

UPSKILLING
2020

Enterprise DevOps Skills Report

DevOps Institute

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A Note from Jayne Groll, CEO, DevOps Institute

As we enter a new year and a new decade, one thing has become clear: human transformation is as important as digital transformation. This becomes more and more apparent as enterprises around the globe start DevOps and other digital initiatives only to find out that lack of skill is constraining them more than lack of technology. We also know that the definition of “skill” is not limited to technical or mechanical skill. Humans are complex and multi-dimensional with a spectrum of interoperable skills that are necessary for professional growth and organizational success.

DevOps Institute's first 2019 Upskilling: Enterprise DevOps Skills Report proved that point when the community data demonstrated that automation, process and soft (now called human) skills were considered equally important for the modern Human of DevOps. Strong indicators in areas such as collaboration, empathy, systems thinking, flow analysis, testing, cloud and security heralded the dawn of the T-shaped IT professional where enterprises and individuals must be intentional in their upskilling efforts in multiple areas. We need to update our human skills as frequently, and with the same focus, as our technology skills.

The 2019 report gave us a benchmark by which the DevOps Institute could trend patterns and anti-patterns. The 2020 report enables us with year over year guidance, to form personal and organizational talent acquisition and upskilling programs. I am particularly excited about the 2020 report because for the first time, we can break down the data regionally to see through both a global and local lens. DevOps Institute is a global association committed to advancing the human elements of DevOps by equipping people with Skills, Knowledge, Ideas and Learning (SKIL). I sincerely hope this report helps you to SKILup in the new decade. Enjoy and if you have feedback, we would love to hear from you.



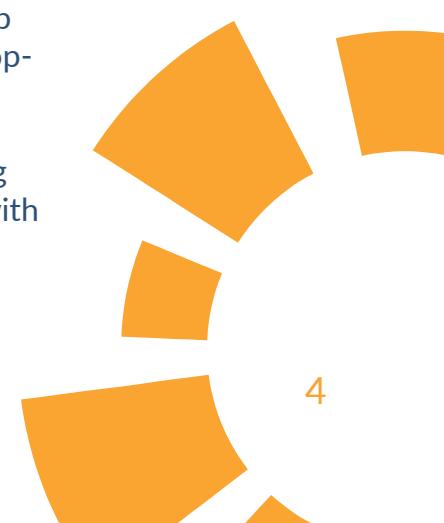
Preface Summary

Today, we stand on a critical juncture to enable and support our organizations towards putting the right technology to work. According to the World Economic Forum, by 2022, over 60% of global GDP will be digitized. An estimated 70% of new value created in the economy over the next decade will be based on digitally enabled platforms¹. Welcome (again) to the Fourth Industrial Revolution. While organizations are transforming towards digital operating models, challenges of speed and scale of technological advances, IT budgets and a huge skill gap are causing a slowdown of this fourth Industrial Revolution.

The world is facing a huge skill gap and business and HR leaders say that this will have a stifling impact on the economy and innovation. A recent study by the Society for Human Resource Management reports that 83% of the respondents had difficulty recruiting a suitable candidate in the past 12 months with the biggest skill gap in tech talent². Our research shows that 52% of survey respondents are currently recruiting or are planning to recruit DevOps humans. The biggest challenge is to find skilled people across all regions and all verticals. The good news, according to the World Economic Forum, is that 60% of organizations are willing to invest in reskilling current employees.

The DevOps human and the associated skills plays a huge role in enabling an organization and its culture towards agile innovation, cross-functional collaboration and risk-taking to support digital operating models such as DevOps. The fight for talent is not new as hiring managers are nervous about a talent gap in their teams relative to human, functional, technical and process skills and knowledge. Individuals in current positions are eager to update their skills. New job entrants are needing to know how to compete with skills and talents for todays and future opportunities.

All the above has motivated us at DevOps Institute to conduct the second study researching the necessary skills a DevOps human must possess. The following report shares the result with all interested in understanding the DevOps human must-have skills to SKILup for 2020.



Introduction

For our 2020 Upskilling: Enterprise DevOps Skills Report, DevOps Institute has surveyed more than 1,260 individuals globally to identify which skills are considered critical to DevOps and digital transformation. In last year's first report, we brought clarity regarding the skills individuals should be honing or organizations should be hiring for. This second global research report provides an update to last years findings and what it means. The report provides additional critical insight and benchmark data on the state of DevOps human skills.

DevOps Institute fielded the "2020 Upskilling: Enterprise DevOps Skills Report" to help business and technology leaders, teams and individuals understand what skills DevOps practitioners must have or develop, or what to look for when recruiting into DevOps journeys.

The strategy for talent within enterprises today depends on many factors such as the business model and the culture and philosophy of its leaders. DevOps has different maturity states within organizations. As Jeff Weber, executive director at Robert Half Technology, states "The search for DevOps people is pervasive in all size and all types of organizations. A DevOps person in one company might need different skills and experience in another company, which makes recruiting and hiring very difficult." While we found that some companies are looking for DevOps individuals internally, others prefer to hire externally. Upskilling and retraining must be high on every organization's agenda as the pace by which technology change happens will cause talent strategies to shift away from specific narrow roles, competencies and skills to a broader hybrid model of human and hybrid skills.

The report leveraged a sample size of more than 1,260 professionals representing enterprises worldwide. We again organized the skills into the following key focus areas: process and framework skills, human skills, functional skills, automation skills and technology skills (see Figure 1). We also examined the importance of business skills and the importance of certifications.

The end of the report includes a variety of attributes that provide insight into the demographics of the survey respondents such as industry, revenue, function and job title. From the survey we understand that the importance of crucial skill categories differs significantly by role, so we have created the following groups and the respective results (Figure 2).

Unless noted, the figures in this report show the entire sample size which includes all respondents regardless of their role, function, company size and DevOps organizational model.

Figure 1: The DevOps Human Skill Matrix



Figure 2: Levels Within Organizations

C-level executives are positions responsible for driving organizational strategy, such as a CEO, CIO, CTO or CMO.



Individual contributors are team members or practitioners who are already part of, or want to move into, DevOps teams.

Management are VP-level, project or program leads responsible for driving efforts across specific departments and functions and are hiring DevOps individuals into their teams.



Top Takeaways 2020

Here is what we discovered



There are notable differences between the 2019 and 2020 study.

We found that for 2020:

- The category of process skills and knowledge moved into first place ahead of automation skills in 2019.
- DevOps adoption, Agile and SRE have all gained in their percentage for must-have skills.
- External recruiting is still the predominant hiring model.
- The DevOps Engineer role title has almost doubled in popularity.
- Governance, risk and compliance/audit has increased its must-have skill vote by 4%.
- CI/CD toolchain knowledge are a must-have skill.
- Interpersonal skills has risen from last year's 3rd spot in must-have to this year's second spot.
- Collaboration and cooperation is still the top must-have human skill.

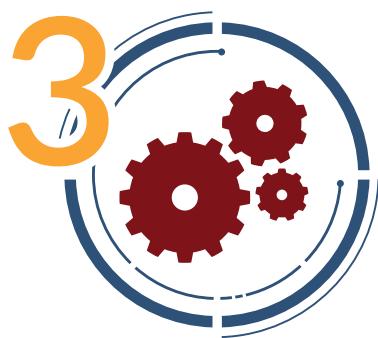
What it means: We believe that this is due in part to a next step in DevOps adoption. In the first step, users were learning about the technology and its potential benefits and/or implementation difficulties. Once past this step, the next logical stage is to establish the process and rules through which the technology will be used, hence the evolution of the human skills required.



DevOps topologies primarily used today are a huge challenge.

As described by experts in topology, there are different team structures which inhibit or accelerate the success of a DevOps team³. We found three different models which are currently used. The one which is leveraged the most is the DevOps team silo or DevOps Advocacy model where there is a separate DevOps team between Dev and Ops. The second most used is the DevOps collaboration model where DevOps is everyone's job, and the third most deployed team structure is that of the DevOps tool team where the DevOps team is responsible for tooling required.

What it means: These different approaches reflect the level of adoption and confidence in the technology. By adding a separate DevOps team between Dev and Ops, the original organization (and the vested interests in it) is preserved, while the responsibility and advocacy of the DevOps adoption is "subcontracted" to a new team. This is a "swim or sink" status quo. The second model shows a determination to go with DevOps all the way, and probably the most challenging but most rewarding approach. It will need a lot of holding hands and convincing to transform the existing structure into a full DevOps one, but the reward is proportional to the effort. The third approach is still an exploration of the tools rather than a full DevOps adoption. It is still closer to an exploratory stage with a potential evolution towards models 1 or 2.



DevOps transformation journey is still very difficult for more than 50%.

Our survey respondents agree that managing the people, processes and technologies associated and necessary for a DevOps transformation are all difficult. Each category has received the same amount of responses for being a challenge. Emerging technologies of Artificial Intelligence, Internet of Things, Virtual Reality, Quantum Computing and Robotic Process Automation are ranked as the biggest revenue drivers. CompTIA projects a 3.7 percent increase in IT spend in 2020⁵. This would amount to a global IT industry including hardware, software, service and telecommunications of \$5.2 trillion globally in 2020. There are a variety of factors which influence this growth, and one of them is the availability of skilled IT members.

What it means: DevOps is a fundamental change in the traditional structure of IT. It not only represents the adoption of new technology but also, and more importantly, an organizational transformation challenge with all that it implies in terms of "evangelization" of the existing responsibility silos. It certainly may be perceived as threatening for several structures which are comfortable in the existing traditional organizational model.



Agile, DevOps and ITIL are getting strong competition from SRE.

While Agile adoption (81%), DevOps adoption (75%) and ITIL adoption (25%) have grown since our 2019 research work, SRE has risen from 10% adoption in 2019 to 15% in 2020. Additional philosophies such as Value Stream Management (19%) and System Thinking (13%) are also being leveraged. Many of these disciplines and/or frameworks co-exist in organizations. We also probed for Holacracy for the first time and are seeing a 2.4 % adoption globally.

What it means: The rise in SRE shows that IT operation processes and the service health are a critical part before services are released and while products are being planned and not just an afterthought. Proactive work, the inclusion of the developer in responsibility of update of services in production, is tearing down some silos of the past.



Finding and attracting skilled people continues to be a challenge in 2020.

Still the number one challenge is the finding and attracting skilled DevOps people. 58% of respondents said that finding skilled individuals is a huge challenge, whereas 48% say the retention of skilled DevOps individuals is a challenge. With salaries in the high \$180,000 for experienced people and the current skill gap, 2020 will be a tough year for hiring managers and HR leaders. Individuals who have the right skills and experience, and who are good negotiators, can certainly score big. Key verticals such as financial services, healthcare, manufacturing and distribution, and technology are eager to find DevOps and tech talent.

What it means: This is typical of any technological innovation that occurred in IT over the past half century where early adopters developed the talent that is most needed when widespread adoption starts. Not much can be done about it except to find the right human resource talent and build positions and offers that will attract the needed talent.



Some skill categories will be less in demand and others more in demand.

Both project management and program management have declined in must-have skills since last year. Experience with source control models and processes has risen to the top category in process skills replacing last year's software development life cycle skills. Additionally, the category of experience with performance tuning and monitoring has moved from a 32% must-have skill to a 39% must-have skill ranking.

What it means: IT organizations must adapt their hiring strategies to match the pace of their transformation to DevOps. At the end of the day, all talents are required but the order in which they are needed requires a DevOps transformation strategic plan.



The DevOps human as a hybrid job and role.

The term "hybrid jobs" was first coined in 2015⁶ to mean jobs that combine skill sets that never used to be found in the same jobs. Since then, one in eight job posting is highly hybridized according to Burning Glass. They found analyzing close to a billion job postings and employee resumes from millions of companies that jobs are becoming more "hybrid," more complex, and demand key important new sets of skills. In fact, one-quarter of all occupations in the U.S. economy show strong signs of hybridization, and they are almost universally the fastest-growing and highest-paying jobs⁷.

What it means: The ideal candidates for a DevOps role at this stage demand a holistic view and understanding of issues faced by Dev, Ops and the possibilities of automation. Such "hybrid" candidates are hard to find but they are a top priority for DevOps success.



The Hybrid DevOps human must be equipped with key skills.

Human, process, knowledge and automation skills are equally important. Additionally, the hybrid DevOps human leverages skills from a wide area of fields which range from technology skills such as cloud infrastructure, to functional skills such as IT operations, to process and frameworks skills such as SRE or Agile. And last, having some exposure and skills around specific automation tools which one might have gained throughout their career or training, combined with business acumen, make a perfect hybrid DevOps Engineer. Specific certifications are a proof point for having acquired specific skills.

What it means: You don't need to lay eggs to be able to cook an omelet, and a maestro understands music without being a virtuoso in any specific instrument. A holistic view of IT and deep understanding of all the moving parts is key. Skills and experience will be extremely valuable.



Upskilling needs attention now.

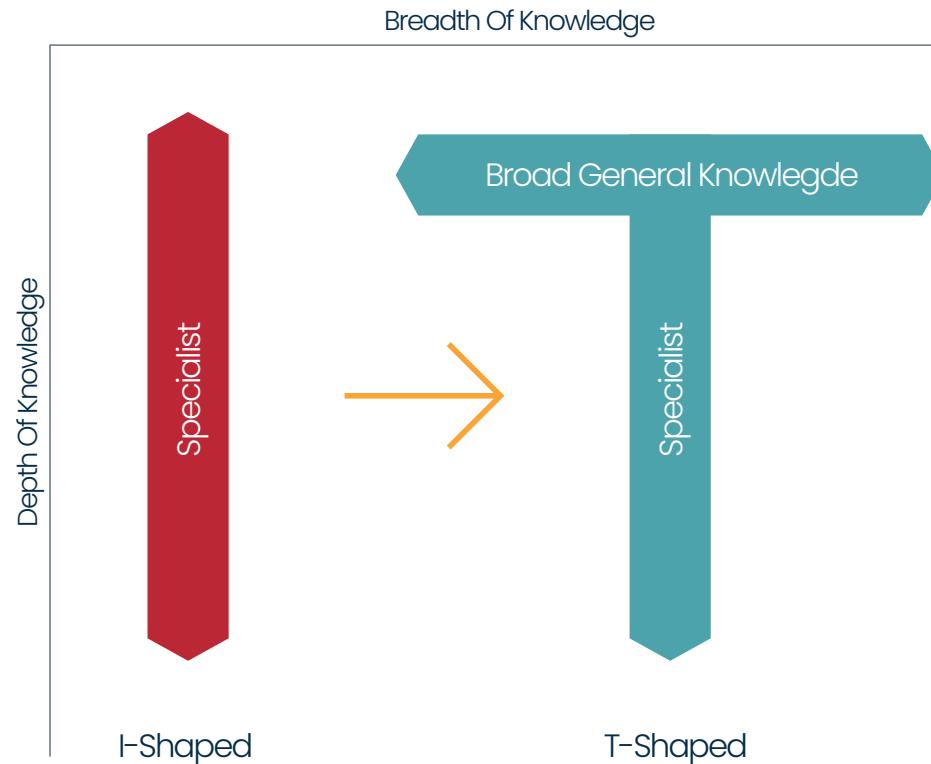
Which computer science programs teach interpersonal skills? How many IT Operation folks know about security practices? How does somebody learn how to code in multiple programming languages? How does one know the multitude of cloud and other infrastructures? The challenges on upskilling is not new and, according to the World Economic Forum, is the biggest challenge across the world with the tech job. Unfortunately, over 38% of our respondents' organizations have no upskilling program, 21% are currently working on one and 8% don't even know if their organization has a upskilling program. Companies like Federal Express, Amazon (will invest \$700 million in upskilling in 2020), AT&T, Google (will invest \$1 Billion in upskilling) and PwC have announced investments re-training and upskilling their workforce. 31% of survey respondents indicated that their company had already implemented a formal upskilling program within their organizations.

What it means: IT faces the same type of crisis as with every deep transformation. Skills that are needed, especially technical ones, are effectively taught in schools. Some, especially leadership and a broad understanding of processes, are not. IT organizations must work closely with human resources to spot potential talent and nurture them into key roles. Knowledge of how the IT department functions and an understanding of current practices is important. Upskilling employees who have that knowledge is a better way to success.

Introducing the 2020 E-Shaped DevOps Human

Last year we focused on the T-shaped person which was popularized by IDEO chief executive Tim Brown. T-shaped individuals have deep knowledge (the deep stem of the T) in at least one discipline or system, but also have a wide range of general knowledge of many disciplines and systems and a variety of boundary crossing competencies (the general top of the T⁸) (see Figure 3).

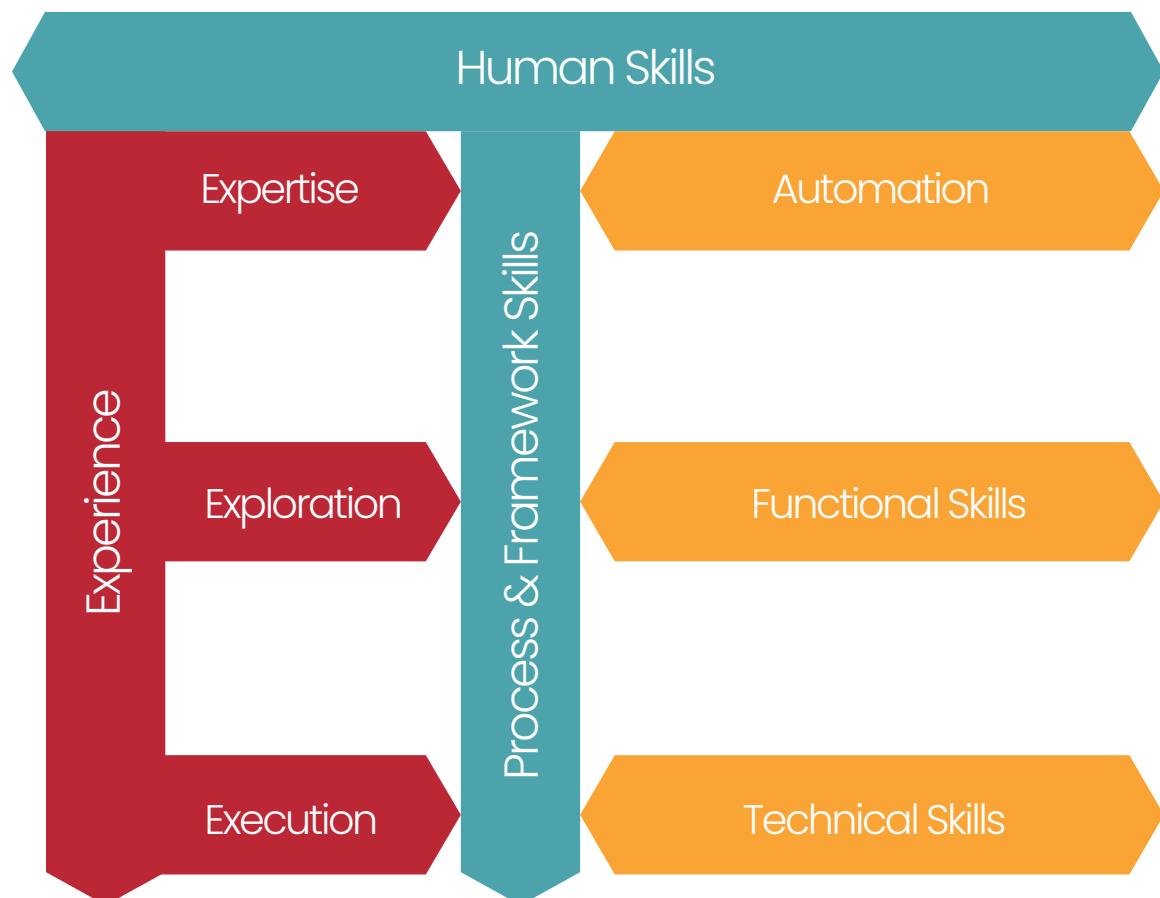
Figure 3: The T-Shaped DevOps Human



This year we have evolved our DevOps human to be E shaped. Sarah DaVanzo argues, ``The trends clearly favor those with “breadth” and “depth”, as well as the tangible (execution) and intangible (exploration), implying having both a big-picture outlook and an attention to detail from being a practitioner. She continues “E-Shaped People have a combination of “4-E’s”: experience and expertise, exploration and execution. The last two traits, exploration and execution, are necessary in the current and future economy’’.

From the analysis of the skills categories we have derived the E-shaped DevOps human (see figure 4).

Figure 4: The E-Shaped DevOps Human



1 There are three horizontal skill categories which comprise a specific set of capabilities: automation skills, functional knowledge and skills and technical skills. These can vary depending on what the person is interested in, the individuals experience and abilities and are somewhat easy to train, develop and measure.

2 A second grouping of skills, the categories of process and framework skills, is more of a vertical skill which focuses on flow and understanding the ins and outs of how things work leveraging a variety of best practices and methodologies like Scrum, Agile and Value Stream Mapping. These will need to be applied atop of the automation, functional and technical skills. Technology varies in its adoption and so do the technology skills as it depends on the technologies used and the plan for the organization, its current processes and methods used. This skill category requires some cognitive abilities, analytical thinking and innovation thinking to find and develop creative solutions for the complex world of DevOps.

3 Another vertical skill category is the human skills which includes skills such as collaboration, interpersonal skills and more which are all necessary across all other skill categories. Unfortunately, human skills are not easy to train, upskill and measure. The experience and expertise come with time and upskilling; exploration is a fundamental of DevOps and execution is the simple proof of what a person has done applying his or her skills in terms of results.

Top Skill Categories for the DevOps Human

While DevOps needs champions, excellence can be achieved only if the entire organization is on board which includes commitment from top down and bottom up. The following figures show how our survey respondents have rated the importance of the skill categories (Figure 5), the different roles (C-level, Management, and Individual Contributor) and their perspectives from our survey across the skill categories (see Figure 6).

Figure 5: The DevOps Human Skill Categories

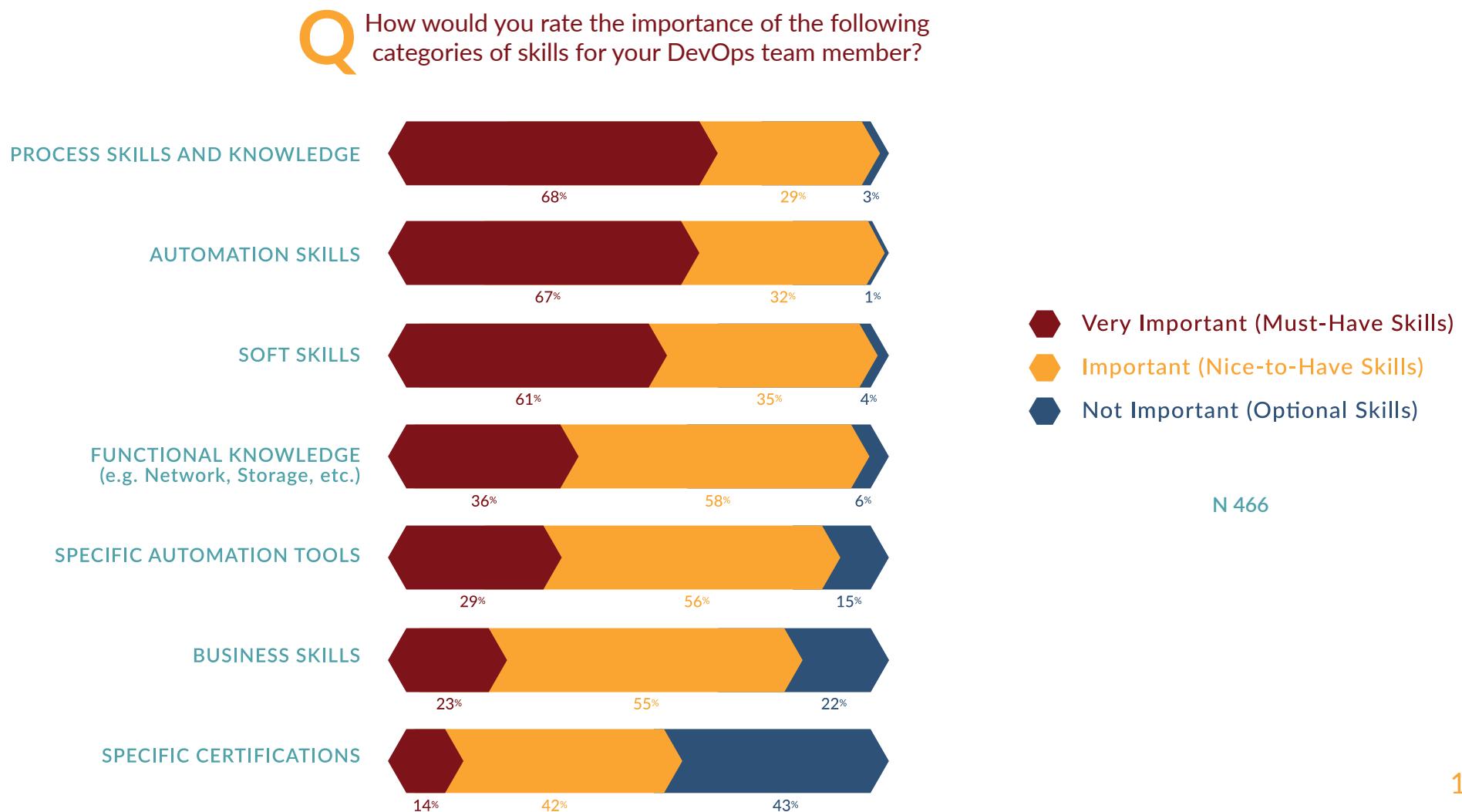
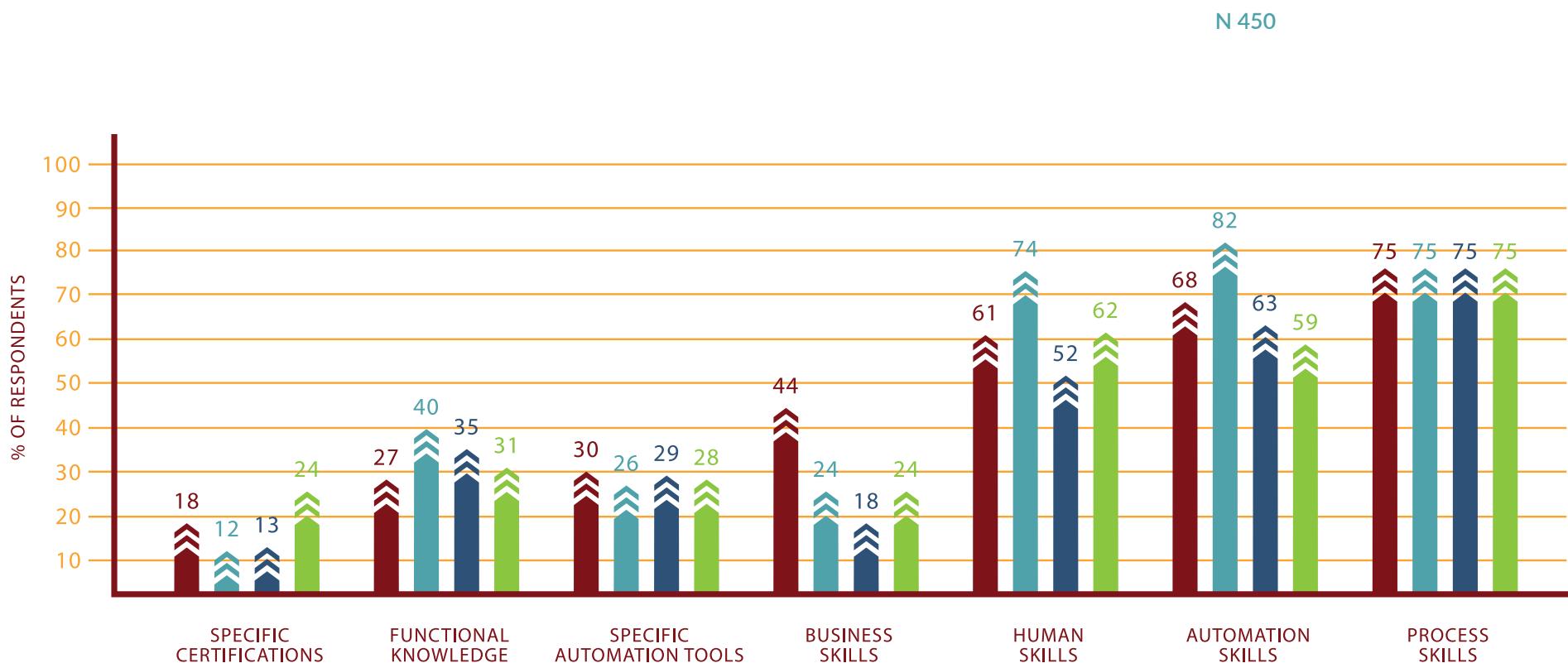


Figure 6: Difference In Perspectives Of Must-Have Skills Relative To Key Roles



A photograph of three people in an office setting. A man in a blue t-shirt sits at a desk on the left, looking towards a woman in a blue dress who is seated on the right. A third person, a man in a blue shirt, stands behind them, leaning over the desk. They are all smiling and appear to be engaged in a collaborative discussion. In the background, there is a large glass wall covered with numerous colorful sticky notes, suggesting a brainstorming session or project planning. A laptop and some papers are visible on the desk.

Process and framework skills are essential to understand how to eliminate waste.

We have probed for the same frameworks and process skills as last year, but have added a few emerging methodologies, frameworks or disciplines which are relevant. The top three must-have process and framework skills are: understanding of process flow and analysis (52% must-have responses), experience with source control models and processes (52% must-have responses), and knowledge of the software development life cycle (51% of must-have responses). Methodologies such as Agile and Scrum also rank within the top 5 must-have skills of process and framework skills (See Figure 7). The digital business does require some effective way of performance tuning and monitoring, which is reflected in our survey results, as this skill has received 39% of our respondent's must-have vote.

**Figure 7: Process And Framework Skills Category:
Process Flow/Analysis, Experience With Source Control
And SDLC Rank As The Top Three Process Skills**

Q How would you rate the importance of the following process and framework skills for a DevOps team member?

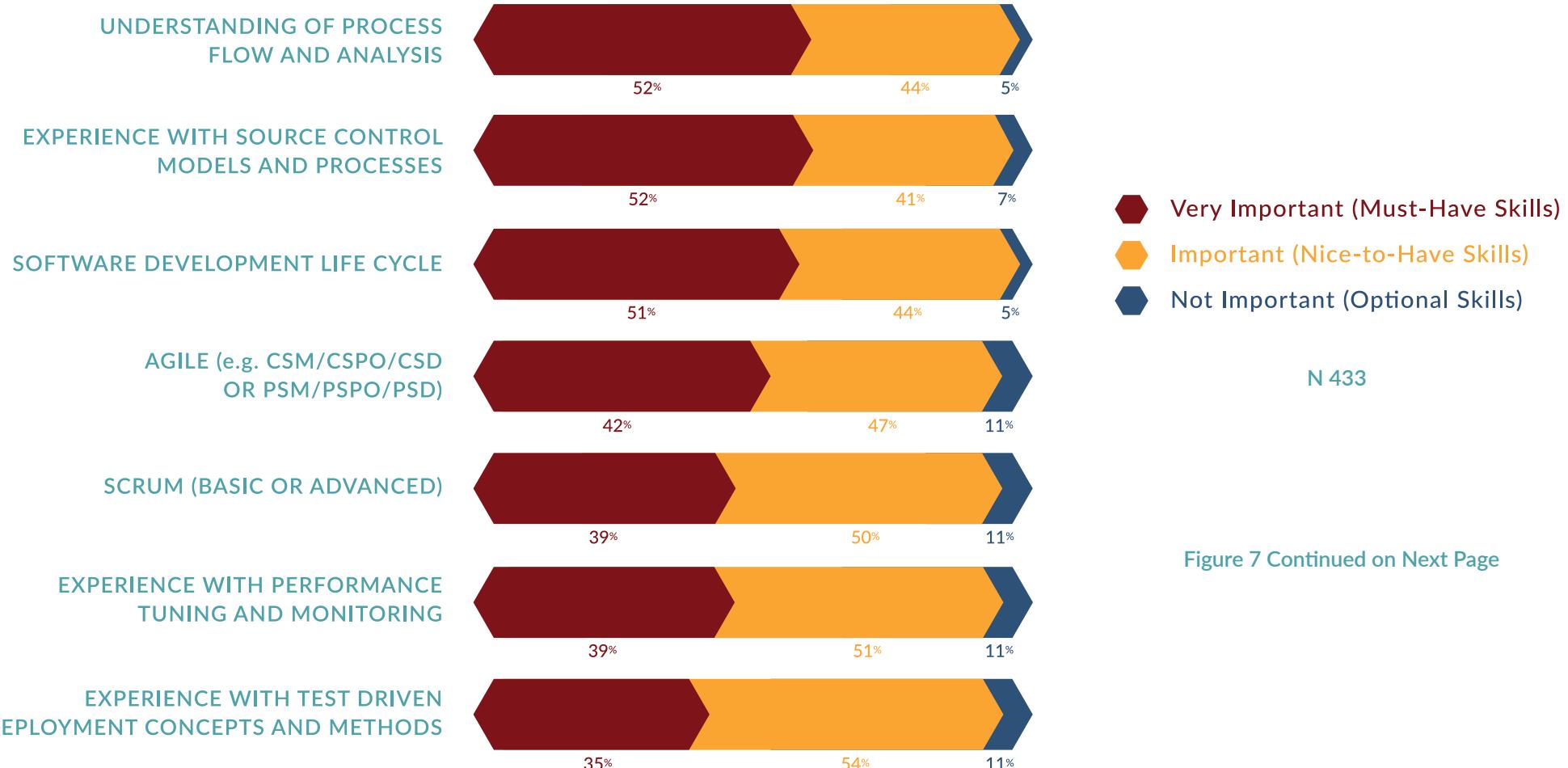
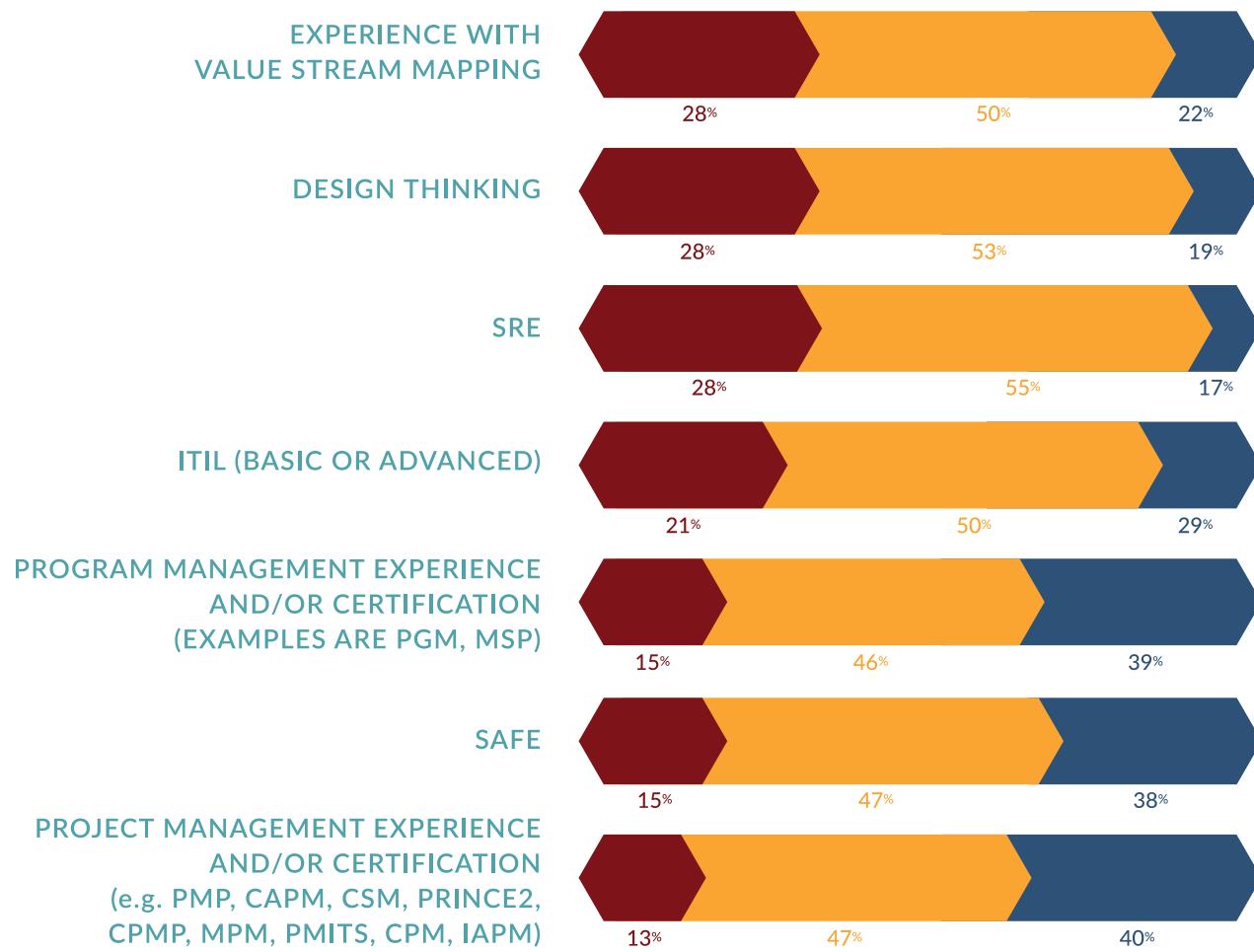


Figure 7 Continued



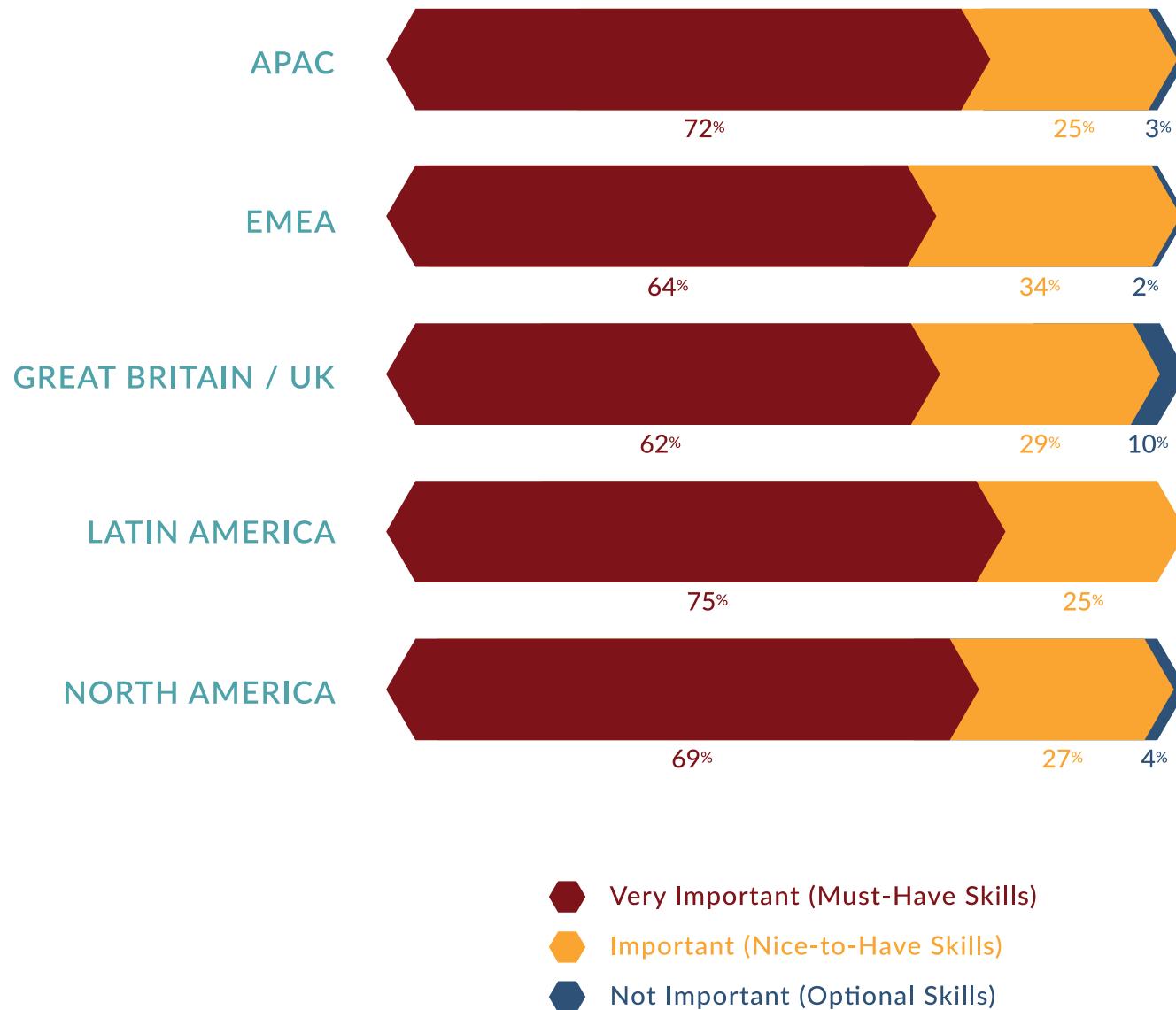
Delta from 2019:
Three new categories
SRE, VSM, and SAFe

Delta from 2019:
PMO and PM
fell in must-
have votes

Delta from 2019:
SDLC and understanding
of process flow gained
must-have votes

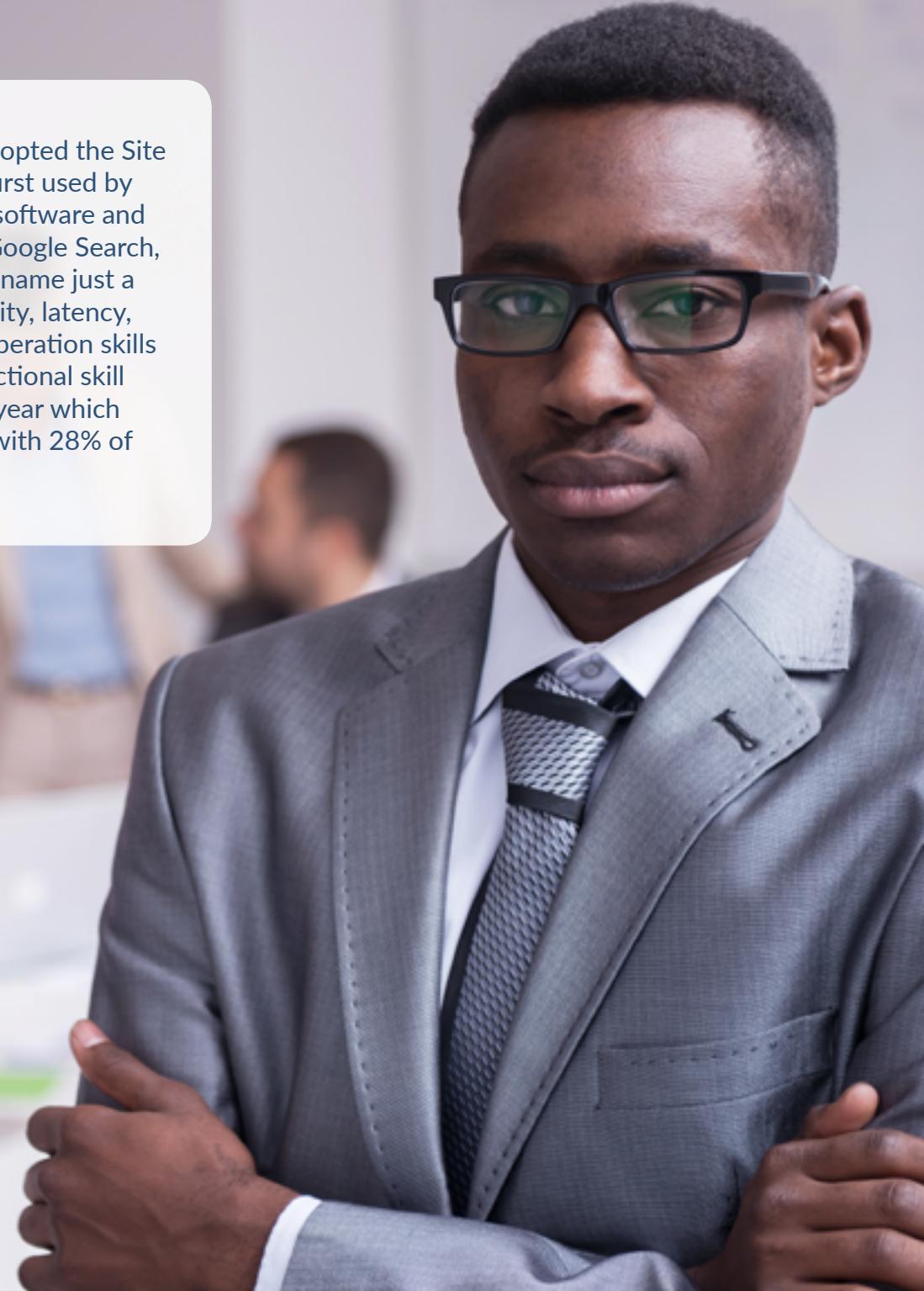
Delta from 2019:
Design thinking
fell in must-have
votes

Figure 7: Process and Framework Skills Category Responses Across Regions



APAC and LAR data suggests they rate process skills and knowledge higher in the must-have category

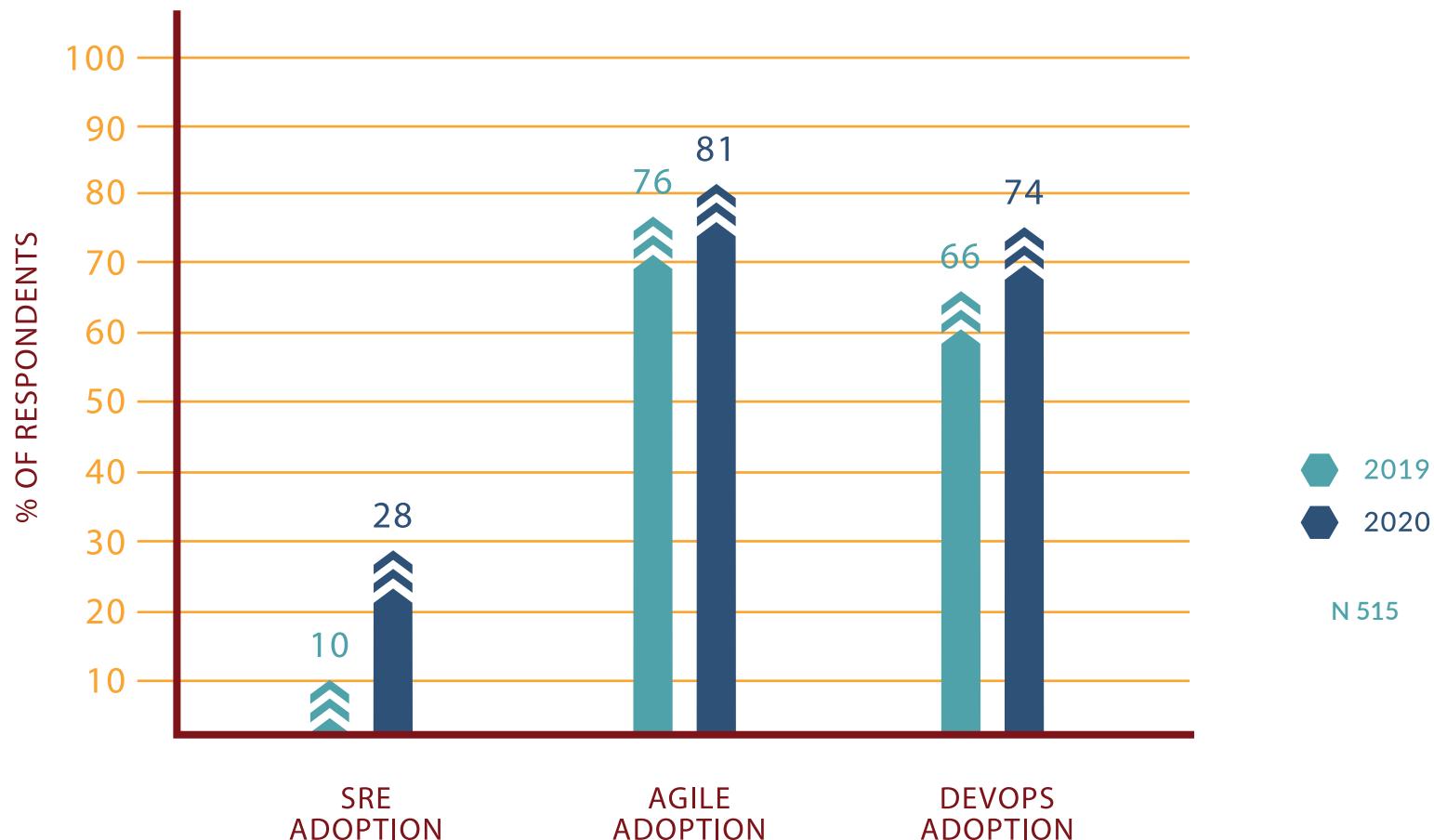
- Very Important (Must-Have Skills)
- Important (Nice-to-Have Skills)
- Not Important (Optional Skills)



Today, 15% of IT enterprise organizations have adopted the Site Reliability Engineering (SRE) practices, a method first used by Google to “protect, provide for, and progress the software and systems behind all of Google’s public services — Google Search, Ads, Gmail, Android, YouTube, and App Engine, to name just a few — with an ever-watchful eye on their availability, latency, performance, and capacity.” SRE people have IT operation skills which we know is a top must-have skill in the functional skill category. This is a tremendous increase from last year which also explains why SRE skills are a must-have skill with 28% of respondents (see Figure 8a and 8b).

Figure 8A: SRE Adoption Is On The Rise

Q Which discipline(s) or frameworks does your organization primarily apply within your IT environment today?
(select all that apply)



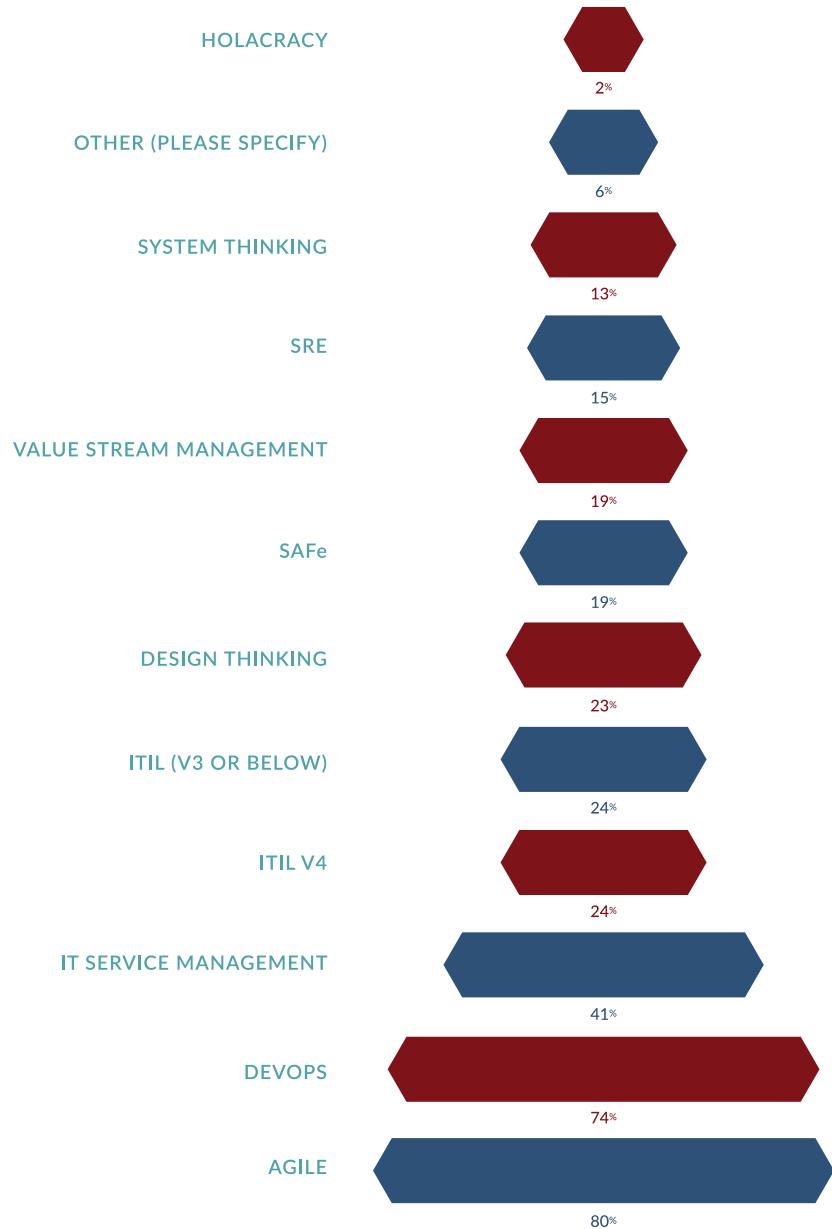
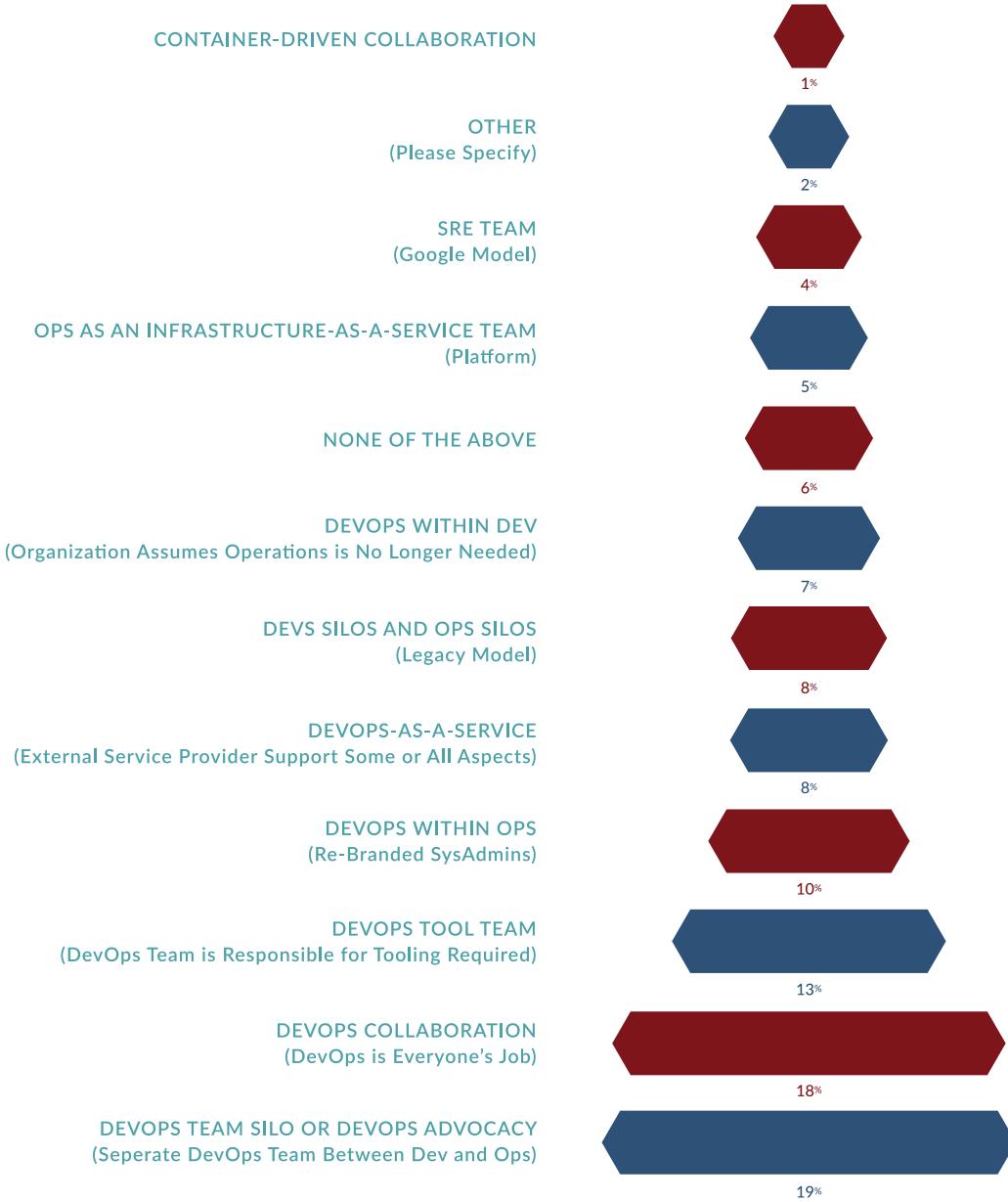


Figure 8B: Agile, DevOps, IT Service Management and ITIL Are Still The Top Popular Frameworks

Q Which discipline(s) or frameworks does your organization primarily apply within your IT environment today?
(select all that apply)

Topologies should maximize flow.

Matthew Skelton, co-author of Team Topologies (IT Revolution, 2019) and originator of the original DevOps Topologies patterns, says “High-performing organizations are moving away from one-size-fits-all static team patterns and towards team topologies that help maximize flow and minimize cognitive load on teams³”. Figure 9 shows which topologies are in use in the organizations we surveyed. The topologies in use today require some work following Matthew’s advice.



Others mentioned: DevSecOps, ISO, SFIA

Figure 9: Topologies In Use Today

Q What topologies are leveraged as the primary model within your organization today?

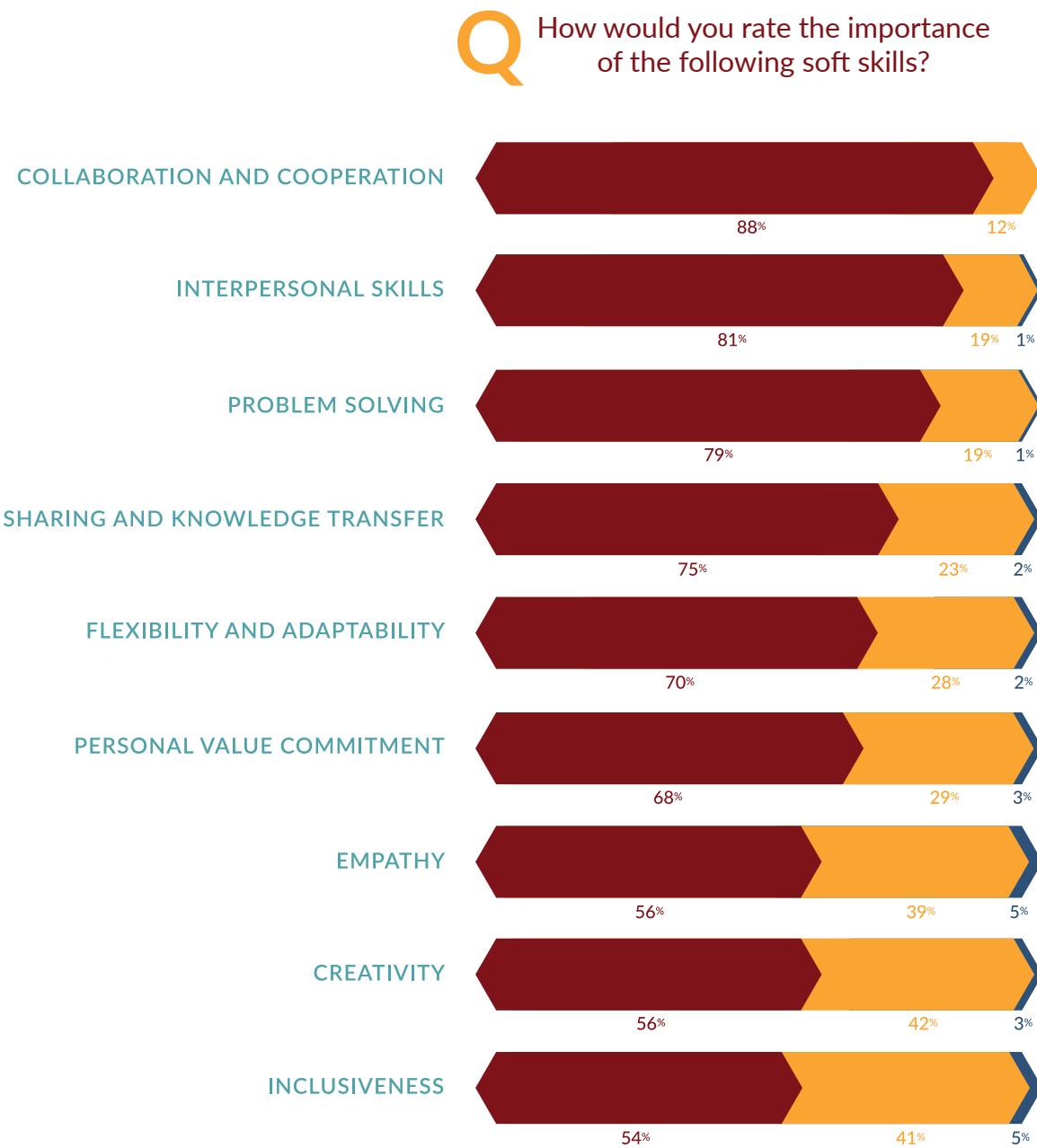
Soft skills are no longer soft – they are human skills.

Seth Godin (and others) have discussed the term soft skills^{10/11}. We can change the term from soft skills to human skills, which is not difficult. But what is difficult is to change the mindset recognizing the value human skills will bring to a team. DevOps transformations are hard, and the challenges are in equal parts due to people, technology and processes. The transformation to a DevOps collaborative model and moving away from existing silos is a huge change. As Karen Ferris, an organizational change agent, points out “Resistance to change is a normal response. But resistance to change is less of a problem than employees ignoring the change or being in denial of the change¹²”. It will take fundamental changes in mindset to help humans to recognize the value that strong human skills bring to a team and the will and resources to foster this valuable skill set in employees. Perhaps the first step is to stop using the word “soft” and champion the word “human”. But most importantly, it is to understand which human skills are essential must-have skills for the DevOps human. Figure 10 will help you determine what human skills to hone into. For details on what is included in each of the human skill categories please refer to Appendix A.



- Collaboration
- Interpersonal Skills
- Problem Solving
- Sharing and Knowledge Transfer
- Flexibility

Figure 10: DevOps Human Skills



Delta from 2019:
Interpersonal skills moved to second most important must-have skill from last years third spot.

Delta from 2019:
All categories have gained in must-have from last year.

- ◆ Very Important (Must-Have Skills)
- ◆ Important (Nice-to-Have Skills)
- ◆ Not Important (Optional Skills)

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Figure 10 Continued on Next Page

Figure 10 Continued

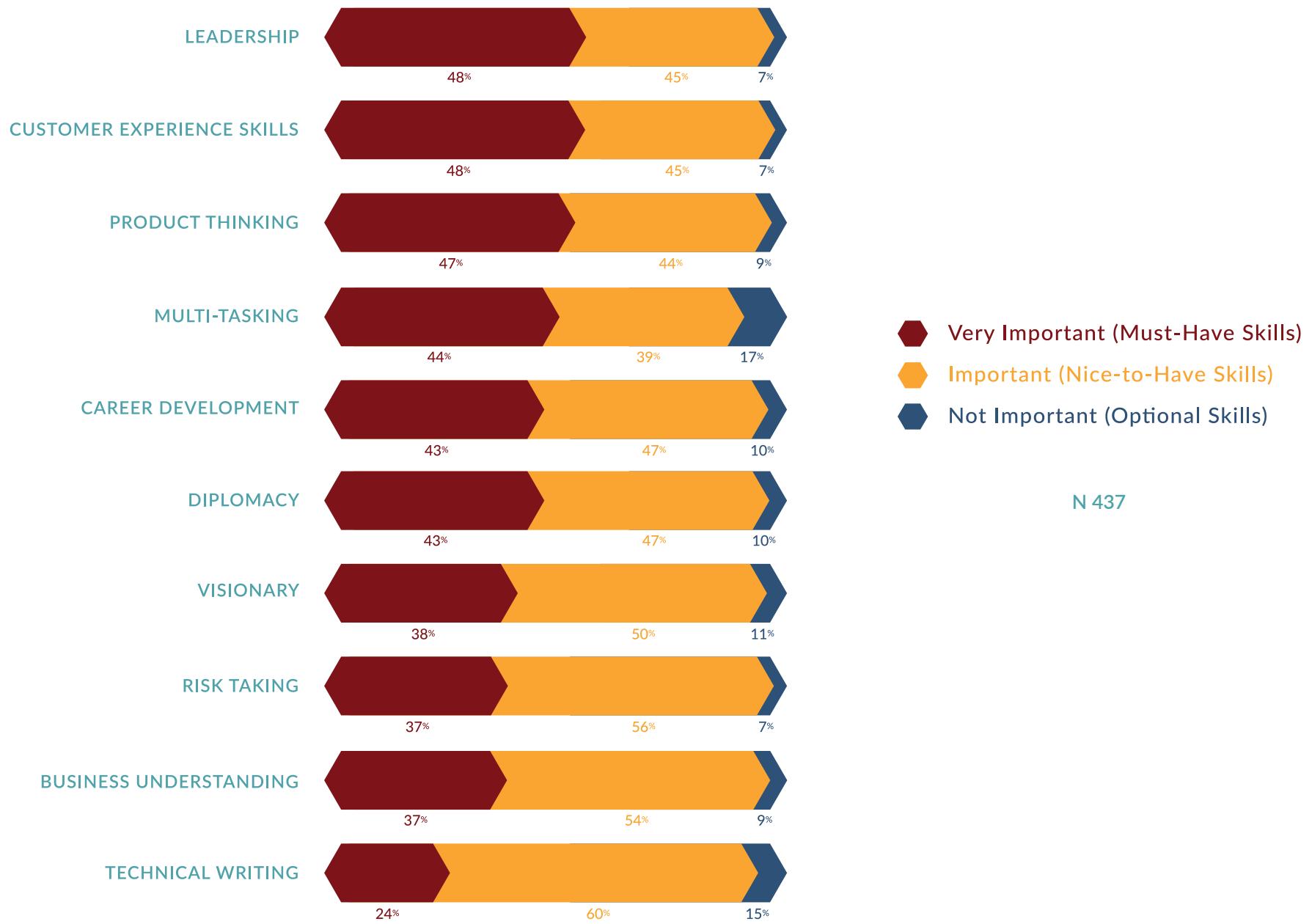
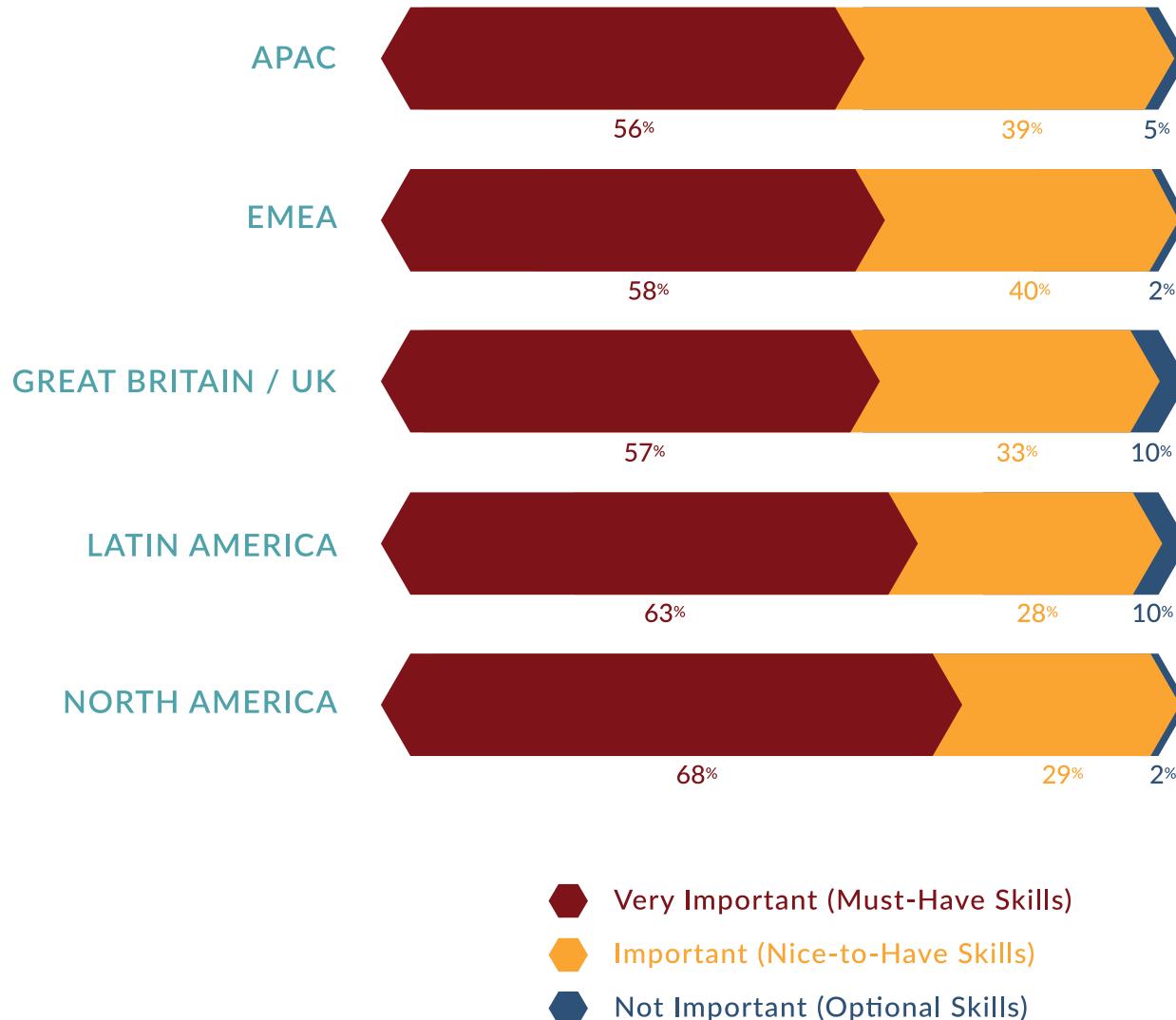


Figure 10: DevOps Human Skills Category Responses Across Regions

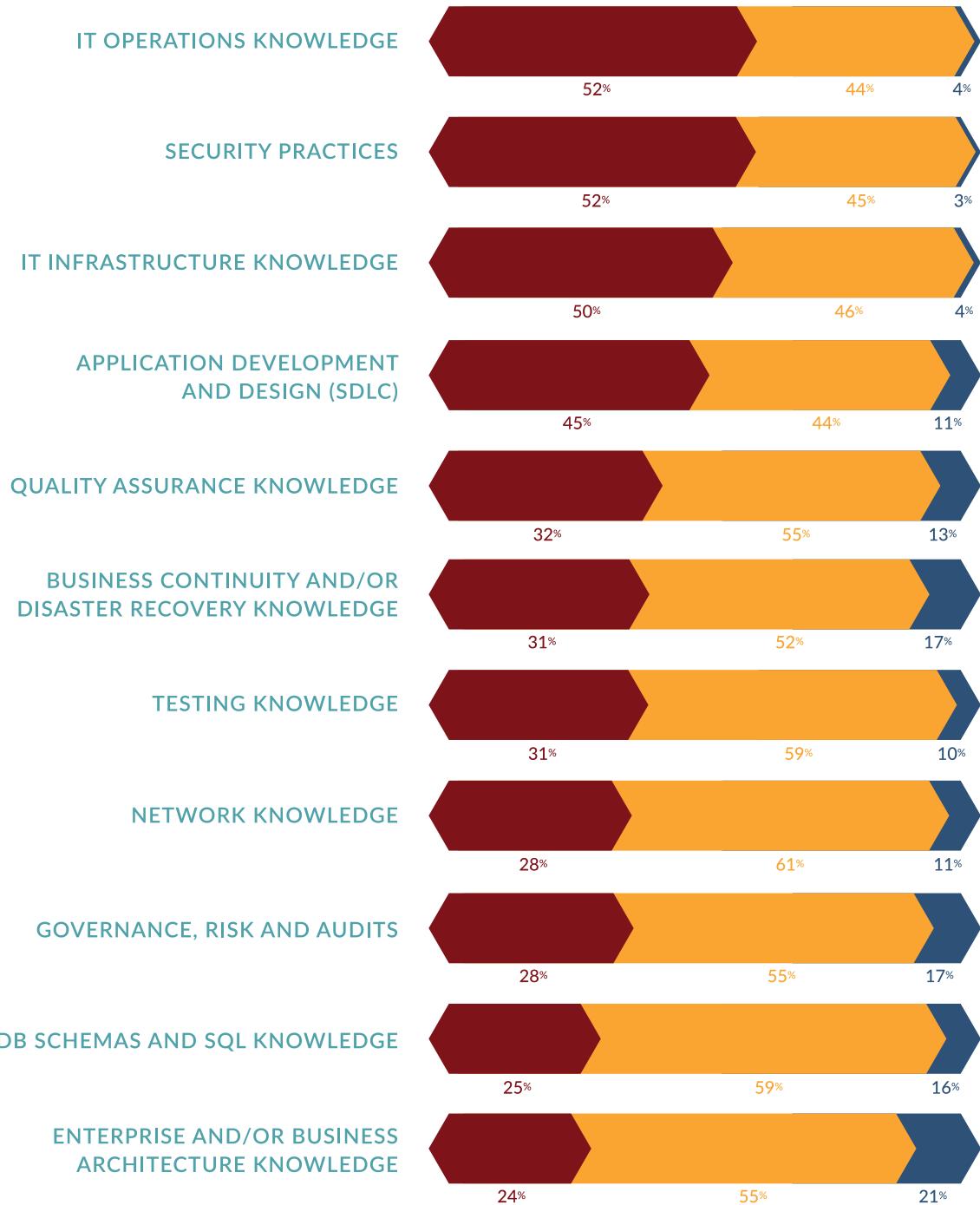


Differences of
must-have
human skills
across regions



Functional skills are a key part of the building blocks for the E-shaped DevOps human.

The DevOps human must have functional skills which include IT Operations (ITOps), security practices, IT infrastructure, application development and design (AD&D), quality assurance and business continuity/disaster recovery (BC/DR). A DevOps Engineer will work with software developers and, therefore, requires knowledge on how to speak their language and an understanding of what they do. Continuous delivery requires knowledge depth in ITOps processes such as release and change management. Security topics and concerns must be addressed, even though security topics in depth (just as the other functional topics) are covered by functional experts which are part of the extended DevOps team. Understanding concepts of quality assurance (such as testing) and business continuity allow for better collaboration and improved results in the speed and quality of the software and services delivered. Figure 11 describes the top functional skills for the DevOps human.



IT Ops, Security And Infrastructure Skills Are Just As Important As Application Development

Figure 11: Functional Skills

Q How would you rate the importance of the following functional skills for your DevOps team members?

Delta from 2019:
IT Infrastructure, network, security, GRC, BC/DR and Application Development all gained must-have votes from 2019.

- ◆ Very Important (Must-Have Skills)
- ◆ Important (Nice-to-Have Skills)
- ◆ Not Important (Optional Skills)

Figure 11: Key Functional Skills Categories Responses Across Regions

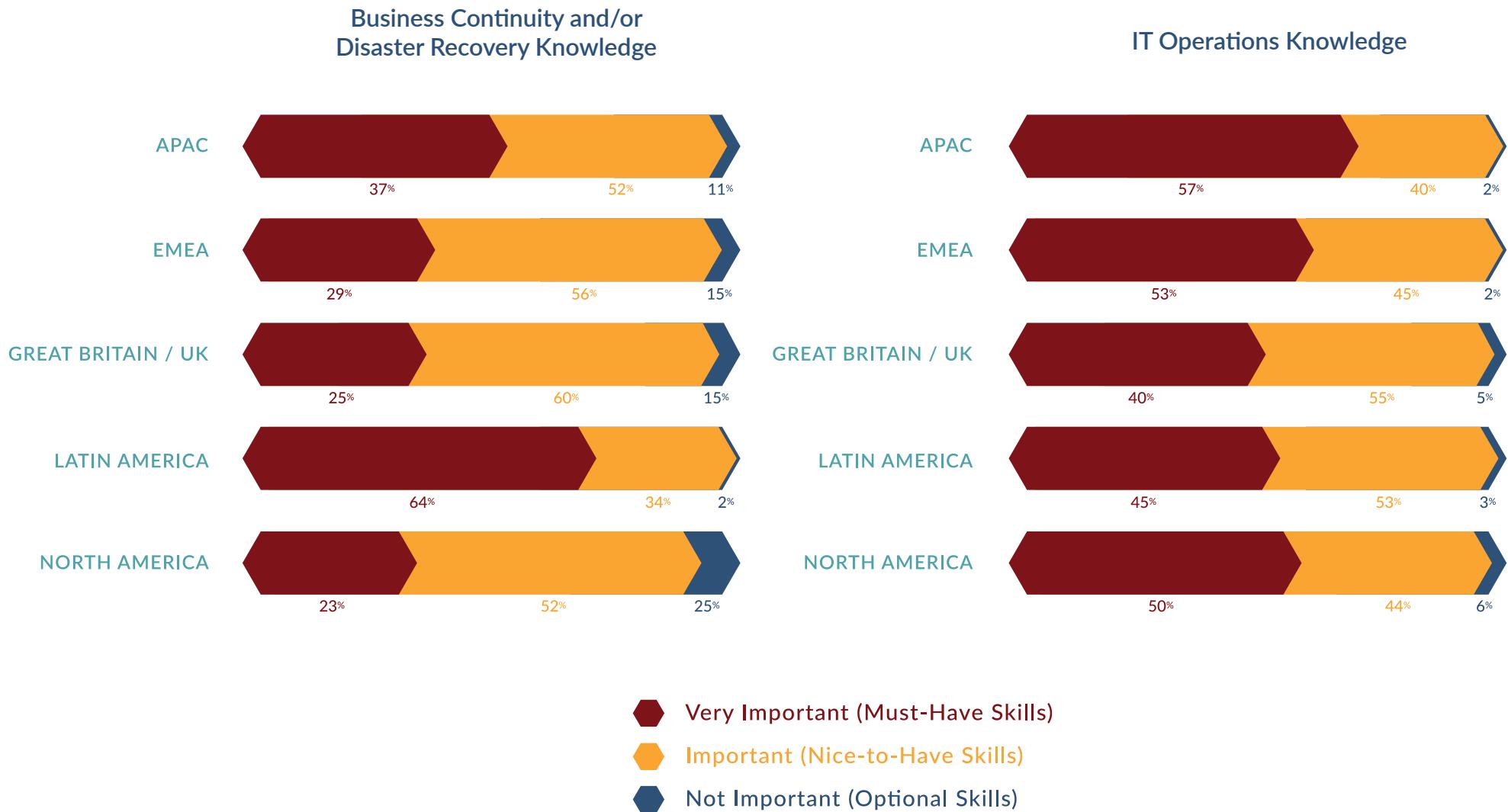
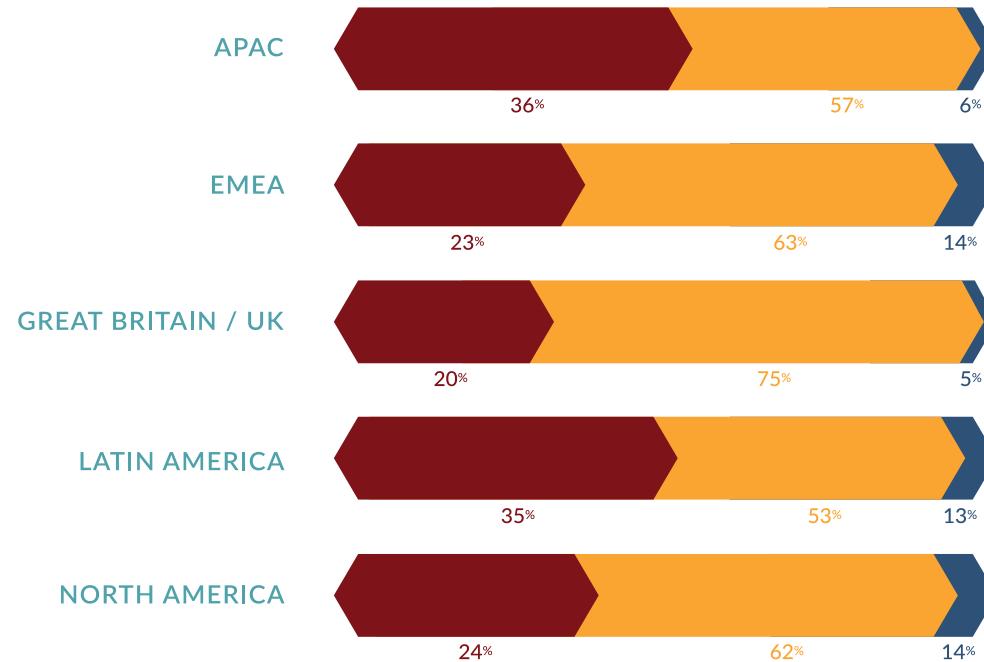


Figure 11 Continued on Next Page

Network Knowledge



- Very Important (Must-Have Skills)
- Important (Nice-to-Have Skills)
- Not Important (Optional Skills)

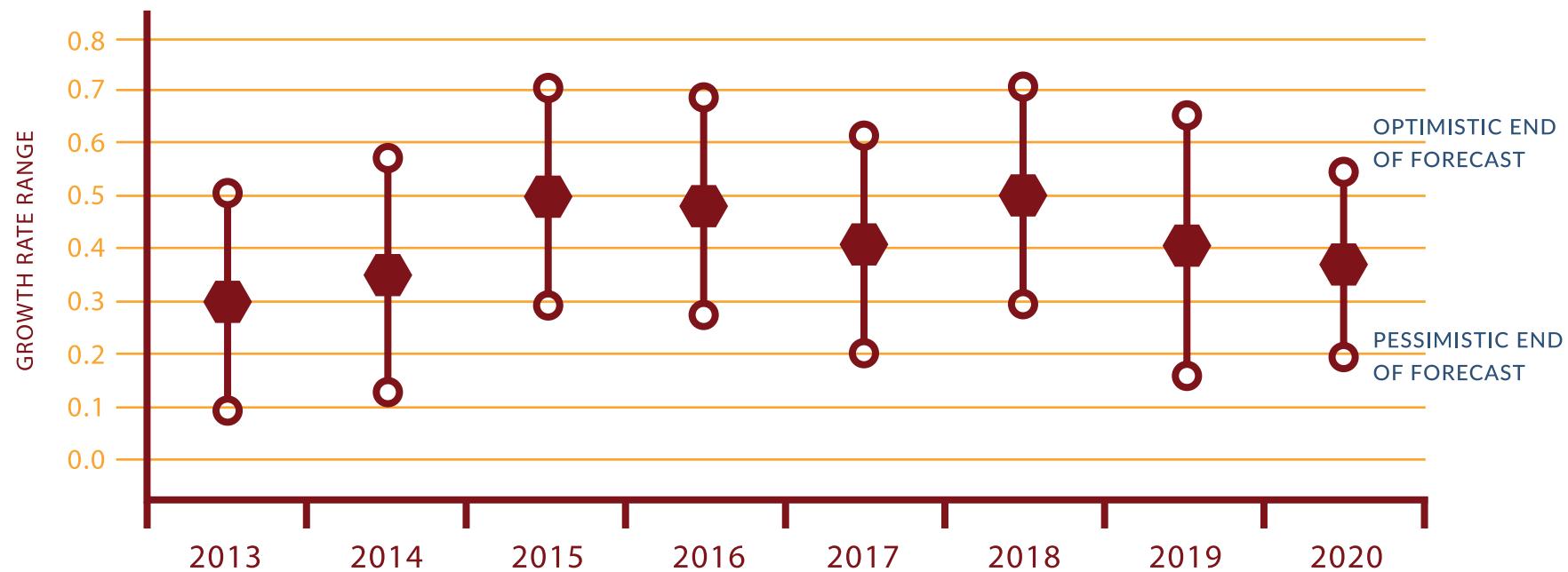
Regional variations
around BC/DR, IT
Operations knowledge
and network skills.

Continuous technology innovation will force technical skills to be in constant flux.

George Westerman, a senior lecturer at MIT Sloan School of Management, principal research scientist for Workforce Learning at the MIT World Education Laboratory (J-WEL) and author of Leading Digital says, "Technical people need to keep up with constantly changing tools and technologies. But everyone needs to be able to adapt to changes in their work and, in the longer term, to reskill and pivot to new roles over the course of their careers". This is specifically true during the times of fast changes in technology. 90% of the data in the world was created within the last two years¹³. Artificial Intelligence (AI) can now detect more than 50 eye diseases better than a doctor¹⁴. 5G is no longer a potential future, but the reality in more than 13 countries in the world¹⁵.

Additionally, Worldwide IT spending forecasts (according to Gartner) will be at \$3.86 trillion in 2020, a small rise from \$3.73 trillion in 2019¹⁶ with the biggest growth in enterprise software (10.5% growth from last year) and IT services (5.0% growth from last year). Figure 12 shows the year over year IT spend which demands additional skills. The adoption of DevOps is critical to survive in a digital era. Organizations are needing to deliver value and differentiation to their customers. The 2019 Accelerate State of DevOps report states that "DevOps delivers value to customers and end users by impacting both commercial and non-commercial goals¹⁷". You cannot be left behind, therefore, you must pay attention and acquire the skills that are needed to succeed.

Figure 12: Global IT Industry Growth Projected to Hit 3.7%



Source: CompTIA.org

A professional portrait of a young woman with dark hair, wearing a dark blazer over a white collared shirt. She is smiling at the camera. In the background, there are blurred figures of other people, suggesting a public or office setting.

The priorities of technical must-have skills for the DevOps human are shown in Figure 13. The top five technical skills are essential for a successful DevOps journey. For the first time we have asked for the importance of the knowledge around Continuous Integration/Continuous Delivery (CI/CD) toolchains and this skill has risen to the top of the must-have list. In short, CI/CD toolchains help with velocity and quality of code, allow for better collaboration among the teams and automates many steps, tasks and processes which reduced the risk and cost of software development. Understanding cloud platforms, being somewhat competent in the topics around APIs and possessing analytical skills are all must-have skills necessary in transforming organizations towards the digital business.

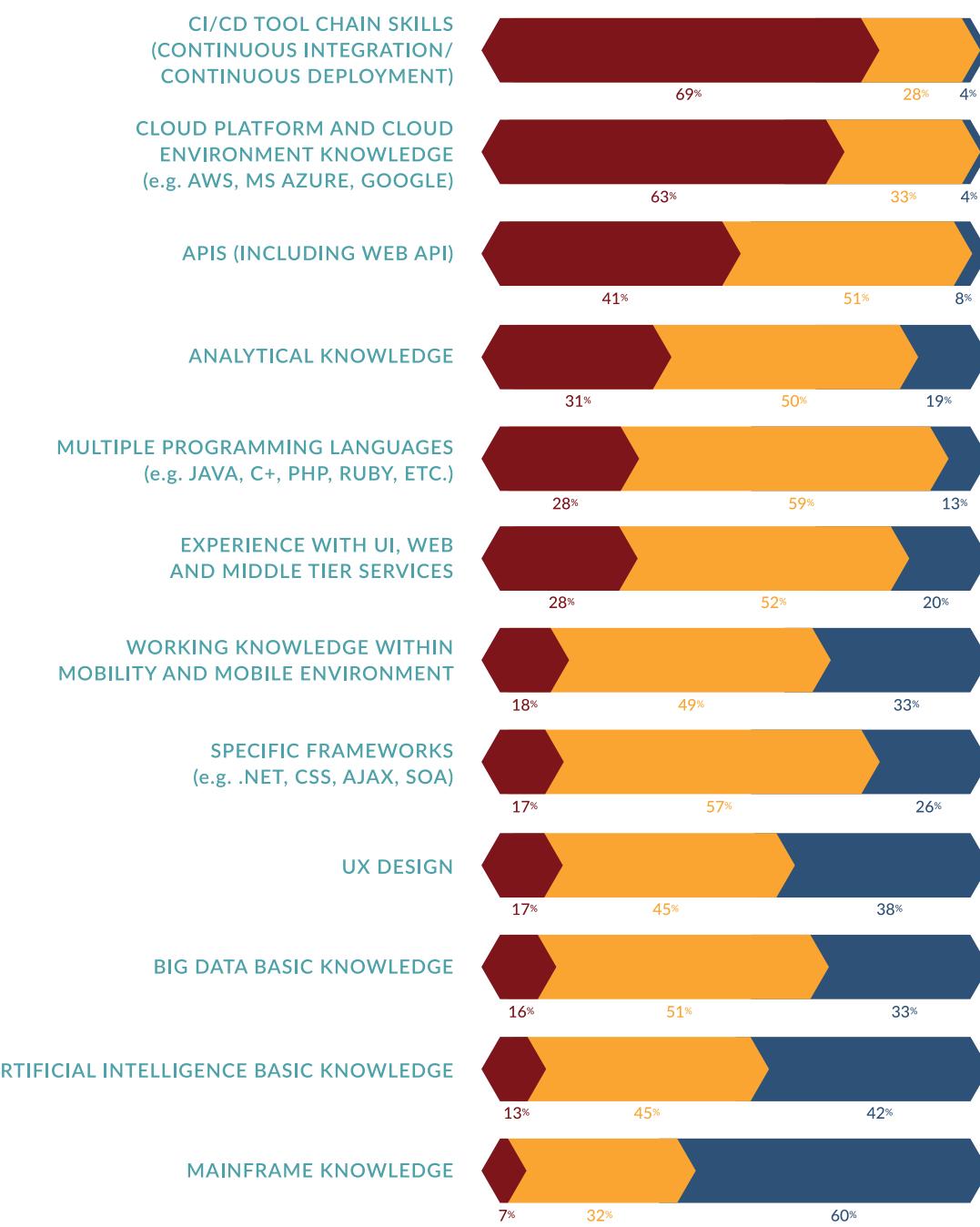


Figure 13: Technical Skills For The DevOps Human
CI/CD Toolchain, Cloud Platform And Understanding APIs Are The Top 3 Must-have Technical Skills

Q How would you rate the importance of the following technical skills for your DevOps team members?

Delta from 2019:
New category CI/CD rose to the top.

- ◆ Very Important (Must-Have Skills)
- ◆ Important (Nice-to-Have Skills)
- ◆ Not Important (Optional Skills)

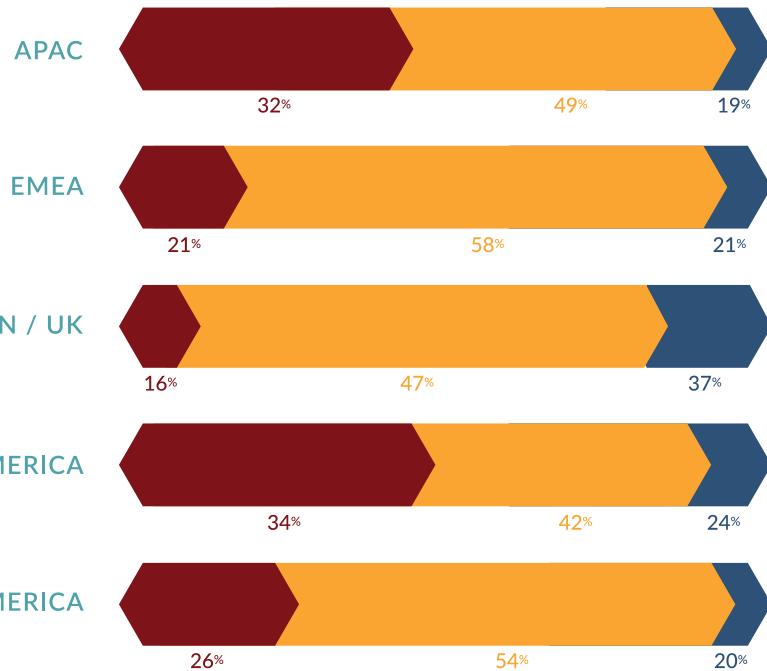
N 447

Delta from 2019:
Analytical knowledge, cloud platform, specific frameworks (.NET, etc.), multiple programming languages gained must-have votes since 2019.

Delta from 2019:
Mainframe skills are still must-have but declined from 11% to 7%.

Figure 13: Key Technical Skills Categories Responses Across Regions

Experience with UI, Web, and Middle Tier Services



Mainframe Knowledge

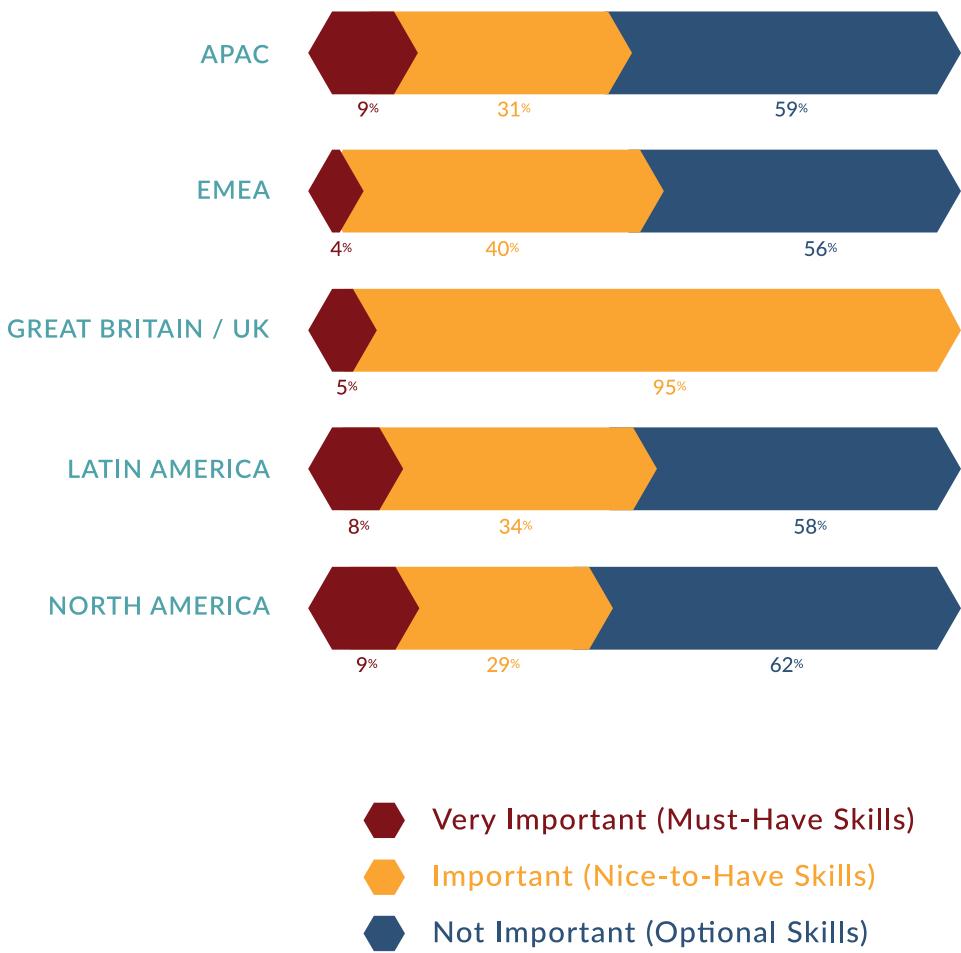
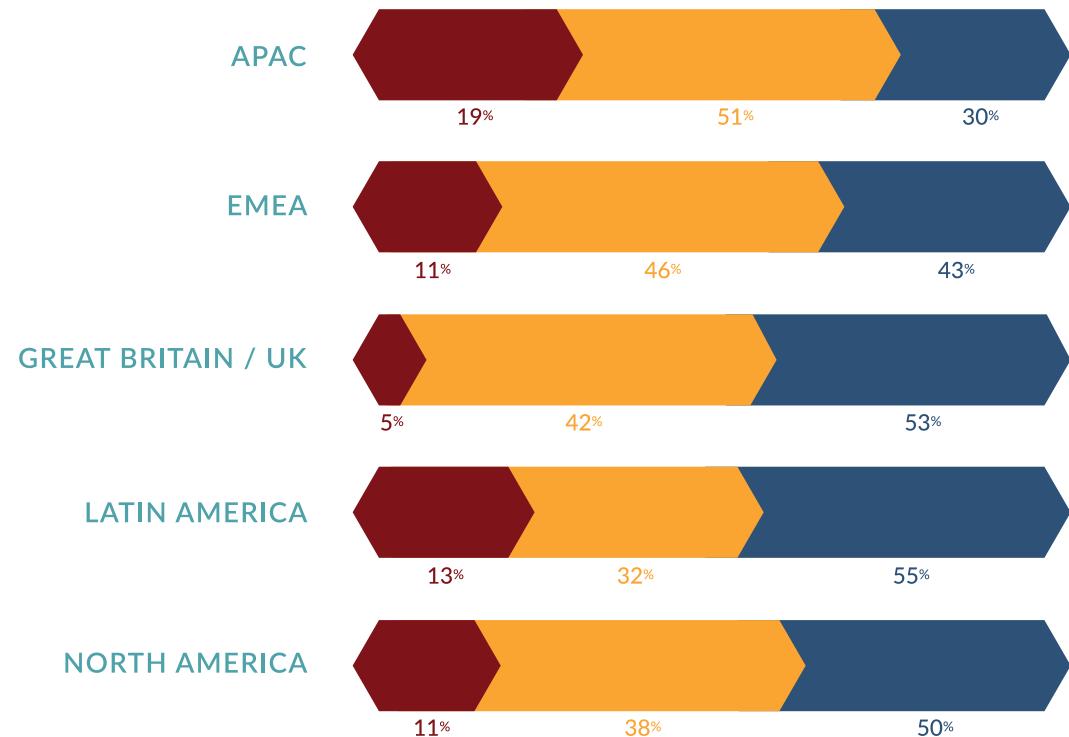


Figure 13 Continued on Next Page

Artificial Intelligence Knowledge



Regional variations on experience with UI etc, mainframe and AI.

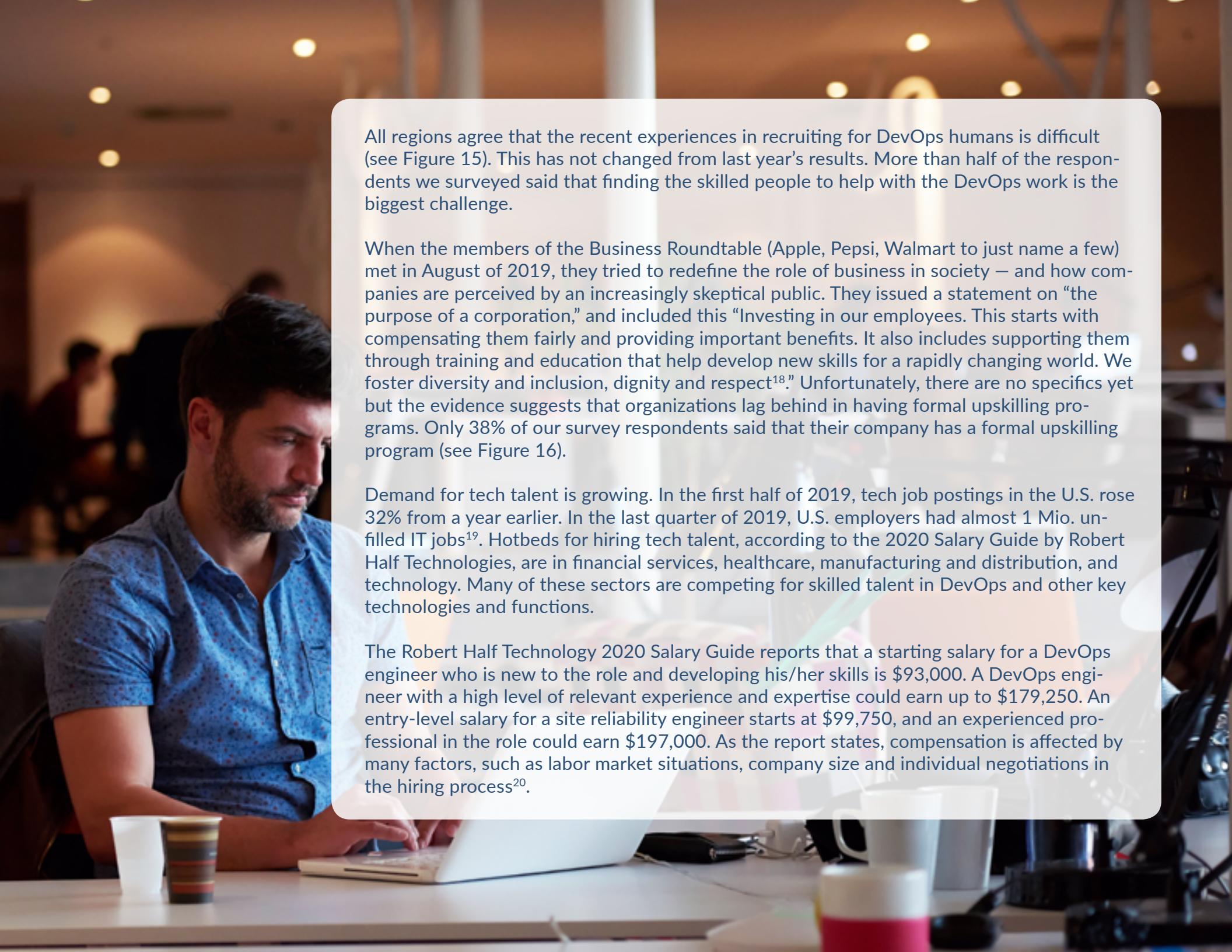
- Very Important (Must-Have Skills)
- Important (Nice-to-Have Skills)
- Not Important (Optional Skills)

The E-shaped DevOps Human Positions: Fast-Growing, High-Paying and Tough to Find and Fill

Our survey found that more than 52% of respondents are currently recruiting or plan to recruit DevOps humans (see Figure 14). The current thinking relative to the hiring of DevOps team members varies from region to region. When we asked for what job title they currently recruited, DevOps Engineer was chosen by 51% of the respondents.

Figure 14: Recruiting For DevOps Human In 2020





All regions agree that the recent experiences in recruiting for DevOps humans is difficult (see Figure 15). This has not changed from last year's results. More than half of the respondents we surveyed said that finding the skilled people to help with the DevOps work is the biggest challenge.

When the members of the Business Roundtable (Apple, Pepsi, Walmart to just name a few) met in August of 2019, they tried to redefine the role of business in society — and how companies are perceived by an increasingly skeptical public. They issued a statement on “the purpose of a corporation,” and included this “Investing in our employees. This starts with compensating them fairly and providing important benefits. It also includes supporting them through training and education that help develop new skills for a rapidly changing world. We foster diversity and inclusion, dignity and respect¹⁸.“ Unfortunately, there are no specifics yet but the evidence suggests that organizations lag behind in having formal upskilling programs. Only 38% of our survey respondents said that their company has a formal upskilling program (see Figure 16).

Demand for tech talent is growing. In the first half of 2019, tech job postings in the U.S. rose 32% from a year earlier. In the last quarter of 2019, U.S. employers had almost 1 Mio. unfilled IT jobs¹⁹. Hotbeds for hiring tech talent, according to the 2020 Salary Guide by Robert Half Technologies, are in financial services, healthcare, manufacturing and distribution, and technology. Many of these sectors are competing for skilled talent in DevOps and other key technologies and functions.

The Robert Half Technology 2020 Salary Guide reports that a starting salary for a DevOps engineer who is new to the role and developing his/her skills is \$93,000. A DevOps engineer with a high level of relevant experience and expertise could earn up to \$179,250. An entry-level salary for a site reliability engineer starts at \$99,750, and an experienced professional in the role could earn \$197,000. As the report states, compensation is affected by many factors, such as labor market situations, company size and individual negotiations in the hiring process²⁰.

Can't Find Them? Train Them with Formal Upskilling Programs

The good news is that upskilling, reskilling and training is being considered and some organizations already have formal upskilling programs (See Figure 16). Today, 31% of our respondents said that their organization has a formal upskilling program and 20% are currently developing one. The bad news is that 7% of our survey respondents don't know if there is a formal upskilling program in their organization (which is a different problem in itself).

But what are the best upskilling models? Our research will continue towards answering this question in the future. However, Allison Salisbury, a Partner & Head of Innovation at Entangled Group, an education venture studio and strategy consulting firm headquartered in San Francisco has some great suggestions. She suggests the following five models for upskilling (see Figure 17). A variety of excellent examples of companies are working on building their IT brand to attract new skills and talent. Some great examples can be found in the HBR report on IT Talent Strategy: New Tactics for a New Era²¹.

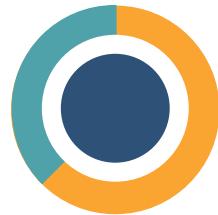
Certifications are a proof point that you have learned skills.

What makes any person qualified for a position is defined by the demands of the company. Jeff Weber, executive director of Robert Half Technology, said, "Certifications are somewhat important as they are proof that a person has the knowledge and skills in question. There is more interest around specific technologies with regard to certifications, but we have seen an uptick recently with DevOps certifications." IT technology certifications such as Microsoft Certified Solutions Expert (MCSE), RHCE (Red Hat) or vendor-neutral certifications from ISACA or DevOps Institute have an industry-wide appeal since the knowledge and skill measured by them can be used across almost all companies no matter which vertical or geographic location. 42% of respondents say that specific certifications are a nice-to-have skill. Certifications should be considered as a human asset just like in other fields like law, accounting or medical doctors. An IT person attaining certifications allows the individual to seek promotion, improves the respect by peers and customers, increases the awareness of knowledge, skills and shortcomings and improves self-confidence. Additionally, certifications are ensuring that there is sound code of practices leveraged which results in confidence that compliant and legal work is being performed. However, certifications have value only if they are recent and should be updated frequently due to the rapid changes around technologies and frameworks. For which certifications or combination of certifications please refer to the technical, process and framework skill priorities in this report.

Figure 15: Recruiting Experience For DevOps Human

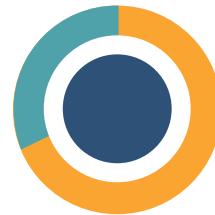


How would you describe your experience during your recent DevOps recruiting process?



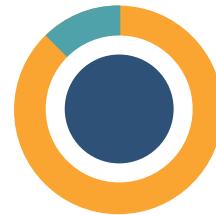
34%

Extremely Difficult/
Difficult



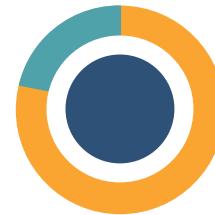
31%

Somewhat Difficult



8%

No Difficulty



12%

Don't Know



15%

Other

Figure 16: Need to SKILup the DevOps Human

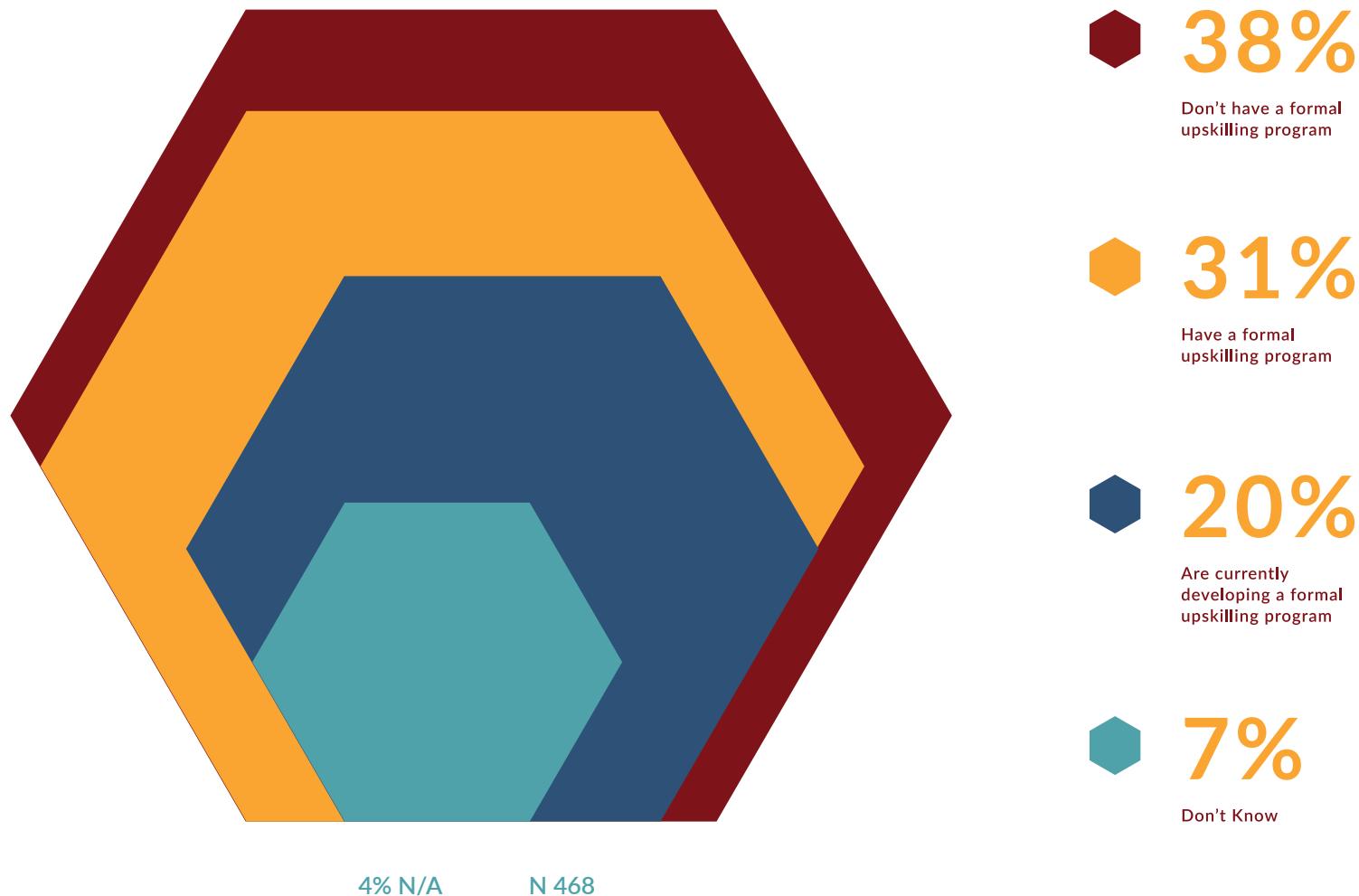
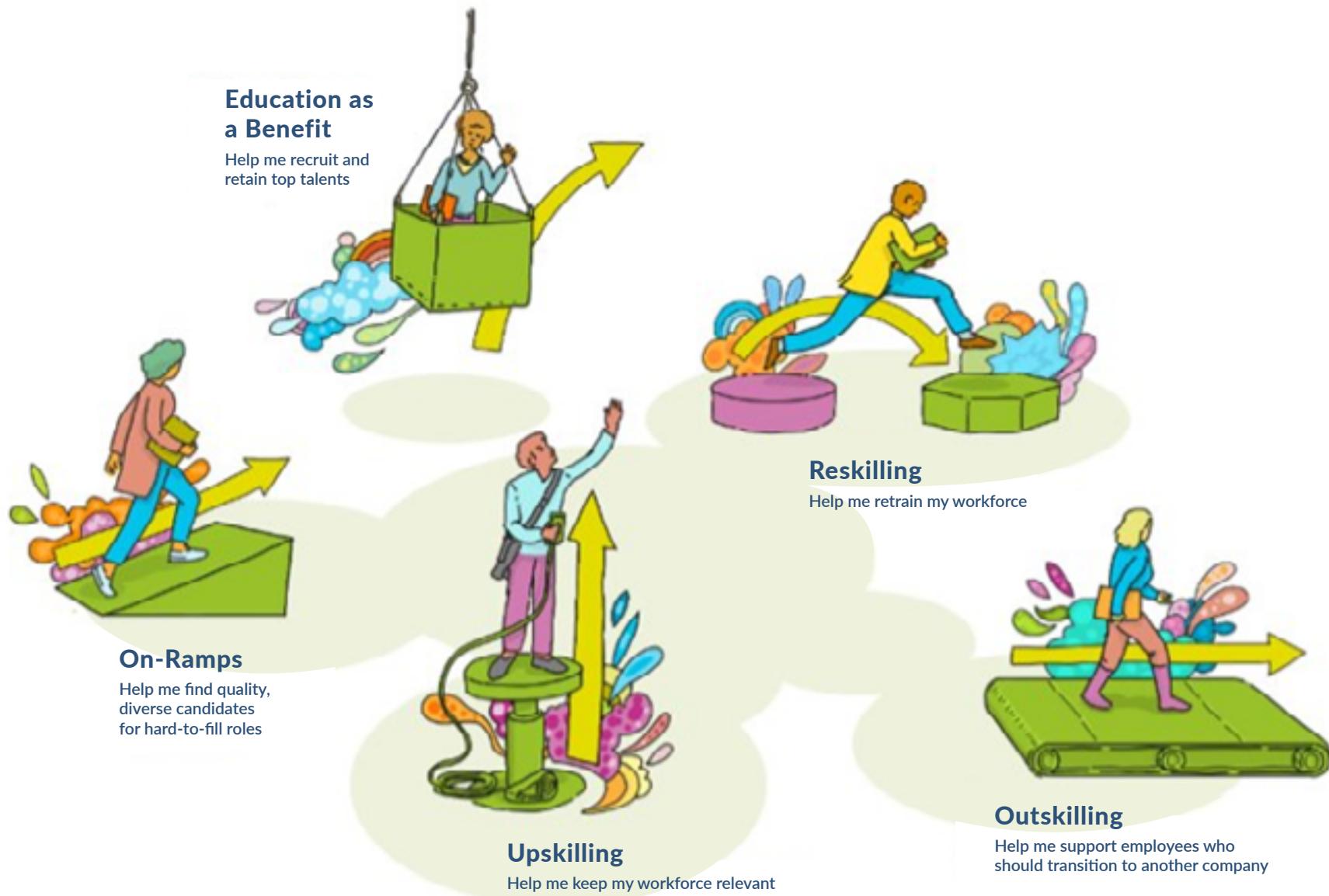


Figure 17: Training Models



Source: Allison Salisbury, entangled.group, 2020

Conclusion

An E-shaped DevOps human must continuously evolve his/her skills. Our suggestion is that all stakeholders must work together to manage the retraining and upskilling challenges ahead. We, as an industry association, can help build talent pipelines, provide community support, connect people, develop content, and orchestrate and create certifications. In our mission to advance the human elements of DevOps with Skills, Knowledge, Ideas and Learning (SKIL), we invite you to become a free member of our global community by joining at www.devopsinstitute.com. We also want to thank all our sponsors who have helped make this research possible. If you are interested in sponsoring the 2021 Upskilling research, please reach out to us. We also have listed a variety of contributors in the acknowledgement section. These people have supported us with their knowledge and help throughout this research project.

THANK YOU

Additional DevOps Findings From Our Research

The following figures are self-explanatory and are intended as backdrop for the “2020 Upskilling the Global DevOps Human” report.



To which specific role or team do you belong?

Figure 19: Mix Of IT Environments And Teams

How would you describe the current state of your IT environment today?

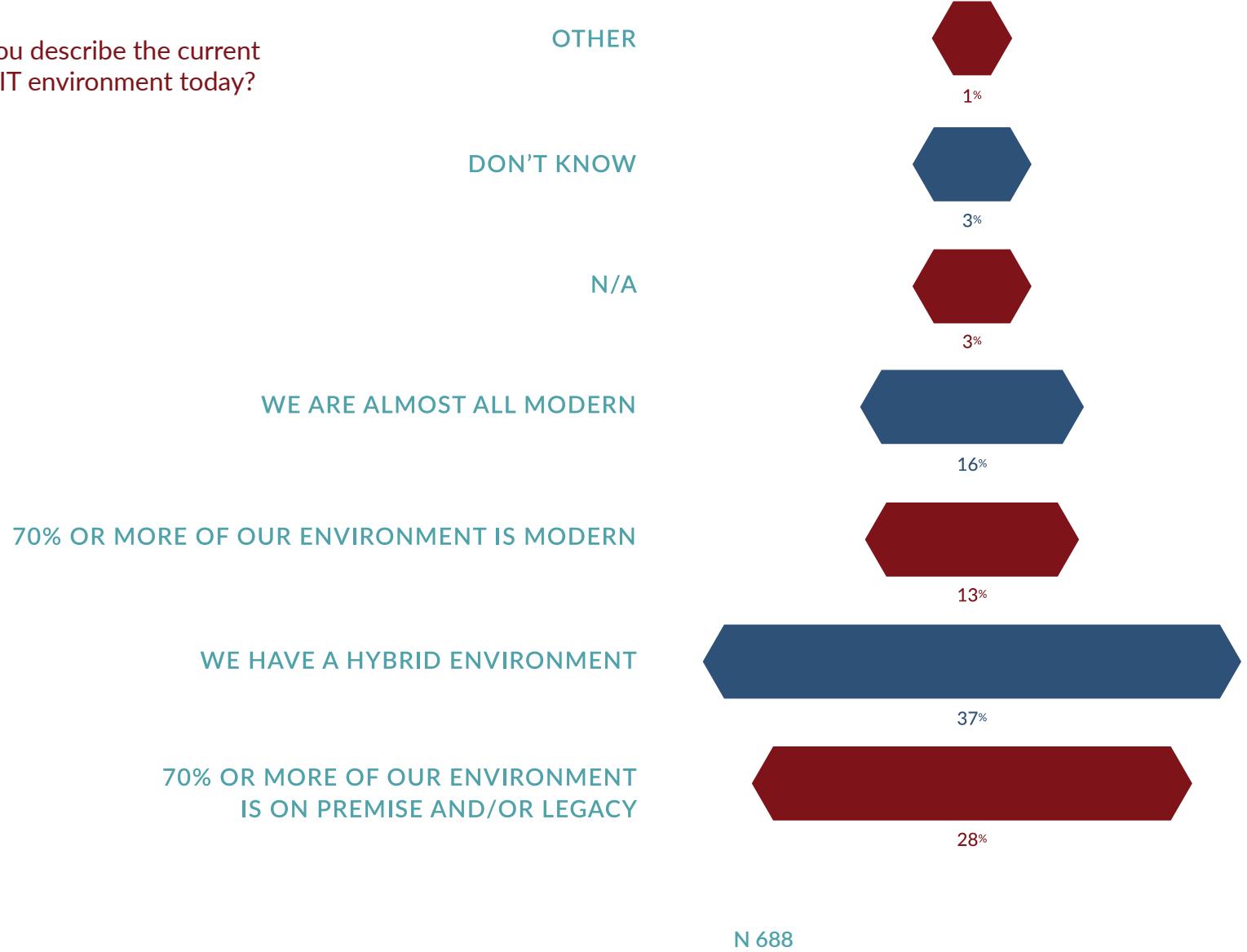


Figure 20: Impact Of Moving To The Cloud

Q Which of the following best describes the impact of your organization moving from on-premise to the cloud?

- Significant impact, I am retraining to learn new tools and/or processes to work with cloud technologies
 - Minimal impact, my work is already in the cloud
 - Some impact, as workloads transition to the cloud, but my skillset will remain the same or only change slightly
 - None as my company or my area is not transitioning to the cloud
 - Other
- N 660

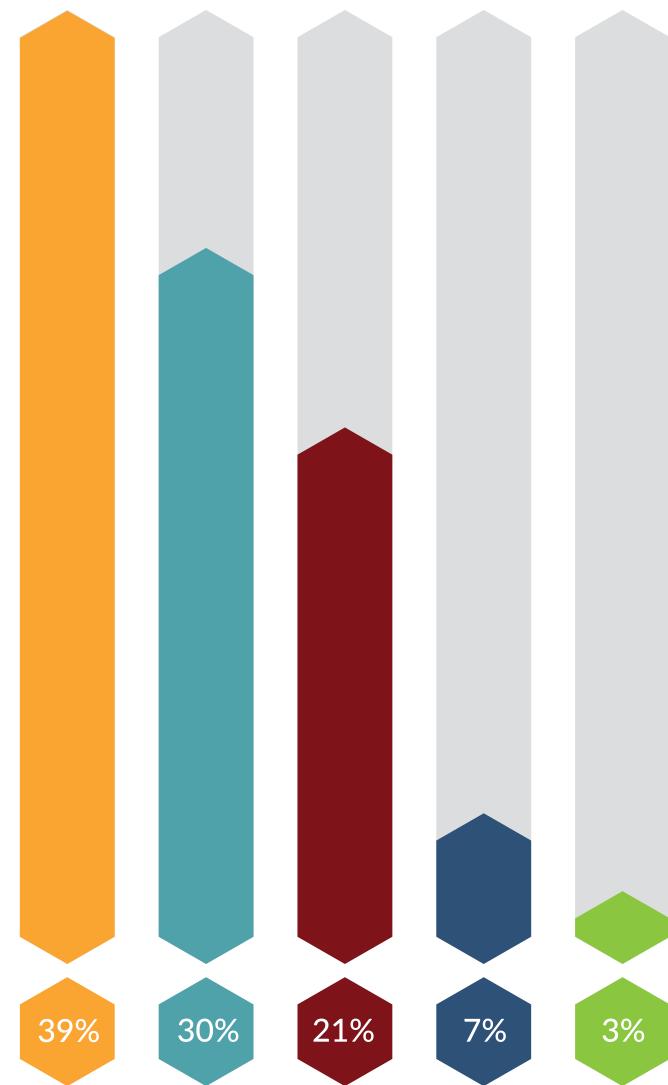
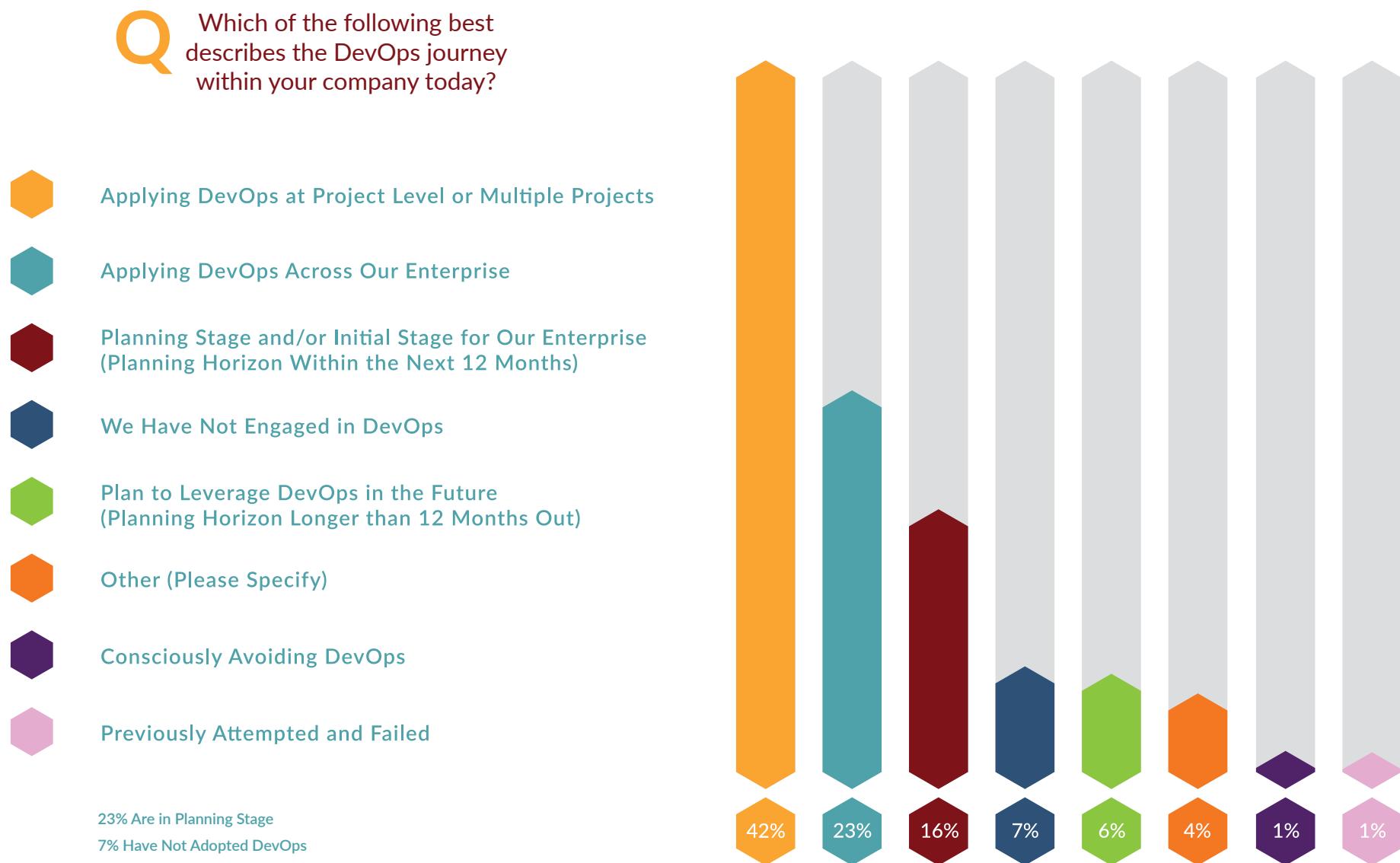


Figure 21: The 2020 State Of Global DevOps Adoption

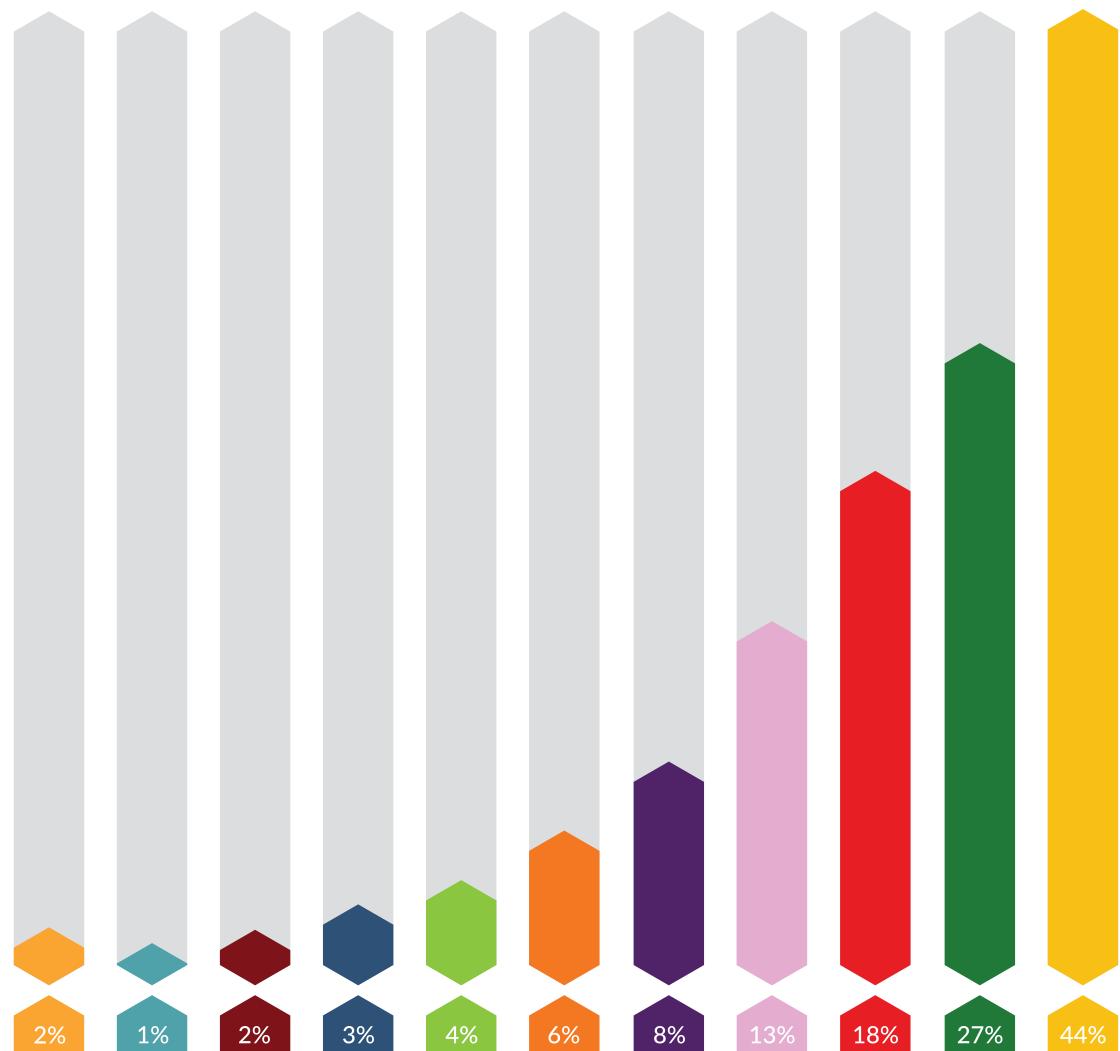


N 906

Figure 22: Release Cadence

My Organization's Release Cadence Is:

- OTHER
- YEARLY OR MORE
- MORE THAN EVERY HALF YEAR BUT LESS THAN YEARLY
- HOURLY OR MULTIPLE TIMES PER HOUR
- MORE THAN QUARTERLY BUT LESS THAN EVERY HALF YEAR
- NA
- DON'T KNOW
- QUARTERLY OR MULTIPLE TIMES PER QUARTER
- DAILY OR MULTIPLE TIMES PER DAY
- WEEKLY OR MULTIPLE TIMES PER WEEK
- MONTHLY OR MULTIPLE TIMES PER WEEK



Other Responses 2%:

- Varies from Project to Project
- As Needed
- Ranges by Program from Daily to Monthly
- At HOC

N 598

49

Figure 23: Governance Is - For Most DevOps Humans' - Part Of Their Responsibility

Q How do industry or governance regulations and governance processes impact your role today?

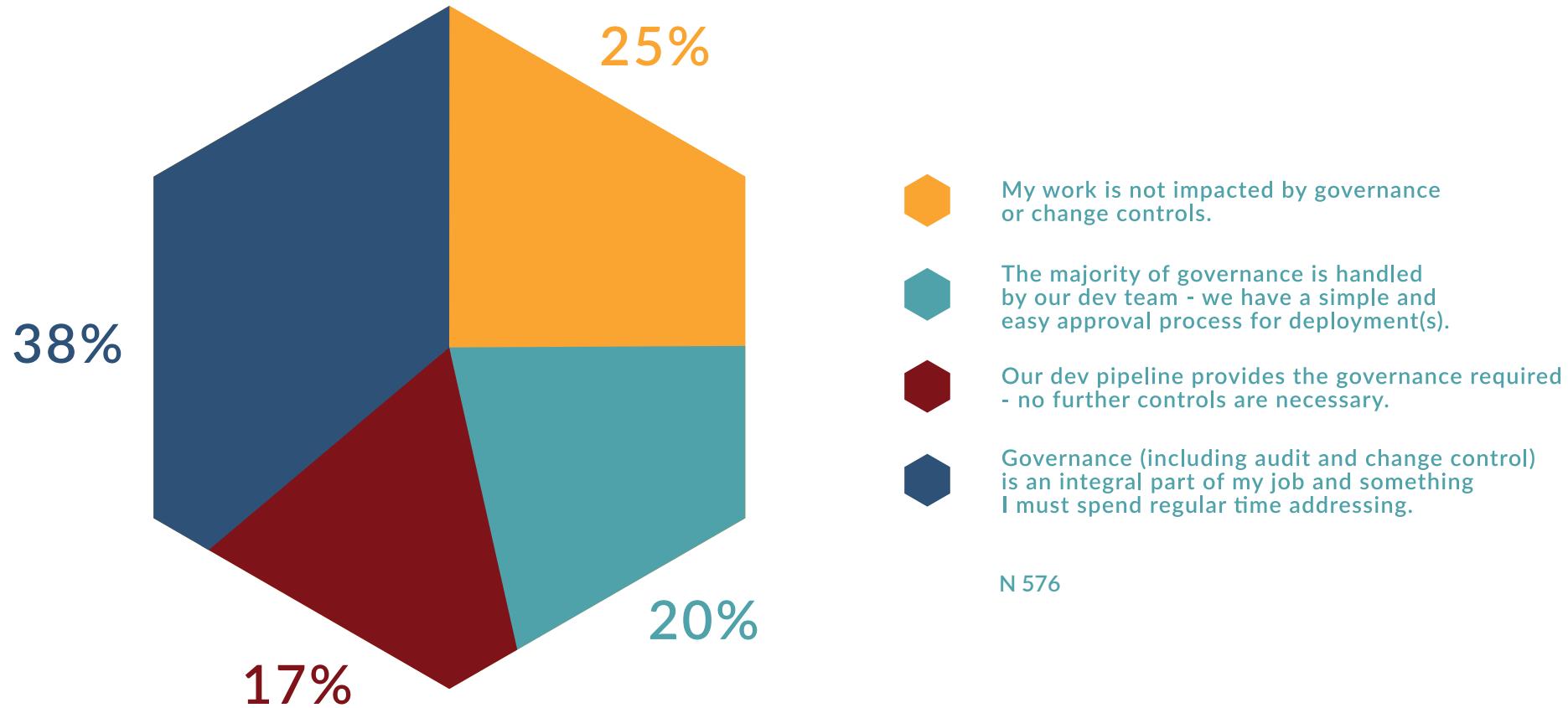
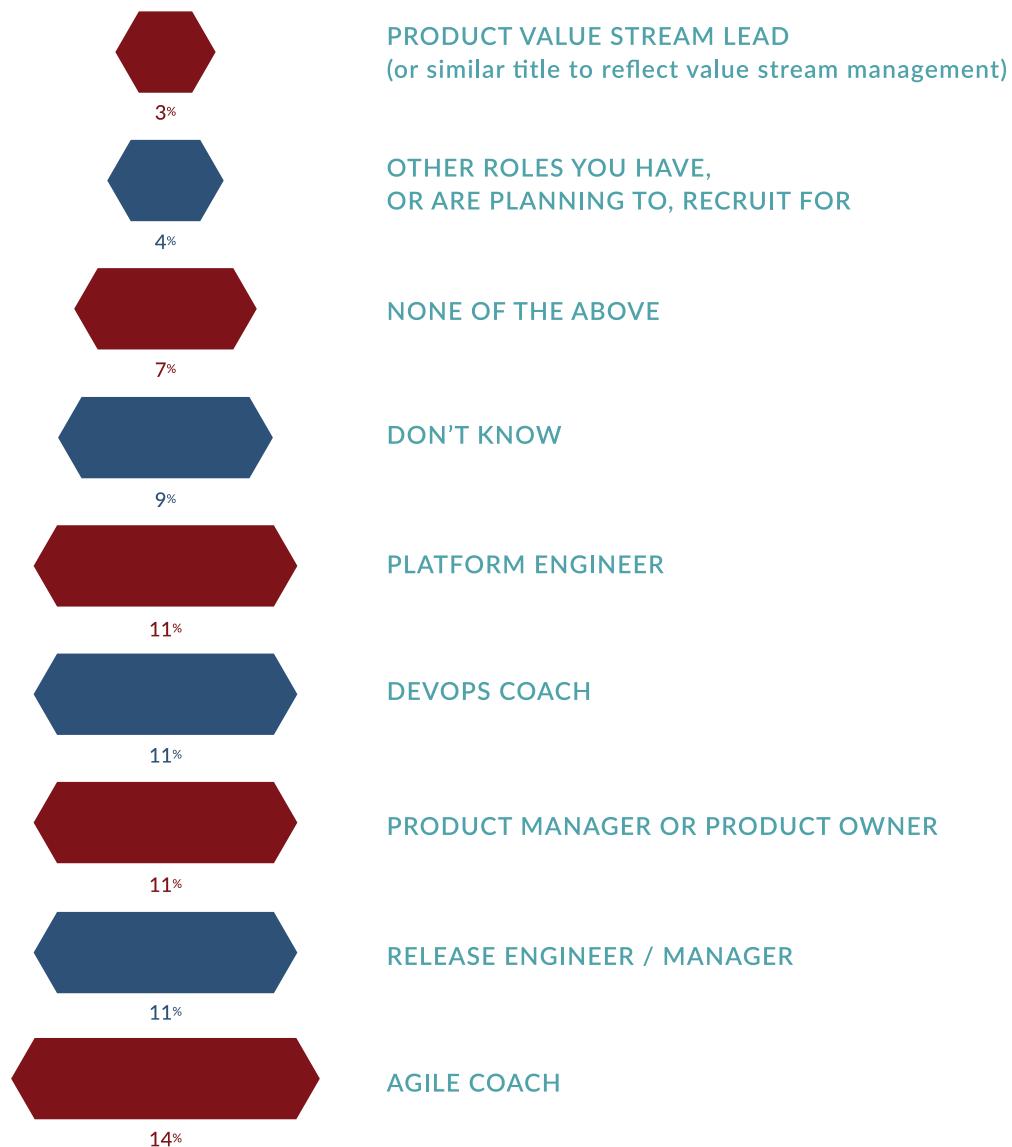


Figure 24: DevOps Engineer Is Still The Most Dominant Job Title In 2020

Q What titles are being hired?

N 473

Figure 24 Continued on Next Page



SYSTEM ADMINISTRATOR



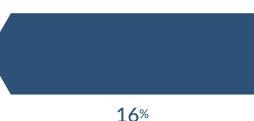
AUTOMATION ARCHITECT



TEST ENGINEER



SCRUM MASTER



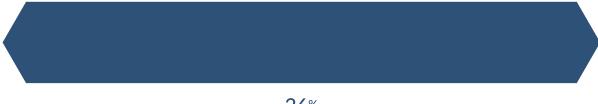
SITE RELIABILITY ENGINEER

INFRASTRUCTURE ENGINEER
(cloud, environment, etc)

CI/CD ENGINEER



DEVOPS CONSULTANT



SOFTWARE ENGINEER



DEVOPS ENGINEER / MANAGER



Delta in 2019:
DevOps Eng rose
from 39% to 51%

Sponsorships

*The DevOps Institute extends a special thank you
to our partners for helping make this year's survey possible:*

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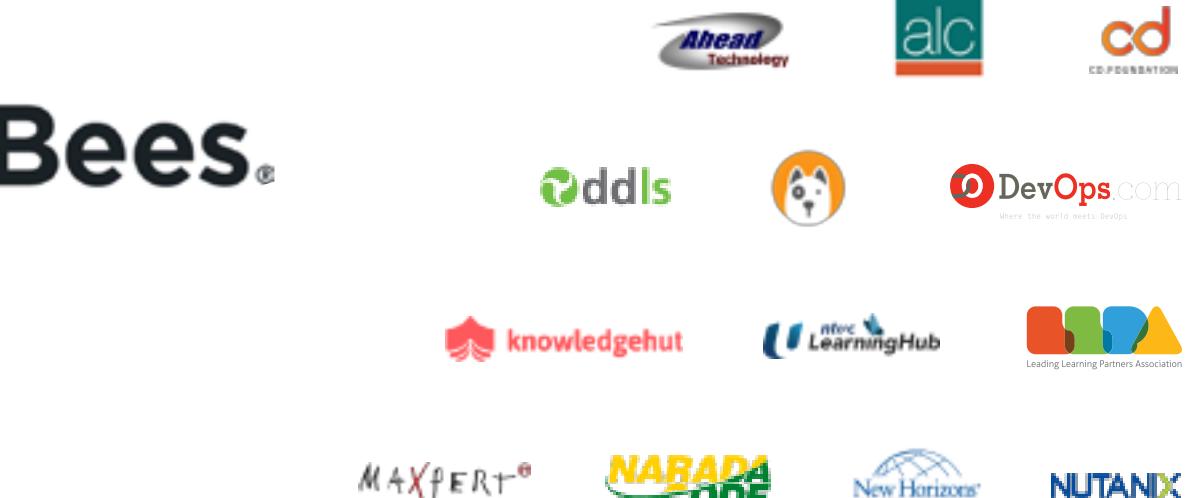
GOLD
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SPONSOR



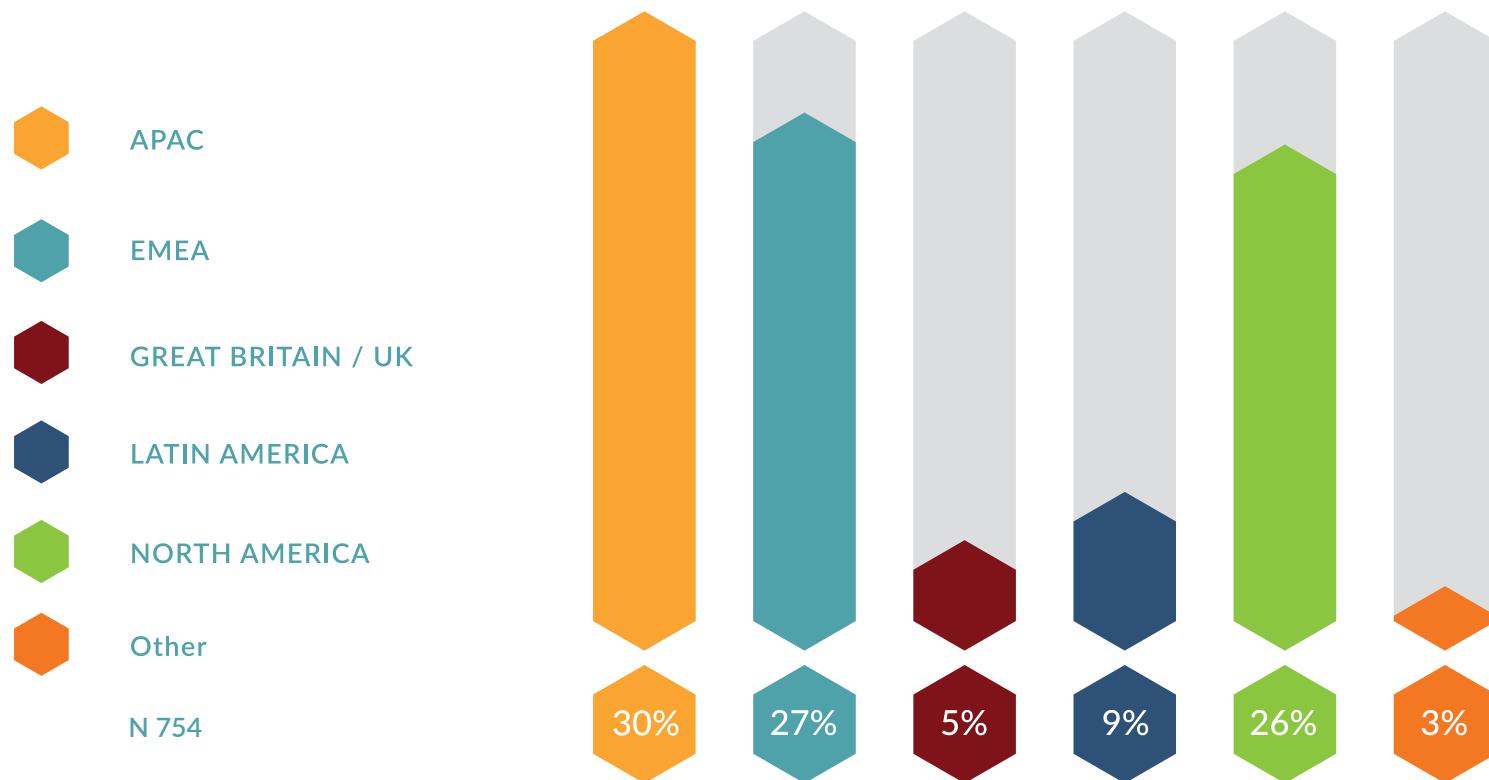
Demographics

The following figures will describe the demographics of the 2020 Upskilling The Global DevOps Human. We had a total of 1,653 survey respondents with good distribution across the globe, across verticals, and enterprises. We also had a good representation of organizations with a hybrid infrastructure environment and modern infrastructures. Our survey respondents came from the key roles within IT organizations.

Global Representation of 2020 Survey Respondents

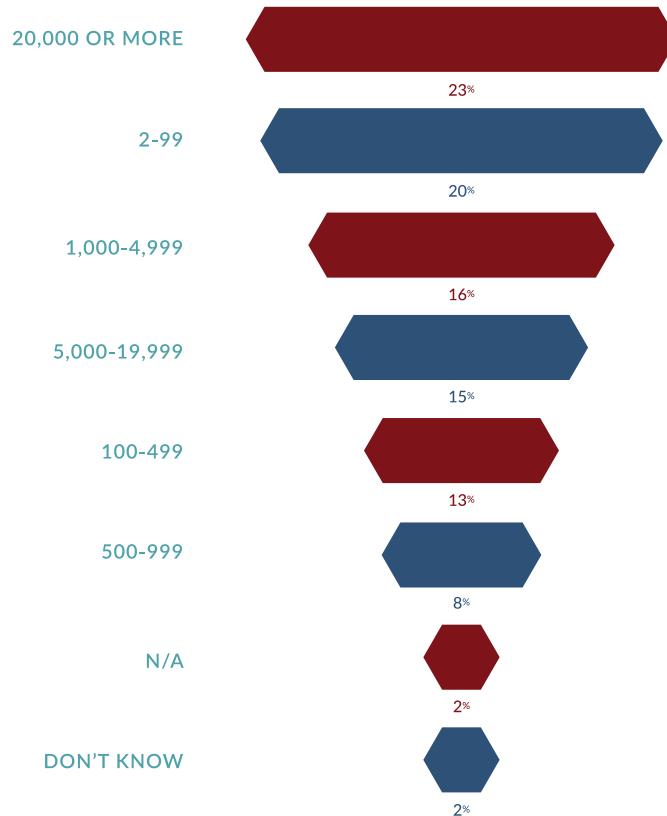


In which primary region do you work?



Survey Participants Represent A Mix Of Company Size And Roles

Q Using the best estimate, how many employees work for your company/organization worldwide?



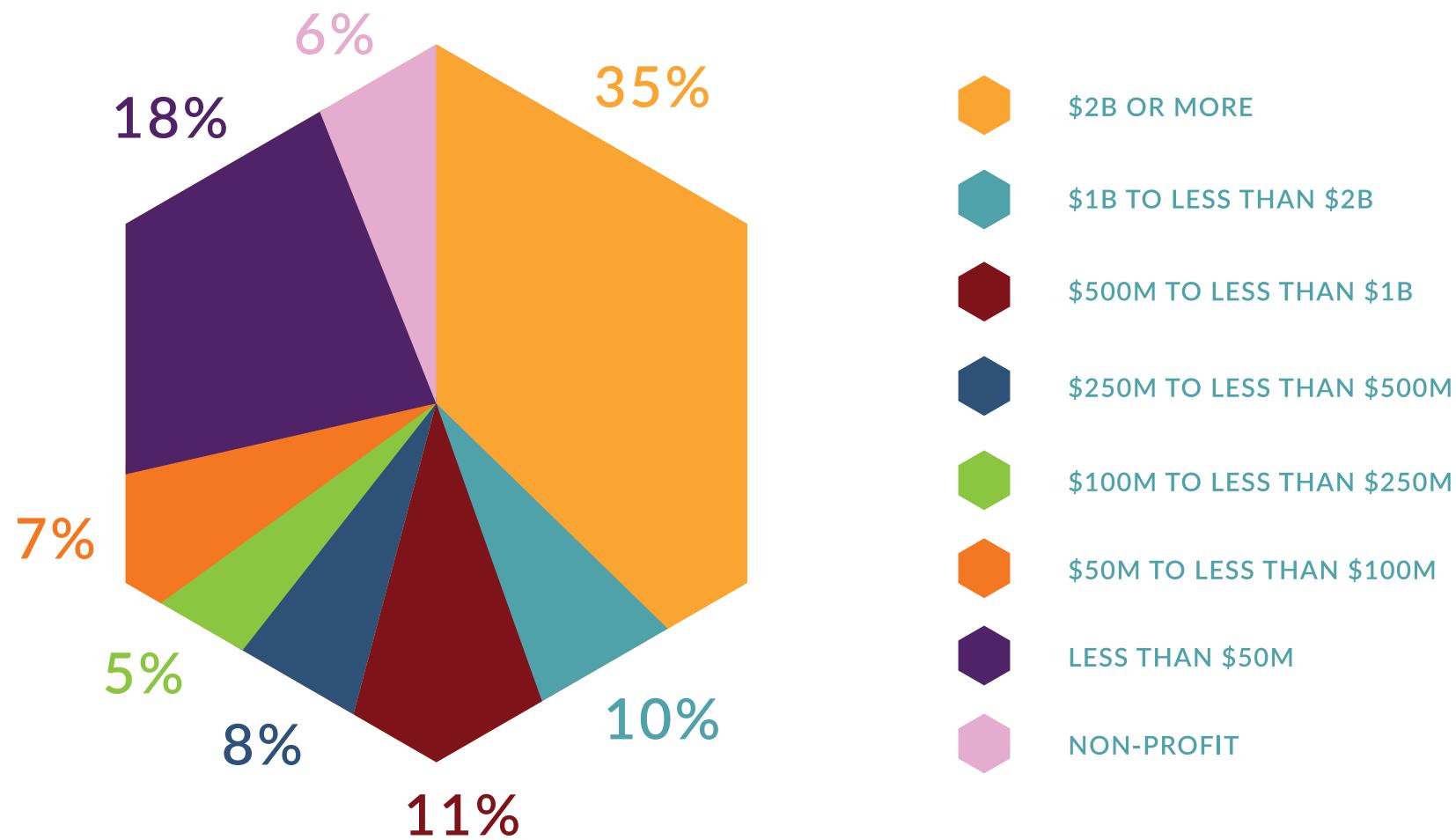
Q Which title describes your role within your company/organization today?



Survey Respondents Yearly Revenue

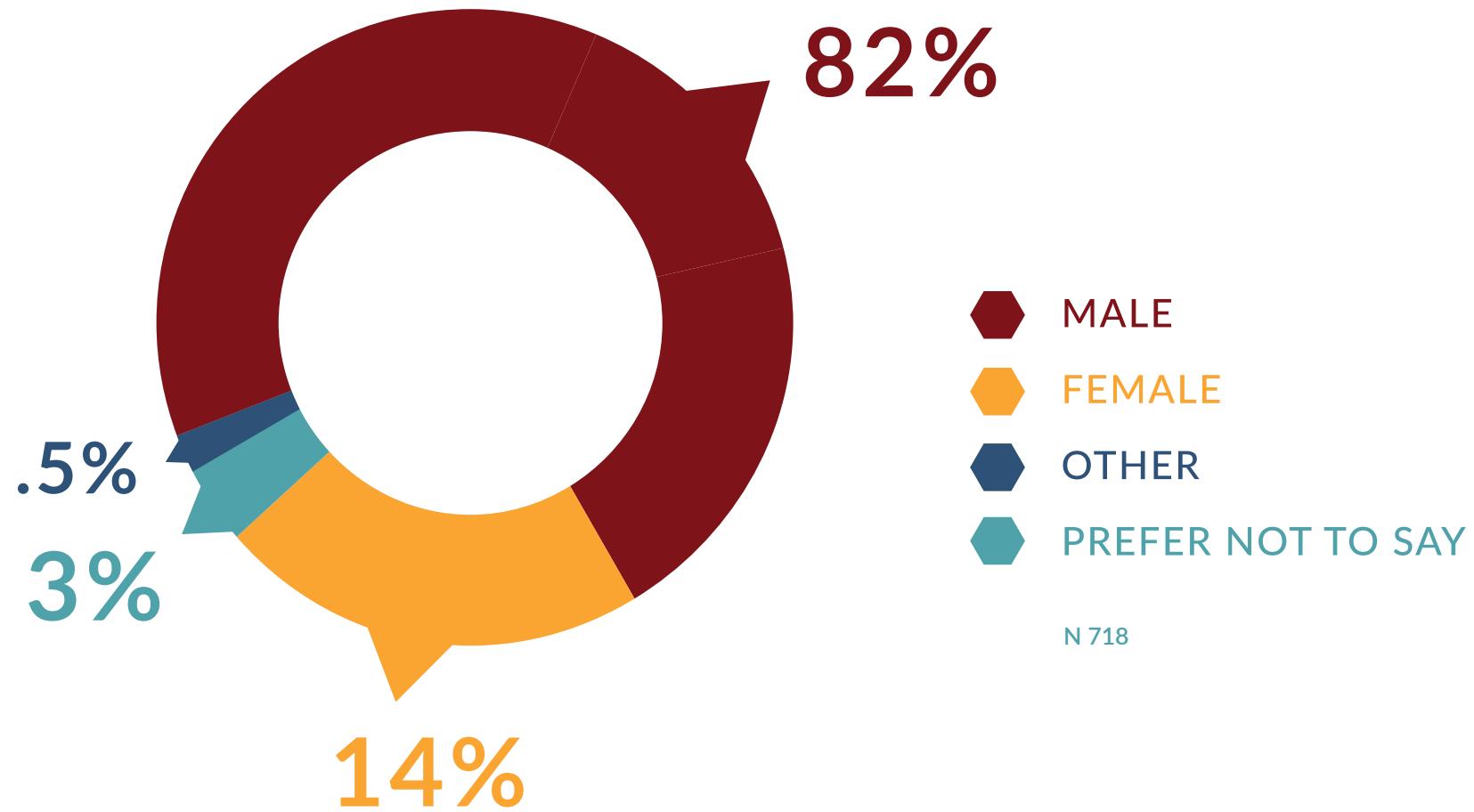


What is your companies yearly revenue?



Gender Breakout

Q What is your gender?



Acknowledgments

The DevOps Institute would like to thank all those who have provided their thoughts, ideas, inputs and guidance on this year's report. This work is not possible without including and connecting with subject matter experts, partners and friends around the world. We are very grateful to them for their willingness to share, collaborate, discuss, critique and contribute to this report. We also want to thank those who have helped on structure, content review, editing, creative work and assembly of the final report. And finally, a huge thank you to all the people who have completed our survey which is the foundation of our work.

Research Methodology

The "2020 Upskilling: Enterprise DevOps Skills Report" report is the second report capturing the perspectives of a variety of roles which are involved in recruiting, hiring or working within DevOps initiatives. We set out to understand what is very important (must-have), important (nice-to-have) and not important (optional) skills within key categories. After extensive research around skill categories, we determined the following skill categories: Automation, process and knowledge, soft skills, functional skills, and automation tool skills. The target population for this survey was the community of DevOps practitioners, hiring managers, team leaders, consultants, human resources and other individuals who are familiar with DevOps. We targeted all industry verticals and all company sizes. We promoted the survey via online promotions, short research webinars, social media, communication during major events, press releases and through our network of people who helped us to share the survey with their network. Our sample is limited to individuals that are familiar with DevOps. We designed our survey questions with input from a variety of team members and experts. We tested our survey questions extensively to ensure good constructs and we leveraged Survey Monkey Enterprise as our survey and design instrument. We collected primary data from our survey respondents. Our goal was to achieve a sample size of 1,200 individual responses targeting key geographic areas such as North America, Europe, Asia Pacific and Latin America.

Interviews

We also leveraged personal interviews as a complementary research method to provide us with additional in-depth details. The interview scripts consist of brief, but open questions.

The results from the interviews are not generalizable, because of the subjectivity of data obtained. On the other hand, their flexible format contributed to a deeper explanation and understanding and allowed us to augment our report with interesting details.

Instrument Design

For the purposes of this research, the writer designed one questionnaire script and one brief interview script. The questionnaire for the survey takers from the companies consisted of 29 closed questions, related to DevOps skill priorities and importance within their teams or jobs. The first part of the questionnaire consisted of demographic questions, related to company size, region, the professional role of the participants and the IT environment. The second part of the questions focused on DevOps topologies, hiring situations and challenges. The last and main part focused on the key skill categories.

If you have questions on our survey methodology,
please contact oehrliche@devopsinstitute.com.



Appendix A: Human Skills And What They Include

Human Skill	What are some other areas which belong to this skill?
Technical Writing	Includes capability to author and edit technical content for others to consume.
Business Understanding	Includes seeking and working for and with the business to solve business problems.
Risk Management	Includes the ability of identifying potential risks in advance, analyzing them and taking precautionary steps to reduce/curb the risk.
Risk Taking	Includes making decisions taking risks into consideration, possibly without supervision.
Visionary	Includes setting visions, missions, goals and measuring progress and adjusting for individuals or teams.
Diplomacy	Includes diplomacy when dealing with others, effectively resolving conflict.
Career Development	Includes coaching others or oneself for ongoing development of all skills.
Multi-Tasking	Includes able to focus resources and activities on multiple tasks while achieving key goals and/or desired results.
Product Thinking	Is defined as the thinking of "building the right thing, the right way."
Customer Experience Skills	Includes an understanding of how customers interact with the business.
Leadership	Includes helping others, developing others, going beyond one's self to help the group, social judgment needed to solve organizational problems.
Inclusiveness	Includes the encouraging and valuing the different viewpoints of diverse members of the team.
Creativity	Includes taking responsibility of new ideas and solutions to solve problems.
Empathy	Includes understanding and taking different backgrounds, ideas and styles into consideration when working.
Personal Value Commitment	Includes trustworthiness, respect of others, ethics, integrity.
Flexibility & Adaptability	Includes adapting easily to change, remaining flexible and open to change.
Sharing and Knowledge Transfer	Includes effective transfer of acquired knowledge to others.
Problem Solving	Includes showing good judgment, focus on the right thing, high quality decision making, accept feedback to strengthen further improvement.
Interpersonal Skills	Includes communication, relationship building, listening.
Collaboration and Cooperation	Includes working with others to achieve common goals.



Author and Biographies

Eveline Oehrlich, Independent Research Director, DevOps Institute

Eveline Oehrlich is an independent Research Director at the DevOps Institute. As former VP and Research Director at Forrester Research, Eveline led and conducted research around a variety of topics including DevOps, Digital Operational Excellence, Cognitive Intelligence and Application Performance Management for 12 years. She is the author of many research papers and thought leadership pieces and a well-known presenter and speaker. She has more than 25 years of experience in IT. Her passion is to help companies transform their IT organization, processes and tools towards high performing teams enabling their business partners to achieve better business results. She has helped some of the largest enterprises across the world to adopt new strategies, workflows and automation within their journey towards a digital business.



Jayne Groll, Co-founder and CEO, DevOps Institute

Jayne Groll is co-founder and CEO of DevOps Institute. Her IT management career spans over 25 years of senior IT management roles across a wide range of industries. Her expertise spans multiple domains including DevOps, Agile, ITIL and Leadership. Jayne is a recognized and respected IT thought leader and influencer. In addition to authoring the Agile Service Management Guide, Jayne has co-authored several IT position papers including "Modernizing IT Operations in the Age of DevOps" that was published in 2018 by IT Revolution. Jayne is very active in the global DevOps, ITSM and Agile communities and is a frequent presenter at local, international and virtual events.



Jean-Pierre (JP) Garbani, Advisor and Content Editor

JP has an extensive experience as an industry analyst through his research at Forrester and Giga Information Group where he was the research director of the computing infrastructure group. JP Started his career in early 1968 as a software engineer working on the automation of nuclear power plants in France. After joining Bull General Electric in Paris (subsequently Honeywell Bull), JP designed and implemented very large projects including network infrastructures in France, Scandinavia and the United States. At Bull, JP occupied several positions in software development and marketing before moving to the United States in 1984 where he filled several engineering and marketing positions at Bull Information Systems. In 1994, JP created Epitome Technology Corporation, a middleware software company focused on Manufacturing Execution systems. Prior to joining Giga, JP worked as an IT management consultant for very large financial institutions in the US.

Jean-Pierre graduated from Ecole Superieure d'Electricite (Supelec-Mehari) in France and was granted the equivalent of an MS in Computer Science in the US.

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