



MANAGING THE RAPID RISE IN DATABASE GROWTH: 2011 IOUG SURVEY ON DATABASE MANAGEABILITY

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TABLE OF CONTENTS

<i>Executive Summary</i>	3
<i>Challenge: Expanding Database Environments</i>	4
<i>Challenge: Performance Diagnostics</i>	7
<i>Challenge: Performance Tuning</i>	9
<i>Challenge: Managing Changes</i>	11
<i>Challenge: Database Testing</i>	13
<i>Challenge: Configuration Drift</i>	16
<i>Challenge: Meeting Demand Spikes</i>	18
<i>Challenge: Managing Routine Administrative Tasks</i>	19
<i>Recommendations</i>	23
<i>Demographics</i>	24

Managing the Rapid Rise in Database Growth: 2011 IOUG Survey on Database Manageability was produced by Unisphere Research and sponsored by Oracle. Unisphere Research is the market research unit of Unisphere Media, a division of Information Today, Inc., publishers of Database Trends and Applications magazine and the 5 Minute Briefing newsletters. To review abstracts of our past reports, visit www.dbta.com/research. Unisphere Media, 229 Main Street, Chatham, NJ 07928. Tel: 973-665-1120, Fax: 973-665-1124, Email: Tom@dbta.com, Web: www.dbta.com.

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Data collection and analysis performed with SurveyMethods.

EXECUTIVE SUMMARY

As the era of “Big Data” marches on unabated, data is coming from an ever wider range of sources, including transactional systems, mobile devices, sensors, streaming media, and social networks. Businesses are looking for innovative ways to better leverage terabytes—and for some, petabytes—of information. This has placed tremendous pressure on IT departments to deliver database services faster and at lower operational costs. With this rapid rise in demand for database services comes the stewardship and challenge of managing multiple databases. Database administrators (DBAs) and IT operational teams increasingly need proactive self-managing and automated systems to augment or replace manual techniques and processes. Traditional methods such as using customized scripts for database management are simply not scalable with today’s data surge.

A new independent survey of Oracle product and technology users reveals that:

- Some DBAs still use legacy or past practices in their attempts to address or prevent unplanned downtime, whether by manual database tuning or hardware provisioning.
- One out of five administrators indicated they take little or no action to prevent unplanned outages.
- There are a surprising number of DBAs who attempt to address system problems reactively by denying users access to business applications until the situation is better understood and under control.

With input from 445 member respondents from within the Independent Oracle Users Group (IOUG) community, the survey finds that forward-looking companies, led by Oracle technologists and DBAs, are meeting the challenges head-on with more comprehensive and smarter database management practices. The bottom line: the faster the data growth, the greater the inclination to adopt methodologies and proactive solutions that provide better database manageability. The survey was conducted by Unisphere Research, a division of Information Today, Inc., in partnership with Oracle Corporation.

Respondents to the survey have a variety of job roles and represent a wide range of company types, sizes, and industry verticals. The greatest number of respondents includes those with the DBA title, followed by IT managers and developers. More than one-quarter come from very large organizations with more than 10,000 employees. The largest industry segments in the survey come from IT government agencies, IT services, utilities/

telecommunications, education, and manufacturing. (See Figures 22-24 at the end of this report.)

Key findings:

The following summarizes the results of the survey, which explore issues and solutions around managing fast-growing database environments. Key highlights and findings include:

- More than one-third of companies in the survey report their data stores are expanding at a rate greater than 20% a year. The survey finds that this growth is a key contributor to many of the day-to-day challenges and pains database administrators face. Slowing down or purposely delaying changes may limit some of the pain, but it comes with a major disadvantage that most organizations can’t live with—an inability to access information or address the companies’ ever evolving business requirements.
- Identifying origins of an issue in the complex mission-critical systems at many respondents’ sites is easier said than done. Performance issues can arise within a number of components across the infrastructure, leading to episodes of performance regression or even unplanned downtime.
- Close to one out of five respondents admit they do nothing to address database and application performance issues, or don’t even know how those issues are addressed.
- Nine out of ten respondents report experiencing unplanned downtime as a result of database changes not properly tested.
- Eight out of ten respondents report experiencing unplanned downtime as a result of configuration drift, which results as changes are made.
- Growing usage necessitates proactive measures and therefore a more comprehensive approach to overall database management is required. However, most respondents do not have systematic means or practices to address such surging requirements. Most are unable to automatically bring new databases online fast enough to meet demand.

Most notably, 13% of respondents reported no downtime or system performance issues. With this response, coupled with the other data points by those respondents, it is evident that these administrators are already benefiting from using advanced database management capabilities and automation. This enables them to avoid downtime as a result of performance issues altogether.

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CHALLENGE: EXPANDING DATABASE ENVIRONMENTS

More than one-third of companies in the survey report their data stores are expanding at a rate greater than 20 percent a year. The survey finds that this growth is a key contributor to many of the day-to-day challenges and pains database administrators face. Slowing down or purposely delaying changes may limit some of the pain but it comes with a major disadvantage that most organizations can't live with—an inability to access information or address companies' ever-evolving business requirements.

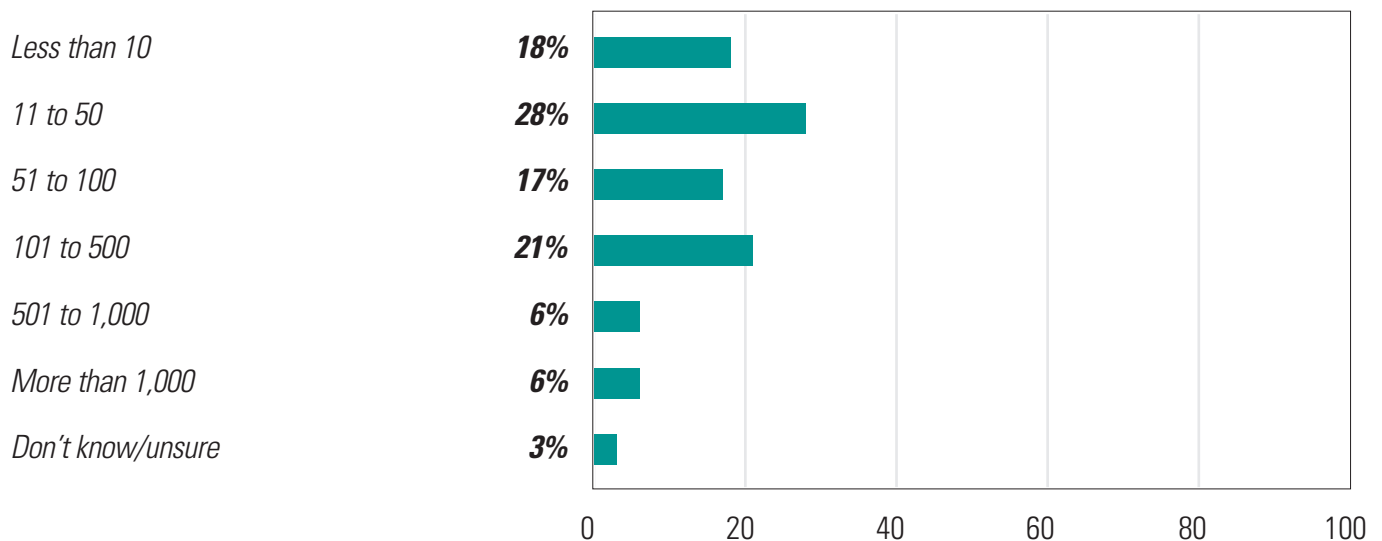
Core to the many challenges DBAs face today, are the rapid, unrelenting growth of data stores. In fact, many of the database sites covered in this survey are quite sizable operations. About one-third of the sites covered in this survey run more than 100 Oracle Database instances. Another 17 percent run between 50 and 100 instances, and 28 percent oversee between 10 and 50 instances. (See Figure 1.) For the most part, these database

instances are deployed on 50 or fewer physical systems. (See Figure 2.)

For almost all respondents, the number of database instances is expanding from year to year. Two out of five respondents reported that their number of instances expands at a rate of 10 to 20 percent a year, meaning that a typical site with 100 databases instances is adding up to 20 new database instances annually. Another 18 percent of respondents report that this growth exceeds 20 percent a year. At the lower end of the range, 37 percent say the growth is less than 10 percent a year. (See Figure 3.)

Likewise, for the most part, data growth itself appears to occur at a pace of between 10 and 20 percent a year, as cited by close to half the respondents, 46 percent. Another 34 percent say this growth actually exceeds 20 percent a year. Only 15 percent see a more moderate pace of data growth in the single digits. (See Figure 4.)

**Figure 1: Total Number of Oracle Database Instances
(Includes development, testing and production)**



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Figure 2: Total Number of Systems Supporting Oracle Databases (Includes development, testing and production)

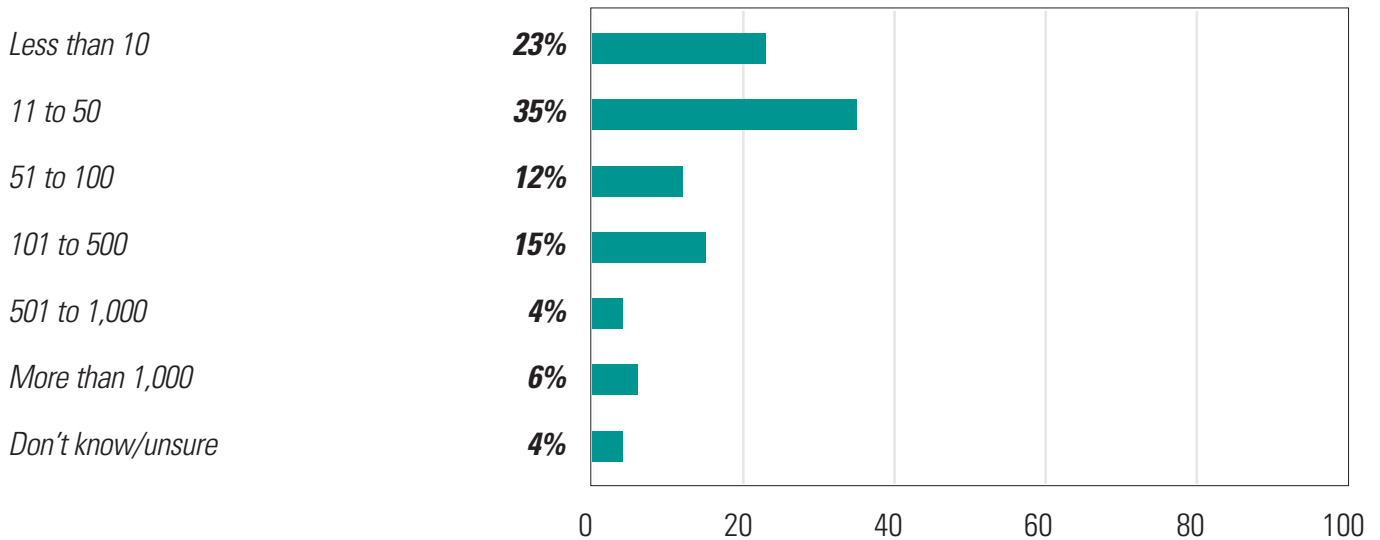
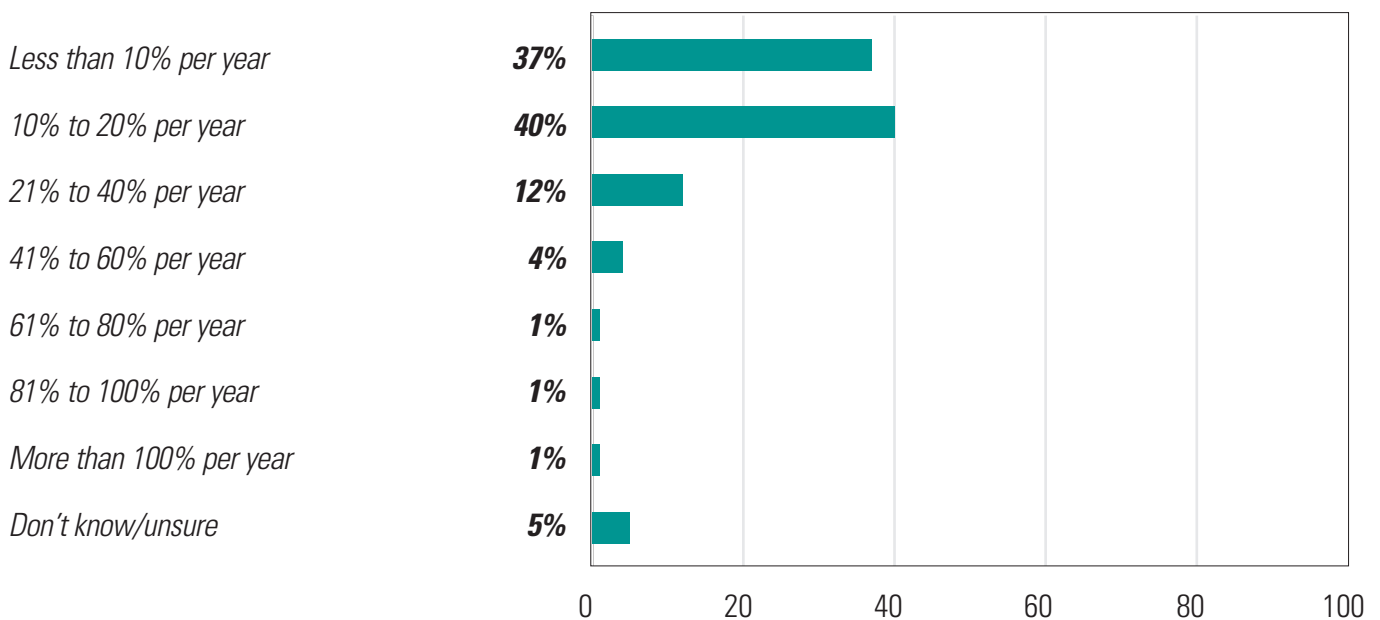


Figure 3: Rate of Annual Growth—Oracle Database Instances

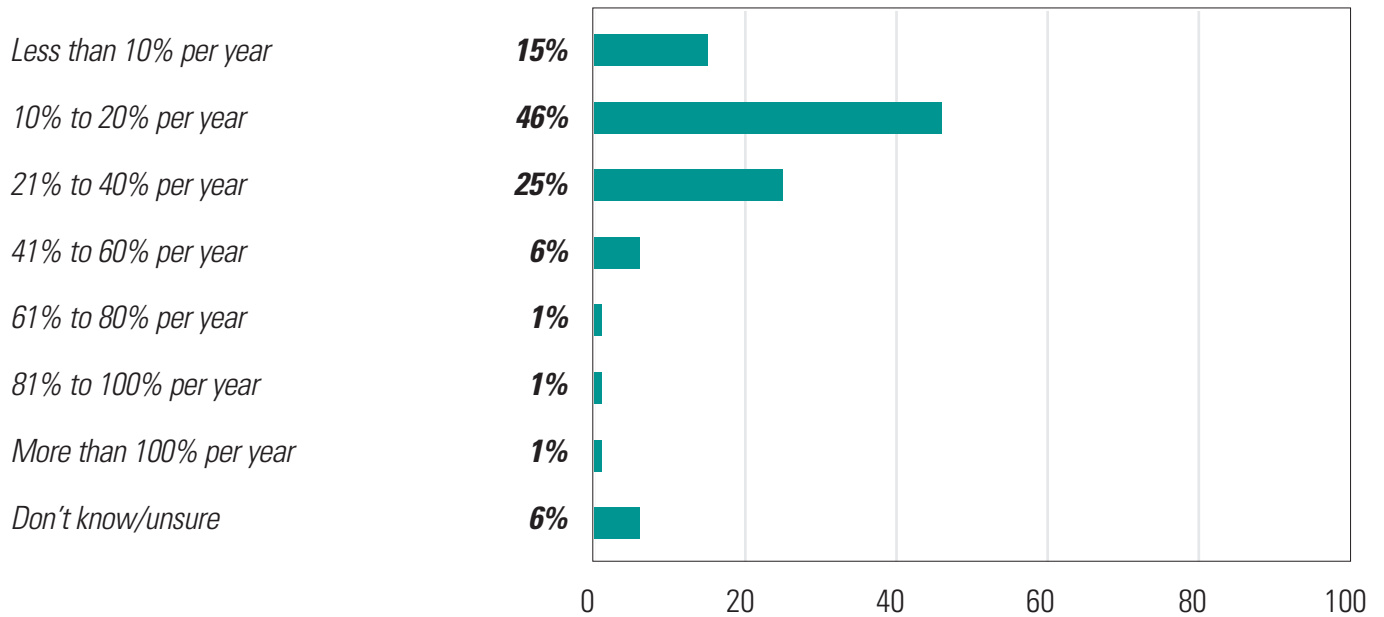


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Figure 4: Rate of Annual Growth—Database Sizes (gigabytes or terabytes)



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CHALLENGE: PERFORMANCE DIAGNOSTICS

Identifying origins of issues in the complex mission-critical systems at many respondents' sites is easier said than done. Performance issues can arise within a number of components across the infrastructure, leading to episodes of performance regression or even unplanned downtime.

Performance slowdowns that can lead to unplanned downtime vexes many organizations, and those with fast rates of data growth are more likely to be experiencing more frequent episodes.

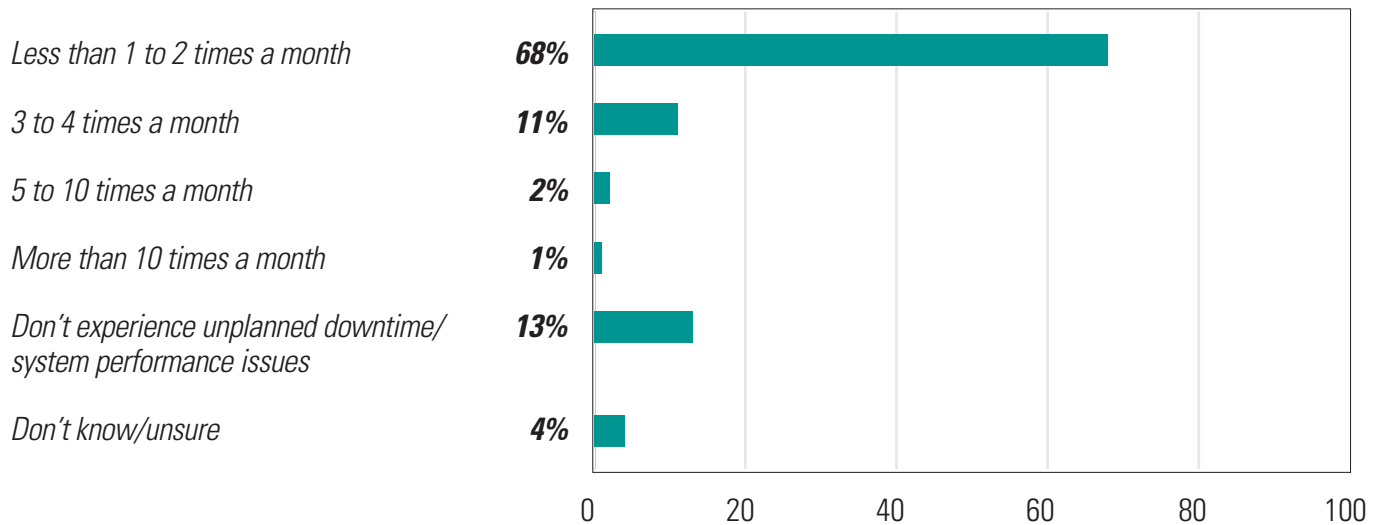
When respondents were asked about periods of unplanned downtime due to database or systems performance issues, 68 percent reported they experience one or two episodes of unplanned downtime a month. However, it's notable there is a segment of respondents, 13 percent, that do not have downtime issues. With this response coupled with the other data points by those respondents, it is evident that administrators who are

using new management practices and technology are better enabled to avoid performance issues that result in downtime. (See Figure 5.)

Identifying issues within interconnected and complex systems is quite difficult across the tiers of components, such as operating systems, middleware, and applications, that can be the root cause of performance issues. However, for most surveyed, it's difficult for them to get visibility and assess how non-database components within the infrastructure are impacting performance. Only 29% reported they are able to gauge impact of these additional components on database performance all or most of the time. (See Figure 6.)

The study also finds that quite a number of unplanned outages were the result of performance issues and more prevalent in those organizations with fast-growing databases. (See Figure 7.)

Figure 5: Frequency of Unplanned Downtime Due to Performance Issues



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Figure 6: Able to Tell if Other Cross-Tier Components (e.g., OS, Middleware, Applications) are Affecting Database Performance?

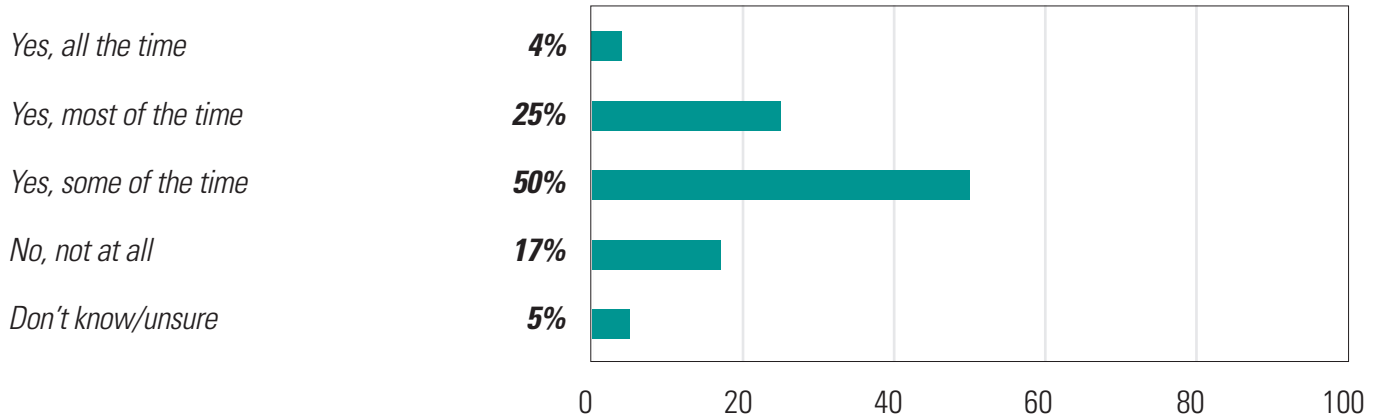


Figure 7: Frequency of Unplanned Downtime Due to Performance Issues—By Data Growth Rate

	LOW GROWTH <i><10%/YR.</i>	MODERATE GROWTH <i>11% to 20%/YR.</i>	HIGH GROWTH <i>>20%/YR.</i>
<i>Less than 1 to 2 times a month</i>	73%	71%	63%
<i>More than 2 times a month</i>	8%	13%	21%
<i>Don't experience unplanned downtime</i>	15%	13%	13%
<i>Don't know/unsure</i>	4%	3%	4%

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CHALLENGE: PERFORMANCE TUNING

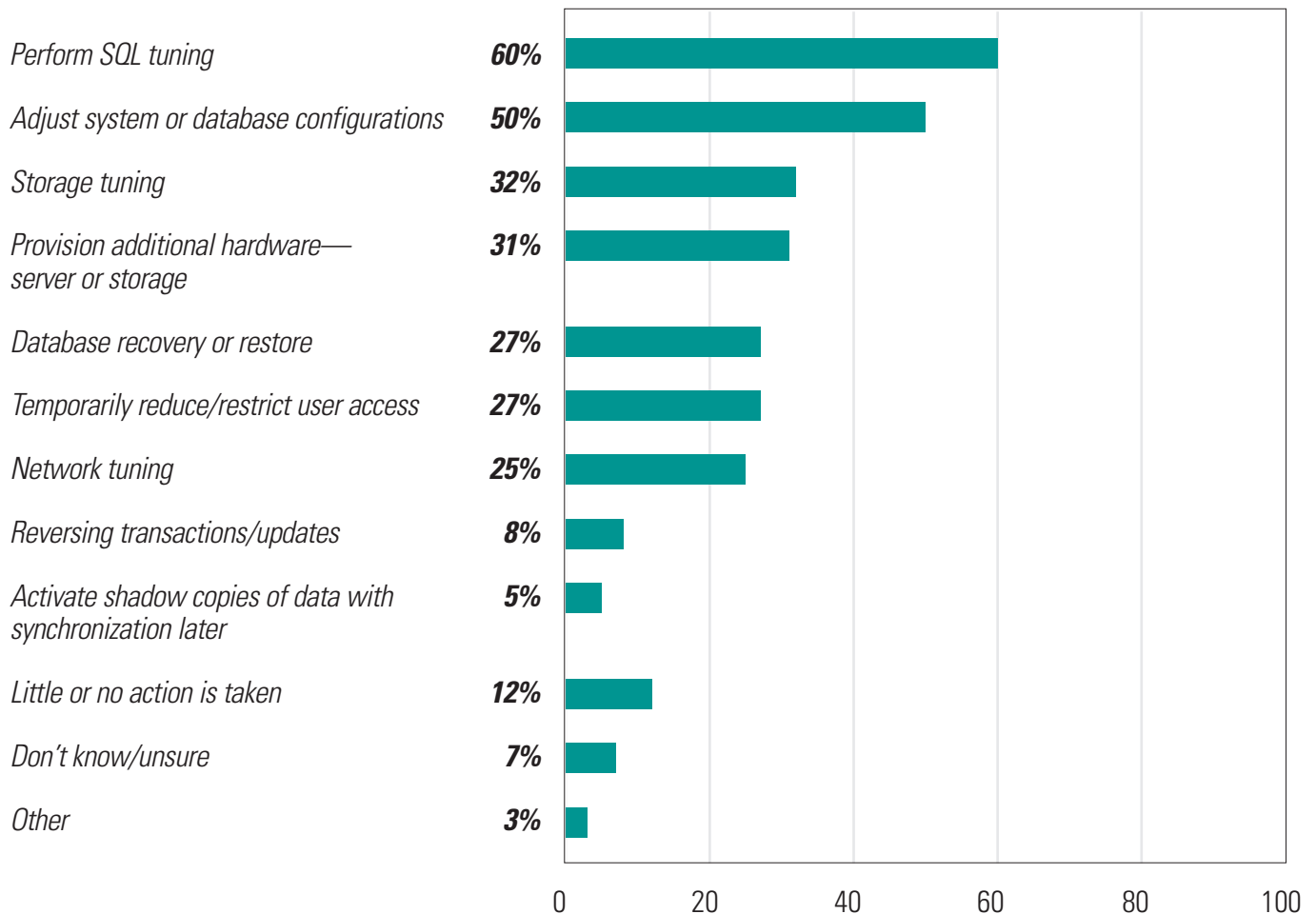
Close to one out of five respondents admit they do nothing to address database and application performance issues, or don't even know how those issues are addressed.

Database performance tuning is seen as the most optimal solution to address many of these issues as they arise. When issues come up, respondents take a number of systems-specific measures to address the problems. The most common response, cited by 60 percent, is managing Structured Query Language (SQL) optimization. Half attempt by manually adjusting their system or database configurations. About one-third attempt to

tune their storage systems and a similar number will provision more hardware in an effort to address issues. (See Figure 8.)

Among companies with the highest data growth rates, often drastic action needs to be taken to resolve sudden lapses in database performance. For example, one-third of the high-growth sites (seeing more than 20 percent data growth annually) will reduce or restrict user access while the problem is dealt with, versus 25 percent of low-growth sites. In addition, there is a much greater tendency among high-data-growth companies to provision more hardware to address the problem—40 percent versus 22 percent of the low-data-growth sites. (See Figure 9.)

Figure 8: How is Unplanned Downtime Due to Performance Issues Addressed?



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Figure 9: How is Unplanned Downtime Addressed —By Data Growth Rate

	LOW GROWTH <i><10%/YR.</i>	MODERATE GROWTH <i>11% to 20%/YR.</i>	HIGH GROWTH <i>>20%/YR.</i>
<i>Perform SQL tuning</i>	49%	66%	59%
<i>Adjust system or database configurations</i>	37%	50%	54%
<i>Storage tuning</i>	25%	36%	32%
<i>Provision additional hardware— server or storage</i>	22%	27%	40%
<i>Database recovery or restore</i>	29%	27%	26%
<i>Temporarily reduce/restrict user access</i>	25%	24%	32%
<i>Network tuning</i>	24%	29%	23%
<i>Reversing transactions/updates</i>	4%	6%	12%
<i>Activate shadow copies of data with synchronization later</i>	0%	6%	6%
<i>Little or no action is taken</i>	14%	10%	13%
<i>Don't know/unsure</i>	8%	6%	7%

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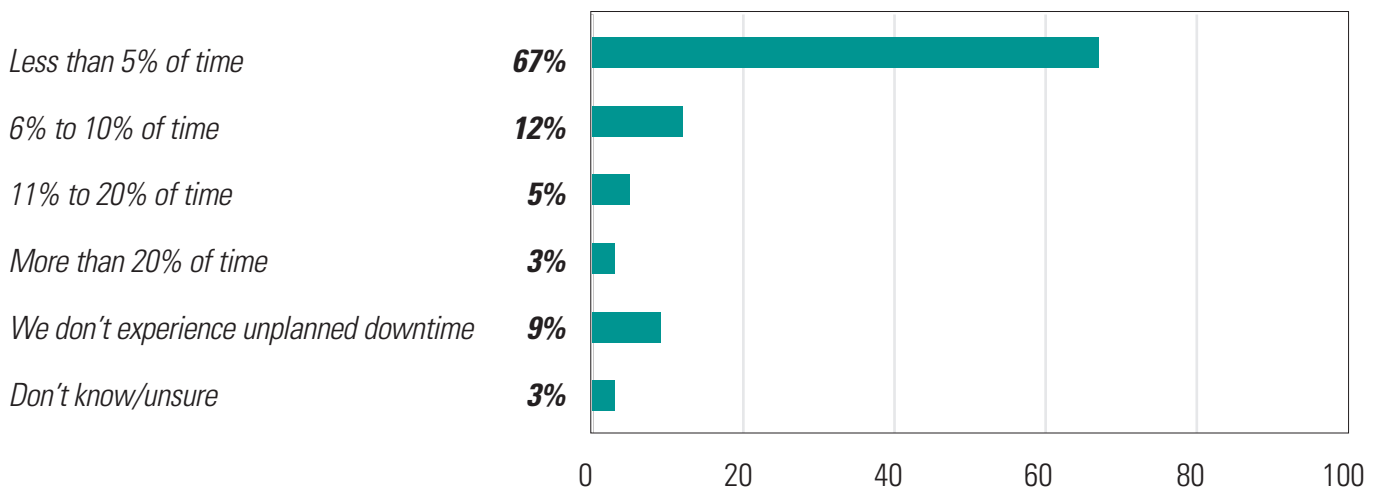
CHALLENGE: MANAGING CHANGES

Nine out of 10 respondents report experiencing unplanned downtime as a result of database changes not properly tested.

What causes these unplanned downtime incidents? A leading factor that contributes to unplanned downtime is database changes. These changes include adjustments to configuration parameters, application schema objects, PL/SQL-based business logic or application data. Twenty percent of respondents report that this results in unplanned downtime more than five percent of the time, and 67 percent report they see this up to five percent of the time. Only nine percent could say they never have issues with unplanned downtime. (See Figure 10.)

When asked about their change management challenges and the effect it has, the study found those organizations with higher rates of data growth are significantly more likely than low-data-growth sites to be adopting the best practices for database change management. For example, 65 percent consider the use of production workloads in database testing activities to be of critical importance, versus 40 percent of the low-data-growth sites. In addition 58 percent are concerned with avoiding changes to production databases because of system performance impact, versus 40 percent of the low-data-growth companies. (See Figure 11.)

Figure 10: Frequency of Unplanned Downtime as a Result of Database Changes



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Figure 11: Importance of Database Change Management Practices —By Data Growth Rate

(Percentage of respondents ranking challenge a “4” or “5” on a 1 to 5 scale, from “1” meaning of little importance to “5” meaning extremely important.)

	LOW GROWTH <i><10%/YR.</i>	MODERATE GROWTH <i>11% to 20%/YR.</i>	HIGH GROWTH <i>>20%/YR.</i>
<i>Using real production workloads to test DB changes and/or patches before production deployment</i>	40%	52%	65%
<i>Reducing post-deployment database performance instabilities that result from recent changes</i>	38%	56%	51%
<i>Avoidance of making changes to production DBs because of system performance impact</i>	40%	46%	58%
<i>Detecting unwanted DB changes, e.g., dropped indexes, init.ora parameters, app. data changes</i>	28%	50%	43%
<i>Using database stress/regression testing tools in your change management practices</i>	29%	42%	52%
<i>Reducing manual testing processes</i>	31%	42%	48%
<i>Using automated processes to perform necessary database testing</i>	26%	47%	44%
<i>Shortening the testing time and cycles for database changes</i>	27%	39%	39%
<i>Using automated processes to promote DB changes from development or test to production</i>	25%	39%	36%

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CHALLENGE: DATABASE TESTING

More than half of those surveyed say they use real production workloads to test database changes before deploying them into production.

Rigorous database testing is another important aspect of change management. Database changes could range from simply applying a patch to a test system to performing a major upgrade. Each one is just as important as the other and testing those changes and resultant workloads before deploying them into production is crucial for any company. Respondents were asked to pick their most important database testing practices. More than half the respondents cited using real production workloads

to test database changes and/or patches before production deployment (54 percent), along with reducing post-deployment database performance instabilities that result from recent changes (51 percent). At least half also place great importance on avoiding making changes to production databases because of system performance impact. (See Figure 12.)

Inadequate testing can result in performance regression or even an outage. Any major change needs to be adequately tested. Database testing in the wake of important changes is a process that usually takes up to a week to 10 days. (See Figure 13.)

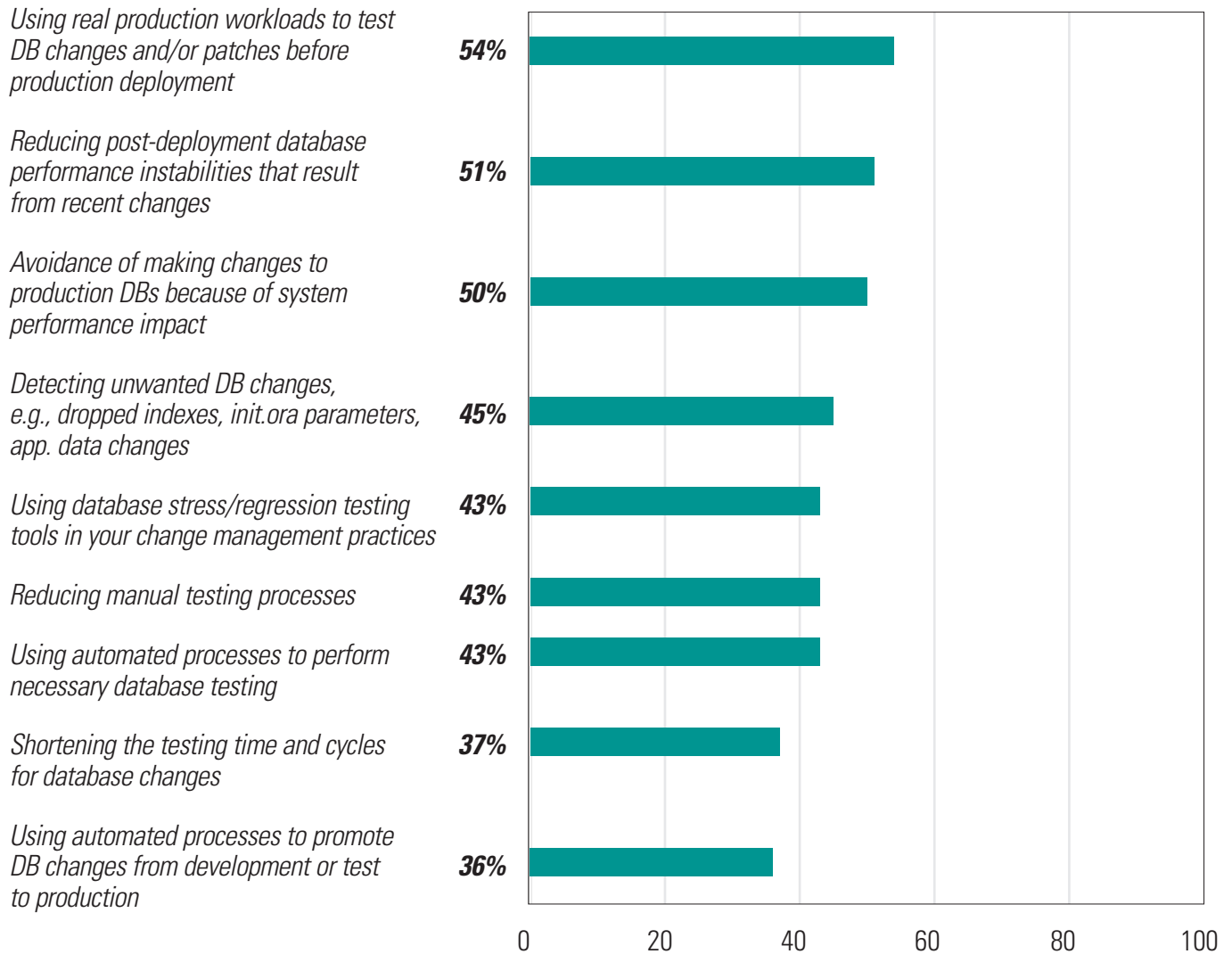
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Figure 12: Importance of Database Change Management Practices

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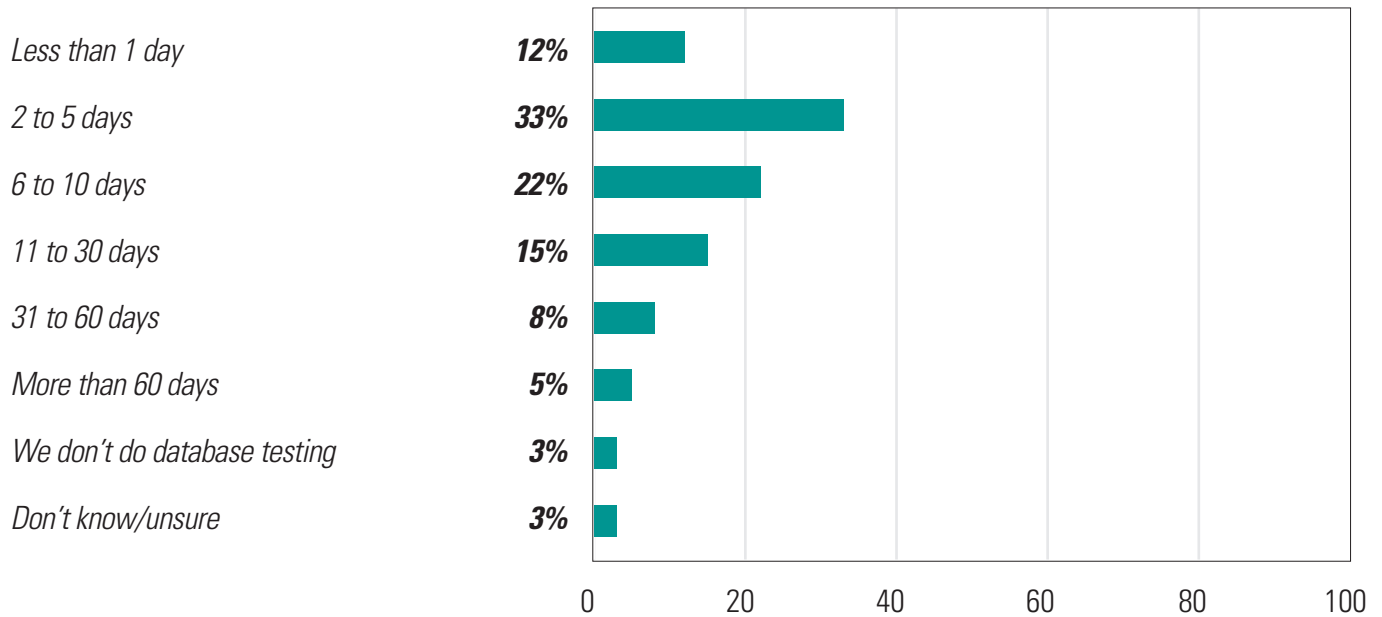


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Figure 13: Amount of Time for Testing Following Database Changes, Migration or Upgrades



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CHALLENGE: CONFIGURATION DRIFT

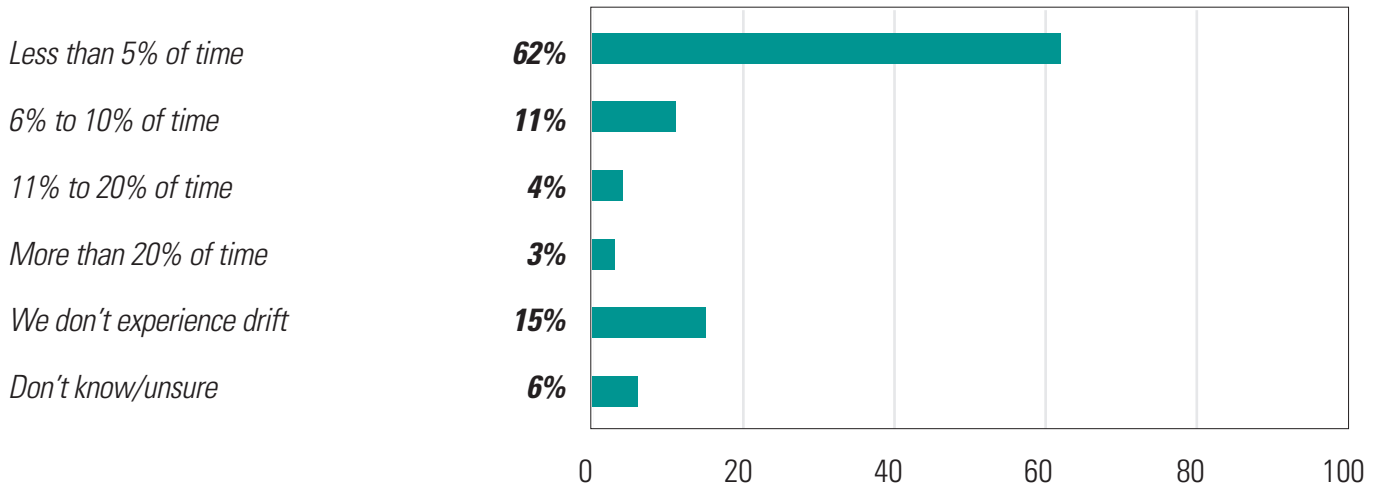
Eight out of 10 respondents report experiencing unplanned downtime as a result of configuration drift, which results as changes are made.

Another factor that may create a service outage is configuration drift, which occurs when a system's hardware or software configuration changes, or differs from a prior-defined baseline, standard or established best practice. Eighteen percent of respondents report that unplanned downtime resulted from

configuration drift more than five percent of the time, and 62 percent say they see this up to five percent of the time. Only 15 percent would say that they rarely have issues with configuration drift. (See Figure 14.)

Likewise, an administrator making an unauthorized change could also impact database performance. Half of the respondents said they would be able to tell right away if this were the case, while half said they likely would not be able to do so. (See Figure 15.)

Figure 14: Frequency of Unplanned Downtime as a Result of Configuration Drift

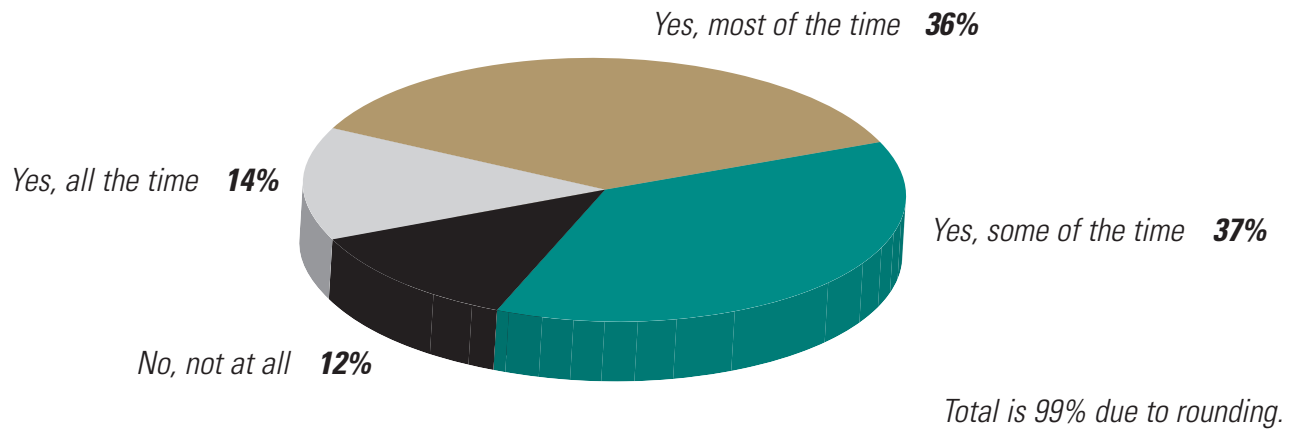


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Figure 15: Able to Tell if System Problem Caused by Unauthorized Database Change?



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CHALLENGE: MEETING DEMAND SPIKES

Growing usage necessitates proactive measures to accommodate growth and therefore a more comprehensive approach to overall database management is required. However, most respondents do not have systematic means or practices to address such surging requirements. Most are unable to automatically bring new databases online fast enough to meet demand.

When usage demand spikes, DBAs face the challenge of attempting to bring new systems online to meet the surge in demand. However, a majority of sites, 56 percent, either are only able to bring new database systems up “some of the time,” cannot provide new systems quickly, or simply don’t know if they can handle such workloads in a repeatable and efficient manner. (See Figure 16.)

The survey looked at the responses to challenges among companies experiencing relatively minor data growth versus those

with high data growth sites. Interestingly, those sites in the middle, experiencing what can be considered “moderate” rates of data growth (between 10 and 20 percent annually), were experiencing more issues with database provisioning than those with low growth or high levels of growth. Those companies with higher rates of growth (more than 20 percent a year) may be more experienced with handling this challenge. (See Figure 17.)

Those organizations with relatively low data growth may be isolated from issues for greater stability in their environments. Indeed, many organizations place strict restrictions on their systems for compliance reasons, thereby limiting their exposure to issues resulting from changes. This of course limits the IT group’s ability to respond to changing business requirements by bringing new systems online faster.

Figure 16: Able to Rapidly Provision New Database Systems During Peak Demand Periods?

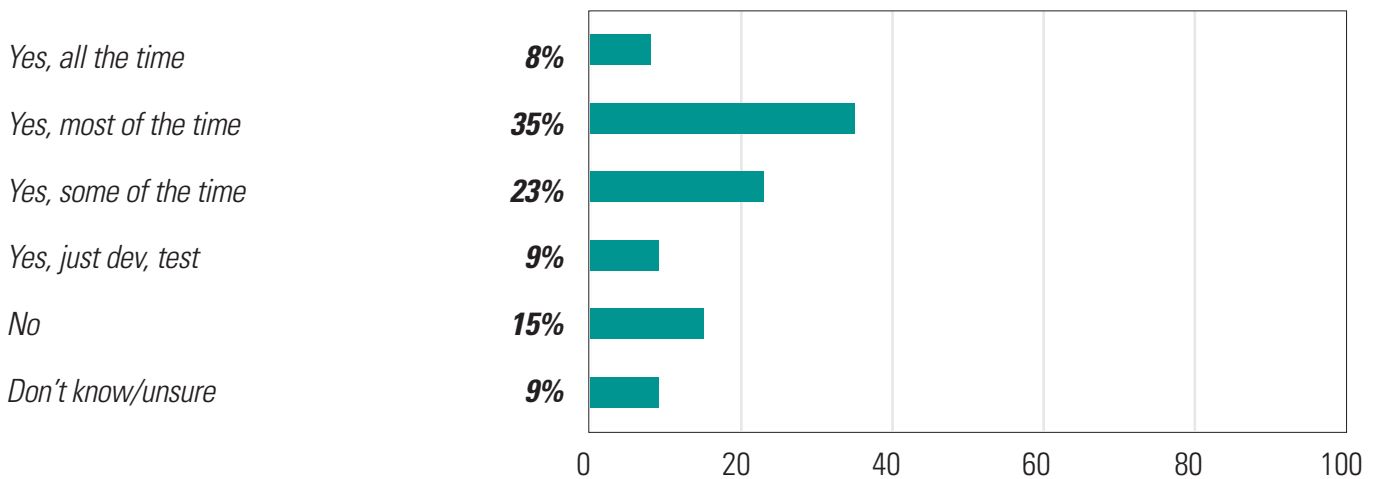


Figure 17: Ability to Rapidly Provision New Databases —By Data Growth Rate

	LOW GROWTH <10%/YR.	MODERATE GROWTH 11% to 20%/YR.	HIGH GROWTH >20%/YR.
All or most of the time	51%	40%	47%
No/don't know	24%	25%	22%

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CHALLENGE: MANAGING ON-GOING ADMINISTRATIVE TASKS

Database administrators play a variety of roles from managing operations to data security. However, many face routine and ongoing administrative challenges in areas such as change and patch management as well as compliance. Companies with greater data volumes report more difficulty keeping systems patched, diagnosing problems, and ensuring data security.

With the rapid growth of data reported earlier in this study, organizations are recognizing that database performance and availability are both critical pieces of their business. This is especially relevant at a time when more data needs to be collected, processed, managed, and stored—often in real time.

One thing is certain—database managers and professionals now have highly varied jobs, with a large variety of unpredictable and often conflicting demands, both from the business and technical sides of the house. For the most part, they are absorbed in non-database management functions, which may include everything from people management to architecture to selling new technology concepts to the business side.

In fact, 30 percent of respondents say that a good part of their week (defined as exceeding 25 percent of their work week) is spent immersed in non-database functions. Twenty-one percent report they spend large blocks of time focused on a variety of database tasks—such as space management, schema creation, or patching. Another 18 percent spend a good part of their average week involved in database performance diagnostics and tuning tasks, such as system tuning, SQL tuning, or I/O tuning. (See Figure 18.)

The higher the rate of data growth, the more time database managers and administrators need to spend on day-to-day

database administrative tasks. For example, close to one-third of respondents in high-data-growth environments (expanding by more than 20 percent a year) get caught up in various database administrative tasks, versus 13 percent of those in slow-data-growth environments. Likewise, respondents in high-data-growth environments are close to three times as likely to spend more time doing performance diagnostics and tuning, or installation and configuration tasks. (See Figure 19.)

For many respondents, the greatest challenges in day-to-day management of their environments is their ability to keep databases at current patch levels (45 percent), and diagnosing database performance problems (42 percent). Security is also an issue cited by more than one-third of respondents, along with managing larger numbers of databases with the same resources. (See Figure 20.)

The survey also found that the intensity of these administration challenges grows significantly as the volume of data increases. For example, close to 46 percent of those surveyed with high data growth, have indicated that one of their top challenges is identifying resource-intensive SQL statements in real-time. Those that have written SQL scripts know this means combing through many lines of code to find where the problem is occurring. It could also explain why another 47 percent have also reported challenges in diagnosing performance problems. This goes to back to the earlier discussion where many administrators still use manual methods to identify performance issues, and because of this, cannot automatically identify which top SQL statements are consuming the most resources. (See Figure 21.)

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Figure 18: Where Time is Spent on a Weekly Basis

	>10%	10% to 25%	26% to 50%	>50%
Non-database administrative functions	31%	35%	17%	13%
Various ongoing administrative tasks	34%	43%	15%	6%
Database performance diagnostics/tuning	41%	40%	13%	5%
Backup and recovery	55%	36%	5%	2%
Database installation and configuration	73%	18%	4%	2%

Figure 19: Where Most Time is Spent on a Weekly Basis —By Data Growth Rate

(Percentage of respondents reporting spending more than 25% of their time on tasks)

	LOW GROWTH <10%/YR.	MODERATE GROWTH 11% to 20%/YR.	HIGH GROWTH >20%/YR.
Non-database administrative functions	31%	28%	32%
Various ongoing administrative tasks	13%	19%	29%
Database performance diagnostics/tuning	9%	17%	24%
Backup and recovery	0%	5%	15%
Database installation and configuration	4%	3%	11%

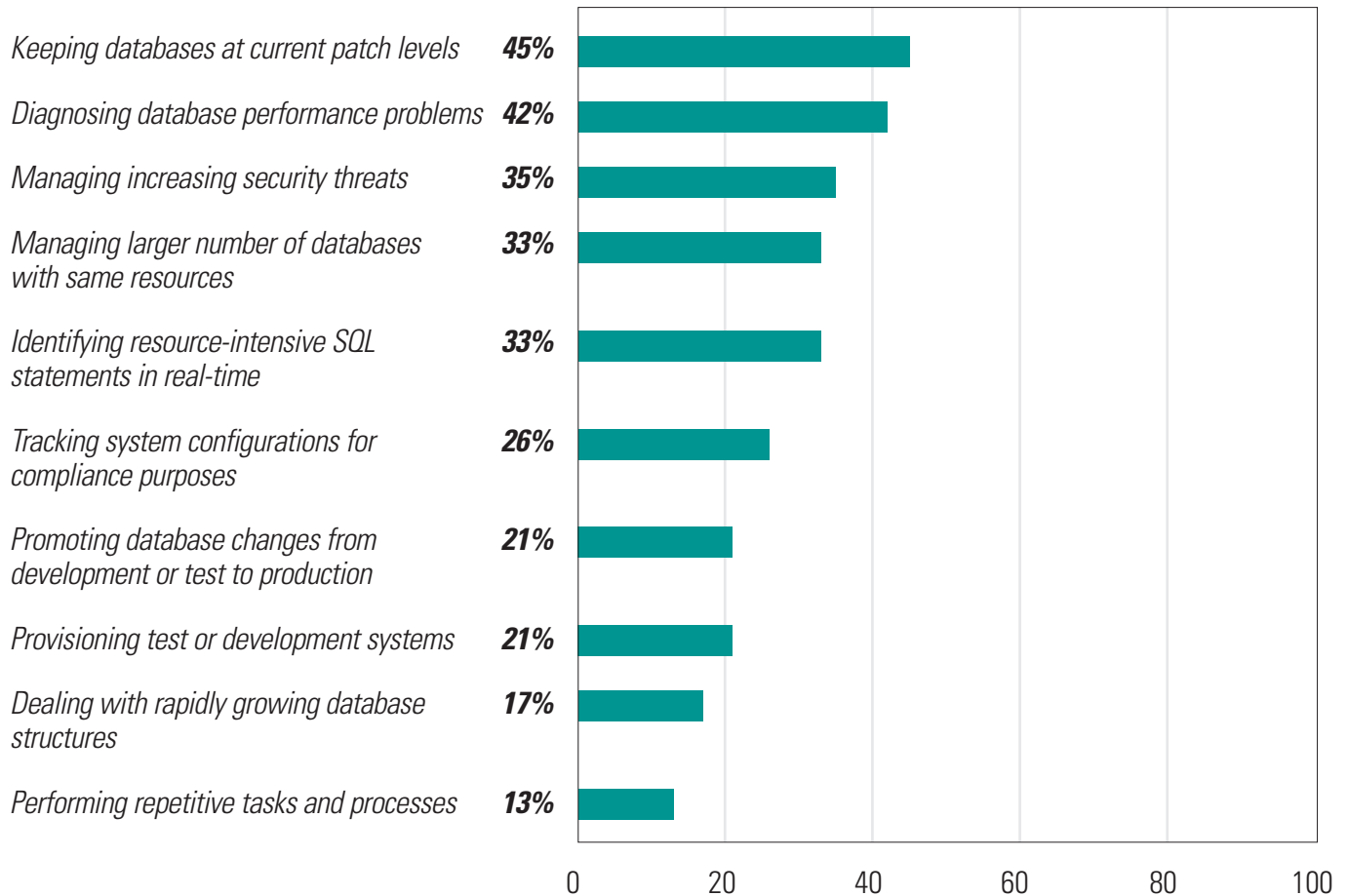
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Figure 20: Top Database Administration Challenges

(Percentage of respondents ranking challenge a “4” or “5” on a 1 to 5 scale, from “1” meaning little challenge to “5” meaning extreme challenge.)



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Figure 21: Top Database Administration Challenges —By Data Growth Rate

(Percentage of respondents ranking challenge a “4” or “5” on a 1 to 5 scale, from “1” meaning little challenge to “5” meaning extreme challenge.)

	LOW GROWTH <10%/YR.	MODERATE GROWTH 11% to 20%/YR.	HIGH GROWTH >20%/YR.
Keeping databases at current patch levels	29%	51%	46%
Diagnosing database performance problems	21%	45%	47%
Managing increasing security threats	19%	38%	39%
Managing larger number of databases with same resources	17%	32%	42%
Identifying resource-intensive SQL statements in real-time	18%	31%	46%

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RECOMMENDATIONS

As more organizations are challenged by the surge of data, the need for proactive database management practices, techniques, and technology is paramount. The guiding principles must also include a commitment to demonstrating value to the business through higher service quality, availability and greater cost control.

This survey identifies that companies, particularly those with rapidly expanding data environments, need to engage in more comprehensive management methods to alleviate growing burdens placed on their staff. IT executives, IT operations and database managers should review and consider the following methods:

- **Move away from separate or siloed methods.** Administrators can take advantage of the latest innovations and techniques that leverage the next generation in database management. While customized scripts may be useful for managing very small database environments, it is a method proven not to scale or be cost-effective for enterprise production environments. The survey found, administrators are faced with managing upwards of 50 or more databases each. Past practices are simply not sustainable and adding staff is typically not an option.
- **Look at the big picture, not just the database.** Performance issues may not stem from the database itself, but from other parts of the infrastructure and network. It's important to have open lines of communication with teams responsible for other parts of the IT infrastructure. Having the ability to quickly diagnose and remediate performance problems accurately, before issues impact business users, is vital.
- **Adopt or update change management practices.** Using best practices and management tools that automate manual tasks such as patching can help IT organizations become more proactive. Being able to automatically configure, test and provision new databases quickly can free up administrators'

time, making them more productive. Automating change management tasks not only reduces the risk of non-compliance, but also ensures that service levels are not disrupted.

- **Testing is essential.** As databases grow and evolve, DBAs must ensure appropriate testing best practices and techniques are followed, otherwise unplanned outages and performance issues may impact the business.
- **Keep up to date with the techniques and technology.** Education and best practices from the user community, as well as product technology and solutions offered by Oracle and its partners can provide greater automation and assurance of database uptime. This further aids administrators in more proactive, consultative and planning tasks, such as capacity planning, reviewing and keeping up with ever changing requirements from business stakeholders and strategic planning—all of which provides greater value to the business by the IT organization.

Oracle has designed and developed Oracle Database 11g and Oracle Enterprise Manager 11g to aid companies with these challenges. There are a number of advanced technologies and time-saving capabilities that help automate many of the daily administrative tasks—providing relief to cope with the onslaught of data. With over 20,000 members of the community, IOUG offers you access to best practices, networking and education from independent experts within the Oracle user group community. It provides an unbiased source and is an organization your company should join if using Oracle technologies.

The IOUG provides administrators the opportunity to educate themselves about what the latest releases of these platforms have to offer.

Disclaimer:

The foregoing recommendations are general in nature and do not apply to any individual user, organization or company. Each user's requirements, systems and capabilities are different, and it may or may not be advisable or feasible for all users to implement any or all of the recommendations listed above. Each user is responsible for making its own analysis of the advisability of implementing or adopting any of the recommendations and for actually implementing the same. Each user should consult with its own technical advisors or other applicable, qualified professional advisors before adopting or implementing any of these recommendations. IOUG shall not be liable to any person or entity arising out of any user's adoption or implementation of any of the recommendations contained herein.

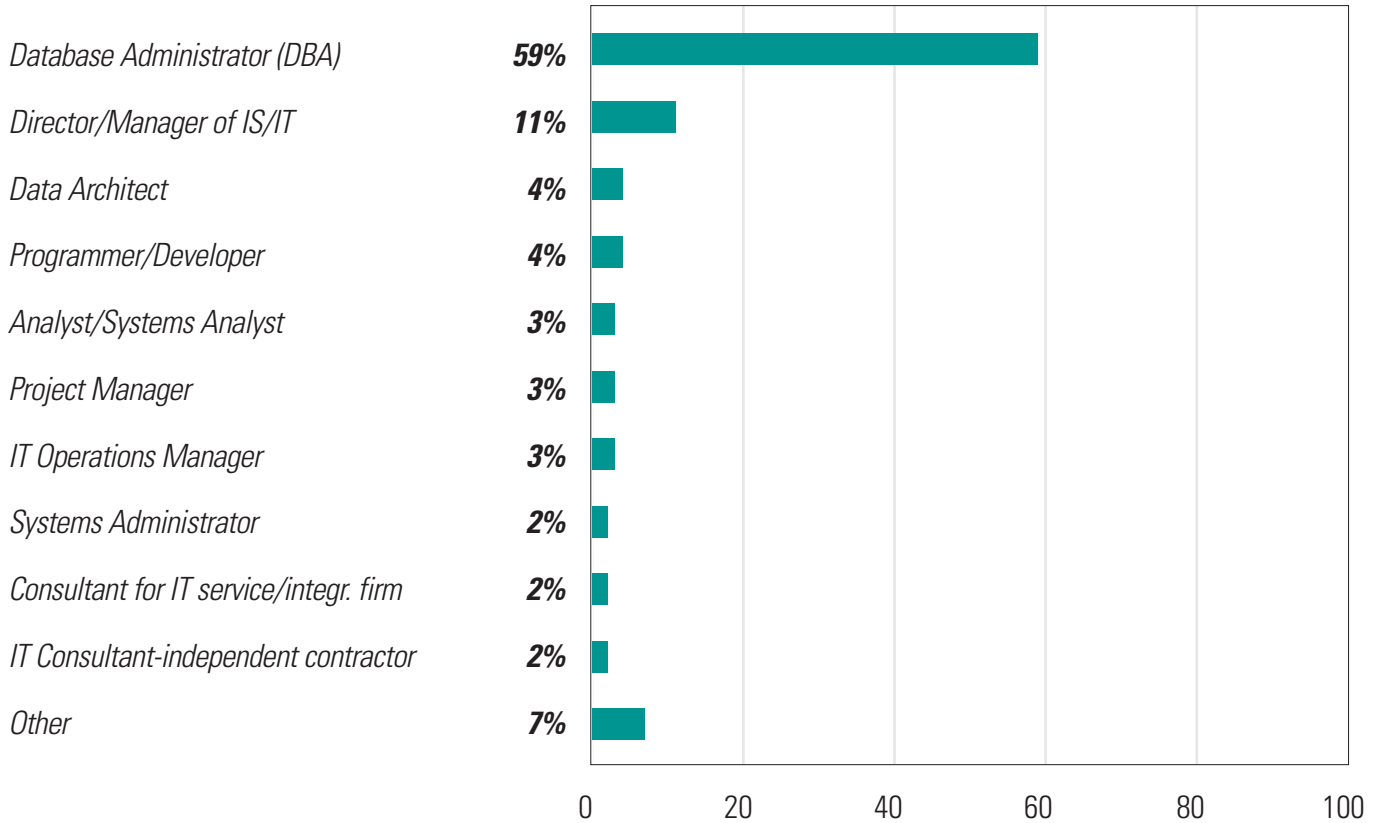
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DEMOGRAPHICS

Figure 22: Respondents' Primary Job Titles

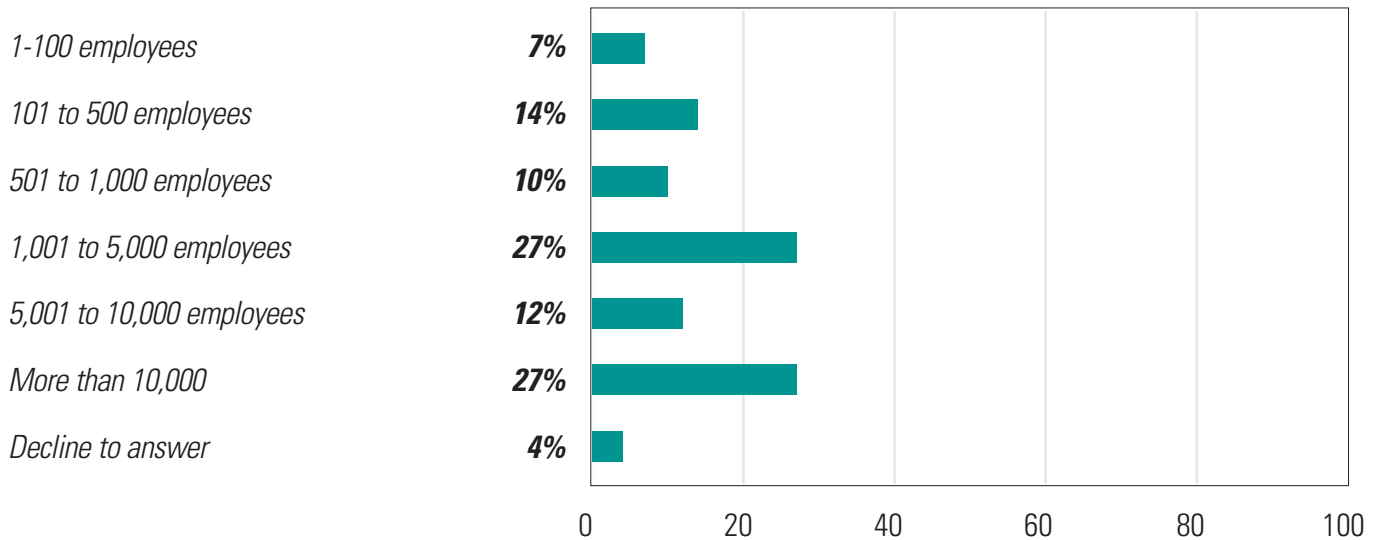


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Figure 23: Respondents' Company Sizes—By Number of Employees

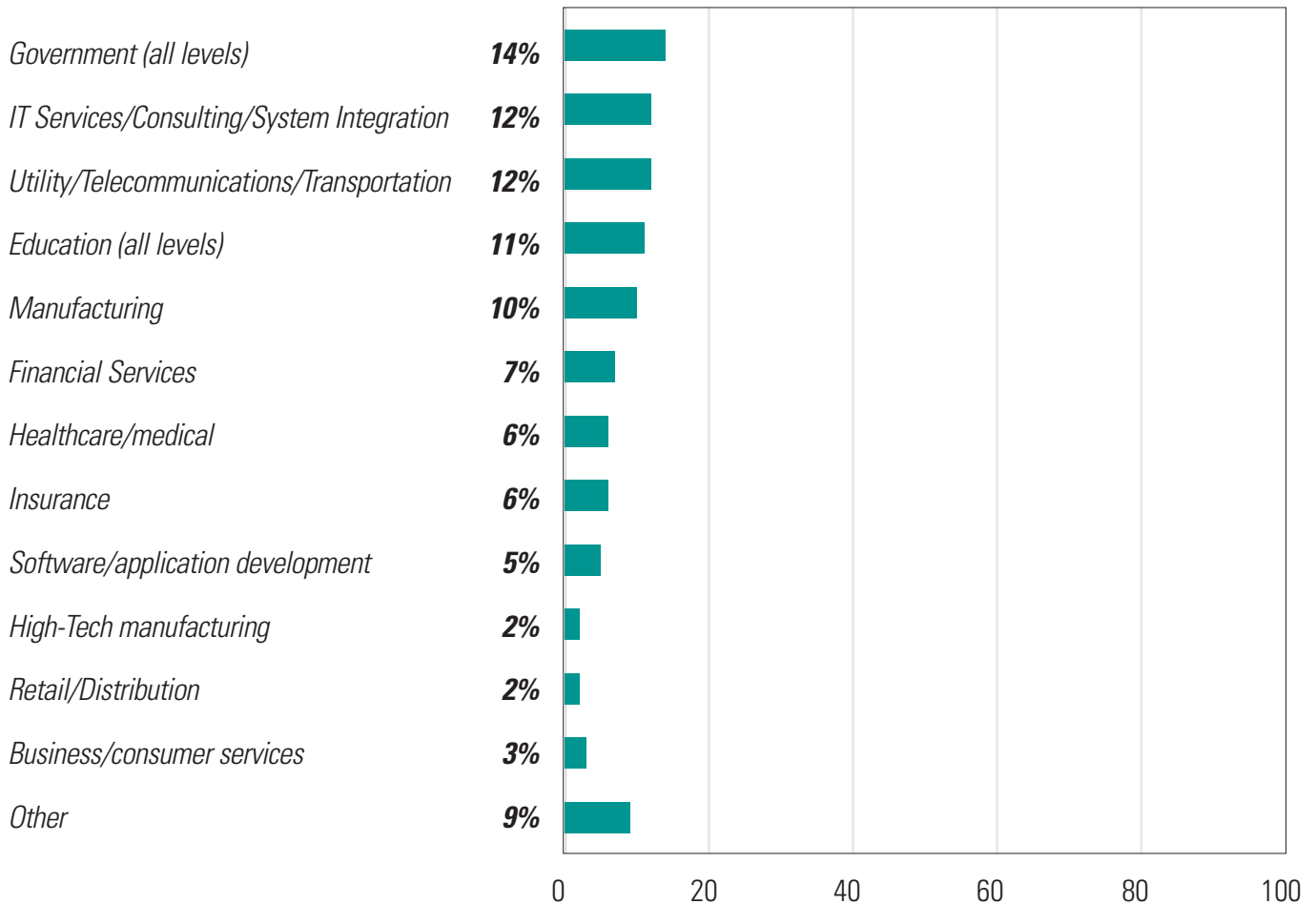


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Figure 24: Respondents' Primary Job Industries



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