

# THE POWER OF PREDICTIVE IT

**Improve Reliability and  
Prevent Outages Across  
Your Organization**

Sponsored by

**splunk**>

## SPONSOR PERSPECTIVE

The rapid evolution of technology across industries has been a double-edged sword. New levels of productivity and efficiency have created an “always on” mentality for customers and employees alike. Within this new status quo, any interruption or outage can be costly; it can even sound the death knell for an organization if not avoided or remediated quickly. The issue is compounded as the wave of digital transformation washes over organizations, generating more possible points of failure while broadening organizations’ attack surface. Fortunately, with technologies like artificial intelligence (AI) and machine learning (ML), organizations can now do more than respond after the fact and instead take a proactive approach to IT operations.

Although smart technology is just coming into its own, it’s proving to be perfect for sifting through mountains of data and alerts to gain effective insights. Automated baselining, dynamic thresholding, anomaly detection, event consolidation, correlation, and predictive alerts all come together to optimize IT operations. ML-backed tools have rapidly become proficient at identifying deviations from the norm and are constantly improving on themselves as they ingest more data.

When effectively harnessed, AI and ML can form the core of a dynamic predictive IT system, saving money, streamlining operations, and raising productivity as organizations become more adept at avoiding operational, and security issues that could affect their bottom line.

Early adopters are already reaping the benefits of predictive IT.

Viasat, a global communications company, uses an ML solution to predict the potential impact of IT maintenance activities and strengthen cross-team collaboration. On one occasion, Chris Crocco, Viasat’s lead solutions engineer, and his team alerted the service assurance team of a probable circuit failure. By the time the event took place, remediation had already occurred with no impact on customer traffic.

“We predict the likelihood of maintenance actions having an adverse effect on the environment,” Crocco says. “Splunk IT Service Intelligence (ITSI) finds outliers and lets us know when a threshold is breached. Its predictive algorithms are very effective. Combining that insight with our orchestration and auto-remediation capabilities, we take scripted actions. So, not only are we advising people when their maintenance is likely to have an adverse effect, we’re ahead of the game in preventing impact.”

It’s time for you to start on your journey to predictive IT. Identify the most impactful problems and skills gaps, and develop a plan that will prevent future IT issues. Gain the benefits of richer data stores and advanced technology while reducing implementation risks as your organization digitally transforms. Beyond making your operations more efficient, consider that predictive IT can help you avoid loss of revenue and customers and stay ahead of the competition.

What are you waiting for?



**RICK FITZ**  
**SENIOR VICE  
PRESIDENT AND  
GENERAL MANAGER,  
IT MARKETS**  
**SPLUNK**

# THE POWER OF PREDICTIVE IT

## Improve Reliability and Prevent Outages Across Your Organization

Reliable connectivity today is nonnegotiable. Everybody—customers, employees, suppliers, other third parties—demands and expects to be “always on,” 24/7, with no interruptions, outages, or security breaches. While this places a heavy burden on companies’ IT operations, the stakes are just as high for the organizations themselves and the customer experience they offer. When your website, for example, experiences an outage or interruption, your customers’ and end users’ experience suffers, and they may take their business elsewhere. Anything less than secure connectivity all the time can constitute a real competitive disadvantage for your organization.

An outage or interruption in your IT environments can have any number of causes: a server crash, a power failure due to a flood or earthquake, an operational error by a provider or user, a complete or partial failure of hardware and software components. What these have in common is that they degrade the customer experience by either imposing a break in service or making it erratic, causing customers to run the risk of missing a vital communication exchange or, at worst, losing control of sensitive data. Whatever the cause, it’s the responsibility of IT operations to keep such events from happening—and from threatening the customer relationship.

When it comes to addressing outages and interruptions, “some companies—even a lot of newer ones—are really good,” says Koos Lodewijkx, chief technical officer for IT risk in the office of the chief information services officer (CISO) at IBM. “Others are lagging behind. Will they be eclipsed?”

To meet the standard, it’s not enough to identify and respond quickly and effectively to incoming threats. Companies must be proactive rather than reactive, anticipating threats and addressing weaknesses before a breach or outage takes place.

To develop this capability, first you must be able to see across the data silos that commonly separate the business and the corresponding IT functions, getting ahead of outages and disruptions before they occur. Otherwise, visibility gaps develop that can render your company vulnerable. To prevent this requires a data platform that brings together all the relevant resources and data needed to anticipate a problem.

### HIGHLIGHTS

- It’s not enough to identify and respond quickly and effectively to incoming threats; companies must be proactive, anticipating threats and addressing weaknesses before a breach or outage occurs.
- To anticipate interruptions and outages before they take place requires spotting occurrences across silos, lines of business, and functional areas. That requires applying artificial intelligence (AI) and machine learning (ML) to your cross-silo data.
- With the right platform and strategic application of AI and ML capabilities, your organization can minimize the danger of losing clients and customers to less-than-reliable experiences—thus enhancing its competitive edge.

---

By avoiding downtime, an organization is able to preserve revenue, protect brand reputation and customer experience, and ultimately reduce internal friction between IT and the business itself.

---

To ramp up your ability to quickly and reliably detect gaps, it's critical to apply artificial intelligence (AI) and machine learning (ML) to your cross-silo data. AI algorithms can rapidly become proficient at identifying deviations from normal patterns, constantly refining their ability to detect outliers. ML and advanced analytics can provide automated baselining, dynamic thresholding, anomaly detection, event consolidation, correlation, and predictive alerts, for example. Cognitive AI capabilities are increasingly being applied to such functions as natural language interfaces and pattern and even image recognition.

With all your data coming together in a single platform, the right AI and ML tools can cluster hundreds of alerts into a single point of failure for investigation, detect when complex service orchestrations are beginning to deviate from threshold patterns, and send immediate alerts to appropriate teams when a truly anomalous data pattern points to an imminent outage. The result, if done right, is a "predictive IT" tool that can save costs, streamline operations, raise productivity by redirecting skilled employees to more value-add operations, and above all, protect your brand by improving the customer experience.

### **Data Is Becoming Harder to Manage**

IT's job is to enable the organization to avoid downtime and outages. By avoiding downtime, an organization is able to preserve revenue, protect brand reputation and customer experience, and ultimately reduce internal friction between IT and the business itself. Yet both the incidence and cost of critical IT incidents are rising.

Out of some 1,200 monthly IT incidents, five will be critical, generating a mean business cost of \$105,302, according to a report last year by Quocirca.<sup>1</sup> Hefty costs mean that companies must spend more to manage the problem; the worldwide IT operations management (ITOM) software market reached \$8.3 billion in 2017, representing growth of 9.1% over the prior year, according to IDC.<sup>2</sup> There is longer-term damage, too. Seven out of 10 survey respondents said a past critical incident had caused reputational damage to their organization, the Quocirca report found.

What's behind this? As more tasks and functions become software-driven, "systems become more complex, and harder to manage and operate to ensure continuous uptime," says Mazin Gilbert, vice president of advanced technology and systems at AT&T Labs. As an example, he offers FirstNet, for which AT&T is building a high-speed wireless broadband network for first responders. "We can't afford to have our network down even for a moment," Gilbert says. "We have to be able to predict and anticipate operational, management, and security issues and address them in advance."

IT environment infrastructure and application layers themselves are evolving fast, becoming more layered and dispersed—some data and applications may be housed on premises, on the cloud, or in hybrid architectures. Meanwhile, as more and more aspects of organizations' activities are digitalized, event noise and false positives can make it difficult to quickly determine whether an event will have a serious business impact, notes Kenji Takahashi, vice president of innovation at NTT Security GmbH.

Complexity, born in part of incremental response, is a big part of the problem. Legacy IT solutions have left many organizations with a complex, unproductive manual system that leaves data and response tools siloed and, therefore, ineffective. Meanwhile, “we’re seeing an increased rate and pace of change in types of IT architecture and information distribution across domains,” says Chris Brahm, partner and leader of the Global Advanced Analytics practice at Bain & Co. “Literally every layer of the technology stack is subject to more rapid change, which should be elevating concerns around stability, security, and performance.”

Typically, when an event like an outage or interruption takes place, alerts are generated, events are manually investigated, a service ticket is requested, support and domain owners are engaged to troubleshoot and remediate, and incidents are analyzed to determine the root cause. This process was not designed to cope with the complexity of IT and the frequency and severity of incidents we experience today. Too many alerts are generated with no clear indication of which incidents impact the business. Not surprisingly, then, most companies are not confident of their ability to address these issues even though they are devoting increasing time and resources to infrastructure, operations, and security.

Two-thirds (66%) of the companies Quocirca surveyed said they find dealing with the volume of events reported by their IT monitoring tools to be a challenge: 52% just about manage, 13% struggle, and 1% are overwhelmed. Another 20% said they have no event management process at all. The mean time to repair for critical incidents is 5.81 hours, although this goes down when there are fewer incidents to manage. On average, companies spend an additional 7.23 hours on root-cause analysis, which is successful 65% of the time.<sup>3</sup>

Duplicate and repeat incidents are another persistent problem. Almost all Quocirca respondents (97%) said

their event management process leads to duplication, in which multiple incidents are created for the same IT problem. Of all incidents, 17.2% are duplicates. Almost all Quocirca respondents (96%) said failure to learn from previous incidents through effective root-cause analysis leads to repeat incidents.

Most companies are not confident of their performance in addressing these operational issues, despite the investment they are making. “The dominant mode of response is still *ex post facto*,” says Tom Davenport, professor of information technology and management at Babson College.

### What Is Predictive Analytics?

Because of the frequency and possible consequences of outages and interruptions, IT organizations must move from reactive to predictive in their approach. This requires better use of data and better tools for analyzing it. Predictive analytics encompasses a variety of techniques to mine, model, and learn across large volumes of data to help human users anticipate future events. Two essential tools of predictive analytics are AI and ML.

AI is a general term referring to any machine that mimics cognitive functions that humans associate with other human minds, such as learning and problem solving.

ML is a subset of AI in which machines are given access to data, learn from it, and refine their responses without being specifically programmed. As a

result, the machines can progressively improve their performance on specific data-driven tasks.

ML greatly boosts an organization’s ability to perform predictive analytics by pulling together data from any and every source that relates to a particular problem, including data that human experts may not perceive as connected to the problem, using it to flag events as they occur, and suggesting what can be done to change that outcome. “ML can gather data, find bottlenecks in the tech stack, find predictive markers in the infrastructure that suggest it might go down, and look for the root causes of operational issues,” says Bain’s Brahm. “There are very few aspects of IT that don’t lend themselves to ML and AI.”

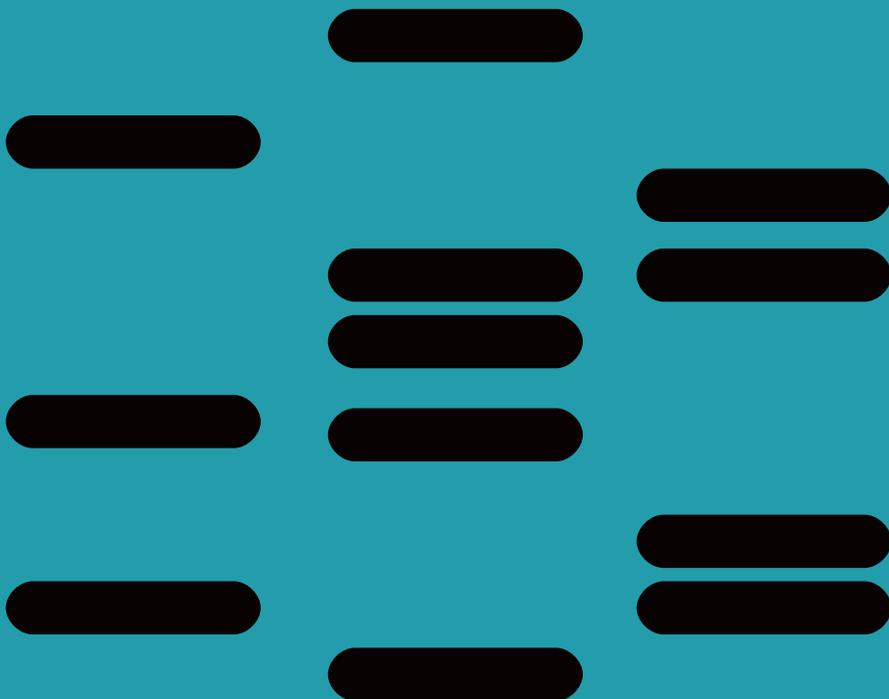
The longer the technology is employed, the more opportunity it has to identify recurring patterns in its data that could suggest an event like a systems outage is looming. That’s because ML systems not only absorb and analyze the vast amounts of data that their underlying IT and security infrastructure systems produce, but they also learn for themselves.

This ability to identify and analyze patterns has enormous potential benefits for companies across multiple areas, including competitive intelligence and cybersecurity. But IT may be especially poised to sharpen its performance with these new technologies because they enable it to see more of the organization’s condition at any given time. Centralized data platforms “mean you can aggregate way more data about



**THE INCREASING FREQUENCY AND POSSIBLE CONSEQUENCES OF OUTAGES AND INTERRUPTIONS MEAN THAT IT ORGANIZATIONS MUST MOVE FROM REACTIVE TO PREDICTIVE IN THEIR APPROACH.**

**ACCORDING TO IDC, COMPANIES WORLDWIDE SPENT A TOTAL OF \$2.2 BILLION ON IT OPERATIONS ANALYTICS (ITOA) PACKAGES ALONE IN 2017, A 19.1% RISE FROM THE PREVIOUS YEAR.**



the health of your applications, of the entire system, of servers, of customers, of cell towers,” says Gilbert, “and you can apply predictive analytics and ML to find out what’s wrong *now*.”

Predictive analytics and ML are enabling organizations to move with much greater speed and insight to get ahead of disruptions and outages. Say a company flags a defect in a server that will require a reboot. That requires decisions, Gilbert says. “Can we move traffic to another machine while we diagnose the server? Will other machines have capacity to take on the traffic? Will customers be impacted? Predictive analytics and ML enable you to put smart policies in place when these events occur.”

They are also allowing organizations to cut costs by retiring legacy IT data management and analytic packages and replacing them with more streamlined, efficient tools. Over the past three years, IT operations have deployed big data and ML technologies separately to support monitoring efforts. And just in the past six months, enterprises have begun to combine their IT operations-oriented big data and ML projects and extend them to the service desk and automation, according to a Gartner study.<sup>4</sup>

- Viasat, a global communications company, uses a ML solution to predict the potential impact of IT maintenance activities and strengthen cross-team collaboration. Implementing scripted actions based on the solution’s learning and analysis, Viasat has been able to reduce network-event remediation time from 20 to 60 minutes to just five minutes, preventing serious impact.<sup>5</sup>
- TransUnion, a consumer credit reporting firm, experiences severe fluctuations in traffic volume on its website. An ML solution gives it a better way to monitor these cycles. The solution visualizes and combines machine data from multiple applications to provide an end-to-end transaction flow that speeds up root-cause determination and thus enables faster resolution.<sup>6</sup>

Increasingly, these kinds of solutions will become not just an advantage but an imperative, some experts say. “The complexity of IT today is so great that the ability of humans to manage it without intelligent tools like AI and ML is negligible,” says Brahm. “So AI is finding its way into every important part of IT to deal with the scale, complexity, and velocity of change; quality-assurance testing of software code is becoming AI-based, for example.”

According to IDC, companies worldwide spent a total of \$2.2 billion on IT operations analytics (ITOA) packages alone in 2017, a 19.1% rise from the previous year.<sup>7</sup> Savvy IT executives, then, see IT operations management tools as a way to apply the competitive advantages of speed and quality to IT environments and modern application architectures, which are both areas critical to business success.<sup>8</sup>

### Making Predictive IT Work

While implementing a true predictive IT system is first and foremost the responsibility of IT, planning and implementation must encompass the entire organization, including all data sets and data owners. If your data source is limited, the information to which you apply ML will be, too. And if that’s the case, then AI and ML will not capture all the problems and potential problems you need them to. Applying predictive analytics from end to end of the organization greatly diminishes the possibility that outages and interruptions will impact the customer experience—and your revenue.

To really make predictive IT work, data and the technology have to be part of a well-crafted structure. There are five steps to creating a robust predictive IT structure within your organization.

### Identify the most impactful problems.

Before you consider the specific tools and processes needed, you first need to know which ones are most critical—that is, which ones are likely to have the greatest business impact. Start by identifying the most costly and impactful problems your organization faces. Understand who the stakeholders involved are and what data and service-level agreements are critical to solving each problem. Then prioritize these problems, focusing first on those that affect customer experience and operational efficiency.

**Identify skills gaps.** How do you want to go about addressing your most critical problems, and do you have the resources to do so? Carefully consider different approaches, e.g., buy, build, or partner with an outside vendor. Remember that the solution you choose must be supported by and integrated into the organization itself and it must work for your teams. Gather the AI educational resources they will need to adapt to the new process and system (there are plenty available). Enlist all the relevant stakeholders to take stock of your data throughout the organization, and prioritize your data sources to correspond with your key problems. “Once you’ve developed algorithms to measure cost, performance, and security, you have to push it out to people in operations and the line of business—the ‘last mile’ of results in analytics—where people actually need to change their behavior,” says Brahm.

**Develop a data and AI plan.** Don’t try to solve everything at a stroke; consider starting with a pilot or proof-of-concept project that focuses on creating a workable approach to a specific problem and defining the data sets needed to do so, and build out

**TO REALLY MAKE PREDICTIVE IT WORK, DATA AND THE TECHNOLOGY HAVE TO BE PART OF A WELL-CRAFTED STRUCTURE.**

---

from there. This will help you sell the value and outcomes of your predictive strategy to IT and key business stakeholders. Once they are on board, scope out and solidify a timeline with your stakeholders. Work with relevant groups to decide which problems to tackle in what order using which data and analytic tools, and incorporate the timeline into a project plan. Leave room for growth and iterations so that your plan can evolve along the way—and establish the KPIs that will define the health and performance status of your systems.

**Account for scale.** One reason for adopting a predictive IT system is that it enables you to wrangle and analyze the vast amounts of data thrown off by an increasingly digital organization. Implementation, then, includes embedding your predictive roadmap in your current data and architecture chart. Make sure your solution is capable of handling the full breadth and depth of your data sets at scale. And look for ML platforms that also provide analytics, allowing you to quickly and easily make sense of data, package it in a usable form, and get the right data to stakeholders to inform their decisions.

**Consider collaboration.** Some companies by their nature are tightly networked with other providers and dependent on those organizations' proficiency as well as their own. These companies may want to consider moving their networking software to an open source format to ensure that every segment of the customer path is protected against outages and interruptions. AT&T two years ago donated its networking code to a Linux Foundation open networking automation initiative,

ONAP. The project now has over 100 members worldwide.

A multiparty telecommunications network “is a very complex undertaking,” says Gilbert. “It’s like a brain; without it, everything stops. So we decided, instead of just us developing it, we’d get global operators, including vendors, to help reference platforms that can be the basis of innovation and interoperability across operators’ networks.” That innovation effort would include enabling greater foresight. “Companies like ours have to do this,” Gilbert adds. “We have to be able to predict failures, optimize traffic flow, and secure the whole network, end to end.”

### **Making Predictive IT Continual**

Once you have your solution in place, ensuring that it keeps delivering reliable connectivity is an ongoing task. Four rules of the road are important to keep top of mind.

**No silos.** To anticipate interruptions and outages before they take place, you must be able to spot occurrences across silos, lines of business, and functional areas—otherwise, AI and ML will not produce the comprehensive reports you need. For a predictive IT system to work optimally for you, then, requires a strong, centralized data platform that operates end to end across the organization.

IT can go even further, Brahm says. He urges companies to take a more integrated approach to creating security and reliability by building an IT “control tower” that can see across the architecture and organization and collect data from any point within it, which will in turn help IT get the most out of AI and ML. “Many IT organizations are applying these tools, but in a fairly narrow, siloed domain and data set,” he says. “They might be instrumenting one application in the software stack or the physical server layer or the help desk resources, but not holistically across all elements of architecture and organization. They’re missing out on a big opportunity to evolve beyond local optimization of stovepipes in IT or layers in the tech stack to systemic



---

**A PREDICTIVE IT SYSTEM ENABLES YOU TO WRANGLE AND ANALYZE THE VAST AMOUNTS OF DATA THROWN OFF BY AN INCREASINGLY DIGITAL ORGANIZATION.**

---

# AI and ML **can't completely eliminate** the need for human intervention—not yet, anyway—but **they can free humans** from engaging in too much low-value work.

---

optimization of all their IT resources, both digital and human.”

**Get the right people.** Predictive IT systems become more adept at making decisions independently over time as ML learns to pinpoint and diagnose events, but this doesn't eliminate the need to have talented people. Infrastructure automation tools free up your systems administrators and IT managers and improve productivity by enabling orchestration and workflows for such tasks as IT configuration, patch management, performance tracking, and incident resolution. But incidents with the greatest potential impact on the business will still require enough skilled human beings to address and respond to them.

**Update continually.** Any effective system of predictive IT too must be continually updated to stay current with new vulnerabilities. While ML learns from doing, the organization itself changes, not least as a result of the new configurations that digitalization makes possible. “We've come from heavily centralized computing, and we're moving into a future where computing and storage are distributed,” notes Gilbert.

As an example, Gilbert notes that the industry is moving toward using “edge clouds” to process and store data related to internet of things (IoT); content caching; immersive experiences like gaming, crowd sharing, and payment processing; and other functions that require greater processing power and low latency. This requires ML algorithms to be placed at the edge to analyze data security and reliability.

**Be realistic.** “The more we deploy AI solutions, the more we learn,” says Gilbert. “A year from now, our

AI systems will be way smarter than they are now because of data.” Even well short of perfection, AI and ML are proving themselves “extremely useful,” he adds. “If you're only getting 20 real cybersecurity tickets in a day as opposed to a million of a mixed bag, it's a big plus.” It's easy to overstate the progress that's been made thus far with predictive IT, especially its ability to predict problems and AI's ability to learn your ever-changing business. Yet companies like Viasat and TransUnion offer compelling evidence that organizations are moving closer to realizing the full potential of these resources.

## **What Human Experts Contribute Most**

Predictive analytics not only protects your company and its clients, customers, and suppliers from outages and interruptions; by investing in a predictive IT platform, you also gain the agility and cost reduction necessary to maintain a competitive edge both in IT and core businesses.

AI and ML can't completely eliminate the need for human intervention—not yet, anyway—but they can free humans from engaging in too much low-value work. “When the system is mature, there's less human intervention needed,” Davenport says.

With a strong platform for predictive IT, data is streamlined, less “noisy,” and easier to analyze. Your organization can redirect its data scientists from analyzing and interpreting its trove of data to higher-value, more strategic tasks that AI and ML can't accomplish. Likewise, predictive IT can enable automation of numerous routines and simple tasks, freeing up other roles for more productive work.



## THE DEMAND FOR DIGITAL TRANSFORMATION EXPERTISE IS LIKELY TO GROW. ONE OF THE GRAVEST THREATS FACING THE AI/ML FIELD TODAY, IT'S OFTEN SAID, IS A SCARCITY OF TALENT.

Analytics can also break down silos that separate pools of information, creating “great data lakes” that can be more easily mined for value, says Lodewijkx. “Traditionally, data was neatly classified and controlled. For instance, you used to not be able to combine sales with inventory with ledger. Now you can.”

What human experts contribute most to any IT operations and analytics strategy is the ability to make strategic decisions, such as actions needed for preventing outages, quickly identifying root causes, cutting through event noise, reaching efficient resolutions, and ultimately protecting the business. “As soon as you can employ automated tools to do work humans were doing, there’s a huge increase in the time the resources get back to work on strategies to strengthen your operations environment,” says Brian Thomas, interim CIO of Johnson County government in Kansas.

Humans also supply the intangible element of common sense. With AI and ML doing the bulk tasks of

predicting outages and proactively monitoring systems and services, the company’s human experts are free to focus on strategic matters such as digital transformation, creating a digital culture, and process optimization. The demand for this type of expertise is likely to grow. One of the gravest threats facing the AI/ML field today, it’s often said, is a scarcity of talent.

### Conclusion

Secure reliability remains an ever-present concern for every IT organization, and companies like Viasat and TransUnion provide promising examples of predictive IT’s power to help. But corporate commitment to predictive IT still has a long way to go. “Even though we and other companies have already made a lot of investment in AI, we’re still at the beginning of that journey,” says AT&T Labs’s Gilbert.

As the quantity and complexity of systems and data grow, however, it’s becoming even harder for IT organizations to deliver, and data remains at the heart of both the problem and the solution. By embracing predictive IT early, organizations have a chance not only to wrangle their swelling data streams but also to put them to best use. With the right platform and strategic application of AI and ML capabilities, organizations can minimize the danger of losing clients and customers to less-than-reliable experiences—thus enhancing the competitive edge increasingly necessary for success in today’s digital world.

### ENDNOTES

- 1 Bob Tarzey, “Damage Control: The Impact of Critical IT Incidents,” Quocirca, November 2017.
- 2 “IDC’s Worldwide Software Taxonomy,” August 2017.
- 3 Rick Fitz, “Damage Control: Critical IT Incidents Cost Companies Six Million Dollars per Year,” Splunk, December 12, 2017.
- 4 Will Cappelli, Colin Fletcher, Pankaj Prasad, “Market Guide for AIOps Platforms,” Gartner, August 3, 2017.
- 5 “Viasat Transforms IT Operations through Splunk Machine Learning, Predictive Analytics,” Splunk Case Study, 2018.
- 6 “TransUnion Invests in Splunk Solutions for Enterprise Monitoring, Machine Learning,” Splunk Case Study, 2018.
- 7 “IDC Market Share: Worldwide Operations Analytics Software Shares, 2017: Strong Market Growth Continues,” September 2018.
- 8 Greiser, loc cit.



**Harvard  
Business  
Review**

ANALYTIC SERVICES

[hbr.org/hbr-analytic-services](https://hbr.org/hbr-analytic-services)



**CONTACT US**

[hbranalyticsservices@hbr.org](mailto:hbranalyticsservices@hbr.org)

Copyright © 2019 Harvard Business School Publishing.

MC211621218