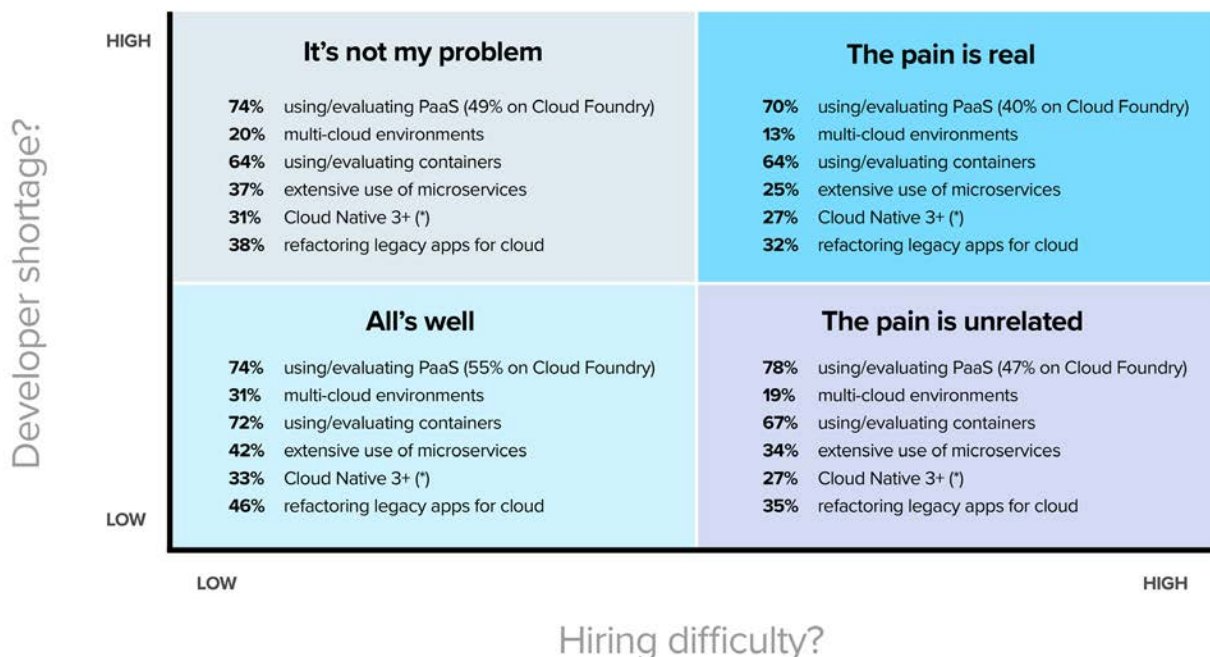| Developer shortage?	HIGH	It's not my problem 20%	The pain is real 44%
	LOW	All's well 23%	The pain is unrelated 13%
		LOW	HIGH

Hiring difficulty?

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Somewhat counter-intuitively, the fourth group—the group which neither sees nor feels the shortage—is furthest along in its cloud journey. This group is more likely to use PaaS and containers. It is more than two times as likely to be in a multi-cloud environment. It is more than two times as likely to make heavy use of microservice and 12-factor app architectures.

Given its heavy use of cloud-native skills, one might think this group would struggle most to find skilled developers and therefore see and feel the pain the most, rather than vice versa. On the contrary, the companies that are less advanced on their cloud journey are the ones that see and feel the shortage.

Why is this?

We suspect that the companies further along in their cloud journey are doing more interesting things and are more risk tolerant; developers find those jobs more attractive. However, those companies that still primarily rely on legacy architectures, don't push the envelope or are only very sluggishly making efforts toward digital transformation, struggle to hire and retain people that have the skills necessary.

Is there a gap, and does your company feel it?

HIGH

It's not my problem

74%	using/evaluating PaaS (49% on Cloud Foundry)
20%	multi-cloud environments
64%	using/evaluating containers
37%	extensive use of microservices
31%	Cloud Native 3+ (*)
38%	refactoring legacy apps for cloud

The pain is real

70%	using/evaluating PaaS (40% on Cloud Foundry)
13%	multi-cloud environments
64%	using/evaluating containers
25%	extensive use of microservices
27%	Cloud Native 3+ (*)
32%	refactoring legacy apps for cloud

All's well

74%	using/evaluating PaaS (55% on Cloud Foundry)
31%	multi-cloud environments
72%	using/evaluating containers
42%	extensive use of microservices
33%	Cloud Native 3+ (*)
46%	refactoring legacy apps for cloud

The pain is unrelated

78%	using/evaluating PaaS (47% on Cloud Foundry)
19%	multi-cloud environments
67%	using/evaluating containers
34%	extensive use of microservices
27%	Cloud Native 3+ (*)
35%	refactoring legacy apps for cloud

Developer shortage? (LOW to HIGH)

LOW ——— Hiring difficulty? ——— HIGH

n=845

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* Out of 8 "cloud-native" characteristics (e.g., platform independence, ephemeral infrastructure, etc.), the percent of companies saying they do 3 or more.

❷
Finding 2: Discrete technology skills are in the greatest demand.

In this survey, we asked respondents to identify the skills their company needs "regularly or on an ongoing basis in order to maintain productivity and competitiveness." This question series also explored what skills their company lacked that pose "a potential risk to your company's productivity."

The results of these two questions were combined to identify a "gap score." The "gap score" revealed that companies have prioritized specific skills to address their immediate needs. Respondents identified mobile app development, coding with a specific language, and database technologies (e.g. MySQL, MongoDB, Cassandra, etc.) as the areas most lacking in their companies.
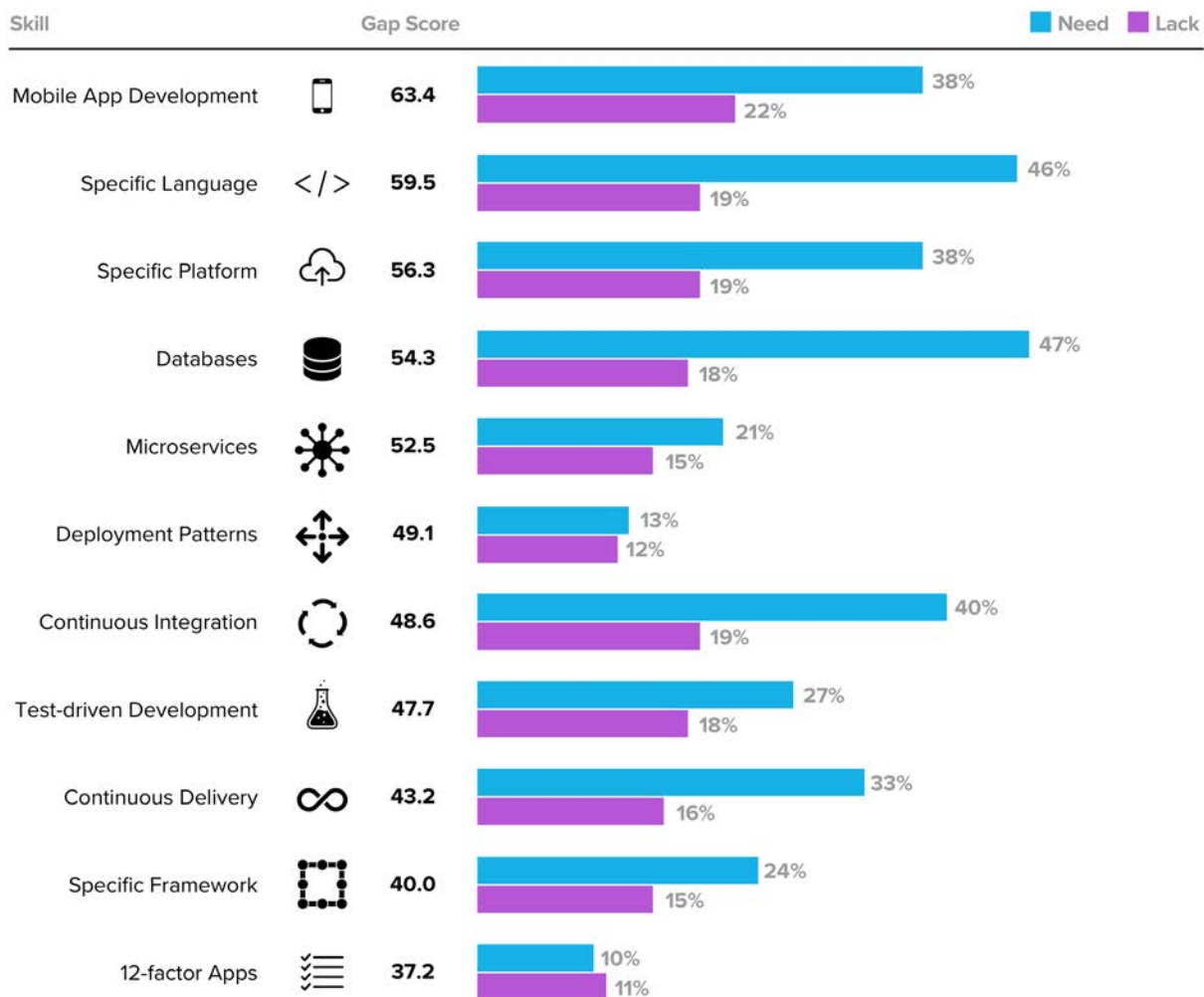
Interestingly, those skills **least** identified as a "lack" are forward-thinking skills like continuous integration, continuous delivery, and test-driven development, with 12-factor application architecture ranking last.

By ranking the skills based on "lack" and "need," the results show many companies favor specific technologies to address the immediate need to become software-centric, but are overlooking the long-term view of the fundamentals to adopt a cloud native strategy.

The most in-demand (need) skills are database (47%) and specific coding languages (Javascript, C++, Go, etc.) (46%). Continuous integration comes in third, with 40% of respondents classifying it as a needed skill. These are closely followed by deploying on a specific infrastructure (38%) like Azure, AWS, or Google Cloud Platform, and mobile application development (38%).

Ranked a little lower were the skills typically associated with the fundamentals of a cloud-native organization: continuous delivery (33%), test-driven development (27%) and microservices architecture (21%), with deployment patterns (13%) (such as canary and blue/green deployments) and 12-factor application architecture (10%) rounding out the bottom of the skills needs.

This indicates that companies are prioritizing the short-term gains of developing and deploying software, but not the necessary interdisciplinary skills to fully embrace the transformation to a software-driven enterprise.
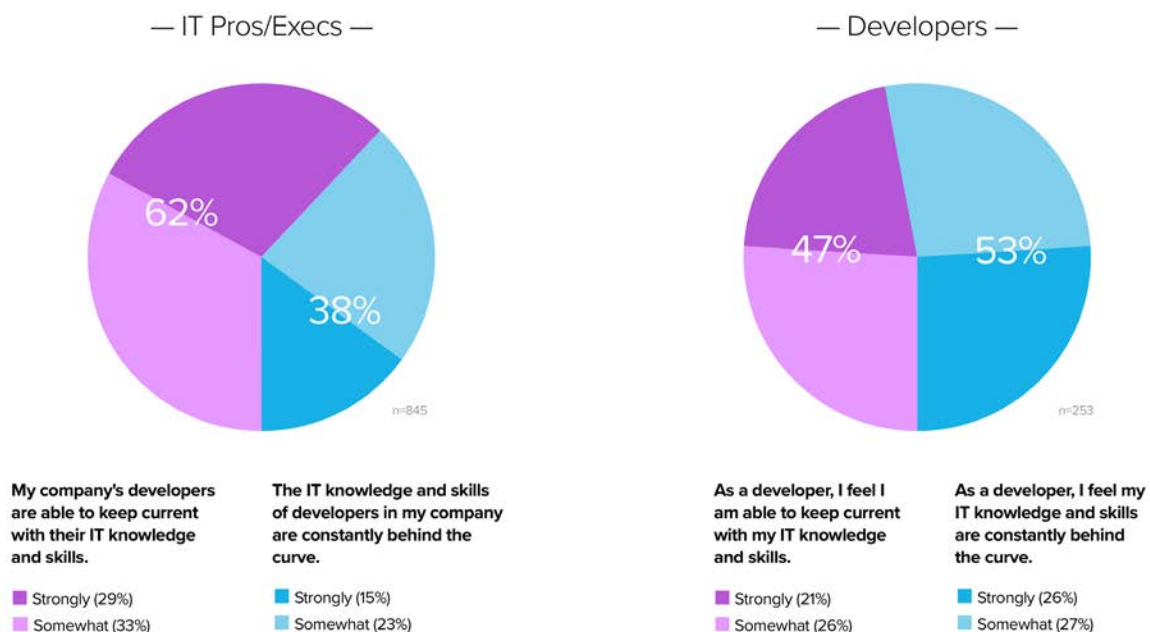
Skill		Gap Score	Need	Lack
Mobile App Development		63.4	38%	22%
Specific Language		59.5	46%	19%
Specific Platform		56.3	38%	19%
Databases		54.3	47%	18%
Microservices		52.5	21%	15%
Deployment Patterns		49.1	13%	12%
Continuous Integration		48.6	40%	19%
Test-driven Development		47.7	27%	18%
Continuous Delivery		43.2	33%	16%
Specific Framework		40.0	24%	15%
12-factor Apps		37.2	10%	11%

n=845

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The gap score is a measurement tool for ranking which skills are most acutely lacking, based both on absolute shortage (the share of companies who "lack" a given skill) and relative unmet demand (the share of companies who "lack" a skill they say they "need"). It uses data from two questions: 1) "Which of the following skills does your company LACK, regularly or on an on-going basis, posing a potential risk to your company's productivity and competitiveness?" and 2) "Which of the following skills does your company NEED, regularly or on an on-going basis, in order to maintain its productivity and competitiveness?"

Finding 3: Training is the preferred solution to address the skills shortage.

At the macro level, the majority of companies (62%) express confidence in the abilities of their developers to "keep current" with their IT knowledge and skills. At an individual level, however, only 47% of developers express confidence in their own ability to keep current.

Which statement do you agree with more?

— IT Pros/Execs —

62%

38%

n=845

— Developers —

47%   53%

n=253

My company's developers are able to keep current with their IT knowledge and skills.

■ Strongly (29%)
■ Somewhat (33%)

The IT knowledge and skills of developers in my company are constantly behind the curve.

■ Strongly (15%)
■ Somewhat (23%)

As a developer, I feel I am able to keep current with my IT knowledge and skills.

■ Strongly (21%)
■ Somewhat (26%)

As a developer, I feel my IT knowledge and skills are constantly behind the curve.
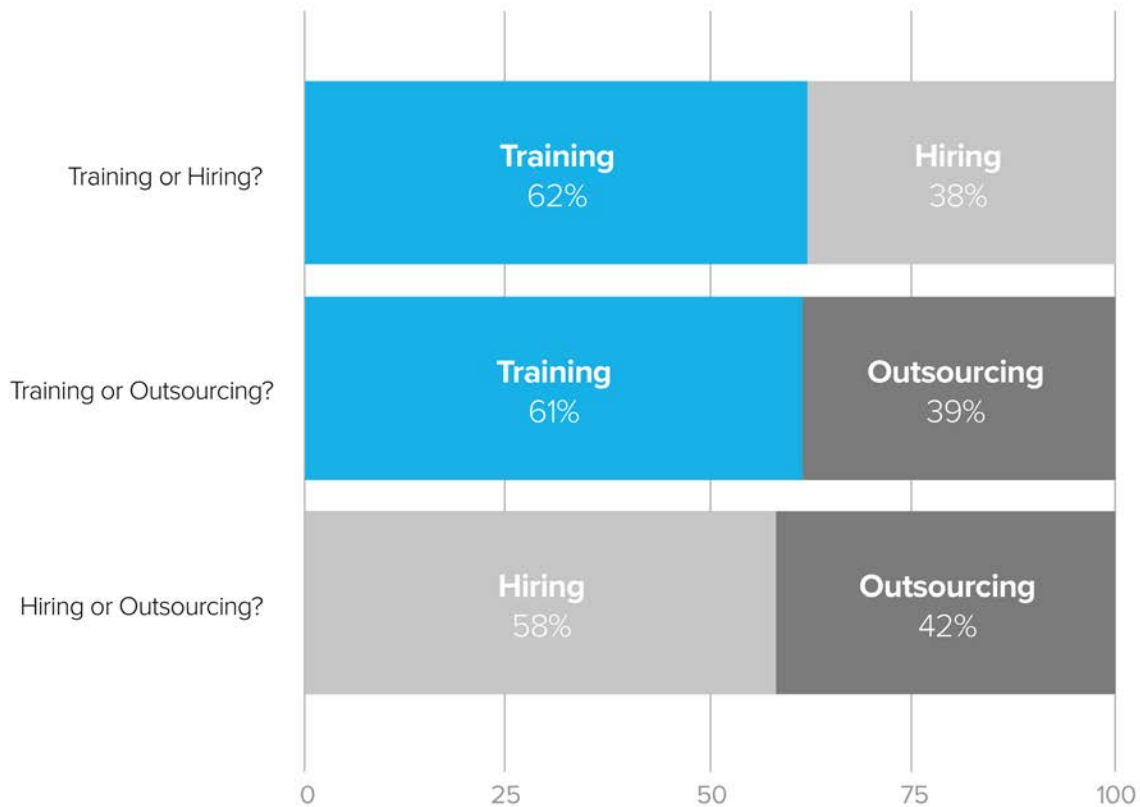
■ Strongly (26%)
■ Somewhat (27%)

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Developers feel how fast the industry is moving, and how complex it is becoming. As the market becomes more fragmented, developers struggle to keep current with the changes.

As enterprises begin their digital transformation journey, adopting new processes and technologies to meet the changing needs of customers, they are focusing on new technologies. By a large percentage (60%), companies say they first adopt a technology—then upskill, train, or hire as necessary. This is preferred to selecting a new technology based on the skills already available in the company (40%).

To meet our company's developer skills need, we are putting more emphasis on:

Training or Hiring?	**Training** 62%	**Hiring** 38%
Training or Outsourcing?	**Training** 61%	**Outsourcing** 39%
Hiring or Outsourcing?	**Hiring** 58%	**Outsourcing** 42%

n=845

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Coupled with the results in Finding 1—the likely trajectory of the industry towards a more acute shortage—the industry is in for a challenge in the not-too-distant future.

Assuming the pool of developers skilled in cloud-native technologies is not going to dramatically increase in the near term, companies will have to cope with a shortage of skilled developers until the market catches up, and more people pursue careers as developers.

What does that mean for companies? How are they coping? And what skills do they need?

By and large, companies are addressing the shortage of skills by training or upskilling existing people rather than outsourcing (61% versus 39%) or hiring (62% versus 38%). They are making use of a variety of training methods from formal internal trainings, vendor-led trainings to informal trainings like "lunch-and-learns."

Conclusion

This research highlights that today the developer skills shortage is real, and will become more acute in the coming months and years. With the near-term focus on immediate problems like mobile app development and types of databases, many companies are losing sight of the skills needed to take advantage of the long-term gain from cloud technologies.

Currently, companies are prioritizing discrete skills, mobile app development, specific languages and infrastructures as key to their success. However, as more application workloads are moved to the cloud, and continuous innovation becomes a priority, the need for skills like continuous integration, continuous delivery and test-driven deployment will increase exponentially. Without obvious training and skills development in place, cloud adoption will be metered by the ability of companies to bring in the talent they need in order to become digital-first organizations.

As companies begin their digital transformation journey, they find themselves confronted by a shortage of people with these new skills as well as increased competition for a limited supply of skilled developers. Today, many of these companies are focused on the short-term gains with specialized skills —developing more software in-house as they adapt to a quickly changing market. This research also found that companies are turning to training, rather than outsourcing or even hiring, to ensure they are able to take advantage of new technologies and processes.

Most companies are still in the early days of a multi-year digital transformation. As these companies progress further along the journey, developing more software and taking advantage of continuous delivery practices, the shortage of talent will become even more evident.

Methodology

This survey was conducted and produced by ClearPath Strategies (www.clearpath-strategies.com), a strategic consulting and research firm for the world's leaders and progressive forces. Following are the firm's research notes for this survey.

Respondent selection

The survey included 845 respondents sourced from a leading global online panel provider. They were selected from the panel based on geographic and role-based quotas, as well as screening questions based on role in IT, decision-making role, company size, and how long they have been in IT. Selected respondents were further screened based on self-reported IT knowledge and attentiveness to survey questions.

Role quotas

The survey divided respondents into four broad IT "roles": Developer 30%, Operations 30%, Manager 20%, and Line of business leadership 20%. Respondents were asked to select which role—from a list of nine options—most closely described their primary responsibility, even if no one was quite right or even if they performed more than one of these roles. Answers were consolidated into those four broad roles.

Geographic quotas

The survey included respondents from the US (18%), UK (17%), China (8%), Japan (7%), Germany (17%), Canada (16%), India (10%), and South Korea (8%). We combine these broadly into three regions: North America (33%; US and Canada), Europe (33%; UK and Germany), and Asia (33%; China, Japan, India, and South Korea).

Industry

Although no industry-level quotas were deployed, we monitored the data to ensure that no single industry was over-represented in the data. The final breakdown of respondents by industry is as follows: IT (software, hardware, services) 26%, Manufacturing 14%, Financial services 10%, Government 6%, Health care 5%, Education 5%, Business services 4%, Telecommunications/ISP/Web hosting 4%, Retail 4%, Construction/engineering 3%, Transportation and logistics 3%, Wholesale 3%, Consumer services 2%, Media 2%, Life sciences 2%, Mining and natural resources 1%, Non-profit 1%, Utilities 1%, and Other 3%.

Respondent screens

Potential respondents were screened out on several criteria:

- **Role:** All respondents who selected either "IT professional / Support / Help Desk—I provide general HW and SW support to non-IT staff" or "Non-IT professional—I work in a non-IT division and am not responsible for IT decisions in my line of business" were excluded from the survey.

- **Company size:** All respondents must self-report that their companies have minimum 100 employees. All potential respondents from smaller companies were excluded. In total, the survey includes 40% from companies with 100-999 employees, 37% from companies with 1,000 to 9,999 employees, 16% from companies with 10,000 to 99,999 employees, and 7% from companies of 100,000 or more employees.

- **Time in IT:** Respondents must have spent minimum 2 years working in or with IT in order to qualify for the survey. In total, 58% of respondents have spent more than 10 years in IT, with 42% having spent 2-10 years.

- **Information level:** In our experience, it is possible to have "qualifying respondents" who nevertheless prove to have too little information or knowledge about the space to provide useful data from which to draw insights. We therefore apply an "information" screen to respondents as well. Specifically, we ask whether or not respondents could explain certain terms to their colleagues, if asked to do so. In order to qualify for this survey, a respondent must say "yes" to this question for both the terms "cloud computing" and "virtualization." There were a few exceptional respondents allowed in who did not say yes to both of these questions, but over 99% of respondents in the data said yes to both.

- **"Attention" level:** It is easy for respondents to speed through surveys or not pay enough attention to provide useful data. We make an effort to exclude these respondents as well, as they provide generally less useful data. In this survey, respondents were screened out for "attention" reasons if they said they could explain the made-up term "Greenfield as a Service (GaaS)" to a colleague in the same question used for the Information Screen noted above. Additionally, respondents were excluded if—when answering the "PaaS awareness question"—they selected the logo/company names for McDonald's or Starbucks. Both of those companies were included in the list of PaaS products, and respondents were asked only to select the PaaS offerings they were familiar with and specifically instructed not to select non-PaaS offerings.

Definitions

An important finding from our GPS studies to date—both qualitative and quantitative—is that IT decision makers have a much less clear-cut vision of the technology stack and do not always make clean distinctions between IaaS and PaaS as we might. For example, although we might not ourselves describe AWS, Azure, or Kubernetes as being true "PaaS" or might say they have "PaaS-like features," the respondents may have a different perspective. Therefore, in the survey, the following definitions were used for PaaS and Containers:

- **PaaS:** "PaaS—also called "Cloud Application Platform" or simply "Cloud Platform"—is a category of cloud computing services that provides a platform allowing companies to develop, run, and manage enterprise and web applications without the complexity of building and maintaining the infrastructure and middleware typically associated with developing and launching an app."

- **Containers:** "Containers offer a way to virtualize an operating system, isolating processes and providing limited visibility and resource utilization—such that the process appears to be running on a separate machine. Containers can allow applications to be packaged, with all of its dependencies, into a single, standardized unit."

A note on margin of error

It is technically impossible and improper to list a margin of error for a survey of this type. The respondents for this sample were drawn from an online panel with an unknown relationship to the total universe, about which we also do not know the true demographics. As such, the exact representativeness of this, or any similarly produced sample, is unknown.