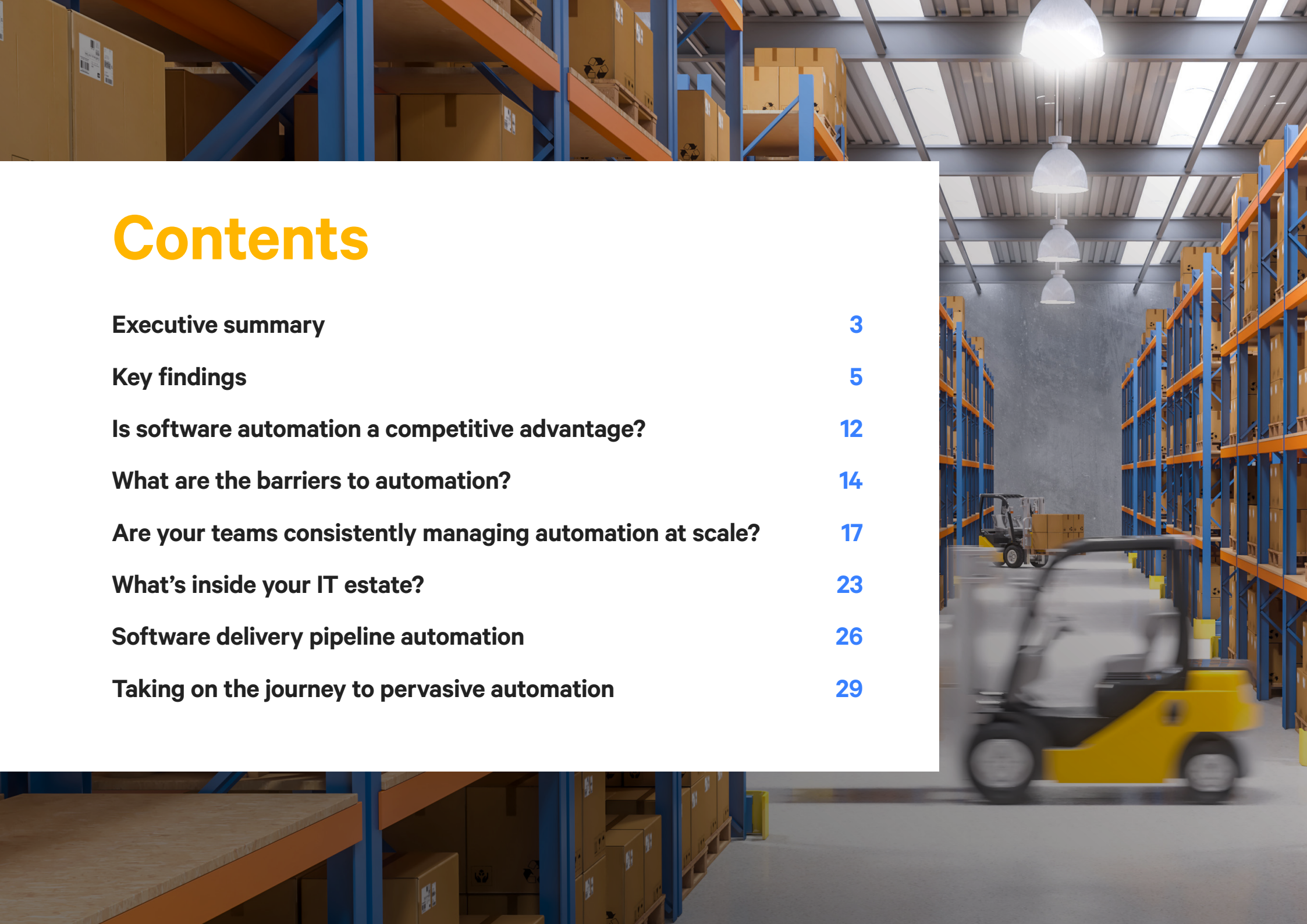
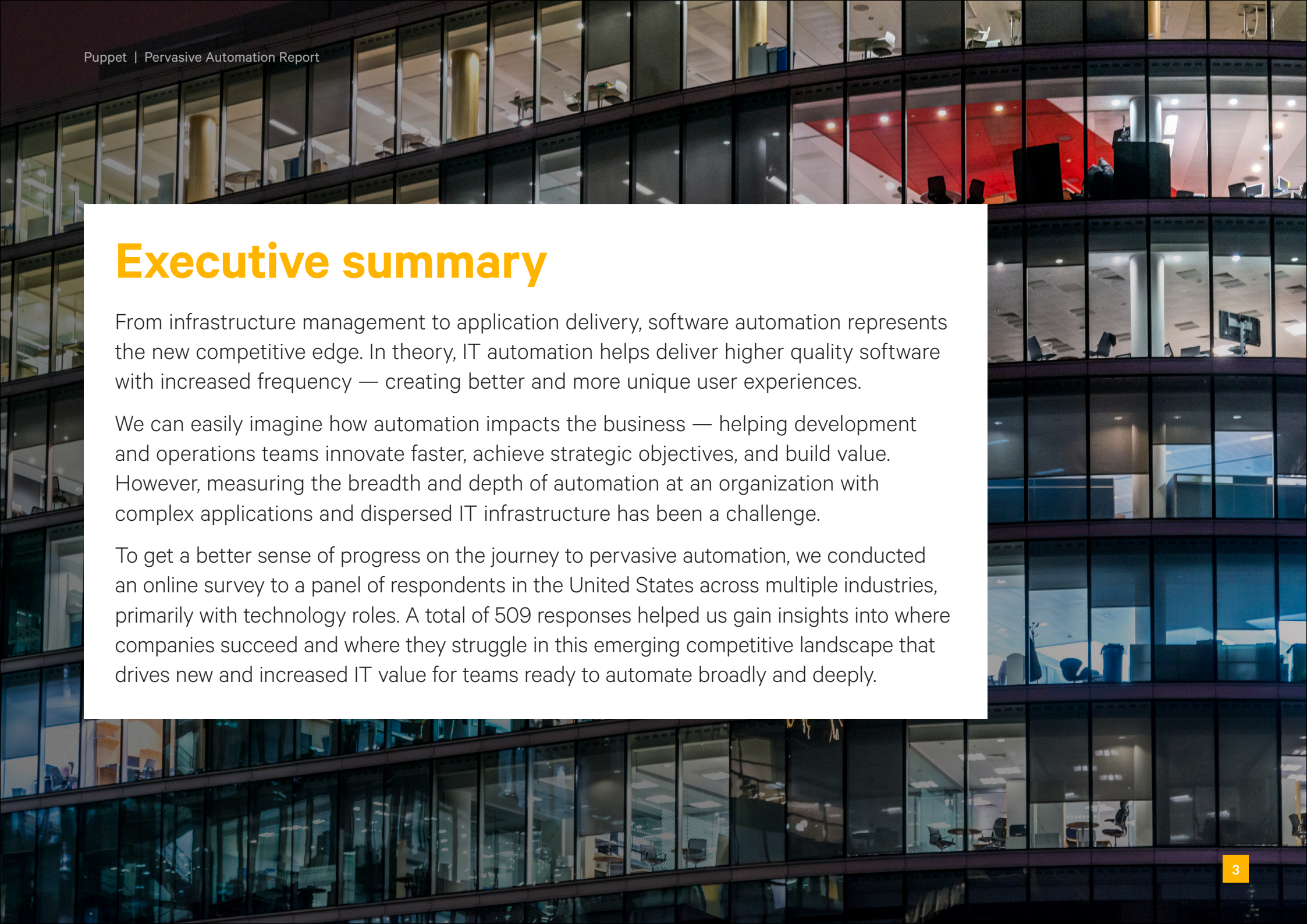
Pervasive Automation Report

puppet



Contents



Executive summary

From infrastructure management to application delivery, software automation represents the new competitive edge. In theory, IT automation helps deliver higher quality software with increased frequency — creating better and more unique user experiences.

We can easily imagine how automation impacts the business — helping development and operations teams innovate faster, achieve strategic objectives, and build value. However, measuring the breadth and depth of automation at an organization with complex applications and dispersed IT infrastructure has been a challenge.

To get a better sense of progress on the journey to pervasive automation, we conducted an online survey to a panel of respondents in the United States across multiple industries, primarily with technology roles. A total of 509 responses helped us gain insights into where companies succeed and where they struggle in this emerging competitive landscape that drives new and increased IT value for teams ready to automate broadly and deeply.

What is pervasive automation?

Pervasive automation is the concept of scaling automation broadly and deeply across the entire software delivery lifecycle.

From how applications and infrastructure are developed, configured, built, tested, and deployed, pervasive automation can unlock efficiencies and standardization that drives significant business value. Considering today's rapid rate of change and how companies must adapt to new market conditions in order to survive, automation is an imperative.

It's precisely this dynamic that makes it impossible to reach and sustain an absolutely automated state. This makes the journey to pervasive automation continuous, one that always leverages the latest DevOps and automation practices across the organization, favoring the teams ready to adapt to tomorrow's challenges. Pervasive automation is what "always ready to ship" looks like.

Key findings

We designed this in-depth survey to provide both a broad view of the state of pervasive automation and reveal where opportunities for or barriers to automation exist. Some of what we discovered was expected, like the near consensus that automation provides a competitive advantage and how challenging visualizing automation processes and metrics can be for larger enterprises. More revelatory is how responses varied by job role and company size, revealing conflicting points of view. Role-based deltas were pervasive throughout the survey data.

Automation as competitive advantage

Not surprisingly, there is widespread agreement at the team, departmental, and organizational level that software automation is a competitive advantage (Figure 1).

Things get interesting when the results are broken down by role (Figure 2). How much a respondent values automation depends on his or her job title. Among C-level respondents, 69 percent strongly agree that automation is a competitive advantage compared to only 43 percent of those in a practitioner-type, hands-on role.

Figure 1. Is software automation a competitive advantage?

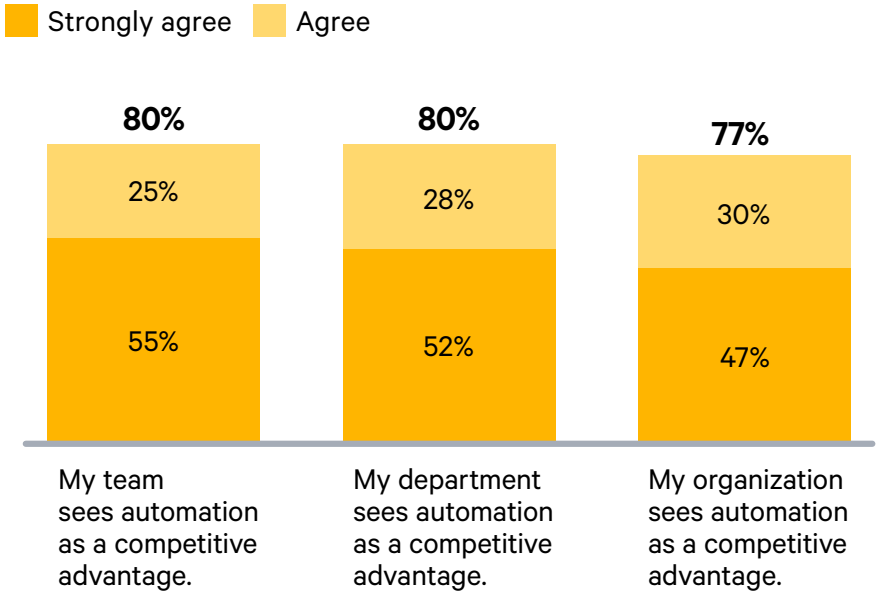
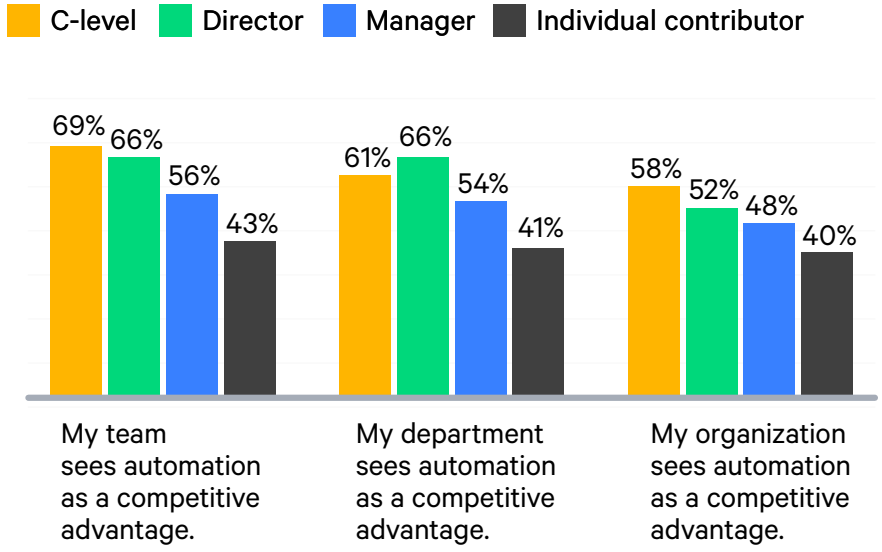


Figure 2. Is software automation a competitive advantage?

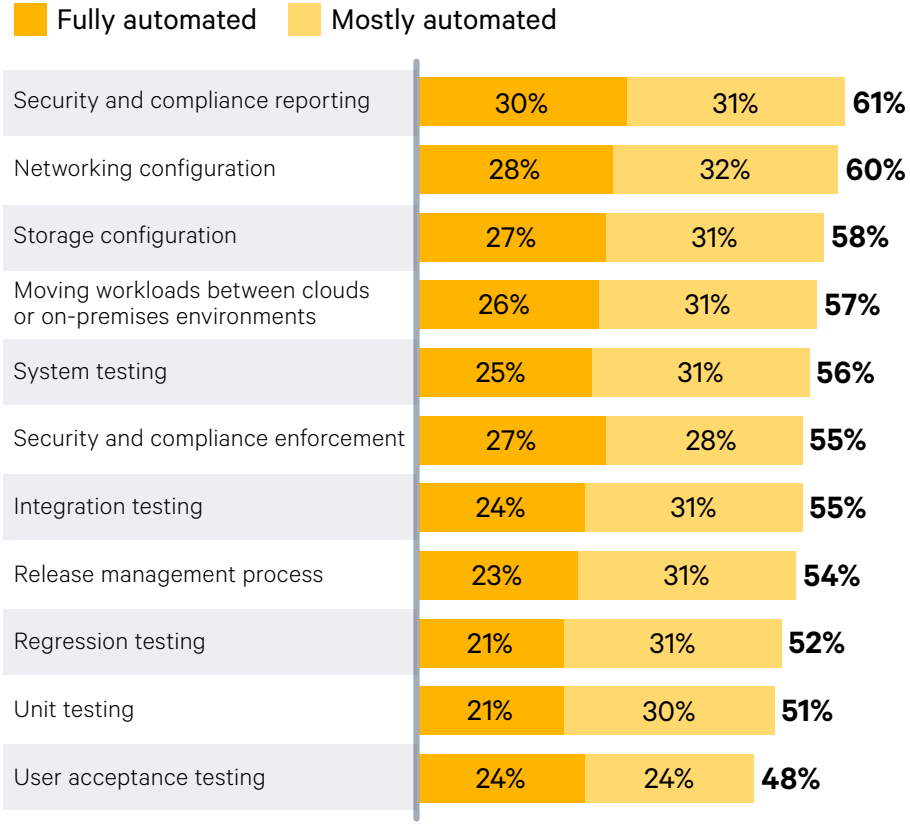
Response shown: Strongly agree



Infrastructure automation

Across the board, respondents indicate there are high levels of automation throughout the software delivery lifecycle.

Figure 3. How automated are the following processes?

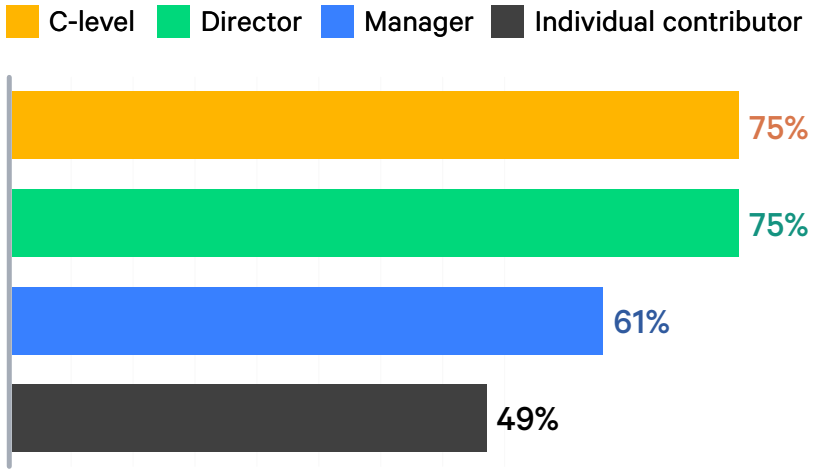


If the value of automation is more apparent to respondents in a leadership role, we should not be surprised that director and C-level respondents also perceive higher levels of automation than department managers and team members.

Using security and compliance reporting as an example, C-level respondents viewed 75 percent of the process as mostly or fully automated versus 49 percent from those more likely to be the ones producing those reports.

Figure 4. Level of automation in security and compliance reporting processes, by job title

Responses combined: Fully automated, mostly automated

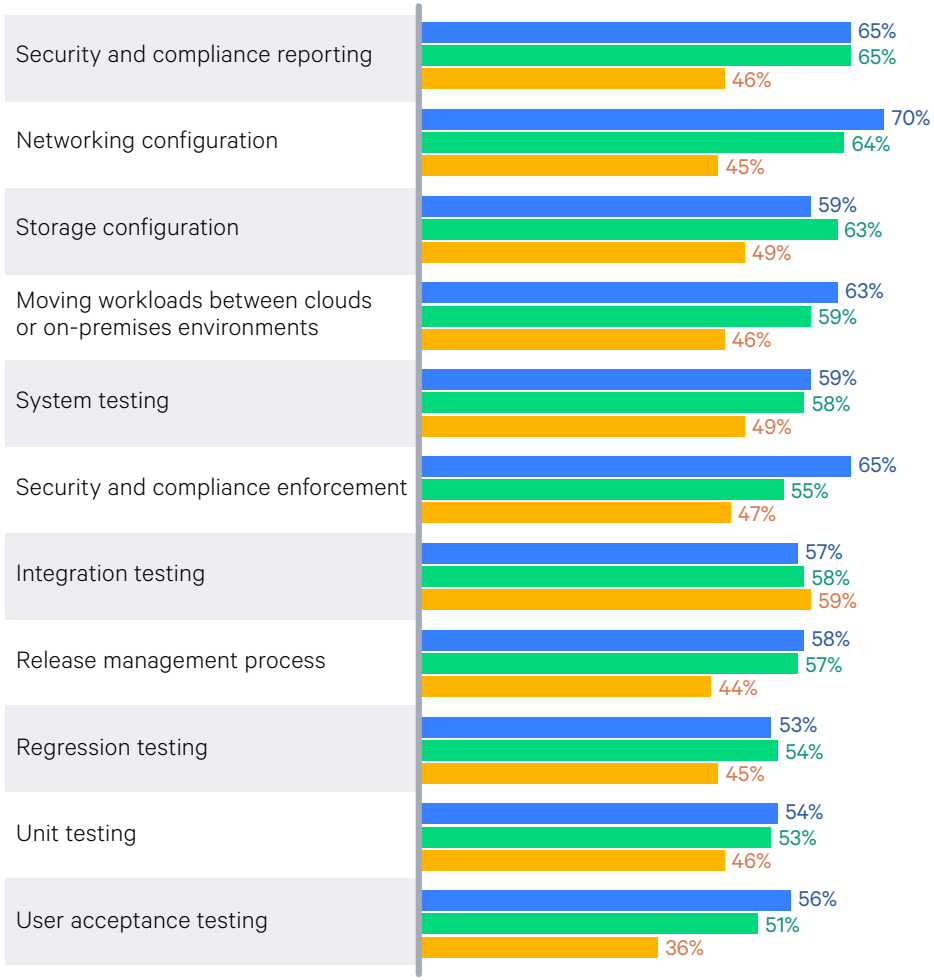


Infrastructure automation (continued)

For the enterprise-level respondents, we saw lower levels of automation for every process compared to those from organizations with less than 10,000 employees.

Figure 5. Automation levels across infrastructure processes, by company size

Responses combined: Fully automated, mostly automated

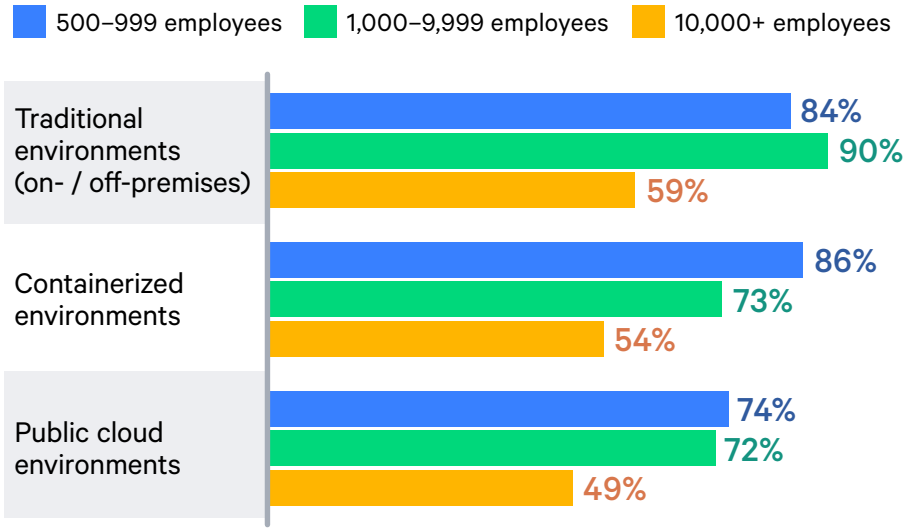


Automated IT asset discovery

It makes sense that to ascertain an organization's level of automation, it's critical to know what is in the IT estate. Here the data is also quite intuitive. Enterprise-level organizations struggle with visibility into their IT estates (Figure 6). Less than half of those responding knew what software they had running in public cloud environments. The numbers were only slightly higher in traditional and containerized environments.

Figure 6. Running software in different environments, by company size ("I know what's running in my...")

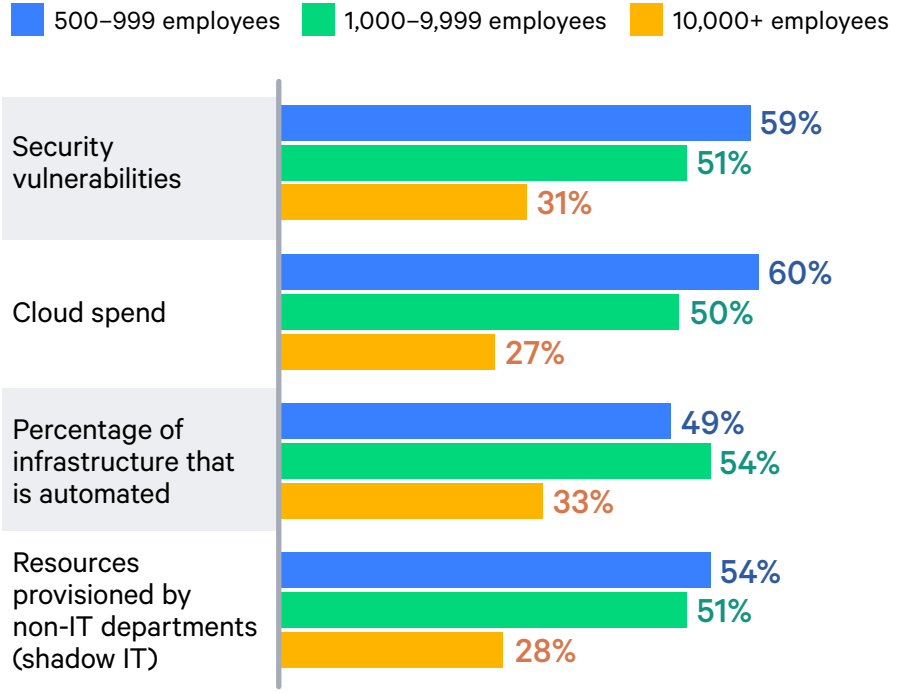
Responses combined: Strongly agree, agree



Respondents in organizations with 10,000 or more employees also have lower relative confidence in their knowledge of security, cloud spend, and the hidden costs of shadow IT (Figure 7).

Figure 7. Level of visibility into infrastructure, by company size

Responses combined: Complete visibility, high visibility



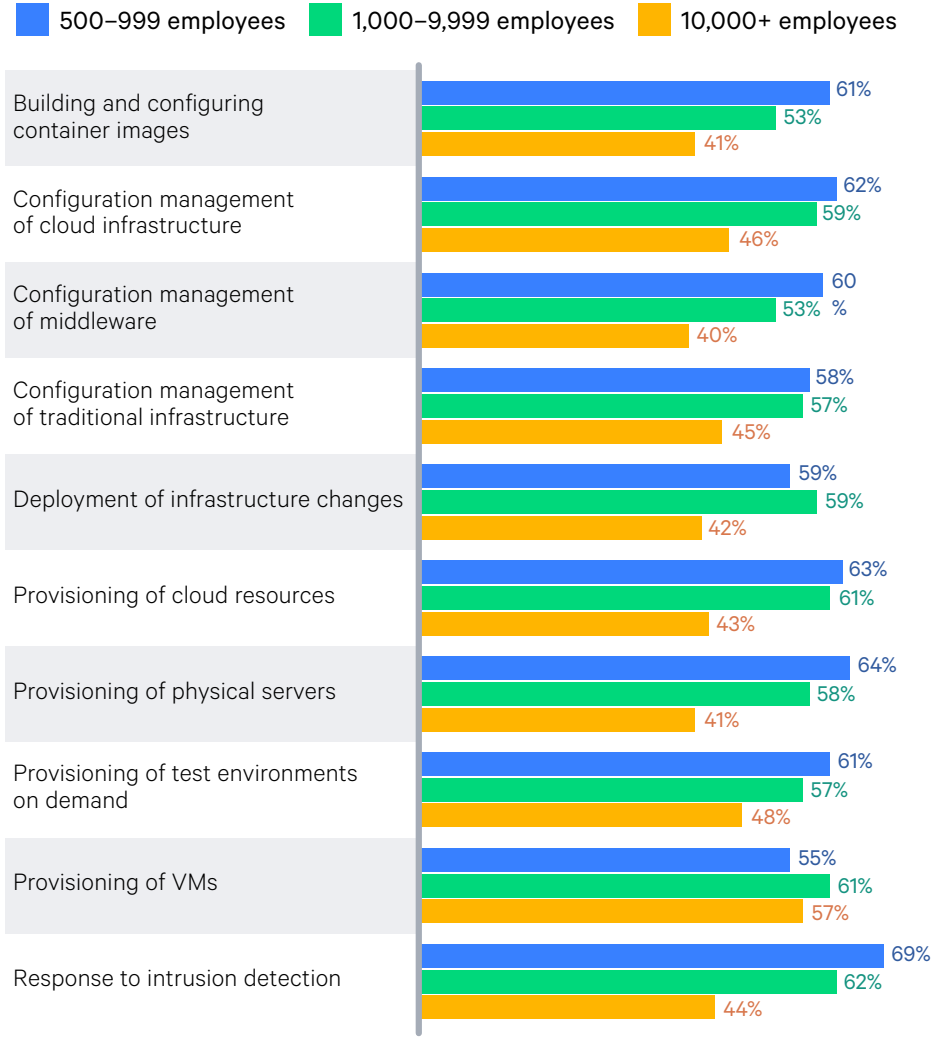
Software delivery pipeline automation

As we move into software delivery, with its inherent challenges and intangibles, the perceived level of automation is higher in small to medium-sized companies. For larger organizations, no more than 50 percent of respondents believe that any individual process is fully or mostly automated. This data begs the question, do organizations have the tools needed to bridge Dev and Ops at scale, sustainably?

> **"Continuous delivery of software is hard. There is no one approach that guarantees that you will be able to compile, integrate, build, deliver, and (if necessary) deploy an application with the push of a button, or even several buttons. Even in the recent past, most of these have been manual steps. Yet if there is to be a way to deliver software rapidly and seamlessly for the business, you have to be able to get a variety of tools working in concert."**
>
> — Individual contributor

Figure 8. Automation levels across software delivery processes, by company size

Responses combined: Fully automated, mostly automated

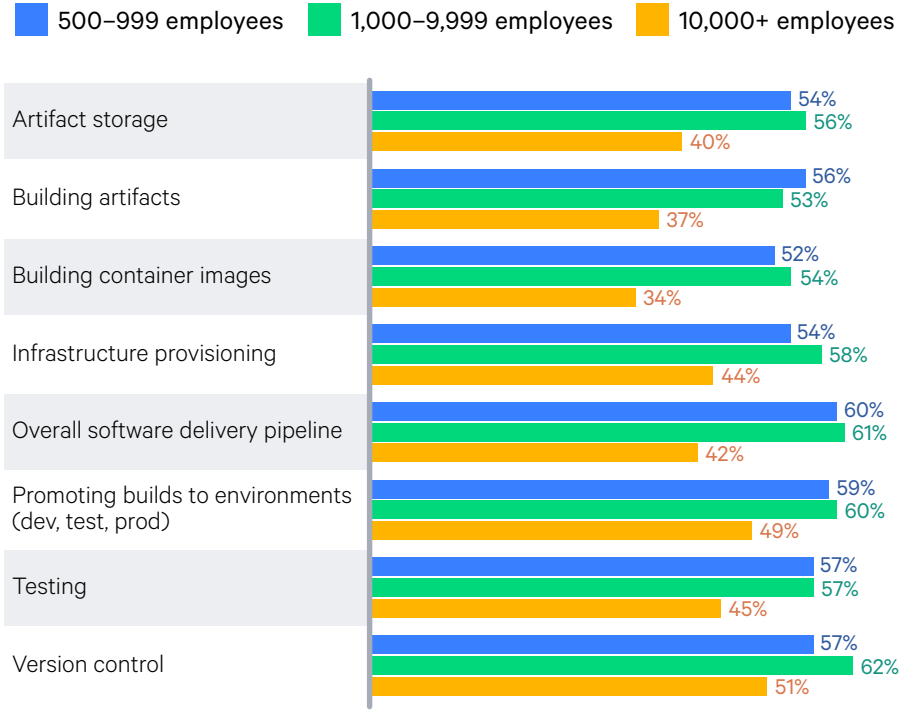


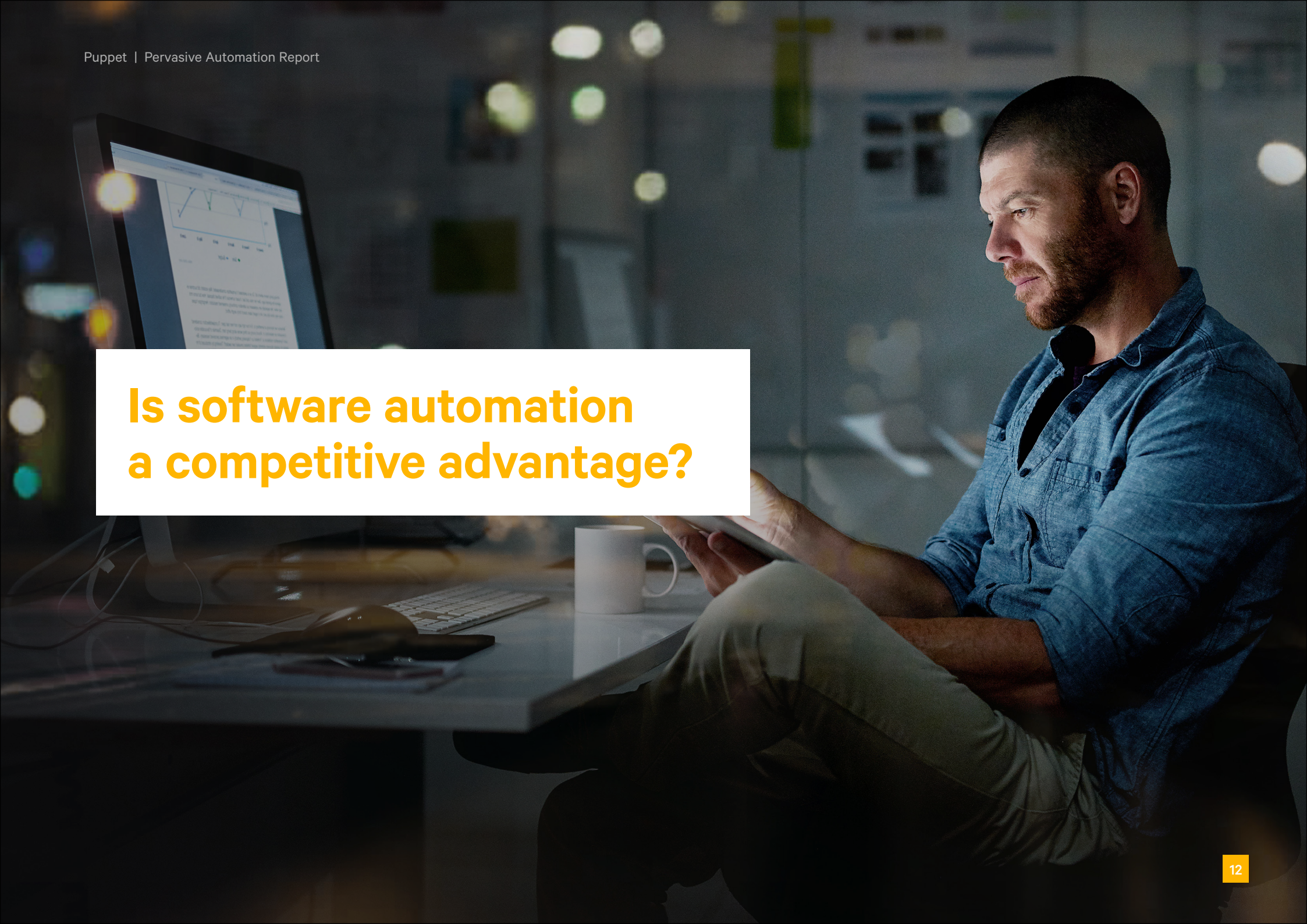
Software delivery pipeline automation (continued)

The data becomes even more alarming when it comes to primary applications and services. Only 34 percent of enterprise-level respondents report the process of building container images fully or mostly automated.

Figure 9. Automation levels for software delivery processes for primary applications or services, by company size

Responses combined: Fully automated, mostly automated





Is software automation a competitive advantage?

Is software automation a competitive advantage?

The short answer is yes. Seventy-seven percent of respondents say that automation is a competitive advantage for their organization (Figure 10). Any initiative that provides a company with competitive edge starts with a worthy objective. Scaling software automation across an entire company can be quite an undertaking.

The data tells us that there is broad awareness of software automation's value at companies of every size, but it varies by role in the organization.

When we break down the responses by role (Figure 11), we see a near unanimous consensus about the competitive advantage of automation at the C-level. From other roles, not so much.

Figure 10. Is software automation a competitive advantage?

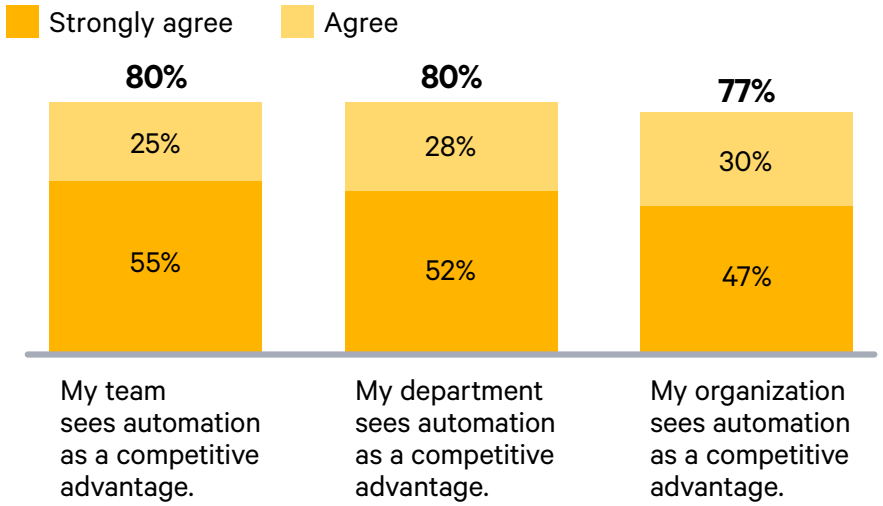
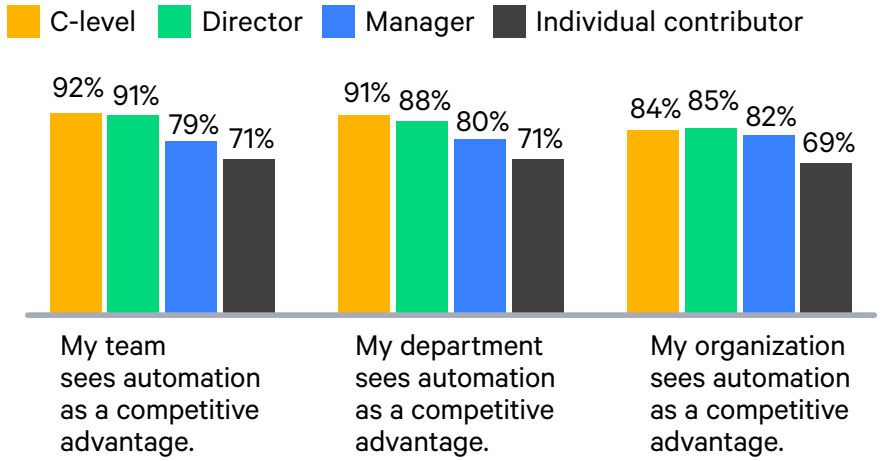


Figure 11. Is software automation a competitive advantage?

Responses combined: Strongly agree, agree



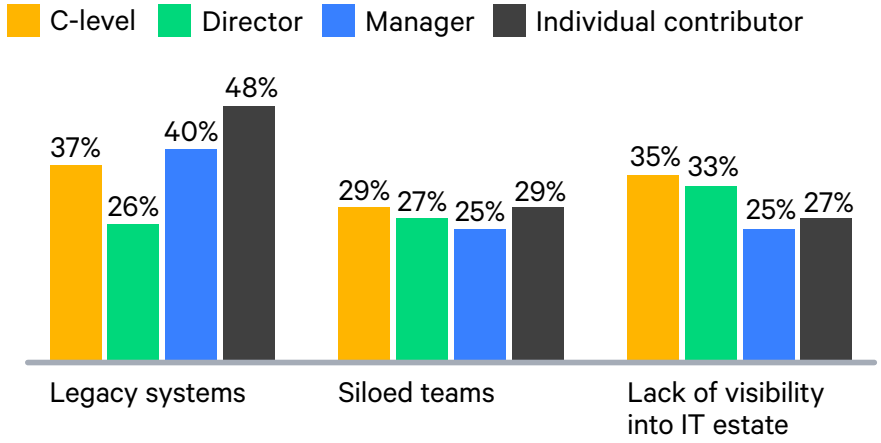
What are the barriers to automation?

Though fewer individual contributors see automation as a competitive advantage versus director or C-level respondents, there exists consensus about its value. With widespread agreement regarding the need for automation established, we can drill further down to determine where barriers to automation exist.

We asked respondents to identify the top three barriers to automation on both their own teams and those they work with to deliver software. There were again some understandable differences in perspective between management and non-management personnel (Figure 12). For example, only 26 percent of director-level respondents viewed legacy systems as a top-three barrier. Almost half of non-management personnel indicated that it is.

Perhaps more interesting is the wide-ranging agreement about where the barriers to adopt and scale automation exist.

Figure 12. What barriers to software automation do you see?



"Automated builds are difficult because we work with a lot of very old legacy code."

— QA analyst

These results may not seem consequential compared to those illustrating agreement about automation as a competitive advantage, but we should consider the nature of the measurement.

Those surveyed were given a list of eleven barriers and asked to choose only three. Their roles within an organization can inform how someone prioritizes items on a list. When we see variance depending on job title category, we can infer if and how this may influence barrier choices.

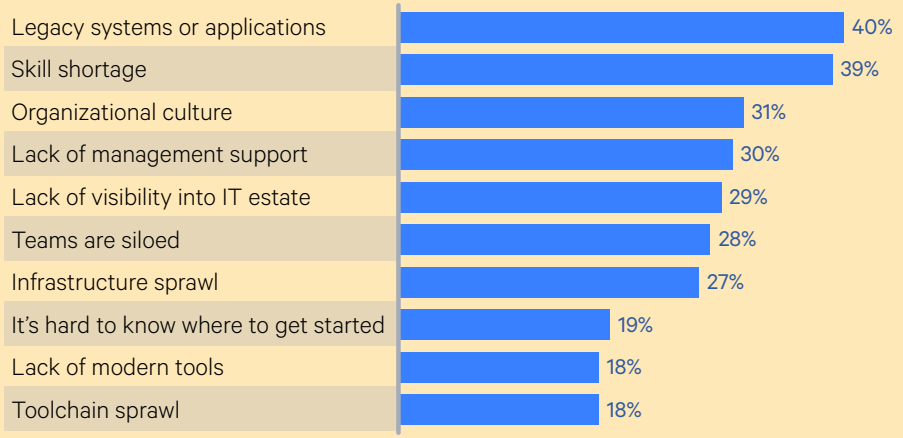
It is therefore not surprising that non-management, practitioner-type respondents would consider legacy systems a bigger issue than those at the director level or higher. These practitioners are, after all, the professionals dealing with those systems on a daily basis. C-level respondents could theoretically be reluctant to choose organizational culture as a top barrier to automation.

Timeout for aggregate data

We chose to focus on where we could determine consensus, but it is still critical to understand the aggregate reporting on this subject. It supports our analysis of how roles impacted response.

Of the seven barriers that stand out as the most critical, legacy systems and skills shortage stood apart with at or near 40 percent of respondents overall identifying them as top-three barriers to automation.

Figure 13. What barriers to software automation do you see?



Digging deeper, we can see that different roles have a different focus. Non-management respondents called out legacy systems in much larger numbers than those director-level and above — elevating it above the rest. Higher percentages of director and C-level responses pushed skills shortage above the other barriers on the list.

In order to present the survey pool with a complete list, we needed to include these options that could increase role-based response variance. So rather than just examine aggregate data, we dug deeper — looking for categories where a significant, relatively equal percentage of respondents identified a critical barrier to automation. Our premise: Less variance implies broad agreement.

Three barriers elicited similar responses across all roles. Respondents of all types chose siloed teams at virtually the same measure. Lack of visibility into the IT estate was another category that scored high across the board. A related category, legacy systems, also yielded a substantial, though not as consistent response from the broader respondent pool.

Respondent priorities change noticeably when the IT infrastructure is larger and more complex. Once an organization has more than 500 of anything — servers, virtual machines, cloud instances, or containers — the calculus for achieving automation is different.

Legacy systems and siloed teams break away from the pack in terms of how many respondents identify them as top barriers. Infrastructure sprawl is also noticeably more of an issue. Some key takeaways are listed here:

- Siloed teams are a top barrier to entry for 40 percent of respondents at companies with more than 500 servers. Just 28 percent of those with fewer than 500 servers chose siloed teams as a top barrier.
- The same is true for public cloud instances, virtual machines and containers. For companies with more than 500 servers, 38 percent consider siloed teams the top barrier versus 24 percent for organizations with fewer than 500.
- In addition, organizations with over 500 public cloud instances cited infrastructure sprawl as a barrier 38 percent of the time — a measure unique to companies using a large volume of cloud services.

Next, we will examine how organizations are progressing on their software automation journey. We investigate how they build and manage the infrastructures that allow them to scale.

Are your teams consistently managing automation at scale?

Are your teams consistently managing automation at scale?

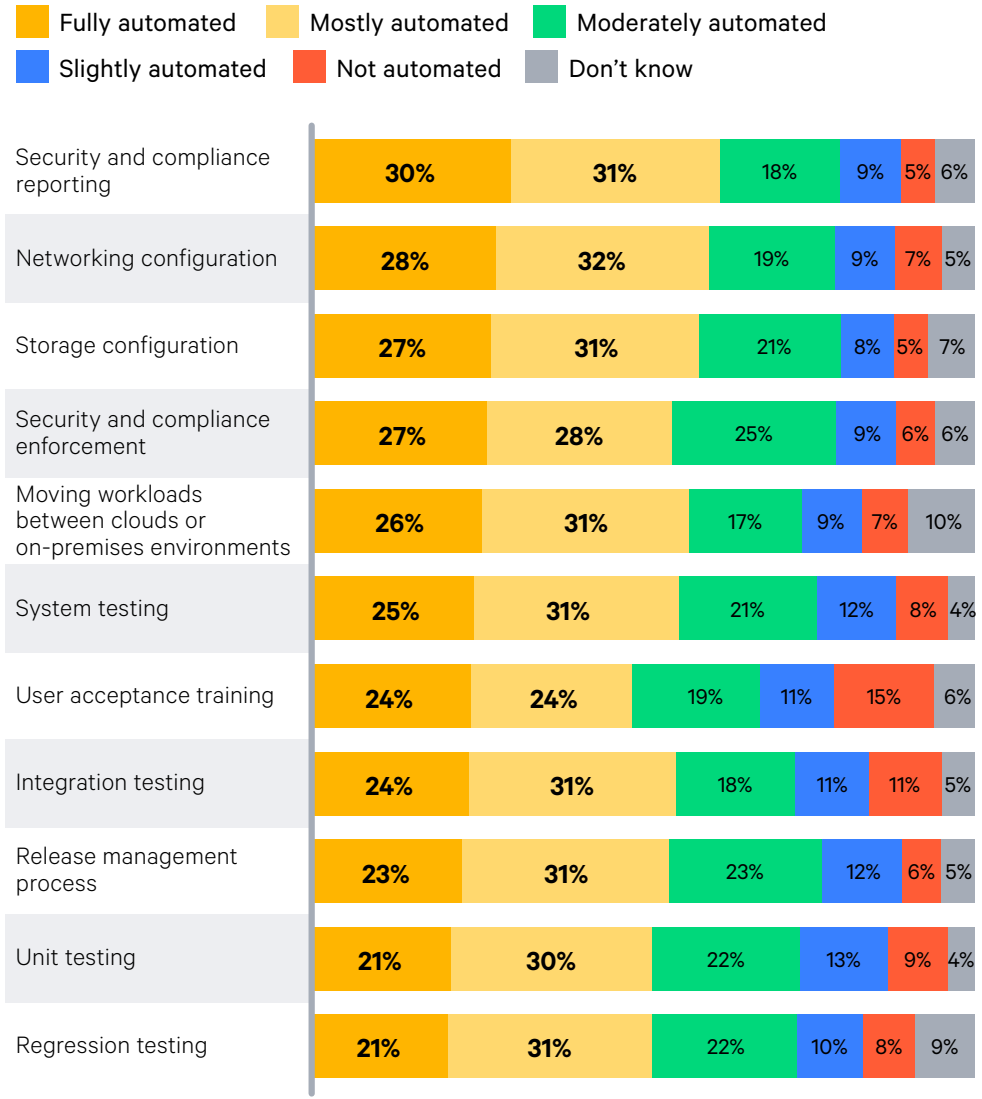
Measuring software delivery automation level by process tells us how well organizations are overcoming barriers to automation. The results here are mixed. There is good news: a large majority of respondents report at least moderate automation of all the processes we queried about. On the other hand, across the eleven processes, only a small number of respondents indicate they have processes that are just slightly automated or not automated at all.

To recognize nuance and gain more insight into the data, we offered the following options when asking about level of automation by process:

- Fully automated
- Mostly automated
- Moderately automated
- Slightly automated
- Not automated

Only a small percentage of processes are not automated at all, supporting the notion that there is widespread agreement about its value.

Figure 14. Automation levels across processes, primary application or service



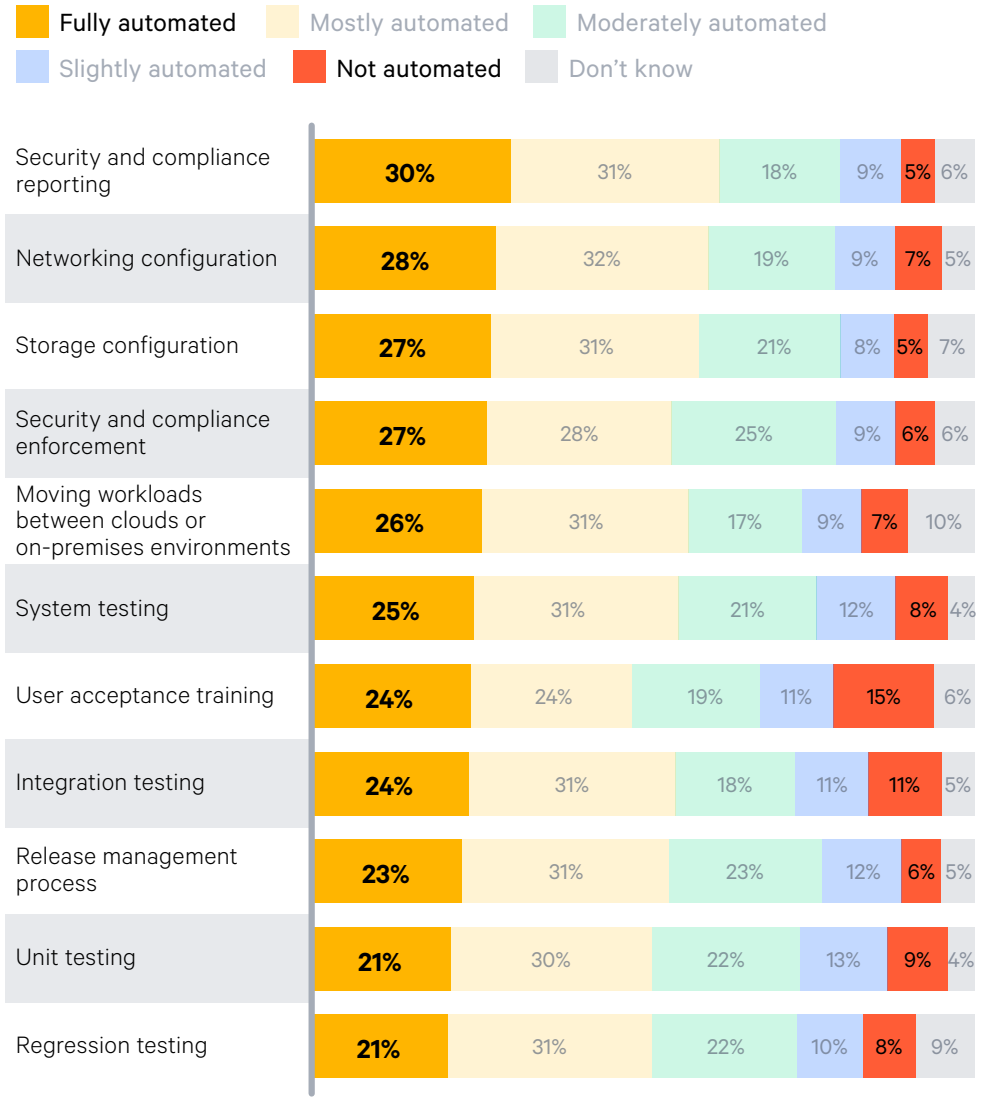
Now let's examine the extreme responses ("fully automated" and "not automated") for insights. Here are several data points that leap out:

- 15 percent of respondents indicate that user acceptance testing is not automated at all.
- 10 percent of respondents do not know if their processes for migrating workloads to the cloud are automated.
- Of the processes surveyed, none were identified as more than 30 percent fully automated.

This last data point represents a wide variance across the processes in terms of achieving full automation. Processes related to security reporting and enforcement are most automated, a measure consistent throughout the data. Unit and regression testing are the least often fully automated.

Looking into the mostly, moderately, and slightly automated processes, we can see that most respondents are still on a journey towards more fully automated processes.

Figure 14. Automation levels across processes, primary application or service



Earlier, we illustrated by comparison that larger organizations perceive less automation across all processes than their smaller counterparts (Figure 5). Of the segment of the survey pool representing companies with more than 10,000 employees, none of the listed processes are being automated by more than 50 percent of the respondents save for one outlier — integration testing.

Companies with 500-999 employees report more processes fully or mostly automated — a range of 56-70 percent. The numbers are almost identical for companies with 1,000 to 9,999 employees. The complex challenge of managing an enterprise-level company makes this unsurprising, but that doesn't make the survey results any less eye-opening.

Consider that 26 percent of our respondents were from companies with more than 10,000 employees, but only 9 percent of respondents had more than a thousand physical servers, just 18 percent had more than a thousand virtual machines, a mere 8 percent had more than a thousand cloud instances, and 7 percent had more than a thousand containers running each day on average.

The number of network devices running in excess of 1,000 and 5,000, a measure directly correlated to employee count, effectively matched number of enterprise-level respondents at 24 percent.

The data illustrates that smaller and medium-sized companies consider themselves more automated, compared to the data we received from larger organizations. For companies with fewer than 10,0000 employees, every process was at least 50 percent automated. For companies with more than 10,000 employees, no process achieved 50 percent automation.

With that in mind, let's take another look at barriers to automation through the lens of company size.

The unique challenge of integration testing

This phase of software testing, one where modules are tested as a group, is complex and requires communication and cooperation across teams. After unit testing, the modules are grouped in larger aggregates and tests are applied according to the defined integration test plan. The output is an integrated system ready for validation testing.

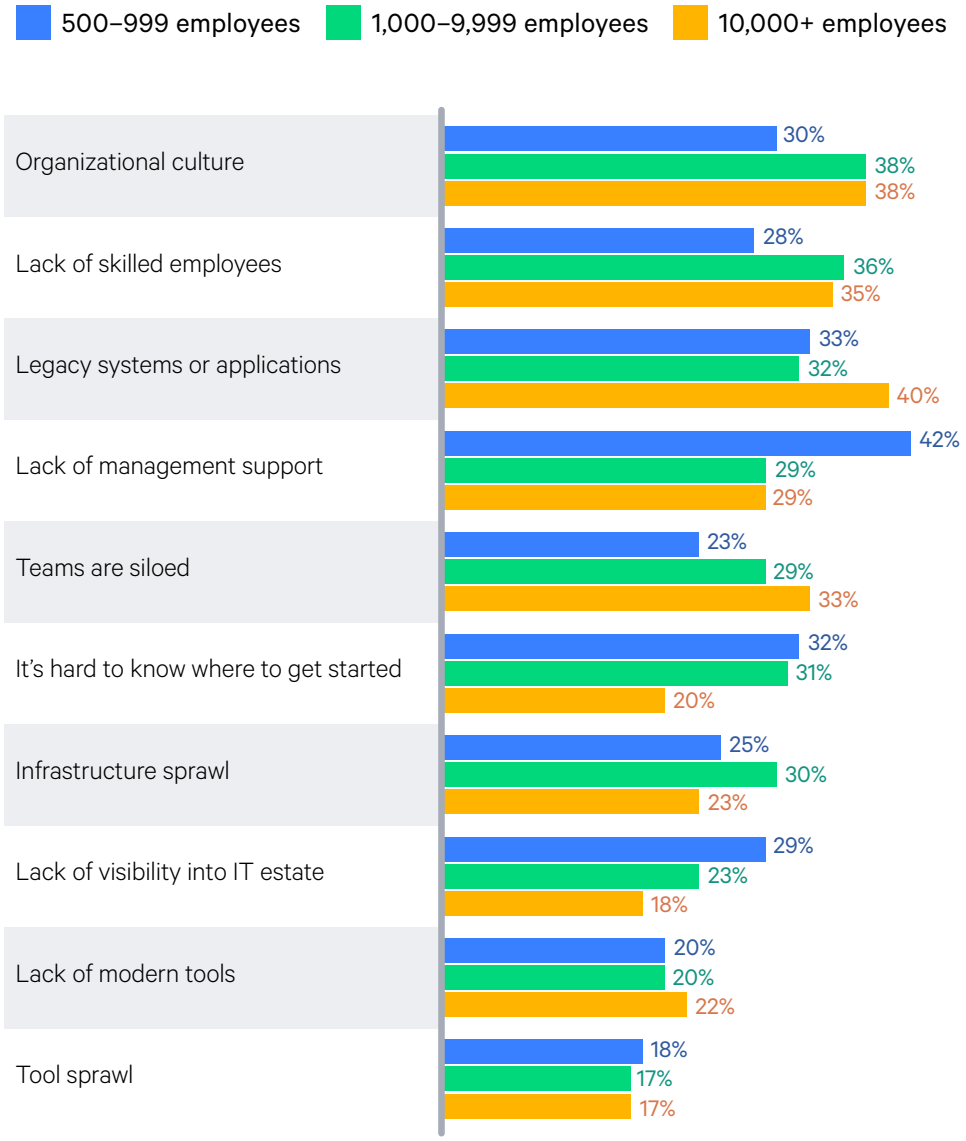
Because of the cooperative, cross-team nature of these tests, more frequent, automated testing yields quicker, actionable feedback. It stands to reason that companies would prioritize integration testing automation, hence the slightly higher reported level of automation.

As one would imagine, smaller companies don't struggle as much with teams in siloes. Somewhat surprising however is the 42 percent of respondents from companies in the 500-999 category who identified "lack of management support" as a top barrier (Figure 15). Runner-up at 32 percent was "not knowing where to start automating" — a factor directly related to lack of management support and indicative of potential leadership challenges in this category of our survey pool.

For the larger organizations, the data tells us an interesting story. Legacy systems are considered the biggest barrier to automation followed by organizational culture and lack of skilled employees.

This finding seems intuitive. A large, mature company with thousands of employees and legacy systems that would be costly to replace struggles to modernize, losing talent to more agile organizations.

Figure 15. Top barriers to automating software delivery for teams, by company size



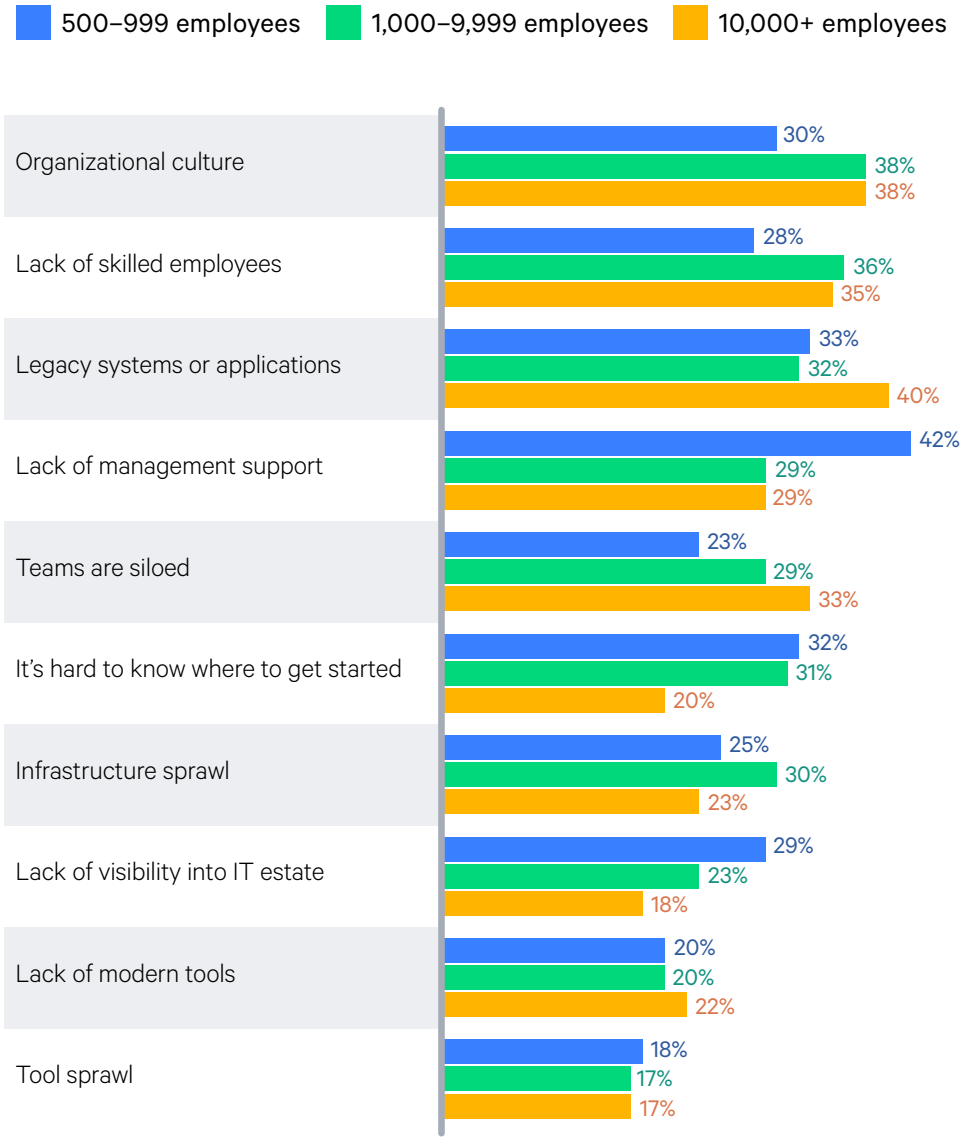
Less intuitive is the relatively few respondents who viewed lack of visibility into the IT estate as a barrier to automation. We are left with the seemingly paradoxical notion that these bigger organizations are able to see the problems but cannot do anything about them.

Based on our results, we see significant opportunity for increased software delivery and IT automation at the enterprise level.

"Our organization has made the approval process for software changes overly complex and not intuitive for developers, so obtaining approval for changes takes weeks to months."

— Programmer, company with 5,000–9,999 employees

Figure 15. Top barriers to automating software delivery for teams, by company size



What's inside your IT estate?

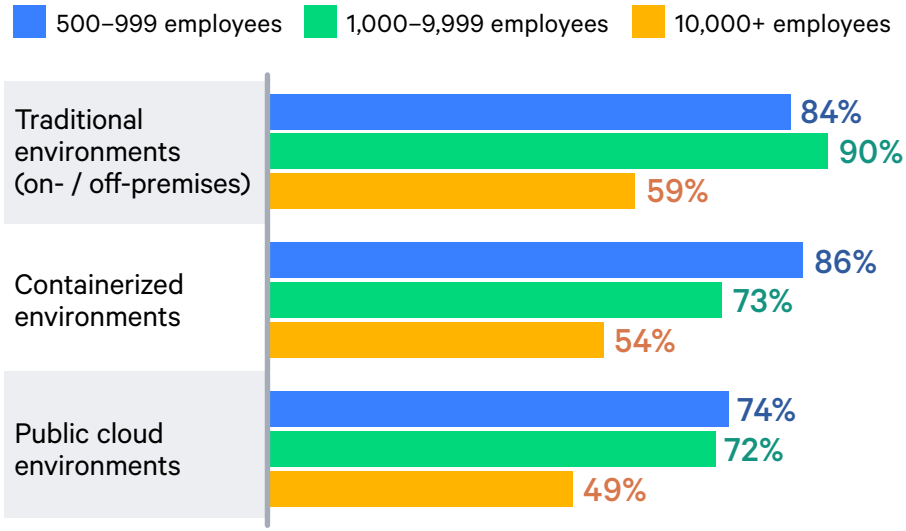
What's inside your IT estate?

The data presents us with a disconnect for companies with more than 10,000 employees. Only 18 percent of them identify a lack of visibility into the IT estate as a barrier to automation, yet far fewer of enterprise-level respondents seem to know what is running on premises, in containers, or on cloud services.

Based on our results (Figure 6), enterprise-level companies seem to have far less visibility into their IT estates than do the smaller organizations. Even software running on premises is a challenge with only 59 percent of respondents indicating that they have visibility. It just gets worse with containers (54 percent) and cloud services (49 percent).

Figure 6. Running software in different environments, by company size ("I know what's running in my...")

Responses combined: Strongly agree, agree



As we break this data down further, we should note that fewer than one in five enterprise-level respondents considered lack of visibility a significant barrier to automation. Overall, respondents reported high or complete visibility as follows:

- Security vulnerabilities across infrastructure: 47%
- Resources provisioned outside IT department: 45%
- Cloud spend: 47%
- Percentage of infrastructure that is automated: 47%

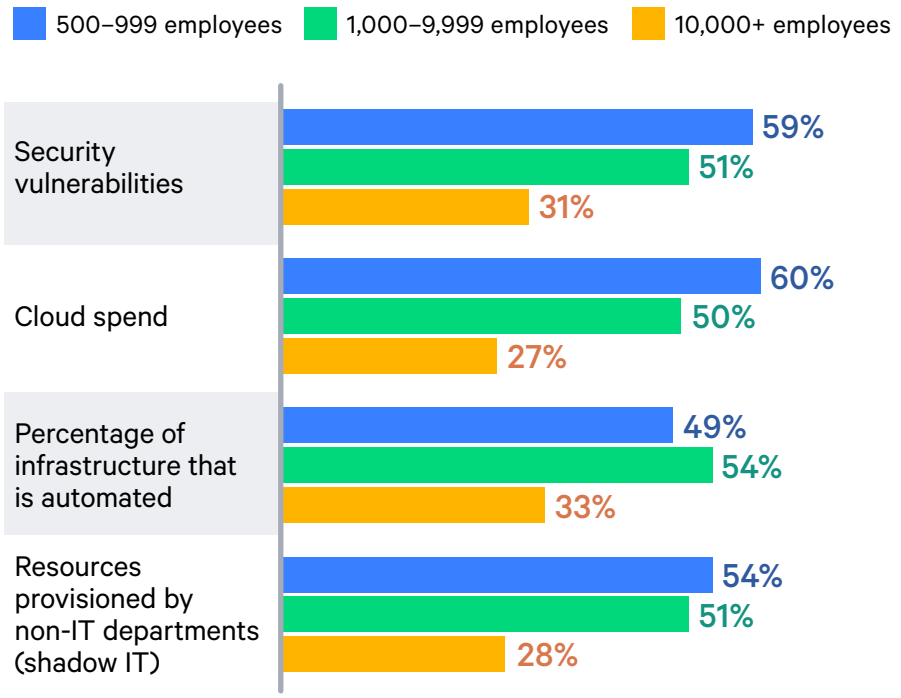
When we separate numbers by company size (Figure 7), we can quickly surmise that small and medium-sized organizations realize far more visibility across all four categories. Larger companies have roughly half as much visibility across the board.

Large companies surveyed here have limited visibility when it comes to security vulnerabilities, cloud spend, infrastructure automation, and shadow IT. There are clear risks associated with lack of transparency — namely vulnerability remediation that is too slow. For respondents with more than 10,000 employees, 26 percent need more than a day to remediate a critical vulnerability once it's been discovered.

Near real-time IT asset discovery is critical for operations of all sizes, but once again, it's more of a challenge at the enterprise level, making IT automation an even greater priority. This is also true with respect to automation of the software delivery pipeline.

Figure 7. Level of visibility into infrastructure, by company size

Responses combined: Complete visibility, high visibility



Software delivery pipeline automation

How you automate the build, test, and deployment of code matters. It is critical to find insights and use them to automate and improve processes. The survey results indicate that while most development processes are at least moderately automated, full automation remains elusive.

This lack of automation creates a competitive gap in no small part because it takes longer to complete changes to your primary application. The process of turning code committed into version control into code successfully running in production should be as fast as possible without sacrificing quality, timing, or customer experience.

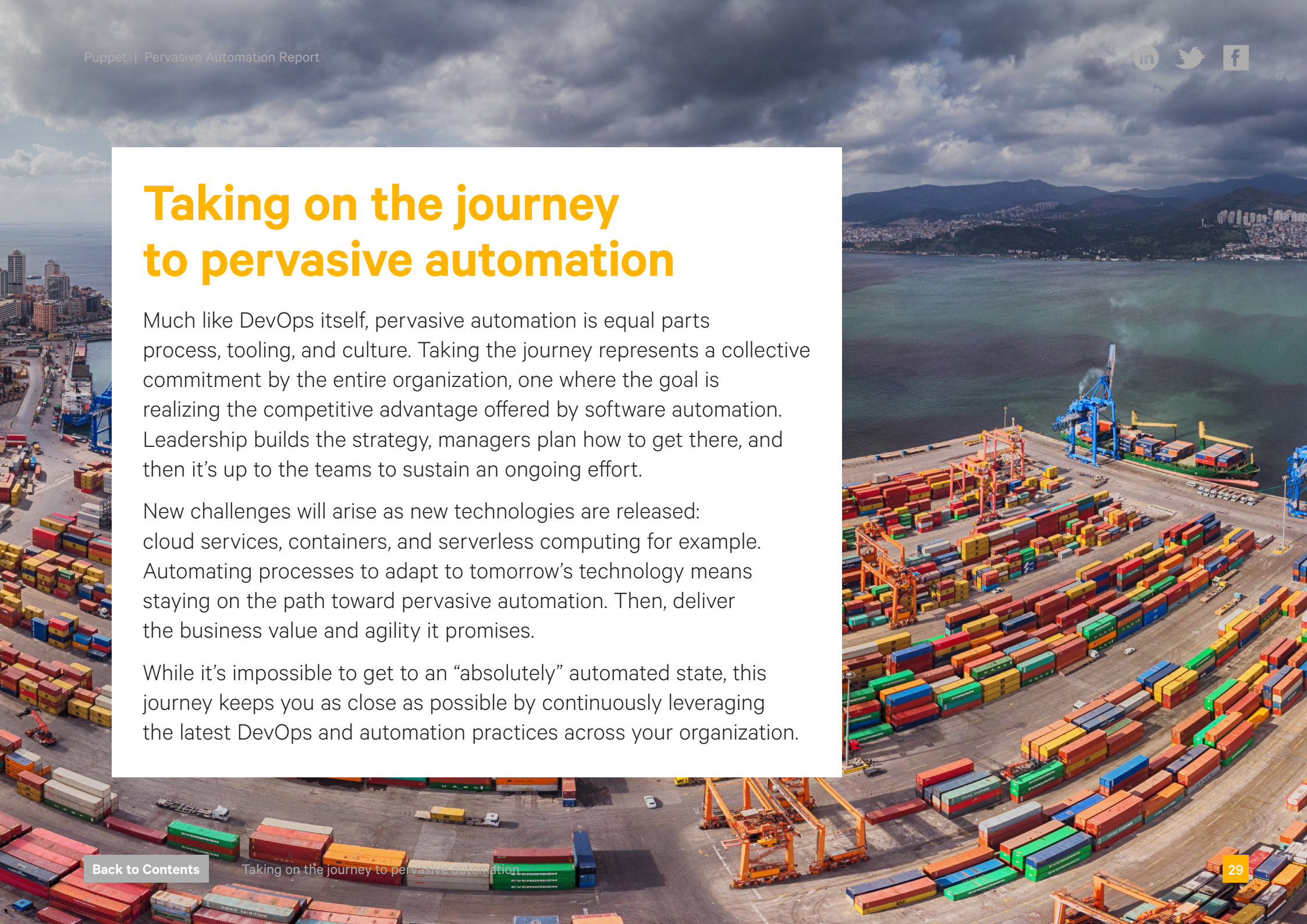
Despite the perceived lack of automation at the process level, enterprise-level organizations are at least able to keep pace with their presumably more agile counterparts. The data shows us that companies within all three size segements deploy changes similarly. This makes sense as some changes to production will require more code commits than others and despite all of the differences we have identified, teams of varying size would seem to make small or large fixes in roughly the same numbers.

Figure 16. Time to deploy change to production for primary applications or services, by company size

Velocity is only one measure and not necessarily the most important one. Success is also a product of quality and user satisfaction, so it is unsurprising that respondents put this at the top of the list across the board.

Here again, we see few, if any, outliers when it comes to measuring success. Larger companies do not prioritize budgetary concerns as a measure of success, presumably because of deep pockets. Those larger operations do place a higher value on governance and compliance, possibly because they have more capital at risk or are likelier to be in a heavily regulated industry.

Figure 17. Success metrics for software delivery pipelines, by company size



Taking on the journey to pervasive automation

Much like DevOps itself, pervasive automation is equal parts process, tooling, and culture. Taking the journey represents a collective commitment by the entire organization, one where the goal is realizing the competitive advantage offered by software automation. Leadership builds the strategy, managers plan how to get there, and then it's up to the teams to sustain an ongoing effort.

New challenges will arise as new technologies are released: cloud services, containers, and serverless computing for example. Automating processes to adapt to tomorrow's technology means staying on the path toward pervasive automation. Then, deliver the business value and agility it promises.

While it's impossible to get to an "absolutely" automated state, this journey keeps you as close as possible by continuously leveraging the latest DevOps and automation practices across your organization.

Puppet is driving the movement to a world of unconstrained software change. Its revolutionary platform is the industry standard for automating the delivery and operation of the software that powers everything around us. More than 40,000 companies — including more than 75 percent of the Fortune 100 — use Puppet's open source and commercial solutions to adopt DevOps practices, achieve situational awareness and drive software change with confidence. Headquartered in Portland, Oregon, Puppet is a privately held company with more than 500 employees around the world.

Learn more at puppet.com