Best Practices for Workload Automation in the Bimodal Era

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Chapter 1: Why Workload Automation?

The IT departments of today have changed substantially from those of the past decades. Waterfall methodologies that were once the go-to software development methodology have been supplanted by a variety of agile practices. Long-term planning and capital expenditure planning are still around, but they are accompanied by discussions about avoiding new hardware purchases and moving applications to the cloud. The concept of monolithic applications is giving way to the more fluid and amorphous concept of services. Services are automated functions designed for incorporation with other automated functions in compositions that are defined in response to changing business needs. To put it simply, businesses do not have time to wait for IT practices of the past.

The practices that are emerging in IT are creating new challenges for IT managers, systems administrators, and application developers. IT professionals have a long history of adapting to new challenges by creating new tools, trying new methodologies, and learning from mistakes. The current dynamic environment is no different. Although every organization will have its own particular challenges and responses to those challenges, common patterns have emerged.

This chapter will focus on two key areas that are fundamental to understanding how workload automation can help address the evolving IT environment:

- Challenges facing IT executives trying to manage and leverage this evolving landscape
- The rise of the bimodal IT department as a response to the disparate needs of those focused on operations and those focused on innovation

As any seasoned IT professional knows there are no silver bullets that will streamline IT operations and put an end to over-budget and delayed projects. Applications will have bugs. Hardware will fail. The goal of this discussion is to demonstrate how to use workload automation to control and manage processes that are amenable to more structured processes. As a result, IT professionals have more time to focus on innovation and address the unexpected, but inevitable, system problems that arise in any complex IT environment.

The Challenges

IT managers and executives face two constant challenges:

- How to acquire and develop staff with the skills needed to operate a dynamic IT department

- How to centralize and consolidate IT operations to maintain a cost-effective operation that delivers on the needs of the business

At first glance, these may seem like unrelated problems, but in fact, they are more intertwined than first appearance suggests. This interconnection will become clear as we delve into the details of each. At the same time, it will start to become apparent how the role of workload automation can help address both of these challenges.

IT Resource Gap

IT professionals with in-demand skills have email inboxes littered with messages from recruiters. Subject lines with phrases like "Immediate Need," "Phone Interview Hire," "Top Salary for Sys Admins with knowledge of x," where x is any of a long list of in-demand skills, such as virtualization, cloud administration, and information security. This practice of borderline-spamming of IT professionals is the canary in the coal mine facing many IT organizations: they do not have the IT skills they need and the employees with top-valued skills are sought after by competitors, collaborators, and other businesses alike.

IT Skills Gap Is a Top Concern Among Executives

The IT skills gap is having a direct impact on organizations' ability to deliver IT services. Problems range from delayed delivery because of unfilled position, loss of revenue, increased workload on existing staff, and adverse impacts on customer service.

A recent study by an online recruiting and job placement firm highlights the problem:

- 60% of survey respondents are concerned about the impact of delays in filling open positions

- 25% have suffered a loss in revenue due to unfilled positions

- 41% of respondents report increased workloads are driving down morale

- Customer service is adversely impacted in 30% of cases

- 25% of respondents report an increase in mistakes and lower quality work product

These statistics speak volumes about the difficult situations facing organizations and employees, but one additional statistic stands out: 22% of respondents report high turnover because of the added demands on staff due to unfilled vacancies.

Thus, the staff members whom organizations depend on to meet business needs and make up for unfilled positions are increasingly at risk of leaving due to frustration, low morale, and excessive workloads (see Figure 1.1). Given the fact that so many organizations are facing similar skill gaps in their IT operations, those with skills in high demand will find they likely have a range of options when looking for a new position. What was a problem filling new positions is now compounded by the fact that businesses need to retain the skilled staff they have in the face of stiff competition for those skills.
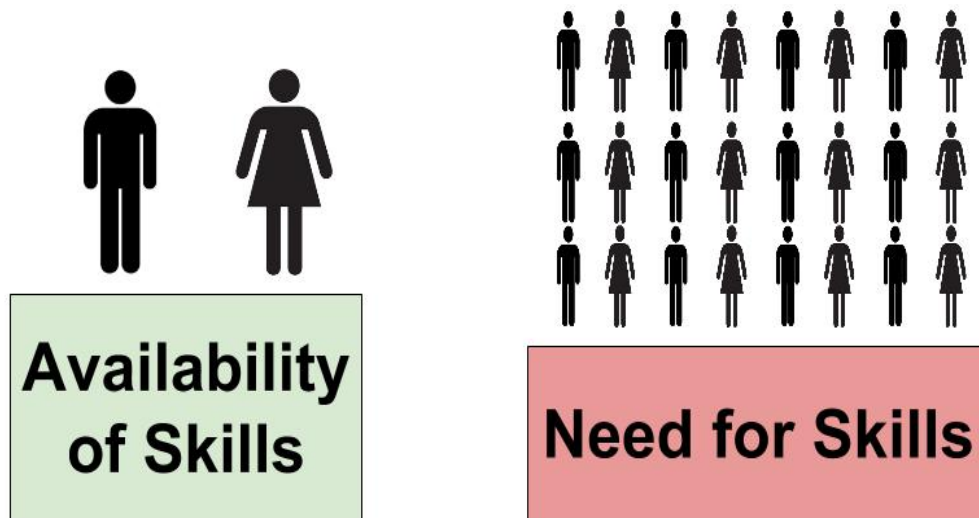
Figure 1.1: Fewer employees have the skills in demand to support IT operations, creating a skills gap.

Evolving Technology Drives Demands for New Skills
Part of the problem is the disparity between the drop in the cost of technology and an insufficient pool of skilled professionals who can leverage that technology (see Figure 1.2). As the cost of technologies, such as servers and applications, drops, more businesses can purchase these technologies. These purchases, in turn, drive up the demand for people with the skills to manage them.

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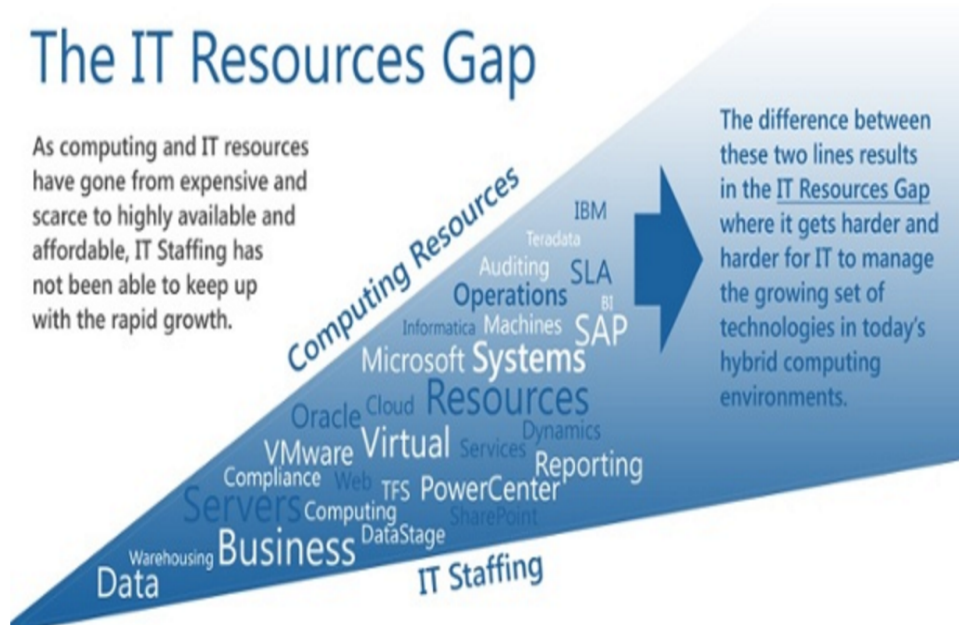
Figure 1.2: An IT resources gap is growing as hardware, software, and services are increasingly available at relatively low costs while the growth in skills needed to fully utilize those tools lags behind (Source: http://info.advsyscon.com/it-automation-blog/addressing-the-growing-it-resources-gap).

Although it might take a team of well-trained software developers with years of experience to make a useful tool, such as a business intelligence reporting tool, that same tool can be applied by thousands of developers in businesses around the globe. Those developers must be familiar with business intelligence reporting, capable of working with business professionals to discover requirements, and have an understanding of state-of-the-art methodologies, such as Agile, to deliver and sustain a finished product. Those skills are in demand.

Leveraging Existing Staff with Automation
As the discussion so far has illustrated, executives and managers are facing difficult decisions about how to allocate their staff resources to projects and operations. If they take experienced IT professionals away from operational duties to develop new applications and services, they risk disrupting operations by pulling experienced administrators from crucial day-to-day operational tasks.

One way to deal with this challenge is to automate administrative tasks, such as running regularly scheduled jobs. This kind of workload automation is commonplace in business. Systems are backed up, data is exported from transaction processing systems and loaded into data warehouses, inventory is analyzed, and new orders placed. These are the kinds of operations that are well-structured business processes and amenable to automation.

They share common characteristics:

- Have a well-defined set of inputs and outputs
- Run on regular schedules or in response to specific events
- Require minimal manual intervention

The inputs and outputs of jobs described here are well defined. An application may generate a file of order details that is read and processed by an order fulfillment process. The order fulfillment process, in turn, makes use of shipping services to schedule pickup and delivery of orders, and then writes additional details about the order fulfillment to a customer support database that allows customers to check on the status of their orders.

This type of series of processes is readily scripted in a variety of languages and tools. Windows administrators might choose one tool for scripting processes, while Linux administrators might choose another, and a developer familiar with a particular programming language might opt for her preferred language. You can imagine how this variation turns out over the long term. There is a polyglot environment of scripts written in:

- PowerShell in Windows environments
- Bash in Linux environments
- Perl, Python, and other "favorite" scripting languages of administrators
- Built-in application-specific schedulers

This siloed approach is understandable. Developers are under tight deadlines, and they are working on multiple projects while trying to support ongoing operations. If they can automate a workload by writing a script in Perl, then Perl is the tool of choice. For those developers more familiar with .NET tools, PowerShell is the go-to solution. Their managers are not going to fault them for getting the job done and moving on to the next top priority. And so the cycle continues.

The problem with this all-too-common scenario is that the short-term technology needs are emphasized over the long-term needs of the organization. Solving problems in isolation leads to a complex unmanageable environment consisting of multiple workload management tools, scripts, and systems (see Figure 1.3). Some are homegrown solutions written in the favorite language of the developer who happened to be tasked with getting a process up and running. Some of the tools are third-party applications purchased by a department to put an end to the disparate collection of Perl, Python, and PowerShell scripts that have accumulated in the department's workloads. At some point, a department manager might lay down the law and declare all processes be developed using a standard tool—standard for that department anyway.
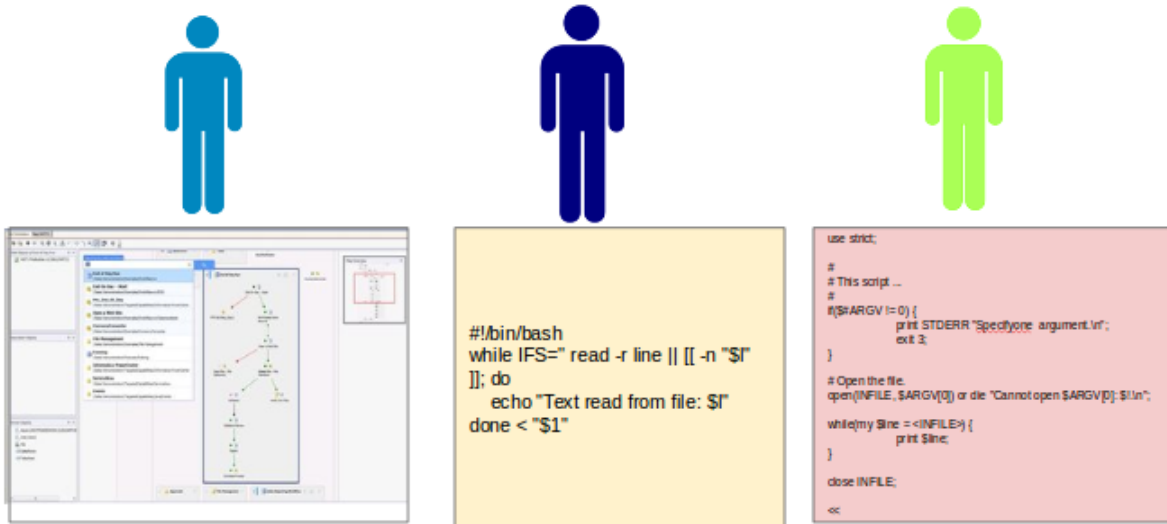
Figure 1.3: Silos of automation tools emerge when individual developers and departments try to separately address the common problem of workload automation.

Throwing Oil on the Fire: Multiple Automation Tools

At first glance, it might appear that automating, using whatever tools are available, is a good thing. And it is, to a point. If your house is burning, there is not much incentive to ask from where the flame-dousing water came. Short-term requirements to get a job done have to be met. After the immediate need has been met, we sometimes find that we have made choices that lead to unintended consequences. In the case of enterprise automation, we find that we have silos of automation that actually exacerbate, rather than ameliorate, the problem we were trying to solve.

The reason many organizations turn to automation tools is to find some relief from the demands on developers and administrators to ensure existing processes and procedures function as expected while adapting to changing business conditions and rolling out innovative services to customers and users. Many organizations have trouble implementing this setup because of the skills gap—there just are not enough people with the right skills to meet demands. By automating, businesses can, in theory, free up the time of their best developers to focus on more strategic needs. However, by letting individual developers, or even departments, choose automaton tools, organizations are left supporting a mix of different technologies that often don't work well together or have a lot of overlap.

We can all imagine where this scenario leads. Businesses are running day-to-day operations using scripts written in a variety of languages and tools that are understood by a potentially small subset of their IT staff (see Figure 1.4). This setup creates, in effect, another skills gap. Workload automation was supposed to solve the problem of lacking skills but instead has effectively institutionalized the problem.

The skills gap problem can be addressed, to some degree, by workload automation, but not if the decision-making is made at the level of individual developers or even at the departmental level. A centralized approach that takes into account broad business requirements and architecture is essential to avoiding, or at least mitigating, the challenges described to this point.

Figure 1.4: Without a centralized workload strategy, organizations struggle to keep disparate solutions and tools operating together.

Think Like A CIO on Workload Management: Centralize and Consolidate

IT professionals approach the IT skills gap with different tactics. Some will try to hire to fill the gaps while others will emphasize additional training for existing staff. Still others will work out formal or even informal arrangements with other departments to share resources and cross-train staff. All of these methods can help provide a buffer when someone with a few key skills is needed in one area in a way that leaves another area without support. Here is where workload automation can be of use.

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As noted earlier, workload automation can help compensate for the skills gap. Tasks that must be performed repeatedly can be automated in a variety of ways. The flexibility of choosing tools for workload automation is both a benefit and a detriment. It is a benefit because individuals and teams can rapidly deploy workload automation scripts using tools they understand and can readily support. The downside emerges as this practice continues with different individuals or teams choosing different tools.

From the perspective of a CIO, the organization has created a system that now depends on a variety of tools requiring different skills sets. The choices each team made were no doubt rational from their perspectives. Unfortunately, those perspectives are often limited to their own project requirements, budget constraints, and scheduling deadlines. Gartner research found that this pattern is so prevalent that it is not uncommon for organizations to support three to eight different workload automation tools. If you are fortunate, your organization supports only three workload automation tools, but some organizations are supporting as many as eight workload automation tools. This conclusion seems out of line with effective IT practices.

CIOs tend to take a broader view of the organization and the portfolio of services they have to support. Thinking like a CIO with that broader perspective, you could see the advantage of a consolidated approach to automation. Ideally, the workload automation solution will serve the needs of multiple projects, operations, and departments. The benefits are clear:

- Fewer distinct tools to support
- Potentially lower costs with enterprise licensing instead of multiple, individual department licenses
- Ability to leverage skills across teams and departments
- Ability to develop best practices and repositories of patterns and reusable code
- Faster time to deployment as skill sets improve
- Easier integration with other tools, such as log management and alerting systems

Perhaps the most important benefit is that a unified job scheduling and workload automation tool provides a single point of control, as Figure 1.5 illustrates.
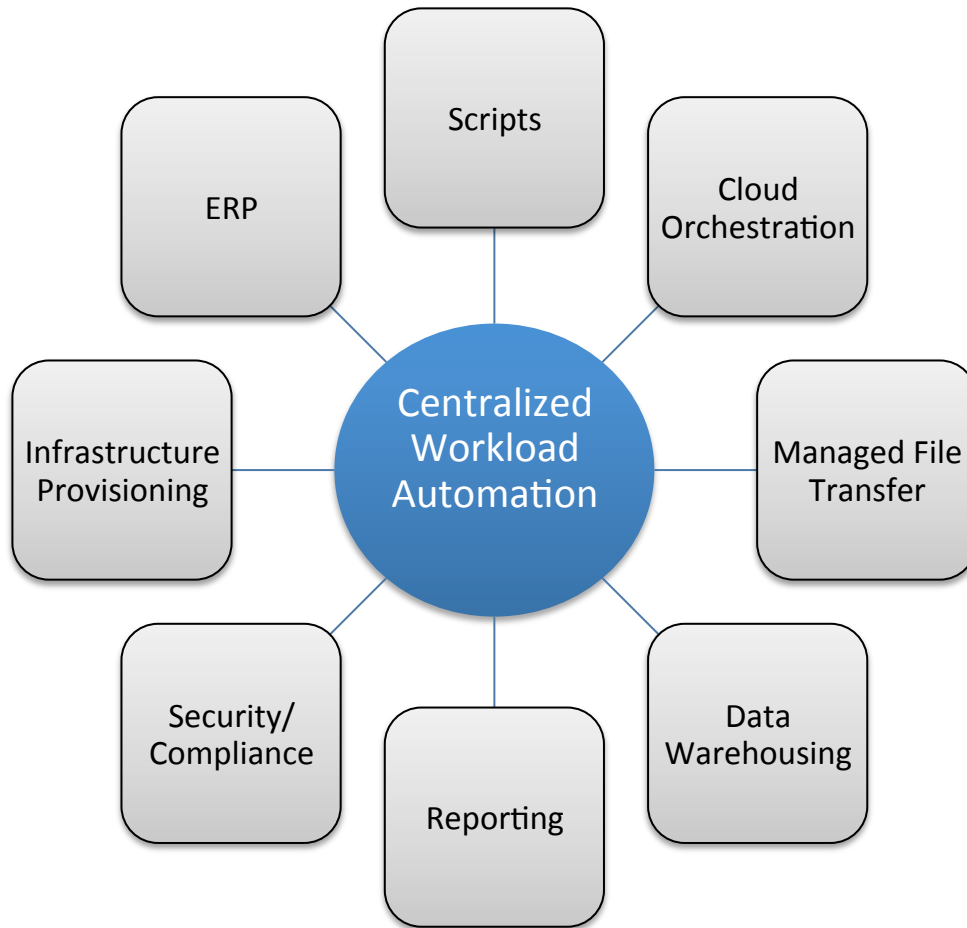
Figure 1.5: Centralized workload automation enables a single point of control and problem resolution.

The ability to support a wide range of workload scenarios is especially important today because IT organizations are shifting their structures to support both day-to-day operations and more Agile development and deployment of new services. An organization's workload automation solution should support both constituents of this bimodal structure.

Bimodal IT and the Need for Workload Automation

Industry analyst firm Gartner has identified a new pattern of IT organization called bimodal IT. As the name implies, it consists of two constituent parts. Mode 1 fills the role of traditional IT with an emphasis on maintaining operations and ensuring day-to-day activities carry on. Some of the more salient characteristics of Mode 1 are:

- Reliability

- Efficiency and price optimization

- Plan-driven approach

- Waterfall methodology

- Ability to work with long-term enterprise vendors

- Month-in-scale projects

- Tend to be IT centric

In short, Mode 1 "keeps the lights on."

Mode 2 addresses the needs of business to respond rapidly to changing market conditions and customer opportunities. Agility is the hallmark of Mode 2 IT. It is characterized by:

- Speed and responsiveness

- Attention to brand and customer experience

- Agile methodologies

- Continuous deployments

- A focus on short-term projects and working with vendors with specialized skill sets

- Operates well under uncertainty

- Produces incremental products in days and weeks

- Tends to be highly business-and customer-focused

We might think mostly of Mode 1 operations when we focus on workload automation, but that would be a mistake. Mode 2's more agile approach introduces new kinds of complexity into an organization. Mode 2 practitioners are experimenters. They may develop a new process and modify it almost continually in attempts to optimize it. This kind of experimenting and tuning would not be possible without workload automation tools. Manually rerunning workload steps would be too time consuming and prone to error.

Gartner recommends that organizations deploy workload automation tools for Mode 1 operations that address the need for reliability and the ability to automate operations from end to end. For Mode 2, the analysts recommend a tool that enables continuous deployment. This kind of rapid deployment is feasible in Mode 2 operations but less appropriate for Mode 1 where change management helps mitigate the risk of disrupting operations.

Using Mode 1 and Mode 2 operation models is a way to balance competing needs within an organization. Some tasks need to be executed in a highly controlled and reliable way. Financial operations, such as generating ledgers and running payroll, fall into this category. The cost of error can be so high in these areas that it is worth being cautious and slow in an effort to minimize risk. Other areas, such as deploying a new version of a mobile application, can tolerate higher levels of risk. If an application is rolled out to employees and it causes problems for 10% of the users, a fix can be created and deployed rapidly. Yes, there may be some slight disruption in the efficiency for those 10%, but the risk is worth it because it is part of a larger innovative process that, over the long term, leads to more efficient operations.

Automation Risks and Service Disruptions

To err is human. In IT, we are reminded of that over and over again. It is not that those of us in IT are any more prone to making mistakes than anyone else, but when we deal with complex systems, we have greater opportunities for something to go wrong. Analysts have been able to quantify the extent of the problem with mistakes in IT operations that lead to service outages. In 2010, Gartner estimated that through 2015, 80% of outages impacting mission-critical services would be caused by people and process issues, with more than 50% of those outages caused by change/configuration/release integration and hand-off issues.

The fact that people and process issues caused 80% of outages related to mission-critical service is perhaps the single most effective argument for workload automation in Mode 1 operations. Mode 1 operations are designed to minimize risks of disruptions because the cost of outages can be so high. When we depend on humans to perform a task over and over again, the chance that an error will occur increases.

Consider examples of the impact of disrupted IT services. On one day in July 2015, three major service disruptions occurred:

- United Airlines experienced a router issue that caused flights to be suspended for 2 hours. By the time the incident was resolved, 800 flights had been delayed and 60 flights had been cancelled.

- The New York Stock Exchange, the largest in the world, shut down for more than 3 hours. The incident was related to a software update that was rolled out. It turned out that some customer gateways were not properly configured for the new software.

- The Wall Street Journal website was down for about 1 hour at the same time the New York Stock Exchange experienced its outage.

These three incidents are not causally related, but the fact that they all happened on the same day highlights the potential for service disruptions across a range of industries. Some disruptions are relatively minor, such as a website being down for a short period of time, while others are costly events that will attract the attention of C-level executives.

Given that service disruptions should be expected, the question becomes how should we as IT professionals plan and prepare for them. We cannot anticipate all possible problems and their root causes, but we can frame processes and workload management procedures with an understanding that they need to be resilient to failure. Broadly speaking, we can approach this challenge with manual procedures or with automated methods.

Reducing Risk the Manual Way: Checklists

There are ways to mitigate the risk of human error. Professionals ranging from airline pilots to surgeons use checklists. The idea of checklists as a means of reducing error was popularized by Atul Gawande in his book The Checklist Manifesto: How to Get Things Right. The idea behind a checklist is that it helps us to execute multistep processes while avoiding errors from skipping a step or executing steps out of order.

Checklists evolve over time. As we learn more efficient ways to do things or discover new tasks that need to be included in our procedures, we can add them to the list. Checklists become a repository of collective knowledge about how to perform a task efficiently and reliably.

Checklists are well suited to some tasks that are inherently manual or static, but in the case of dynamically changing IT and business processes, oftentimes manually checking off steps simply isn't enough.

Reducing Risk the Automated Way: Workload Automation

Workload or IT automation is the best option for implementing efficient, reliable IT processes. Workload automation tools have the advantages of checklists, but are flexible and scalable to meet changing business needs. They

- Capture collective best practices

- Can be tuned over time

- Are reliable enough to support Mode 1 operations

- Are flexible enough to support Mode 2 operations

Modern workload automation tools can help mitigate the risk of disruption due to the complexity of IT systems. They will not eliminate disruptions or mistakes, but they can help minimize the risk of making the same mistake repeatedly.

Another benefit of workload automation solutions is that they can help address the IT skills gap. By deploying a workload automation tool, organizations can develop a set of skills across the organization that will serve operations spanning the business.

When evaluating workload automation tools, be sure to consider several essential characteristics:

- Support both Mode 1 and Model 2 IT operations

- Avoid automation silos

- Leverage automation skills across the organization

- Provide a single point of control and management

- Reduce risk and cost of change

Summary

IT operations are crucial elements of business operations. Some operations must be reliable and highly available while others are subject to near continual change in response to new business opportunities. IT departments across industries face a critical skills gap that leave us putting a premium on solutions that can be reused throughout the organization. Workload automation tools and best practices can help address these organizational needs.