2013 Study on Data Center Outages

Sponsored by Emerson Network Power

Independently conducted by Ponemon Institute LLC

Publication Date: September 2013

2013 Study on Data Center Outages

Ponemon Institute, September 2013

Part 1. Introduction

Unplanned data center outages present a difficult and costly challenge for organizations. In fact, most of the respondents in this study from senior level to rank-and-file say they would rather walk barefoot over hot coals than have their data center go down.

The first study was conducted in 2010 and findings revealed that organizations were underestimating the impact unplanned outages have on their operations. This year's study reveals that this is changing and in some respects show that the ability to prevent data center outages is improving. For example, new innovations around monitoring and Data Center Infrastructure Management (DCIM) are expected to have a positive impact on availability for the data center industry. There is also high confidence among many in this study in the performance reliability of their generators and switchgear.

We surveyed 584 individuals in U.S. organizations who have responsibility for data center operations. Eighty-five percent of respondents report their organizations experienced a loss of primary utility power in the past 24 months. Among those organizations that had a loss of primary utility power, 91 percent report their organizations had an unplanned outage. Following are the most salient findings from this study.

Perceptions about data center criticality, availability and outages

The findings suggest companies do not have practices and investments in place to reduce or respond to outages. Seventy-one percent of respondents agree their company's business model is dependent upon the data center to generate revenue and conduct ecommerce.

Most every organization in this study has had at least one unplanned outage in the past 24 months. Respondents averaged 2 complete data center shutdowns over the two-year period, with an average duration of 91 minutes. The lengthy duration of the data center outages correlates to lack of resources and planning as only 38 percent agree there are ample resources to bring their data center up and running if there is an unplanned outage.

Only 41 percent believe senior management fully supports their efforts to prevent and manage unplanned outages. Other indications that organizations are not proactive in addressing the risk of unplanned data center outages include the finding that only 36 percent believe they utilize all best practices in data center design and redundancy to maximize availability.

Perception differences between senior level and rank-and-file respondents

Dividing our sample according to respondents' positions in their companies yields interesting differences. Forty-eight percent of senior-level respondents have greater confidence that leadership is supportive of efforts to prevent outages. Rank-and-file respondents are more likely than senior management to believe that unplanned outages happen frequently.

Revelation of industry and data center size differences

Companies in ecommerce and IT services have the lowest number of complete data center outages (1.63 and 1.69, respectively), while healthcare continues to have the highest number with 2.7 total data center outages every two years. Public sector organizations have the longest durations and ecommerce have the shortest duration of outages.

The frequency and duration of data center outages also varies by the size of the data center. Outages become less frequent and shorter in duration as data centers increase in size. The smaller the data center the longer and more common the outages.

Root causes and responses by organizations

Eighty-three percent of respondents know the root cause of the unplanned outage. The most frequently cited root causes of data center outages are: UPS battery failure (55 percent), UPS capacity exceeded (46 percent) and accidental EPO/human error (48 percent). Fifty-two percent believe all or most of the unplanned outages could have been prevented. The most common prevention tactics to avoid downtime are investing in improved equipment (49 percent), improved security and surveillance practices (28 percent) and more budget (26 percent).

Part 2. Key Findings

In this section, we provide an analysis of the findings. Since last conducting the study in 2010, questions have been replaced or modified. For those questions that have remained consistent since 2010 we have included them in this report.

In this year's study, we have identified the following themes. They are as follows:

- Perceptions about data center availability, unplanned outages and governance
- Senior executives have different perceptions than rank-and-file employees
- Frequency and durations of outages
- Root causes of outages and organizations' responses to unplanned outages
- Special analysis: High performing organizations

Perceptions about data center availability, unplanned outages and governance

Figures 1a, 1b and 1c summarize respondents' level of agreement about data center availability, unplanned outages and governance in their organizations.

According to Figure 1a, many respondents continue to have concerns about their organization's ability to withstand unplanned outages or ensure a high level of availability. Despite the perception that their organization is more focused on maintaining availability/uptime than 12 months ago, 68 percent of respondents believe their organization has made sacrifices to availability to improve efficiency or reduce costs inside their data center.

Figure 1a. Attributions about data center availability
Strongly agree and agree responses

	FY 2013	FY 2010
More concerned today about maintaining availability uptime than 12 months ago *	75%	
New innovations with monitoring and DCIM will have positive impact on availability *	74%	
High confidence in the performance reliability of generators and switchgear *	71%	
Sacrifices have been made to availability to improve efficiency or reduce costs *	68%	
High confidence in the performance reliability of electrical utility provider	46%	50%
Highest priority above all other priorities including cost minimization and energy efficiency	44%	42%
All best practices are utilized in data center design and redundancy to maximize availability	36%	32%

* This response was not available in FY 2010

■ FY 2013   ■ FY 2010

Further, only 36 percent of respondents believe that their organization is instituting all best practices in data center design and redundancy to maximize availability. Less than half have high confidence in the reliability of their electrical utility provider, a decline from last year's study.

There are positive developments in data center availability. Seventy-four percent say new innovations around monitoring and Data Center Infrastructure Management (DCIM) will have a positive impact on availability for the data center industry. The majority of respondents (71 percent) also have high confidence in the performance reliability of their generators and switchgear.

Figure 1b shows the perceptions respondents have about unplanned outages. The perceived root causes of unplanned outages and problems associated with these events seem to be related to cost constraints and resources necessary to bring the data center up and running after an unplanned outage. Respondents in this year's study are slightly more positive about the frequency of unplanned outages. However, respondents continue to believe that there are not ample resources to bring their data center up and running if there is an unplanned outage.

Figure 1b. Attributions about unplanned outages
Strongly agree and agree responses
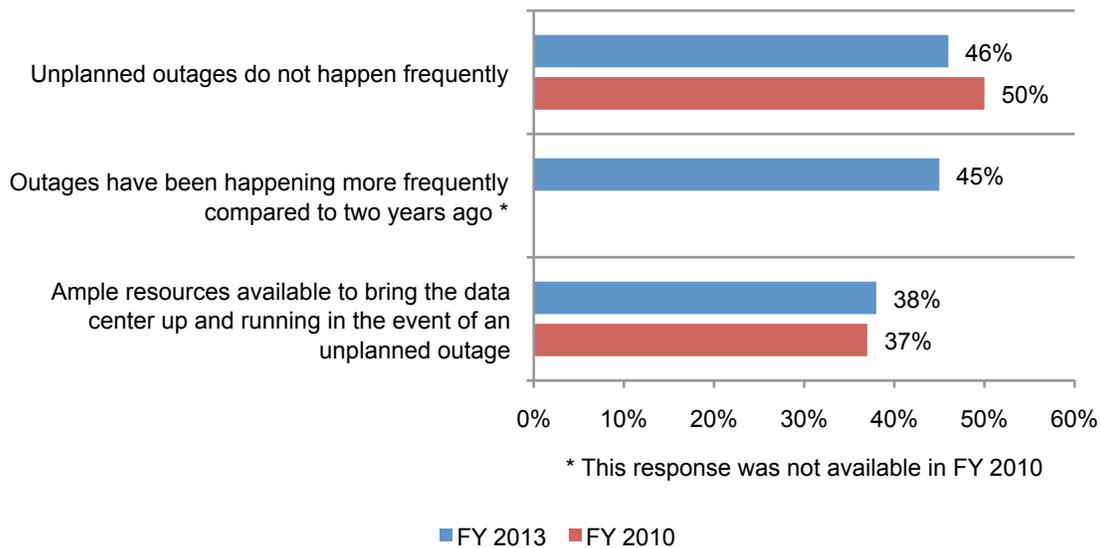
* This response was not available in FY 2010

■ FY 2013   ■ FY 2010

Data center power, cooling and monitoring have become more complex over the last several years, according to Figure 1c. Further, the perception among respondents that their company's business model is dependent upon the data center to generate revenue and conduct ecommerce increased since the last study to 71 percent from 65 percent.

However, similar to last year, less than a majority of respondents believe senior management fully supports their efforts to prevent and manage unplanned outages. The priority is weighted towards cost management and energy efficiency versus data center availability. See Figure 1a, which shows that only 44 percent agree that data center availability is their highest priority.

Figure 1c. Attributions about data center governance
Strongly agree and agree responses

* This response was not available in FY 2010

■ FY 2013   ■ FY 2010
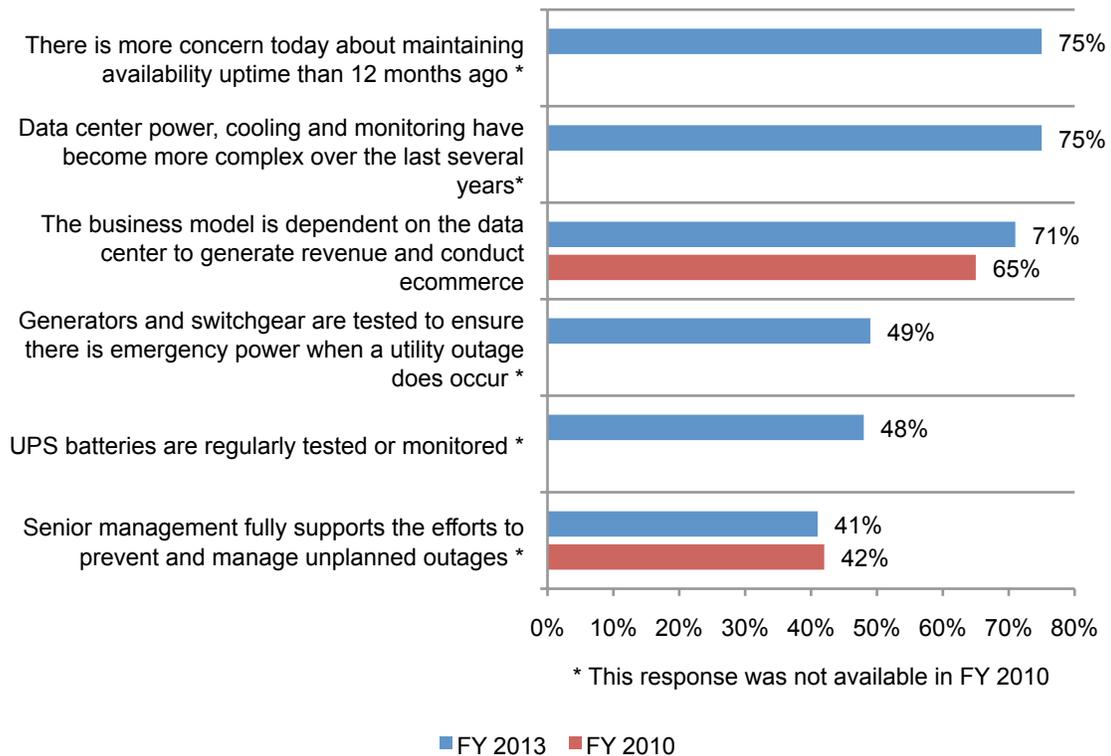
Perceptions of senior-level versus rank-and-file respondents

Positions respondents hold in their companies influence their perceptions about the ability to manage the risk of unplanned outages. In our analysis, we created two subgroups of respondents: those who are at or above the director level (205 respondents) and those who are at or below the supervisory level (168 respondents). Figures 2a, 2b, and 2c report differences in perceptions about data center availability, unplanned outages and data center governance. These attributions also are shown in Figures 1a,1b and 1c.

Respondents in both groups are aligned in their perceptions that DCIM will have a positive impact on availability. However, as shown in Figure 2a, there are major differences in the agreement that sacrifices have been made to availability to improve efficiency or reduce costs, the confidence in the performance reliability of electrical utility provider and the priority of the availability compared to all other data center priorities.

**Figure 2a. Differences in perceptions about data center availability**
Agree combines strongly agree and agree responses

	Supervisor & below (sub-sample size 168)	Director & above (sub-sample size 205)
New innovations around monitoring and DCIM will have a positive impact on availability	76%	73%
Sacrifices have been made to availability to improve efficiency or reduce costs	71%	62%
High confidence in the performance reliability of electrical utility provider	65%	74%
Highest priority above all other priorities including cost minimization and improving energy efficiency	50%	38%
High confidence in the reliability of electrical utility provider	43%	48%
All best practices are utilized in data center design and redundancy to maximize availability	39%	34%

According to Figure 2b, directors are more positive about their organizations' experiences with unplanned outages. Supervisors and below are more likely to agree that outages have been happening more frequently compared to two years ago and less likely to agree that there are ample resources to deal with outages.

Figure 2b. Differences in perceptions about unplanned outages
Strongly agree and agree response combined
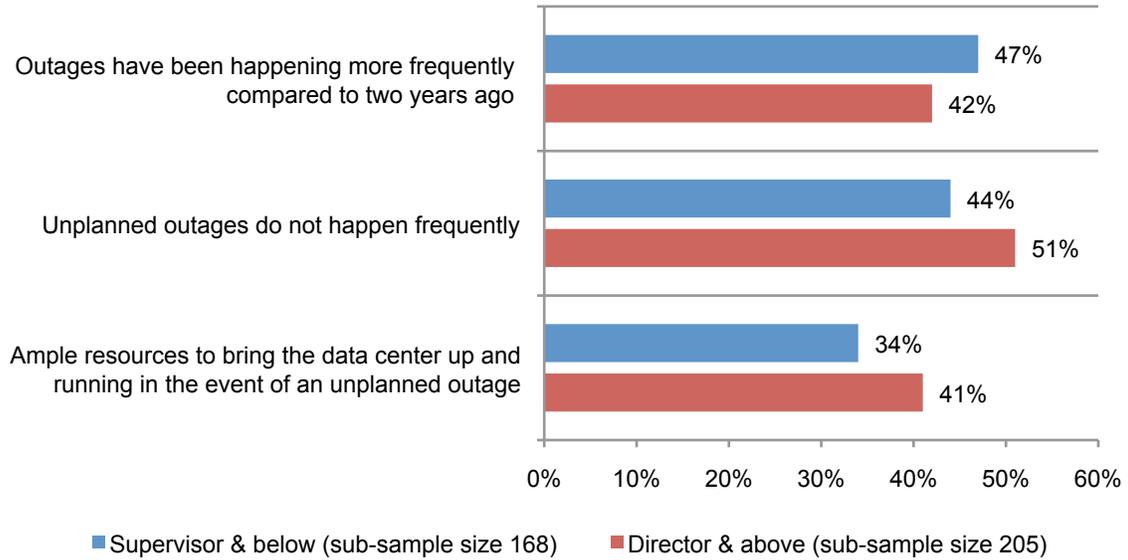
In Figure 2c, we examine the differences in data center governance beliefs. While rank-and-file employees see the growing complexity, more senior employees are more likely to view the business model as being dependent on the data center to generate revenue and conduct ecommerce. These directors and above are more confident that such practices as the testing and monitoring of UPS batteries and the testing of generators and switchgear are being conducted. Both groups are in agreement that there is more concern about maintaining availability/uptime than there was 12 months ago.

Figure 2c. Differences in perceptions about data center governance
Strongly agree and agree response combined

	Supervisor & below (sub-sample size 168)	Director & above (sub-sample size 205)
Data center power, cooling and monitoring have become more complex over the last several years	79%	68%
There is more concern today about maintaining availability uptime than there was 12 months ago	77%	75%
The business model is dependent on the data center to generate revenue and conduct ecommerce	65%	75%
UPS batteries are regularly tested or monitored	46%	55%
Generators and switchgear are tested to ensure there is emergency power when a utility outage does occur	46%	54%
Senior management fully supports the efforts to prevent and manage unplanned outages	38%	48%

Respondents' experience with primary utility power outages

Most respondents (85 percent) say their organizations experienced loss of primary utility power in the past 24 months. This is virtually unchanged since 2010 when 88 percent reported the loss of primary utility power.

Figure 3 shows the frequency of primary utility power outages. The average experienced by organizations represented in this research is 4 primary utility power outages in the past 24 months.

Figure 3. Frequency of primary power utility outages experienced by respondents
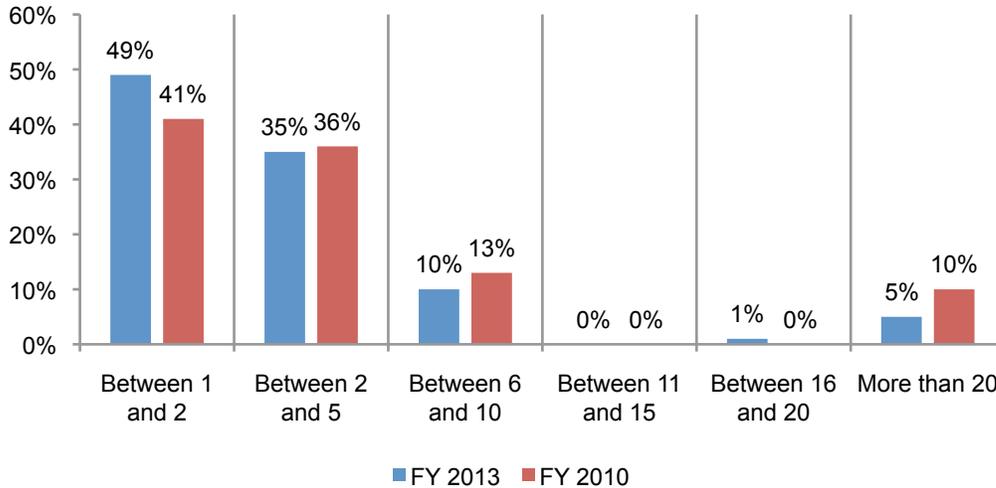

Figure 4 shows the average duration of primary utility power outages. The extrapolated average of a power loss resulting from a primary utility power outage is 138 minutes (or 2 hours 18 minutes). This is an increase from 105 minutes in the 2010 study. As shown below, 50 percent have experienced a duration that was less than five minutes in length. Please note: Many outages caused by primary utility providers do not directly result in data center downtime as designers and managers take measures to mitigate the impact of utility outage. Downtime occurs when those measures fail (root cause analysis will be discussed later in this report).

Figure 4. Average duration of primary utility power outage
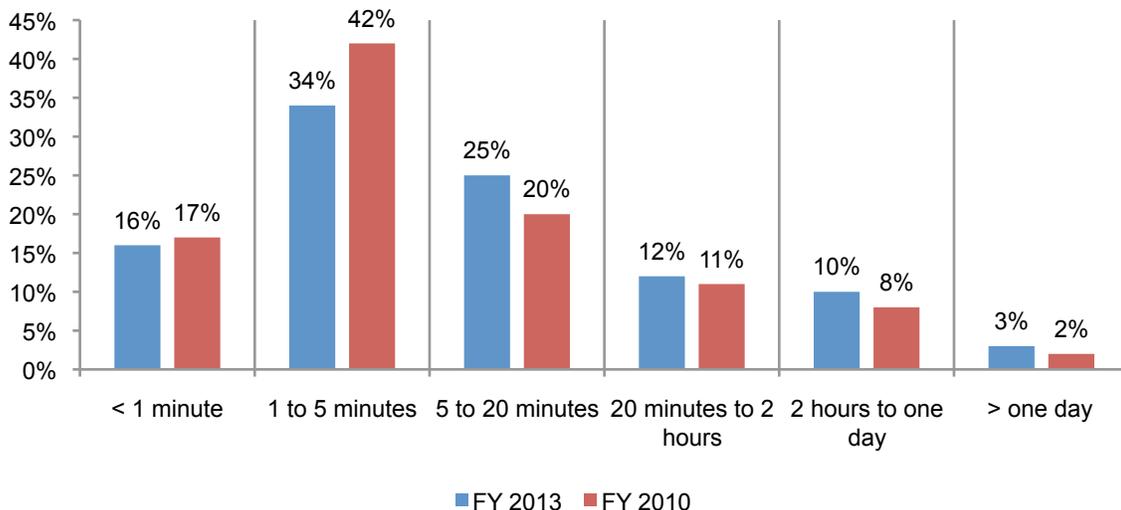
Frequency and duration of outages

Most organizations represented in this research have experienced an unplanned data center outage in the past 24 months (91 percent of respondents). This is a slight decrease from 95 percent of respondents in the 2010 study who reported unplanned data center outages.

Figure 5. Have you experienced an unplanned data center outage in the past 24 months?
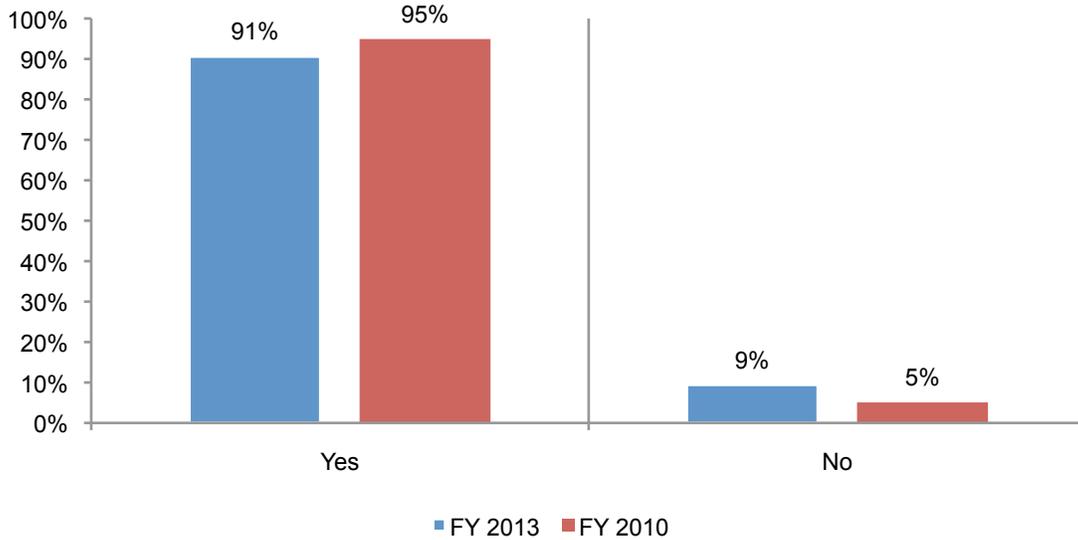
The extrapolated average number of data center outages is shown in Figure 6. This figure provides three different levels of data center outages – namely, complete data center outages, partial data center outages (e.g., limited to certain sections or rows) and device-level data center outages (e.g., limited to individual racks or servers). As shown below, the average number of complete data center outages is 2 every two years. The estimated number of partial data center outages is 6 every two years. Finally, the estimated number of device-level data center outages is 11 every two years. These durations have declined slightly from 2010.

**Figure 6. Extrapolated frequency of data center outages over two years**
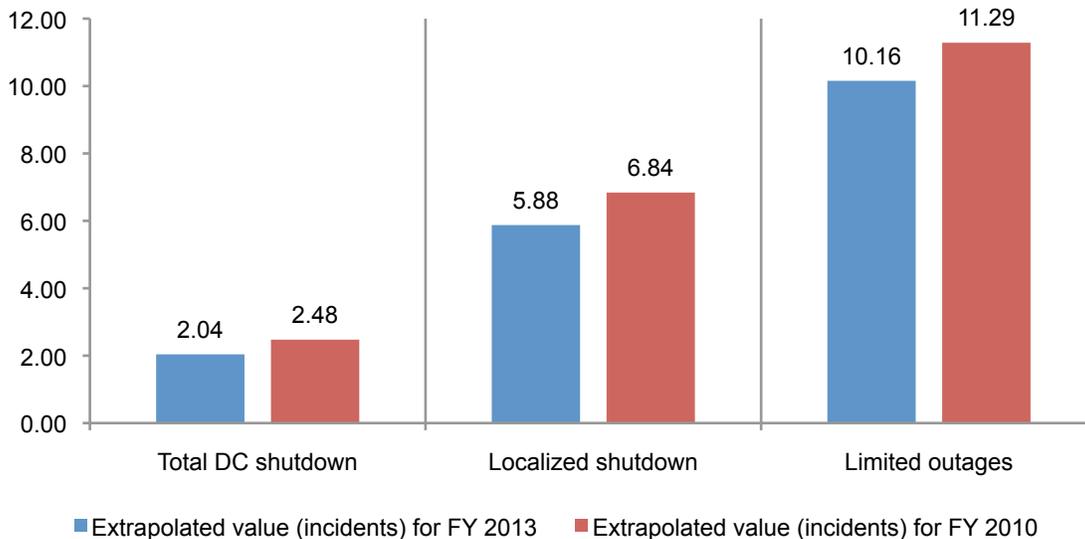
Figure 7 graphs the extrapolated frequency of complete data center outages by the square footage of the data center. This figure clearly shows that the frequency of complete outages is substantially higher for small-sized data centers (less than 5,000 sf) than large-sized data centers (greater than 10,000 sf). This may be due to the critical nature of large data centers (e.g. the larger the data center the more critical it is and vice versa).

Figure 7. Extrapolated frequency of complete data center outages by square footage below

Total data center outage (frequency over 24 months)   ········· Average
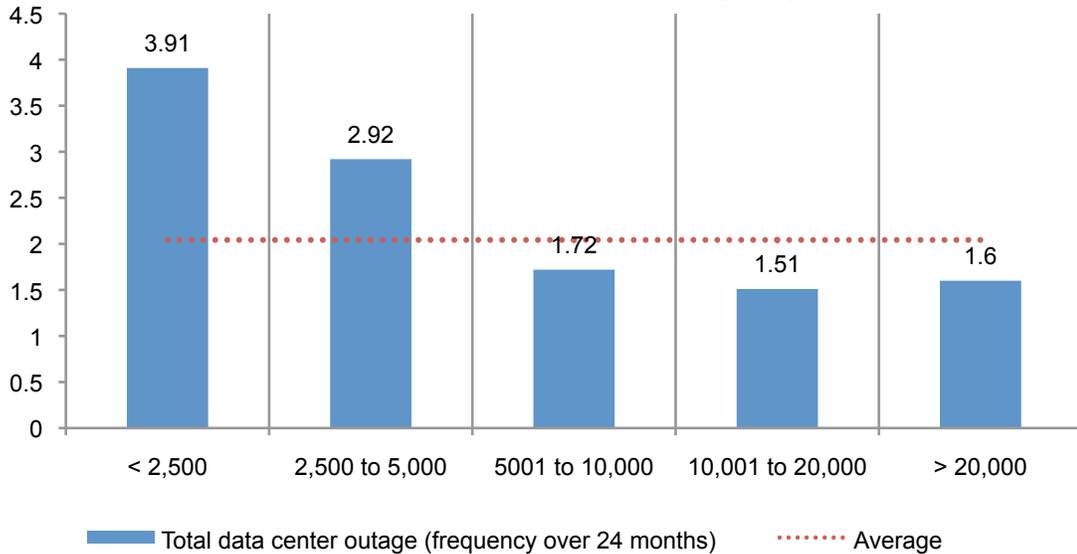
Figure 8 compares the extrapolated frequencies of complete data center outages by industry segment. As shown, companies in ecommerce and IT services have the lowest number of complete data center outages (1.63 and 1.69, respectively), while healthcare continues to have the highest number with 2.7 total data center outages every two years.

Figure 8. Extrapolated frequency of complete data center outages by industry segment

Tota data center outage (frequency over 24 months)
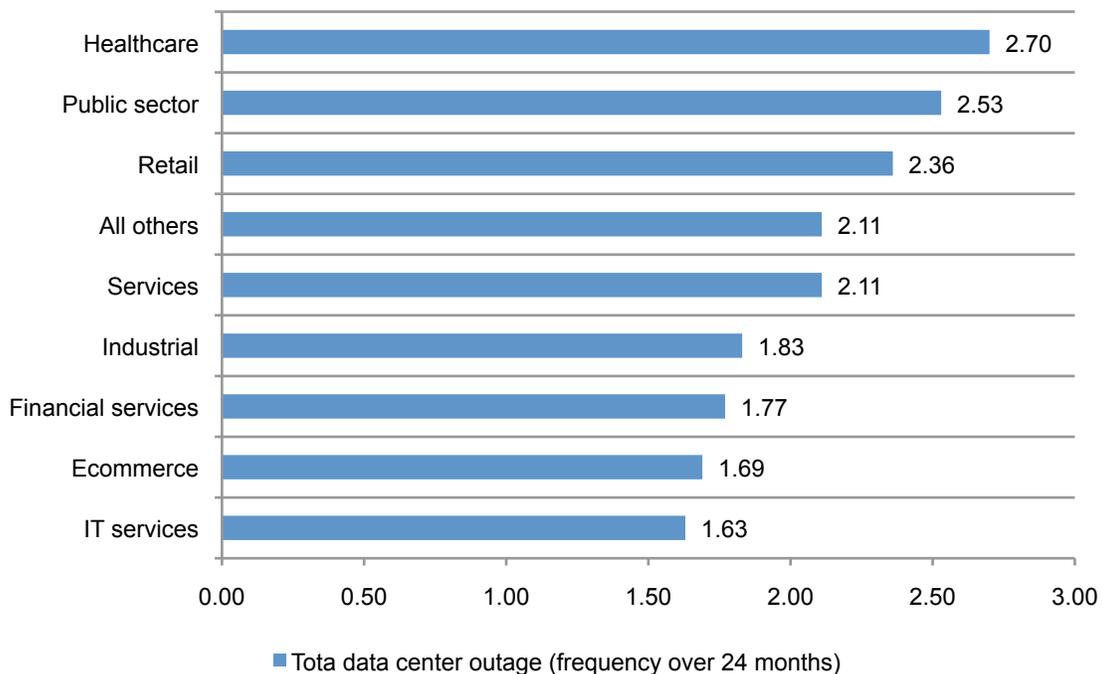
The extrapolated average duration of unplanned data center outages is shown in Figure 9. As reported, the average duration of unplanned complete data center outages is 91 minutes. The estimated duration of partial data center outages is 138 minutes. Finally, the estimated duration of device-level data center outages is 151 minutes. These average durations have declined since 2010.

Figure 9 graphs the extrapolated duration of complete data center outages by the square footage of the data center. Similar to Figure 7 (above) on frequency, this graph clearly shows that the duration of complete data center outages is substantially higher for small-sized data centers (less than 5,000 sf) than medium or large-sized data centers (greater than 5,000 sf).

Figure 9. Extrapolated duration of complete data center outages by square footage
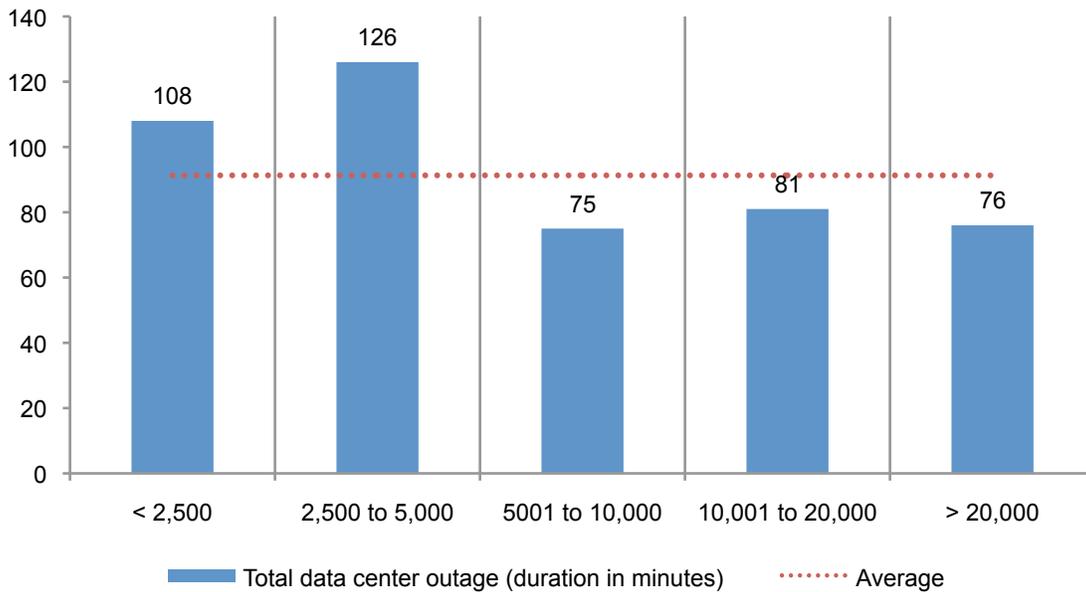
Figure 10 compares the extrapolated duration of complete data center outages by industry. On average ecommerce and financial services have the shortest duration and public sector organizations have the longest duration.

Figure 10. Extrapolated duration of complete data center outages by industry segment
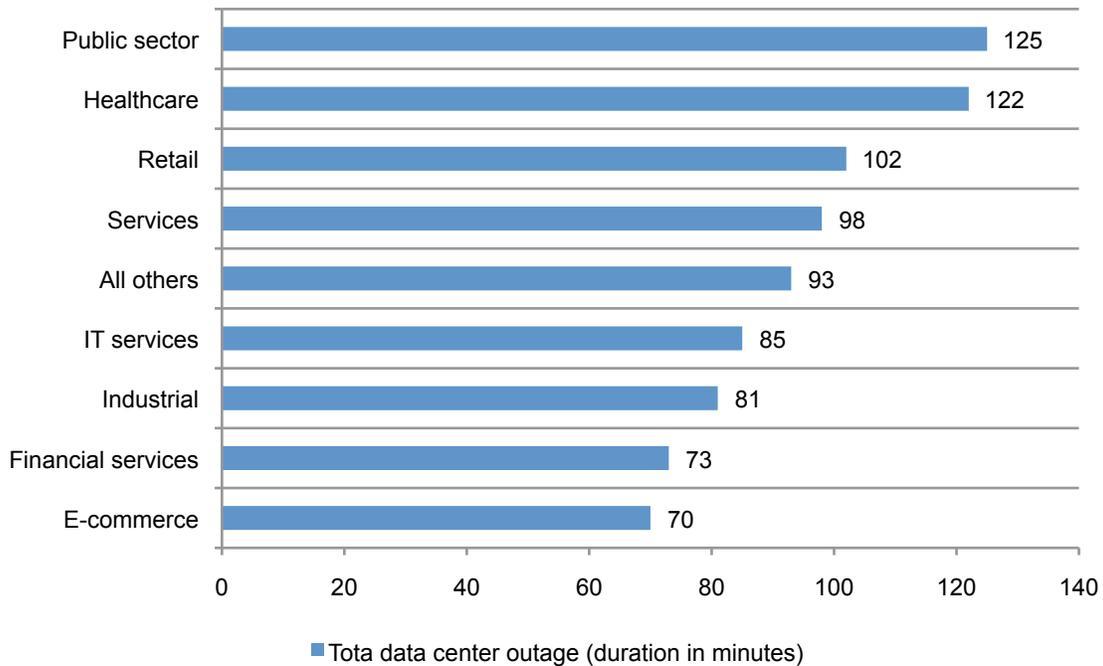
Twenty-six percent of respondents implemented Data Center Infrastructure Management (DCIM) to fix or correct root causes to unplanned outages. As shown in Figure 11, DCIM reduced both the frequency and durations of data center outages.

Figure 11. Impact of DCIM on the frequency and duration of data center outages
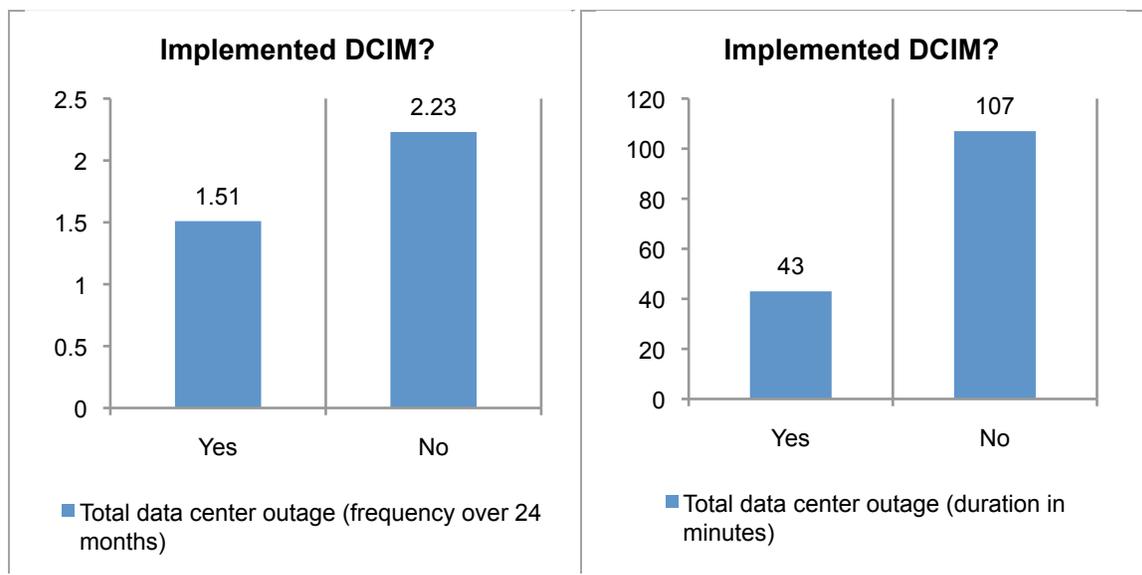
Root causes of unplanned outages and organizations' response to outages

Figure 12 indicates 83 percent of respondents believe they know, at least in part, the root causes of unplanned outages experienced by their organizations over the past two years. Only 21 percent, however, appear to be certain about these root causes. This is an increase from 2010.

Figure 12. Do you know the root causes of unplanned outages during the past 24 months?

■ FY 2013 ■ FY 2010
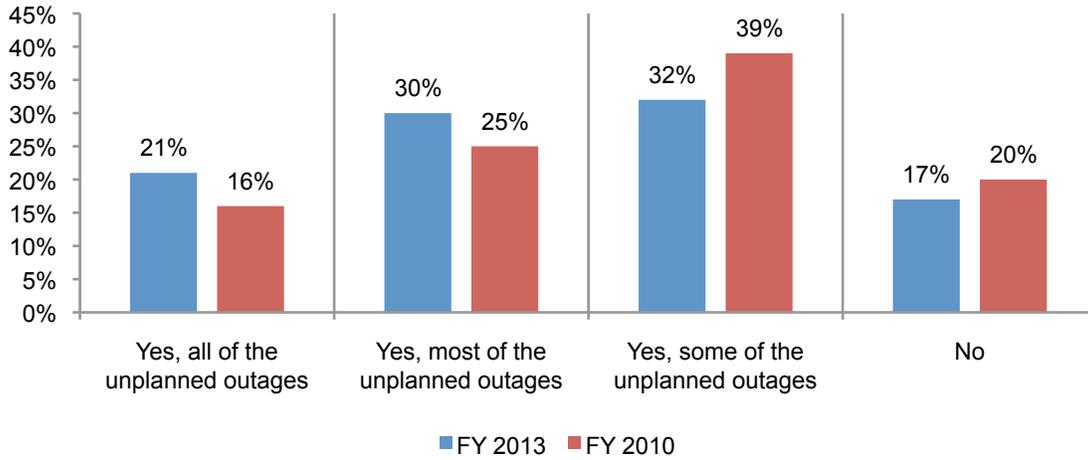
For the 83 percent of respondents stating a "yes" response, Figure 13 provides a list of those root causes cited by respondents in ascending order of importance. The top root causes of partial or complete unplanned outages selected most frequently by respondents include: UPS failure, UPS capacity exceeded, accidental EPO/human error, water incursion, heat related/CRAC failure and PDU/circuit breaker failure. These are similar to the 2010 findings.

Figure 13. Top root causes of unplanned outages experienced during the past two years
More than one response permitted

	FY 2013	FY 2010
UPS battery failure	55%	65%
Accidental EPO/human error	48%	51%
UPS capacity exceeded	46%	53%
Cyber attack	34%	15%
IT equipment failure	33%	29%
Water incursion	32%	35%
Weather related	30%	20%
Heat related/CRAC failure	29%	33%
UPS equipment failure *	27%	
PDU/circuit breaker failure	26%	33%
Generator failure	20%	19%
Improperly deployed server/hardware in a move, add or change *	15%	
ATS failure	15%	16%
Switchgear failure *	13%	
Other	0%	2%

* This response was not available in FY 2010

■ FY 2013 ■ FY 2010

The findings of this year's study reflect several important industry trends and attitude shifts taking place since the release of the first *Study on Data Center Outages* and *Cost of Data Center Outages* released in 2010. The first shift concerns the increased awareness of data center downtime and elevated sense of urgency surrounding availability—initiated in part by the release of the report itself.

The 2010 studies fueled a global discussion on the consequences data center outages at industry events such as AFCOM Data Center World and in dozens of IT and data center publications. It helped define and reinforce a business case for data center availability and safeguarding uptime, which was not previously a consideration for many business decision-makers.

Recent high-profile outages also caught the attention of these business leaders. From the Superbowl to Twitter's Fail Whale to outages of Amazon and Google, major disruptions to IT services around the globe helped bring downtime to the fore and reinforce not only the criticality of availability, but the potential financial cost of downtime (which will be explored in greater detail in the second part of the study, to be released in late 2013).

As 71 percent of this year's survey respondents affirmed, business models are also now more dependent on the data center to generate revenue and conduct ecommerce. Not only are businesses more reliant on the data center— their customers and end-users are too. Currently, more than 8.5 billion devices are connected to the internet, and approximately 3.6 zetttabytes of data are consumed each day in the United States alone—and users now expect that data to be accessible any time, any place.

Uptime is now a baseline expectation, and the urgency to deliver it 24/7/365 reverberates through the findings of this study. Fortunately, the data shows that organizations are rising to the challenge of delivering continuous availability, with the occurrence of outages down slightly since 2010, but opportunities for improvement clearly remain.

One of the most significant changes identified since 2010 is a surge in cyber attacks impacting data center availability, with 34 percent of survey respondents identifying cyber attacks as a root cause of downtime, compared to 15 percent in 2010. Other Ponemon Institute research supports the finding that malicious attacks, including cyber attacks, are on the rise. In fact, they are the most common cause of a data breach and the most costly to remediate.[1]

Inclement weather also jumped as a root cause of downtime, from 20 percent in 2010 to 30 percent in 2013. These occurrences, as well as events such as Hurricane Sandy, have added new criteria to data center site selectors' radars. Previously, utility costs were a primary consideration when selecting the location of a new data center, but now flood planes and hurricane histories are carefully weighed in order to ensure that Mother Nature will not impair availability.

---

[1] See *2013 Cost of a Data Breach: U.S.* conducted by Ponemon Institute and sponsored by Symantec.

Figure 14 lists the response to correcting root causes of partial or complete unplanned data center outages. As listed below, the most frequent responses are the same as last year: repair or replace damaged IT or infrastructure equipment, purchase additional IT or infrastructure and contact equipment vendor.

Figure 14. The organization's response to fixing or correcting the root causes
More than one response permitted

Bar chart comparing FY 2013 and FY 2010 responses:

Response	FY 2013	FY 2010
Repair IT or Infrastructure equipment	66%	60%
Replace IT or Infrastructure equipment	58%	56%
Purchase additional IT or Infrastructure equipment	45%	51%
Contact equipment vendor	44%	51%
No response	29%	35%
Implement / improve monitoring, alert and alarm capabilities	29%	19%
Implement/improve a Data Center Infrastructure Management platform *	26%	
Hire outside experts to remediate or analyze the problem	19%	26%
Conduct a data center audit or assessment	17%	13%
Other	3%	2%

According to Figure 15, most respondents believe that unplanned outages in their data centers over the past two years could have been prevented, at least in part.

**Figure 15. Were the unplanned outages during the past 24 months preventable?**
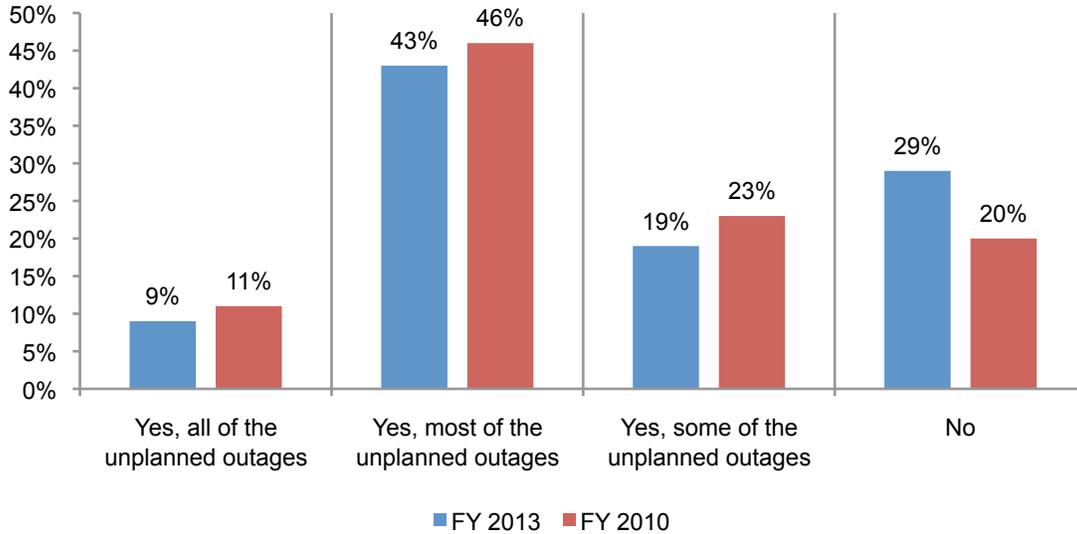
Figure 16 provides the measures or steps respondents believe are most important for preventing unplanned data center outages. As shown in this figure, respondents say investments in improved equipment, increases in budgets and hiring of additional staff are the most important steps companies can pursue to prevent unplanned partial or complete data center outages.

Figure 16. What could be done to prevent unplanned outages in the future?
Two responses permitted
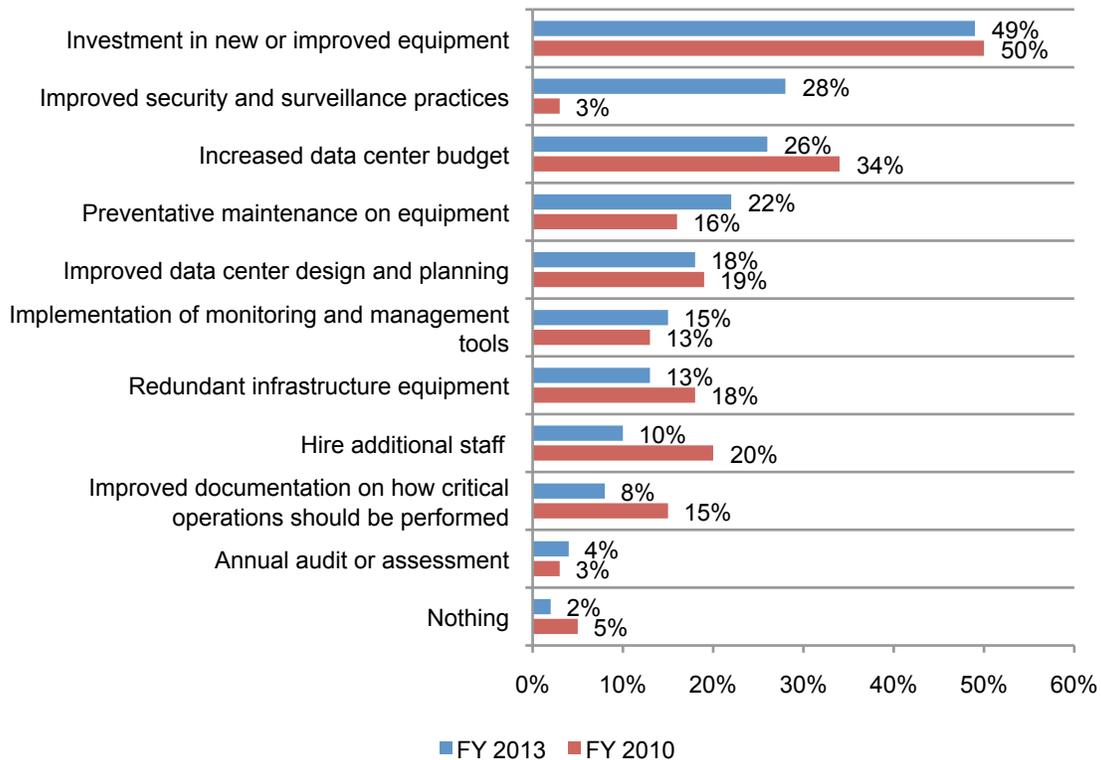
Special analysis: High performing organizations

As part of the analysis, 161 of the 584 organizations represented in this study were identified as high performers based on their agreement with all six of the following attributions about their data center practices:

- Data center availability is the highest priority above all other priorities, including cost minimization and improving energy efficiency.
- We utilize all best practices in data center design and redundancy to maximize availability.
- We have ample resources to bring our data center up and running if we have an unplanned outage.
- Senior management fully supports our efforts to prevent and manage unplanned outages.
- We regularly test our generators and switchgear to ensure we'll have emergency power when a utility outage does occur.
- We regularly test or monitor our UPS batteries.

The findings reveal that high performing organizations do experience greater data center availability than other organizations. As shown in Figures 17 and 18, high performers, as compared to ordinary performers, experience fewer unplanned outages and a shorter duration of unplanned outages. These results are consistent for total data center shutdowns, localized shutdowns and limited outages.

According to Figure 17, high performers have significantly fewer total shutdowns than ordinary performers (1.45 vs. 2.87) and significantly fewer limited outages (5.51 vs. 13.49).

Figure 17. Frequency of unplanned outages
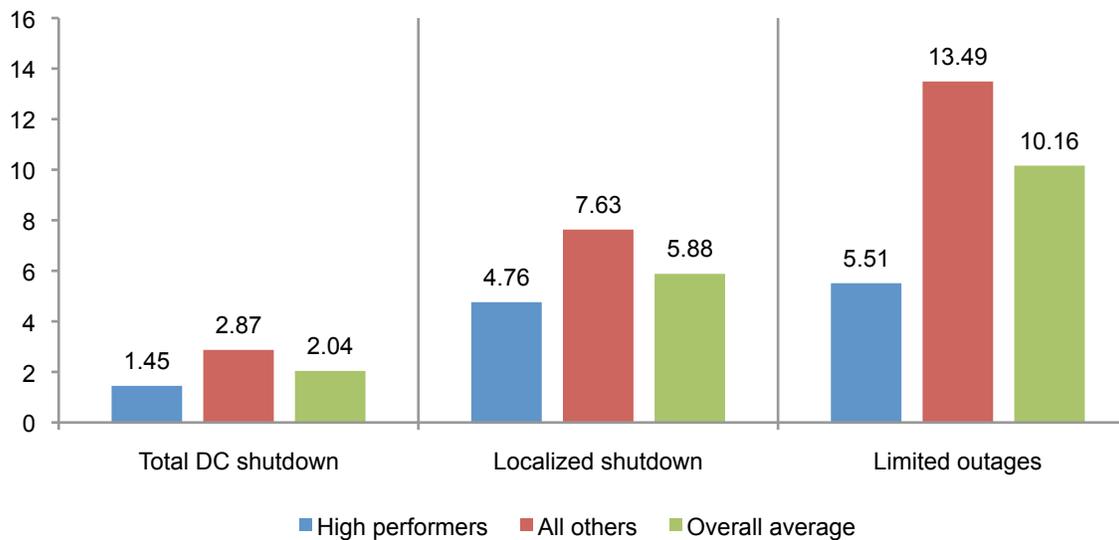
Figure 18 reveals that outages occurring in organizations that are high performers are resolved in fewer minutes than ordinary performers (69.3 minutes vs. 121.2 minutes). The same is true for localized and limited outages.

Figure 18. Duration of unplanned outages
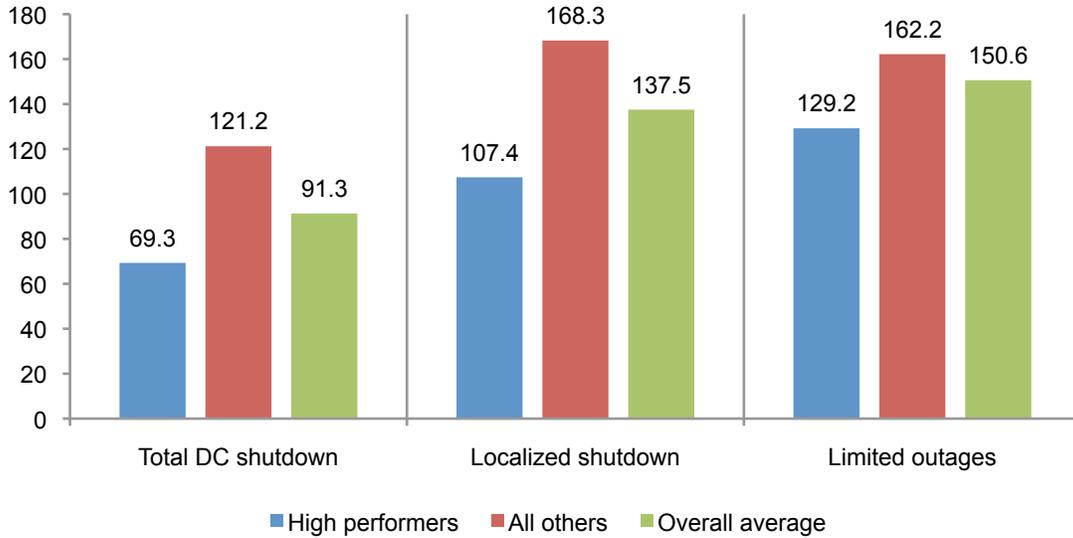
As discussed previously, 83 percent of respondents know the root cause of unplanned outages. Of these, 26 percent say they use DCIM. This means that 126 organizations represented in this study use DCIM. Fifty-four percent of those determined to be high performers use DCIM.

Figure 19 shows that high performing organizations are most likely to use DCIM. Overall, the high performer group represents 28 percent of the total sample. Sixty-eight percent of DCIM users are in the high performing category of respondent organizations.

Figure 19. DCIM users by performance sub-sample
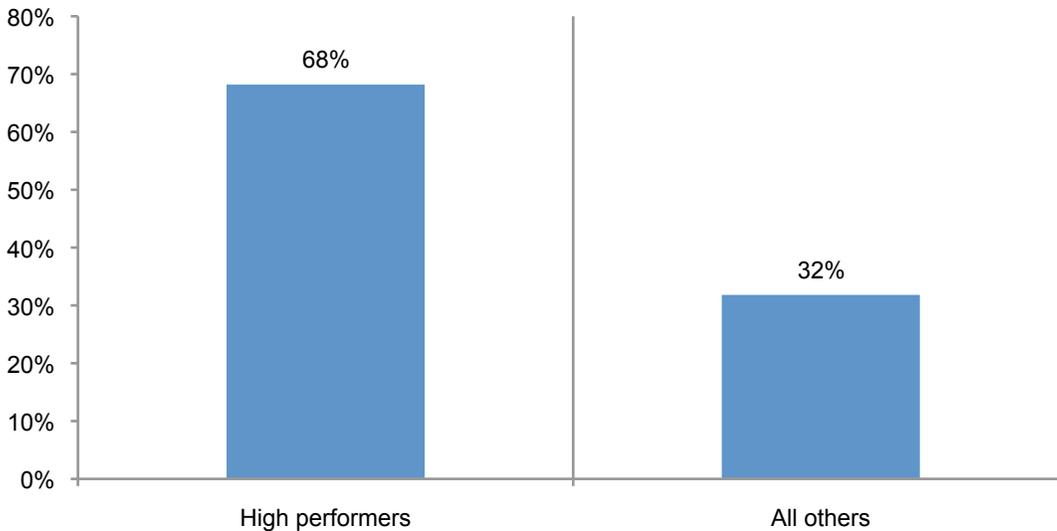
Larger-sized data centers are most likely to have DCIM. As shown in Figure 20, 77 (41 percent + 36 percent) of DCIM users are data centers with more than 10,000 square feet.

Figure 20. DCIM users by data center size

Pct% DCIM users
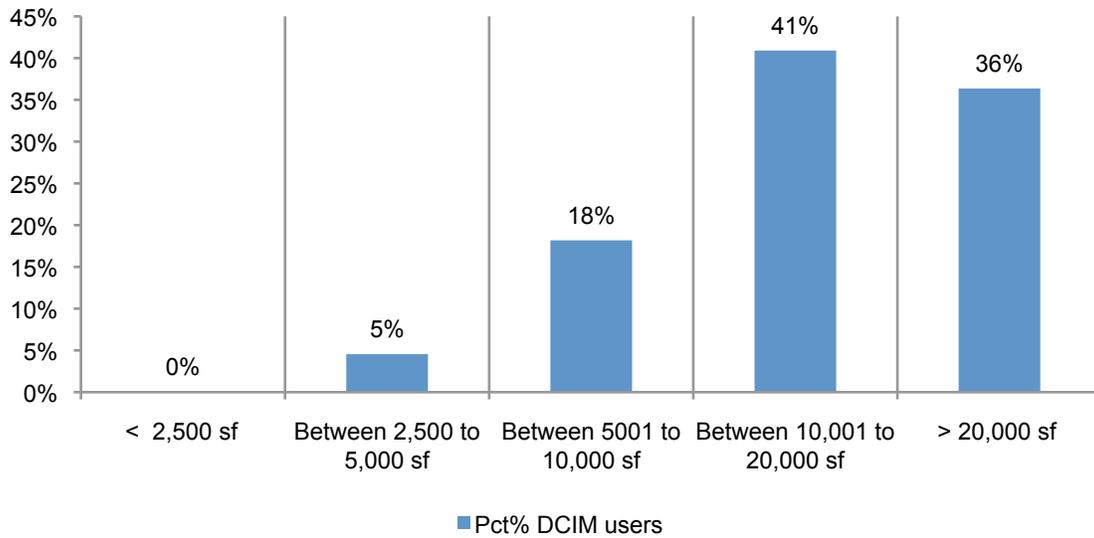
Part 3. Methods

A sampling frame of 11,899 adult-aged individuals who reside within the United States was used to recruit and select participants to this survey. Our randomly selected sampling frame was built from several proprietary lists of experienced practitioners in IT, IT operations and facilities management. In total, 637 respondents completed the survey. Of the returned instruments, 53 surveys failed reliability checks. A total of 584 surveys were used as our final sample, which represents a 4.9 percent response rate.

Table 1: Sample response	Freq.	Pct%
Total sampling frame	11,899	100.0%
Bounce-back	1,043	8.8%
Total returns	637	5.4%
Rejections	53	0.4%
Final sample	584	4.9%

Pie Chart 1 reports the primary industry sector of respondents' organizations. As shown, the largest segments include ecommerce (10 percent), banking (9 percent), co-location/hosting provider (9 percent), and government (8 percent).

Pie Chart 1. Industry distribution of respondents' organizations

Legend:
- Ecommerce
- Banking
- Co-location/hosting provider
- Government
- Healthcare
- Manufacturing
- Retail
- Services
- Energy & utilities
- Chemicals
- Communications
- Education & research
- Hospitality & leisure
- Payment processing & credit card
- Pharmaceuticals & life science
- Brokerage & investment manageme
- Defense
- Insurance
- Internet & ISPs
- Professional services
- Transportation
- Other

Table 2 reports the primary data center square footage for respondents' organizations. As shown, a majority of respondents represent primary data centers with more than 5,000 square feet of space. Only 7 percent of respondents are located in larger-sized data centers with more than 20,000 square feet.

Table 2. Approximate square footage of respondents' primary data center	Pct%
Less than 2,500 sf	1%
Between 2,500 to 5,000 sf	29%
Between 5,001 to 10,000 sf	43%
Between 10,001 to 20,000 sf	20%
More than 20,000 sf	7%
Total	100%

Table 3 reports the respondents' primary reporting channel. As can be seen, 31 percent of respondents report through data center management, 23 percent report through IT operations and 19 percent report through the chief information officer.

Table 3. Respondents' primary reporting channel	Pct%
Data center management	31%
IT operations	23%
Chief information officer	19%
Facilities management	17%
Chief technology officer	4%
Chief financial officer	3%
Chief risk officer	2%
Chief executive officer	1%
Total	100%

Table 4 reports the U.S. regions where the respondents' primary data center is located. As can be seen, the Northeast represents the largest region (19 percent), and the Southeast represents the smallest region (12 percent).

Table 4. Region where respondents' primary data center is located.	Pct%
Northeast	19%
Mid-Atlantic	18%
Midwest	17%
Southeast	12%
Southwest	16%
Pacific	18%
Total	100%

Table 5 reports the approximate position level or title of respondents. As shown, a majority of respondents state they are at or above the supervisor level (82 percent). The mean experience of respondents in this study is 12.16 years and the mean total years in current position is 6.5 years.

Table 5. Respondents' position level	Pct%
Manager	36%
Director	28%
Supervisor	18%
Staff or technician	8%
Senior Executive	4%
Vice President	3%
Other	3%
Total	100%

Part 4. Caveats & Conclusion

There are inherent limitations to survey research that need to be carefully considered before drawing inferences from findings. The following items are specific limitations that are germane to most Web-based surveys.

- <u>Non-response bias</u>: The current findings are based on a sample of survey returns. We sent surveys to a representative sample of individuals, resulting in a large number of usable returned responses. Despite non-response tests, it is always possible that individuals who did not participate are substantially different in terms of underlying beliefs from those who completed the instrument.

- <u>Sampling-frame bias</u>: The accuracy is based on contact information and the degree to which the list is representative of individuals who are IT practitioners with data center management experience. We also acknowledge that the results may be biased by external events such as media coverage. We also acknowledge bias caused by compensating subjects to complete this research within a holdout period. Finally, because we used a Web-based collection method, it is possible that non-Web responses by mailed survey or telephone call would result in a different pattern of findings.

- <u>Self-reported results</u>: The quality of survey research is based on the integrity of confidential responses received from subjects. While certain checks and balances can be incorporated into the survey process, there is always the possibility that a subject did not provide a truthful response.

Appendix: Detailed Survey Results

The following tables provide the frequency or percentage frequency of responses to all survey questions contained in this study. All survey responses were captured in June 2013.

Sample response	FY 2013	
	Freq.	Pct%
Total sampling frame	11,899	100.0%
Bounce-back	1,043	8.8%
Total returns	637	5.4%
Rejections	53	0.4%
Final samples	584	4.9%

Part 1. Attributions	FY 2013	
	Strongly agree	Agree
Q1. Data center availability is my highest priority above all other priorities including cost minimization and improving energy efficiency.	18%	26%
Q2. We utilize all best practices in data center design and redundancy to maximize availability.	16%	20%
Q3. We have high confidence in the reliability of our electrical utility provider.	23%	23%
Q4. My company's business model is dependent on the data center to generate revenue and conduct ecommerce.	32%	39%
Q5. At our data center unplanned outages do not happen frequently.	20%	26%
Q6. Outages have been happening more frequently compared to two years ago.	22%	23%
Q7. We have ample resources to bring our data center up and running if we have an unplanned outage.	16%	22%
Q8. Senior management fully supports our efforts to prevent and manage unplanned outages.	20%	21%
Q9. My organization has made sacrifices to availability to improve efficiency or reduce costs inside of my data center.	30%	38%
Q10. New innovations around monitoring and Data Center Infrastructure Management (DCIM) will have a positive impact on availability for the data center industry.	31%	43%
Q11. We have high confidence in the performance reliability of our generators and switchgear.	30%	41%
Q12. We regularly test our generators and switchgear to ensure we'll have emergency power when a utility outage does occur.	21%	28%
Q13. We regularly test or monitor our UPS batteries.	21%	27%
Q14. Data center power, cooling and monitoring have become more complex over the last several years.	38%	37%
Q15. I would rather walk barefoot over hot coals than have my data center go down.	50%	34%
Q16a. My organization is more concerned today about maintaining availability uptime than it was 12 months ago.	39%	36%
Q16b. If agree or strongly agree, please explain why in the space provided.	Contextual responses provided in separate document	

Part 2. Experience	FY 2013	
Q17a. Have you experienced any loss of primary utility power in the past 24 months?	Freq.	Pct%
Yes	495	85%
No (Go To 18a)	89	15%
Total	584	100%

Q17b. What is the frequency and duration of primary utility power outages in the past 24 months?	
Frequency of **primary utility** power outages	FY 2013
Between 1 and 2	49%
Between 3 and 5	35%
Between 6 and 10	10%
Between 11 and 15	0%
Between 16 and 20	1%
More than 20	5%
Total	100%
Extrapolated value (incidents)	4.0

Duration of **primary utility** power outages	FY 2013
Less than 1 minute	16%
1 to 5 minutes	34%
5 to 20 minutes	25%
20 minutes to 2 hours	12%
2 hours to one day	10%
More than one day	3%
Total	100%
Extrapolated value (downtime in minutes)	138.1

	FY 2013	
Q18a. Have you experienced any unplanned data center outages in the past 24 months?	Freq.	Pct%
Yes	529	91%
No (Go To 19a)	55	9%
Total	584	100%

Q18b. What is the frequency and duration of unplanned data center outages in the past 24 months?	FY 2013 data only		
Frequency	Total DC shutdown	Localized shutdown	Limited outages
Between 1 and 2	73%	32%	11%
Between 3 and 5	27%	31%	8%
Between 6 and 10	0%	15%	41%
Between 11 and 15	0%	15%	23%
Between 16 and 20	0%	4%	13%
More than 20	0%	2%	5%
Total	100%	99%	101%
Extrapolated value (incidents) for FY 2013	2.04	5.88	10.16
Extrapolated value (incidents) for FY 2010	2.48	6.84	11.29

Duration	FY 2013 data only		
	Total DC shutdown	Localized shutdown	Limited outages
Less than 1 minute	40%	30%	21%
1 to 5 minutes	13%	25%	27%
5 to 20 minutes	23%	23%	21%
20 minutes to 2 hours	14%	11%	19%
2 hours to one day	10%	6%	7%
More than one day	0%	5%	5%
Total	100%	100%	100%
Extrapolated value (downtime in minutes) for FY 2013	91.3	137.5	150.6
Extrapolated value (downtime in minutes) for FY 2010	106.9	151.5	153.1

Q19a. Do you know the root causes of the unplanned outages experienced during the past 24 months?	FY 2013
Yes, all of the unplanned outages	21%
Yes, most of the unplanned outages	30%
Yes, some of the unplanned outages	32%
No	17%
Total	100%

Q19b. If yes, please check the root causes of the unplanned outages experienced during the past year. Please select all that apply.	FY 2013
UPS equipment failure	27%
UPS battery failure	55%
ATS failure	15%
Generator failure	20%
PDU/circuit breaker failure	26%
IT equipment failure	33%
Accidental EPO/human error	48%
Heat related/CRAC failure	29%
UPS capacity exceeded	46%
Water incursion	32%
Weather related	30%
Cyber attack	34%
Improperly deployed server or hardware during a move, add or change	15%
Switchgear failure	13%
Other (please specify)	0%

Q19c. What was your organization's response to fixing or correcting the root causes? Please select all that apply.	FY 2013
Repair IT or Infrastructure equipment	66%
Replace IT or Infrastructure equipment	58%
Purchase additional IT or Infrastructure equipment	45%
Conduct a data center audit or assessment	17%
Hire outside experts to remediate or analyze the problem	19%
Implement / improve monitoring, alert and alarm capabilities	29%
Implement/ improve a Data Center Infrastructure Management (DCIM) platform deployed in the facility	26%
Contact equipment vendor	44%
No response	29%
Other (please specify)	3%

Q20a. In your opinion, were the unplanned outages experienced during the past 24 months preventable?	FY 2013
Yes, all of the unplanned outages	9%
Yes, most of the unplanned outages	43%
Yes, some of the unplanned outages	19%
No	29%
Total	100%

Q20b. If yes, what could be done to prevent unplanned outages in the future? Please check only two choices.	FY 2013
Investment in new or improved equipment	49%
Redundant infrastructure equipment	13%
Increased data center budget	26%
Improved security and surveillance practices	28%
Improved data center design and planning	18%
Implementation of monitoring and management tools	15%
Annual audit or assessment	4%
Preventative maintenance on equipment	22%
Improved documentation on how critical operations should be performed	8%
Hire additional staff	10%
Nothing	2%
Other	0%
Total	195%

Q21. In your opinion, what products, features, or tools should power and cooling equipment manufacturers have in place to prevent or curtail future unplanned outages within your data center?	Contextual responses provided in separate document

Part 3. Economic impact	
Q22. What are the likely cost areas that are incurred as a result of an unplanned outage. Please allocate a total of 100 percentage points for the cost areas provided.	FY 2013 Points
Cost to repair or replace damaged equipment	19.00
Cost of downtime	22.00
Cost to recover information assets	16.00
Diminished productivity of data center personnel	13.00
Cost to recover from the outage	5.00
Increased operating expenses	5.00
Cost to conduct root cause analysis	6.00
Diminished productivity of end users	7.00
Lost revenues	2.00
Customer turnover	3.00
Diminished brand or reputation	2.00
Total points	100.00

Q23. In your opinion (best guess), how much revenue would your organization lose **every time** it experienced an unplanned total data center shutdown that lasts **one hour**?	FY 2013
None	4%
Less than $1,000	0%
$1,000 to $5,000	5%
$5,001 to $10,000	8%
$10,001 to $20,000	18%
$20,001 to $50,000	16%
$50,001 to $100,000	15%
$100,001 to $500,000	11%
$500,001 to $750,000	4%
$750,001 to $1 million	7%
More than $1 million	6%
Unable to determine	6%
Total	100%
Extrapolated value (US dollars)	205,550

Part 4. Organizational characteristics and demographics	
D1. Your current title is (please specify)	Contextual responses provided in separate document

D2. What organizational level best describes your current position?	FY 2013
Senior Executive	4%
Vice President	3%
Director	28%
Manager	36%
Supervisor	18%
Staff or technician	8%
Other (please specify)	3%
Total	100%

D3. Check the Primary Person you or your supervisor reports to within your organization.	FY 2013
Chief executive officer	1%
Chief financial officer	3%
Chief information officer	19%
IT operations	23%
Chief technology officer	4%
Data center management	31%
Facilties management	17%
Chief security officer	0%
Chief risk officer	2%
Other	0%
Total	100%

D4. Check the U.S. state where your company's primary data center is located.	FY 2013
Northeast	19%
Mid-Atlantic	18%
Midwest	17%
Southeast	12%
Southwest	16%
Pacific	18%
Total	100%

Experience	Mean	Mean
D5a. Total years of relevant experience	12.16	11.72
D5b. Total years in current position	6.52	6.63

D6. Approximately, what is the square footage of your primary data center?	FY 2013
Less than 2,500 sf	1%
Between 2,500 to 5,000 sf	29%
Between 5001 to 10,000 sf	43%
Between 10,001 to 20,000 sf	20%
More than 20,000 sf	7%
Total	100%

D7. What industry best describes your organization's industry concentration or focus?	FY 2013
Agriculture	1%
Airlines	1%
Banking	9%
Brokerage & investment management	2%
Chemicals	3%
Co-location/hosting provider	9%
Communications	3%
Defense	2%
Ecommerce	10%
Education & research	3%
Energy & utilities	4%
Government	8%
Healthcare	7%
Hospitality & leisure	3%
Insurance	2%
Internet & ISPs	2%
Manufacturing	7%
Media & publishing	1%
Payment processing & credit card	3%
Pharmaceuticals & life science	3%
Professional services	2%
Retail	7%
Services	5%
Technology & software	1%
Transportation	2%
Other	0%
Total	100%

D8. What is the worldwide headcount of your organization?	FY 2013
Less than 100	8%
100 to 500	20%
501 to 1,000	24%
1,001 to 5,000	21%
5,001 to 25,000	14%
25,001 to 75,000	8%
More than 75,000	5%
Total	100%

For more information about this study, please contact Ponemon Institute by sending an email to research@ponemon.org or calling our toll free line at 1.800.887.3118.

Ponemon Institute
Advancing Responsible Information Management

Ponemon Institute is dedicated to independent research and education that advances responsible information and privacy management practices within business and government. Our mission is to conduct high quality, empirical studies on critical issues affecting the management and security of sensitive information about people and organizations.

As a member of the **Council of American Survey Research Organizations (CASRO)**,we uphold strict data confidentiality, privacy and ethical research standards. We do not collect any personally identifiable information from individuals (or company identifiable information in our business research). Furthermore, we have strict quality standards to ensure that subjects are not asked extraneous, irrelevant or improper questions.