FORRESTER®

The Total Economic Impact™ Of The Citrix Virtual Apps And Desktops Service

Cost Savings And Business Benefits
Enabled By Virtual Apps And Desktops Service

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Consulting Team: Sean Owens
Jasper Narvil

ABOUT FORRESTER CONSULTING

Executive Summary

Hybrid work is here to stay, and IT managers must balance PC management that not only meets security requirements but also provides employees with resources to get work done without inconvenience. Companies that run the Citrix Virtual Apps and Desktops service with Microsoft Azure have seen improved desktop management and security. Cloud flexibility has helped reduce support calls, IT resource needs, and other costs while also increasing agility. End users, including remote and hybrid workers, benefit with reduced issues and interruptions.

Citrix Virtual Apps and Desktops service is a desktop-as-a-service (DaaS) solution that allows IT departments to provision employees with a virtual PC and application environment as fast as — and identical to — locally installed operating systems and application software. It allows employees to access their personalized desktop environment with customized applications from any device and location. Organizations can modernize their legacy virtual desktop infrastructure (VDI) deployments by reducing on-premises server needs through a move to cloud. Additionally, they can leverage multisession features by adding in Microsoft Azure Virtual Desktop entitlements.[1]

Citrix commissioned Forrester Consulting to conduct a Total Economic Impact™ (TEI) study and examine the potential return on investment (ROI) enterprises may realize by deploying the Citrix Virtual Apps and Desktops service.[2] The purpose of this study is to provide readers with a framework to evaluate the potential financial impact that the Citrix Virtual Apps and Desktops service with Microsoft Azure can have on their organizations. Together these solutions provide secure, simplified PC management with a virtual application and desktop experience for employees. Organizations can take advantage of Citrix and Microsoft's partnership for enhanced integration and flexible licensing options.

To better understand the benefits, costs, and risks associated with this investment, Forrester interviewed four customers with experience using the Citrix

FINANCIAL SUMMARY

Return on investment (ROI)
153%

Net present value (NPV)
$4.05M

Virtual Apps and Desktops service with Microsoft Azure.[3] For the purposes of this study, Forrester aggregated the experiences of the interviewed customers and combined the results into a single composite organization with 15,000 total employees and 5,000 regular Citrix cloud service users. Two-thirds of these users were upgraded from a previous on-premises Citrix solution, and one-third were migrated to the new cloud solution as first-time users.

Prior to using Citrix cloud services, the customers managed applications and desktops from their own data centers, which was expensive to maintain, and it raised security and management challenges. Customers saw high rates of support calls, particularly for employees without prior Citrix solutions, and they had difficulty delivering the same virtual experience to remote workers without additional software solutions.

With Citrix Virtual Apps and Desktops service running workloads on Microsoft Azure, including the Azure

Virtual Desktop entitlement, customers were able to deliver secure, managed virtual experiences for employees working anywhere on any device. Given the effects of the COVID-19 pandemic, this was an especially valuable feature as a significant number of employees needed to transition to a work-from-home setting almost overnight. The CTO for a US municipal government said, "People can go to [their] home, they can go back to the office, and have the same exact experience."

Some organizations migrated to the Citrix Virtual Apps and Desktops service from their existing Citrix on-premises virtualization implementation, while others were new to virtual applications and desktops with Citrix overall. Representatives from interviewed organizations reported they were able to reduce help-desk costs, improve business agility, speed up employee onboarding, reduce overall IT desktop management resource needs, avoid significant software and hardware costs, and provide employees with a more effective and productive application and desktop experience.

KEY FINDINGS

Quantified benefits for the composite organization. Risk-adjusted present value (PV) quantified benefits include:

- **Citrix cloud services and Microsoft Azure enables a 10% improvement in IT efficiency.** With Citrix Virtual Apps and Desktops service and workloads running on Microsoft Azure, IT managers can streamline PC management by standardizing settings for user groups and locking down security. Moving to the Citrix cloud service also alleviated traditional server, operating system, networking, and database maintenance activities associated with an on-premises deployment. The reduced support escalations and overall IT management needs add up to $2 million over three years.

- **There is a reduction of 3,000 help-desk tickets.** With Citrix Virtual Apps and Desktops

KEY STATISTICS

IT efficiency improvement
10%

Employee productivity improvement
5%

service, access to team documents and tools is easier for users, and it is also easier for admins to standardize settings across cloud deployments, reducing service interruptions and access problems. Thousands of help-desk calls are avoided each year, adding up to about 33% of all PC-related calls. Calls that still occur are resolved in half the time. This adds up to a three-year benefit of $590,000.

- **Citrix cloud services enables 8 hours to be saved with each onboarded employee.** Each new or transferred employee requires a PC, accounts to be set up and configured, HR materials, and other physical and software resources. With Citrix cloud services, corporate-

> **"Employees can quickly be working from wherever they need to work. This has been a huge benefit for us — we don't have to worry about hardware, it just scales."**
>
> *Infrastructure manager, US transportation and logistics services*

owned or personal device setup is significantly streamlined, as new resources can be immediately modified from a central cloud-based environment for access from any device. Employee onboarding savings, enabled by Citrix cloud services and DaaS provisioning, adds up to $1.2 million over three years.

- **Legacy software and hardware savings total $1.1 million.** Citrix cloud services can enable the reduction of on-premises data center needs for some legacy software solutions. This leads to reduced costs related to software licensing, database administration, data center operations services, or onsite server room costs, adding up to $1.1 million over three years.

- **Employee productivity improves by 5%.** Employees with device management or information access problems would often face delays that kept them from getting work done. Migrating to Citrix cloud services helped reduce interruptions for these workers. With Citrix, employees have convenient, secure access to company resources, allowing them to save significant amount of time, even when working remotely. This adds up to $1.9 million over three years.

Unquantified benefits for the composite organization. Benefits that are not quantified for this study include:

- **Security.** With Citrix, users don't download data to their device, they view data from the remote virtual machines (VMs) on Microsoft Azure. Survey respondents estimated that 44% of revenue was at risk two years ago, based on the number of employees requiring access to company data and the procedures and security tools at that time. Today, this has dropped to 33%.[4]

- **Employee experience.** At the time of this study, many employees are working from home due to

COVID-19. With the Citrix Virtual Apps and Desktops service and resources hosted on Microsoft Azure, employees are provided convenient tools to get work done with fewer added steps to ensure secure access.

- **Disaster recovery.** Furthermore, a business continuity event like COVID-19 can significantly impact business. With Citrix cloud services, organizations were able to easily shift employees to a work-from-home model with virtual desktop and application access. Cloud flexibility helps to significantly reduce disaster recovery infrastructure and response costs while increasing agility. This is compared to building and maintaining an on-premises infrastructure that is ready for emergency scale.

- **Incremental Azure Virtual Desktop entitlement value.** Microsoft Azure with Azure Virtual Desktop provides multisession features that Citrix can leverage, enabling license cost savings for organizations. Sixty-one percent of survey respondents reported that the Azure Virtual Desktop integration with Citrix Virtual Apps and Desktops service was a very important factor in their decision to invest.[5]

Quantified costs for the composite organization. Risk-adjusted PV costs include:

- **Citrix cloud services and Microsoft Azure licensing.** License costs for both services are based on usage, adding up to $2.5 million over three years.

- **Net-new implementation and ongoing costs.** Cloud migration tasks and new ongoing IT tasks add up to $170,000 over three years.

The customer interviews and financial analysis found that a composite organization experiences benefits of $6.70M over three years versus costs of $2.66M, adding up to a net present value of $4.05 million and an ROI of 153%.

ROI
153%

BENEFITS PV
$6.70M

NPV
$4.05M

Benefits (Three-Year)

IT management efficiency	$2.0M
Help-desk call savings	$590.0K
Device and employee onboarding	$1.2M
Software and hardware cost savings	$1.1M
Employee productivity improvements	$1.9M

Total IT benefits: **$4.7 million**
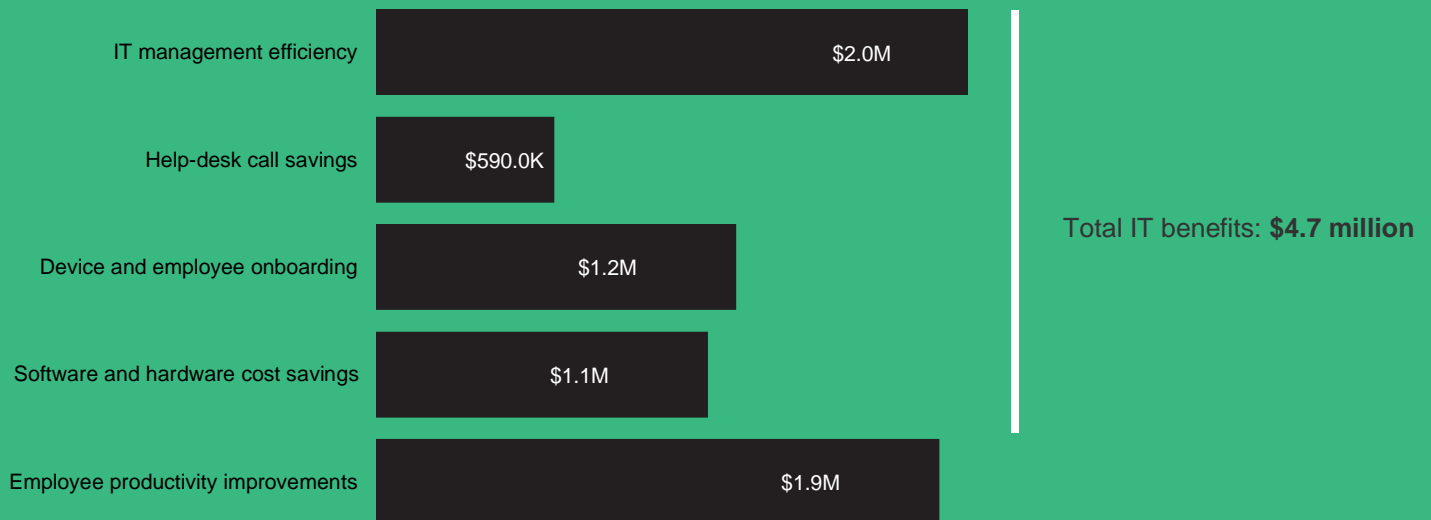
"**None of our application development leaves our network. Home workers see a remote screen, and they work from that. That enables us to keep everything pretty secure.**"

— Workplace services manager, insurance

TEI FRAMEWORK AND METHODOLOGY

From the information provided in the interviews, Forrester constructed a Total Economic Impact™ framework for those organizations considering an investment in the Citrix Virtual Apps and Desktops service running on Microsoft Azure cloud platform services.

The objective of the framework is to identify the cost, benefit, flexibility, and risk factors that affect the investment decision. Forrester took a multistep approach to evaluate the impact that the Citrix Virtual Apps and Desktops service can have on an organization.

DISCLOSURES

Readers should be aware of the following:

This study is commissioned by Citrix and delivered by Forrester Consulting. It is not meant to be used as a competitive analysis.

Forrester makes no assumptions as to the potential ROI that other organizations will receive. Forrester strongly advises that readers use their own estimates within the framework provided in the study to determine the appropriateness of an investment in the Citrix Virtual Apps and Desktops service.

Citrix reviewed and provided feedback to Forrester, but Forrester maintains editorial control over the study and its findings and does not accept changes to the study that contradict Forrester's findings or obscure the meaning of the study.

Citrix provided the customer names for the interviews but did not participate in the interviews.

DUE DILIGENCE
Interviewed Citrix stakeholders and Forrester analysts to gather data relative to the Citrix Virtual Apps and Desktops service.

CUSTOMER INTERVIEWS
Interviewed four decision-makers at organizations using the Citrix Virtual Apps and Desktops service to obtain data with respect to costs, benefits, and risks.

COMPOSITE ORGANIZATION
Designed a composite organization based on characteristics of the interviewed organizations.

FINANCIAL MODEL FRAMEWORK
Constructed a financial model representative of the interviews using the TEI methodology and risk-adjusted the financial model based on issues and concerns of the interviewed organizations.

CASE STUDY
Employed four fundamental elements of TEI in modeling the investment impact: benefits, costs, flexibility, and risks. Given the increasing sophistication of ROI analyses related to IT investments, Forrester's TEI methodology provides a complete picture of the total economic impact of purchase decisions. Please see Appendix A for additional information on the TEI methodology.

Interviewed Organizations

Industry	Region	Interviewee	Employees	Revenue	Migration path
Insurance	Headquartered in Australia	Workplace services manager	12,000	$12 billion	On-premises Citrix servers
Transportation and logistics	Headquartered in Europe	IT director	4,500	$2 billion	On-premises Citrix servers
Government	US municipal government	CTO	1,000	$200 million (budget)	Greenfield virtualization
Transportation and logistics	Headquartered in the US	Assistant vice president, IT	2,600	$5 billion	Greenfield virtualization

KEY CHALLENGES

For this study, Forrester interviewed four organizations: three enterprise businesses and one US municipal government. Additionally, it collected survey responses from 31 separate organizations that all currently use the Citrix Virtual Apps and Desktops service, Citrix cloud services, and Microsoft Azure with Azure Virtual Desktop. Two of the interviewed organizations and all of the surveyed organizations have migrated legacy on-premises Citrix VDI implementations to Citrix cloud services. Interviewed organizations range from 1,000 to 12,000 employees, and surveyed organizations range from 200 to 100,000 employees. One-third of all employees, from both the interviewed and surveyed groups, use the Citrix Virtual Apps and Desktops service with resources hosted on Microsoft Azure.

These organizations previously struggled with common challenges, including:

- **Management efficiency.** Ninety percent of surveyed organizations agreed that lowering help-desk calls was a somewhat important or very important priority.[6] Cloud-delivered and virtualized desktop environments can be managed in a streamlined, standardized way, pooling workstation use cases into a few user

personas that can be replicated or updated quickly, meeting any scale needs. The infrastructure manager for the US transportation and logistics service provider said, "If you have to patch each workstation, it takes time, you have to coordinate with more people, and you have more chances for failure."

Support was another pain point. The CTO for the municipal government said: "Turnaround time was too long. If a computer breaks, we would send someone out, and a lot of times they would bring the machine back to our support offices to source parts or reimage before returning to the employee — that could take a day or several days."

> **"A support call could take several days, and we were losing end-user productivity."**
>
> *CTO, municipal government*

- **Cloud flexibility.** Organizations found themselves with several regional data centers that were managing virtual solutions and other functions for groups of offices, that meant disjointed IT functions that took up a lot of office space. The workplace services manager for the insurance company said, "We had three separate, local implementations of Citrix in Australia, Europe, and North America." Organizations wanted to centralize data center operations, including virtual desktops.

> **"There are a number of data security issues; data privacy is important."**
>
> *IT director, European transportation*

Cloud flexibility was also seen as a way to support business growth. The US transportation and logistics service provider said, "We wanted to open other campuses, and needed to become more flexible in technologies to support our employees."

Seventy-one percent of survey respondents reported that their high on-premises costs was a very important investment factor. And 65% stated how limited capacity with current, on-premises VM density was also very important.[7]

- **Security.** Organizations looked to improve security with a cloud-delivered DaaS approach that would limit both sharing data outside the network and data exfiltration. When asked about their overall security profile two years ago, survey respondents averaged 44%, which translates to a medium amount of risk.[8] The workplace services

manager for the insurance company said: "We have an offshore shared services center that does a lot of account processing. We needed to focus on security and the ability to keep all of the data effectively within the data center."

The municipal government highlighted the desire for improved user security. The CTO said: "We waited to make changes for security reasons. We weren't going to be able to provide a desktop experience to all our end users, because it would just be too expensive. But with [Citrix and] Azure Virtual Desktop, we don't need to provide persistent desktops, every day we can wipe away anything new and build a new workspace with user settings and applications next time."

Interviewed and surveyed organizations needed a solution that maintained or improved security; for some this was a client requirement. The IT director for the European transportation and logistics service provider added, "Internet access from many of our customers is highly regulated for security reasons."

> **"We started running out of physical space in our building."**
>
> *Infrastructure manager, US transportation and logistics services*

SOLUTION REQUIREMENTS

The interviewed organizations searched for a solution that could:

- Provide employees convenient access to information to do their jobs.

- Design employee access security controls to minimize accidental loss or malicious exploitation.

- Improve IT PC management efficiency.

- Reduce software and other costs.
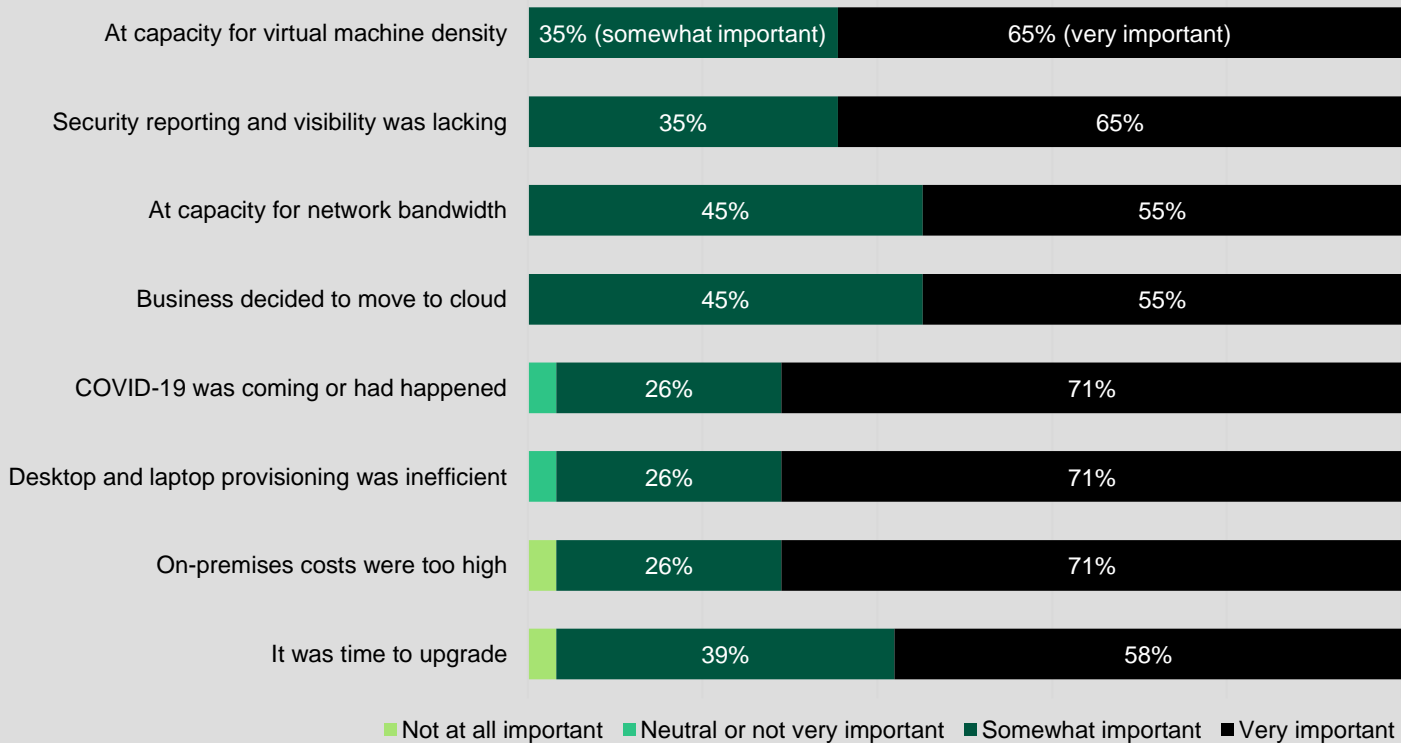
- Support their cloud-first strategy.

Survey respondents highlighted key reasons for implementing the Citrix Virtual Apps and Desktops service with resources hosted on Microsoft Azure. Every respondent identified VM density and network bandwidth as being either somewhat important or very important, along with the need for better security reporting and organizations' broader cloud-first strategies. The chart on this page shows the top eight factors that respondents rated as being somewhat important or very important.[9]

With the Citrix Virtual Apps and Desktops service, organizations found a solution that could deliver streamlined IT management and fewer employee interruptions while delivering high security. The DaaS solution provides remote workers with cloud-delivered screen updates of resources without having to send confidential information down to endpoints.

COMPOSITE ORGANIZATION

Based on the interviews and survey responses, Forrester constructed a TEI framework, a composite company, and a ROI analysis that illustrates the areas financially affected. The composite organization is used to present the aggregate financial analysis in the next section. While readers will likely find their own organization to be either larger or smaller than the composite, many if not all of the benefits should remain valid, and they can use the calculations shown in the benefit and cost tables

Business And IT Factors Driving The Implementation Of The Citrix Virtual Apps And Desktops Service

Factor	Somewhat important	Very important
At capacity for virtual machine density	35% (somewhat important)	65% (very important)
Security reporting and visibility was lacking	35%	65%
At capacity for network bandwidth	45%	55%
Business decided to move to cloud	45%	55%
COVID-19 was coming or had happened	26%	71%
Desktop and laptop provisioning was inefficient	26%	71%
On-premises costs were too high	26%	71%
It was time to upgrade	39%	58%

■ Not at all important ■ Neutral or not very important ■ Somewhat important ■ Very important

Base: 31 IT decision-makers responsible for virtualization
Note: Percentages may not total 100 because of rounding.
Source: A commissioned study conducted by Forrester Consulting on behalf of Citrix, March 2021

to fill in and total their own business KPIs and financial estimates.

The composite organization has the following characteristics:

Description of composite. The composite organization is a $5 billion global enterprise, with 15,000 employees. About one-third of employees regularly access work resources using Citrix cloud virtual solutions. It estimates that 1.5 help-desk calls are made per employee per year related to PC issues, and each call takes on average 90 minutes to resolve. About 15% of employees go through an on-boarding process, whether as a new hire or as transfer to a different department. And its current virtual desktop management includes legacy management and VPN software.

Deployment characteristics. About 5,000 (or one-third of) employees have Citrix cloud services access, and they use it regularly to access work resources. With some location and shift overlap, 4,500 total licenses are required. Two-thirds of these licenses were migrated from the Citrix on-premises VDI solution to Citrix cloud services. For the composite organization, migration took about three months before it was fully operational for all users.

Composite organization key assumptions:

- **$5 billion revenue**
- **15,000 employees**
- **5,000 Citrix cloud services users**
- **4,500 Citrix cloud services licenses**
- **1.5 PC-related help-desk calls per employee**
- **15% onboarding rate**
- **Legacy software: desktop management, VPN, and others**

Analysis Of Benefits

Quantified benefit data as applied to the composite

Total Benefits						
Ref.	**Benefit**	**Year 1**	**Year 2**	**Year 3**	**Total**	**Present Value**
Atr	IT management efficiency	$786,240	$786,240	$786,240	$2,358,720	$1,955,263
Btr	Help-desk call savings	$237,263	$237,263	$237,263	$711,788	$590,037
Ctr	Device and employee onboarding	$478,800	$478,800	$478,800	$1,436,400	$1,190,705
Dtr	Software and hardware cost savings	$228,000	$456,000	$684,000	$1,368,000	$1,098,032
Etr	Employee productivity improvements	$748,800	$748,800	$748,800	$2,246,400	$1,862,155
	Total benefits (risk-adjusted)	$2,479,103	$2,707,103	$2,935,103	$8,121,308	$6,696,192

IT MANAGEMENT EFFICIENCY

Evidence and data. With the Citrix Virtual Apps and Desktops service and workloads running on Microsoft Azure, organizations can streamline and centralize IT management.

- The insurance company had three separate, regional infrastructures, IT departments, and desktop images, with a lot of overlap and inefficiency built in to their on-premises implementation. The workplace services manager highlighted the value enabled with a cloud implementation, "With this move, we've been able to move to a single global desktop image." With image management being streamlined, one FTE has been saved from having to manage multiple on-premises sites.

- The government agency has leveraged the Citrix Virtual Apps and Desktops service with their Azure Virtual Desktop entitlement to deliver an on-demand, multisession desktop and application work environment. It can provide this to many users that don't need much personalization. The CTO said: "These are built on the fly with a

personalization layer and an application layer. We want to make sure that each day we can put things back to a pristine state, for security reasons."

Modeling and assumptions. Based on interviews and survey results, Forrester assumes the following for the composite organization:

- One hundred total IT FTE resources are focused on all corporate PC management activities.

- The average hourly rate for these FTEs (fully burdened) is $42.

- Citrix cloud services and Microsoft Azure enables a 10% improvement in overall IT management efficiency, with those 10 FTEs being reallocated to higher value roles.

Risks. Overstated benefits may occur if the benefit impact estimate is too high. To account for this risk, Forrester adjusted this benefit downward by 10%.

Results. The three-year, risk-adjusted total PV is $2.0 million.

IT Management Efficiency

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
A1	IT resources (FTEs)	Composite	100	100	100
A2	Hourly salary for desktop management resources (average, fully burdened)	Assumption	$42	$42	$42
A3	Efficiency due to Citrix and Azure	Composite	10%	10%	10%
At	IT management efficiency	A1*A3*A2*2,080	$873,600	$873,600	$873,600
	Risk adjustment	↓10%			
Atr	IT management efficiency (risk-adjusted)		$786,240	$786,240	$786,240
	Three-year total: $2,358,720		Three-year present value: $1,955,263		

HELP-DESK CALL SAVINGS

Evidence and data. With the Citrix Virtual Apps and Desktops service and workloads running on Microsoft Azure, interviewed organizations have been able to reduce support requests with more efficient IT management. Application and operating system updates are efficiently applied to the master image, and then they are replicated to thousands of cloud VMs the next time employees log in. Data access is contained, so security-related issues are reduced. And Citrix tools are easy to use, employees do not spend a lot of time logging in to various systems. Employee interruptions are avoided, accidental data loss is contained, and application and operating

system (OS) support issues are reduced. Examples from interviewed organizations include:

- The insurance organization has streamlined processes and formed a single global desktop image by leveraging the Citrix Virtual Apps and Desktops service features to manage applications and move skilled IT administrators from redundant imaging procedures to higher value tasks. The workspace services manager said, "We are probably saving a total of one FTE compared to our old process of creation, test, and deployment of images specific to each region."

- The European transportation and logistics service provider has seen improvements in client support. The IT director said, "We're reducing the number of interventions, because we can just reset a password or reboot a terminal remotely instead of locally."

- The municipal government has streamlined activities with a central image and used monitoring capabilities in the Citrix Virtual Apps and Desktops service to track results and diagnose and resolve issues more quickly and proactively. As stated by the CTO: "We can work

Annual PC-related support calls saved with Citrix cloud services

3,000 calls

through remote-user issues a little better. We can identify an issue [that] might be a user's home network; we can get them working on rebooting or fixing that, while not taking time trying to find a corporate network issue."

- Survey respondents reported that about half of all help-desk calls are related to a PC issue such as hardware, OS, application, and password resets. Respondents further reported a 33% reduction in help-desk calls.[10]

Modeling and assumptions. For the composite organization, Forrester's model includes:

- There are about 9,000 PC-related help-desk support requests from employees now accessing company resources via the virtual desktop and application solution. That is 1.8 calls per employee per year.

- Each request takes an average of 1 hour and 15 minutes to complete.

- The average hourly rate for help-desk technicians (fully burdened) is $27.

- After implementing Citrix Virtual Apps and Desktop service, calls are reduced to 1.2 support requests per employee per year, which is a total of 6,000 calls.

- Each call that now takes place requires 20 minutes to complete.

Risks. Estimates for the number of help-desk calls or the time to resolve each call may be overestimated. To account for these risks, Forrester adjusted this benefit downward by 5%.

Results. The three-year, risk-adjusted total PV (discounted at 10%) is $544,000.

Help-Desk Call Savings					
Ref.	Metric	Calculation	Year 1	Year 2	Year 3
B1	Prior PC-related help-desk calls for Citrix cloud users per year	Composite	9,000	9,000	9,000
B2	Prior time to resolve help-desk calls (minutes)	Composite	75	75	75
B3	Current PC-related help-desk calls for Citrix cloud users per year	Composite	6,000	6,000	6,000
B4	Current time to resolve help-desk calls (minutes)	Composite	20	20	20
B5	Hourly salary for help-desk support technician (fully burdened)	Assumption	$27	$27	$27
Bt	Help-desk call savings	((B1*B2)-(B3*B4))*B5/60	$249,750	$249,750	$249,750
	Risk adjustment	↓5%			
Btr	Help-desk call savings (risk-adjusted)		$237,263	$237,263	$237,263
	Three-year total: $711,788			**Three-year present value: $590,037**	

DEVICE AND EMPLOYEE ONBOARDING

Evidence and data. With the Citrix Virtual Apps and Desktops service, desktop provisioning is significantly improved.

- The US transportation service provider identified image consolidation as a key benefit. The infrastructure manager said, "We have reduced a lot of work for our folks that used to spend a lot of time building PCs and setting them up on desks."

- The workplace services manager for the insurance company added that a bring-your-own-device model can be beneficial with getting employees up and running more quickly: "It can be challenging to get hardware out to people by their first day. Having a solution where they can have a virtual desktop they can log in and get started on things from their home device until the corporate device arrives is very helpful."

- Survey respondents report that two years ago IT device provisioning took them 5.5 hours to complete. This process currently takes 3.5 hours with Citrix cloud services and streamlined imaging processes.[11]

Modeling and assumptions. For the composite organization, Forrester's model includes:

- Fifteen hundred new or transferred employees are onboarded to the company or new department each year. This is about 30% of the organization's total employees using Citrix cloud.

- An overall company turnover rate of 10% is also assumed, so the annual net company change in the number of employees is 0%. Readers can adjust Year 2 or Year 3 numbers to reflect their own growth.

- Before Citrix cloud services, employee onboarding took 15 total hours from IT, facilities, and HR resources.

- With Citrix cloud services, employee onboarding now takes 7 hours.

- The average hourly rate for these FTEs (fully burdened) is $42.

Time per employee onboarding is reduced from 15 hours to 7 hours.

Risks. Forrester has identified the following variables as factors that could potentially lead to overestimation. Additionally, while newly hired or transferred employee time savings were not estimated by interview and survey respondents, they could be included in a reader's custom analysis. Both of these risks are largely due to organization's specific onboarding provisioning environment, as compared to the composite organization:

- The hours required to complete onboarding tasks.

- The share of improvement enabled by Citrix cloud services.

To account for these risks, Forrester adjusted this benefit downward by 5%.

Results. The three-year, risk-adjusted total PV is $1.1 million.

Device And Employee Onboarding

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
C1	Onboardings each year (new and transferred employees using Citrix cloud)	30% of Citrix cloud services users	1,500	1,500	1,500
C2	Prior number of hours to complete onboarding process	Composite	15	15	15
C3	Current number of hours to complete onboarding	Composite	7	7	7
C4	Hourly salary for onboarding support employees (blended average, fully burdened)	Assumption	$42	$42	$42
Ct	Device and employee onboarding	C1*(C2-C3)*C4	$504,000	$504,000	$504,000
	Risk adjustment	↓5%			
Ctr	Device and employee onboarding (risk-adjusted)		$478,800	$478,800	$478,800
	Three-year total: $1,436,400		**Three-year present value: $1,190,705**		

SOFTWARE AND HARDWARE COST SAVINGS

Evidence and data. With Citrix cloud services and Microsoft Azure, several legacy applications, on-premises servers, and data center operations or services costs can be reduced or retired. Interviewees and survey respondents highlighted several examples:

- Survey respondents said a shift to cloud was inevitable. All respondents noted that both the Citrix Virtual Apps and Desktops service was part of a larger cloud strategy and previous VM density and network bandwidth were at capacity, necessitating a change.[12]

- The insurance company highlighted Autoscale, a Citrix technology that dynamically manages cloud capacity, as a key enabler of value. The workplace services manager said: "We use Autoscale to control how many machines are available at any given time. We've been able to fine-tune the right availability of PCs and not have a lot of unused VMs."

- Similarly, the government agency has used Autoscale to tweak cloud capacity and usage

across all end users, reducing metered application and infrastructure cloud usage.

- The government agency has also added some thin client devices to its device pool. The IT department can deliver a virtual environment with access to all the necessary work resources, but it can also avoid spending more on employees that don't need a powerful processor, large hard drive, and other peripherals. It estimates as much as 30% of its own workforce could eventually benefit from this option, saving the department $800 to $1,500 per device replacement.

- Additionally, both the government agency and the US transportations organization were new to DaaS with the implementation of the Citrix Virtual Apps and Desktops service. This has allowed the reduction or retirement of several legacy solutions, such as VPN software.

Modeling and assumptions. For the composite organization, Forrester's model estimates that in Year 1, software and hardware cost savings total $240,000. In Years 2 and 3, those same cost savings total $480,000 and $720,000, respectively. This reflects the necessary ramp-up time to fully migrate

functionality, retire on-premises data centers, and end licensing contracts.

Risks. Since interview and survey responses varied in previous implementations, and thus in the amount

of software and hardware able to be retired, Forrester has reduced this benefit with a 5% risk adjustment.

Results. The three-year, risk-adjusted total PV is $1.1 million.

Software And Hardware Cost Savings

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
D1	Software and hardware costs savings reduced or retired with Citrix cloud	Composite	240,000	480,000	720,000
Dt	Software and hardware cost savings	D1	$240,000	$480,000	$720,000
	Risk adjustment	↓5%			
Dtr	Software and hardware cost savings (risk-adjusted)		$228,000	$456,000	$684,000
	Three-year total: $1,368,000		**Three-year present value: $1,098,032**		

EMPLOYEE PRODUCTIVITY IMPROVEMENTS

Evidence and data. Finally, all the IT help-desk, imaging, patching, and other improvements have reduced interruptions for end users. And the Citrix Virtual Apps and Desktops service with Microsoft Azure has provided a platform where employees can securely access work resources from any device at any location. Interviewed organizations highlighted:

- The municipal government has leveraged the Citrix Virtual Apps and Desktops service hosted on Microsoft Azure with their Azure Virtual Desktop entitlement to improve service, which has raised employee satisfaction. As stated by the CTO: "We have virtualized desktops with Windows 10 multisession. With Citrix Analytics we can track user flow and experience, such as login time. We can actually see over time that improvements to the system leads to improved user performance, with now over 90% of users reporting an 'excellent' experience."

- The IT director for the European transportation company highlighted the added value of reliable business continuity without interruptions that require help-desk support: "I don't have to have people at every site to manage our apps. Our agents are able to get the support they need

virtually, while expanding and extending our offers to add value for our clients."

- Survey respondents reported an 84% employee satisfaction from two years ago, and this rate has improved to 93% today.[13]

Modeling and assumptions. For the composite organization, Forrester has estimated:

- About 5,000 employees have access to a Citrix cloud services desktop and application environment, and they use it daily to access work resources.

- While all employees saw some degree of improvement, the number of employees that dealt with regular frustration and interruptions was reduced: 750 employees, or 15% of all Citrix cloud users.

- Those employees that saw measurable improvement were able to save up to 5% of their time each week (or 2 hours).

- The average hourly rate for these employees (fully burdened) is $30.

- As a standard, Forrester assumes that not all end user time saved is used for additional work. Breaks or socializing with colleagues are likely part of that time saved, which can provide value to the company. But for the purposes of this study, a 40% productivity realization factor is applied.

Risks. Given the difficulty in taking an average across all employees at an organization, with many different tasks and use cases, a 20% risk adjustment has been applied.

Results. The three-year, risk-adjusted total PV is $1.9 million.

Employee productivity improvement

5%

Employee Productivity Improvements					
Ref.	**Metric**	**Calculation**	**Year 1**	**Year 2**	**Year 3**
E1	Employees most impacted by Citrix cloud services		750	750	750
E2	Productivity improvement		5%	5%	5%
E3	Hourly salary for information workers (average, fully burdened)		$30	$30	$30
E4	Productivity realization factor		40%	40%	40%
Et	Employee productivity improvements	E1*E2*E3 *E4*2,080	$936,000	$936,000	$936,000
	Risk adjustment	↓20%			
Etr	Employee productivity improvements (risk-adjusted)		$748,800	$748,800	$748,800
	Three-year total: $2,246,400		**Three-year present value: $1,862,155**		

UNQUANTIFIED BENEFITS

Additional benefits that customers experienced but were not able to quantify include:

- **Security.** With the Citrix Virtual Apps and Desktops service, employees don't download data to their device, they view data on the remote VM running in Microsoft Azure. This is an especially important security feature for remote workers accessing sensitive company data. Survey respondents estimated that 44% of revenue was at risk two years ago, based on the number of employees requiring access to company data and the procedures and security tools at that time. Today, this has dropped to 33%.[14] With Citrix cloud services, the risk of data leakage is lower as remote employees can use home or public internet access with less risk of snooping. Organizations can also block employee downloads without impeding work, and cloud services are up to date with the latest patches.

- **Employee experience.** At the time of this study, many employees are working from home due to COVID-19. With Citrix Virtual Apps and Desktops service and Microsoft Azure, employees are provided convenient tools to get work done with fewer added steps to ensure secure access. Survey respondents rated their organization's employee experience two years ago at an average of 84%. Today, that has increased 10 percentage points to 94%.[15]

- **Disaster recovery.** Furthermore, a business continuity event like COVID-19 can significantly impact business. With the Citrix Virtual Apps and Desktops service, organizations were able to easily shift employees with virtual desktop and application access to a work-from-home model. For many that was an automatic shift, and for others it was as simple as provisioning a laptop. However, for the rest, there was some incremental configuration or expansion of the virtual desktop and application user group.

- **Added Microsoft Azure Virtual Desktop entitlement value.** Azure Virtual Desktop enables multisession features that can unlock license cost savings for organizations. Sixty-one percent of survey respondents reported that the Azure Virtual Desktop entitlement was a very

important factor in their decision to invest in the Citrix Virtual Apps and Desktops service with Microsoft Azure.[16]

FLEXIBILITY

The value of flexibility is unique to each customer. There are multiple scenarios in which a customer might implement the Citrix Virtual Apps and Desktops service and later realize additional uses and business opportunities. For the composite organization, future options are particularly focused on expanding its current implementation to more users, including:

- **Increasing the number of the Citrix Virtual Apps and Desktops service users.** Today, only one-third of the company's employees are provisioned a device for virtual desktop and application access; by doubling that number, the organization could expect up to double the benefits or perhaps even more, considering those users will be migrating from non-virtual to virtual workspaces. This could mean even more benefit opportunities for organizations that need increased security or greater remote worker support.

- **Increased focus on the Azure Virtual Desktop entitlement.** The composite organization has implemented Windows 10 multisession with the Citrix Virtual Apps and Desktops service by leveraging their Azure Virtual Desktop entitlement. Some Windows license savings due to multisession have been identified, and the organization feels even more savings could be enabled in time with more focus on reporting, management, and increasing the number of virtual desktop and application users, per the previous bullet.

Flexibility would also be quantified when evaluated as part of a specific project (described in more detail in Appendix A).

> **"The number one benefit is the flexibility that we're getting through using Citrix cloud [services] on Azure, and being able to rapidly increase or decrease our footprint to meet the needs of the business. The pandemic was a great example of being able to keep up with increased demand."**
>
> *Infrastructure services manager, transportation services provider*

Analysis Of Costs

■ Quantified cost data as applied to the composite

Total Costs

Ref.	Cost	Initial	Year 1	Year 2	Year 3	Total	Present Value
Ftr	Licensing costs	$0	$997,500	$997,500	$997,500	$2,992,500	$2,480,635
Gtr	Ongoing costs	$0	$34,398	$34,398	$34,398	$103,194	$85,543
Htr	Implementation costs	$84,672	$0	$0	$0	$84,672	$84,672
	Total costs (risk-adjusted)	$84,672	$1,031,898	$1,031,898	$1,031,898	$3,180,366	$2,650,850

LICENSING COSTS

Evidence and data. For the composite organization, the incremental cost of the Citrix Virtual Apps and Desktops service subscription is estimated at $350,000 per year. Only incremental costs are included for virtualization licensing. New licenses, as well as any new costs for migrated on-premises licenses are considered. Expanded Microsoft Azure subscription costs are also included, based on the migration of virtual machine infrastructure to the cloud.[17]

Risks. License subscription costs are based on publicly available information, but those costs may still be underestimated, so a 5% risk adjustment has been applied.

Result. The three-year, risk-adjusted total PV (discounted at 5%) is $2.5. million.

Licensing Costs

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
F1	Citrix Virtual Apps and Desktops service subscription costs			$350,000	$350,000	$350,000
F2	Windows Azure consumption costs for Citrix cloud solution			$600,000	$600,000	$600,000
Ft	Subscription and consumption costs	F1+F2	$0	$950,000	$950,000	$950,000
	Risk adjustment	↑5%				
Ftr	Licensing costs (risk-adjusted)		$0	$997,500	$997,500	$997,500
	Three-year total: $2,992,500			**Three-year present value: $2,480,635**		

ONGOING COSTS

Evidence and data. Only the incremental costs of added or expanded virtual desktop management has been included in ongoing cost estimates, such as new tasks specific to implementing the Citrix Virtual Apps and Desktops service, Microsoft Azure, and/or the Azure Virtual Desktop entitlement.

For the composite organization, a total of 15 hours per week of new task time is estimated for the entire IT team.

Risks. To allow for underestimation, this cost has been adjusted by 5%.

Results. The three-year, risk-adjusted total PV is less than $84,000.

Ongoing Costs						
Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
G1	Total additional resource time required for new Citrix cloud services tasks (hours per week)			15	15	15
G2	Hourly salary for desktop management resources (average, fully burdened)			$42	$42	$42
Gt	Ongoing costs	G1*G2*52	$0	$32,760	$32,760	$32,760
	Risk adjustment	↑5%				
Gtr	Ongoing costs (risk-adjusted)		$0	$34,398	$34,398	$34,398
	Three-year total: $103,194			**Three-year present value: $85,543**		

IMPLEMENTATION COSTS

Evidence and data. The Citrix cloud services solution implementation costs include migrating existing on-premises virtualization infrastructure to Microsoft Azure and expanding to a larger cloud-based virtualization infrastructure.

**Risks.** A 5% risk adjustment has been applied in case of underestimation.

Results. The risk-adjusted up-front total cost is $85,000.

Implementation Costs

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
H1	Resources required for Citrix cloud services Deployment (FTE)		4			
H2	Time to deploy Citrix cloud services (months)		12			
H3	Hourly salary for desktop management resources (average, fully burdened)		$42			
Ht	Implementation costs	H1*H2*H3*40	$80,640	$0	$0	$0
	Risk adjustment	↑5%				
Htr	Implementation costs (risk-adjusted)		$84,672	$0	$0	$0
	Three-year total: $84,672			**Three-year present value: $84,672**		

Financial Summary

CONSOLIDATED THREE-YEAR RISK-ADJUSTED METRICS

Cash Flow Chart (Risk-Adjusted)
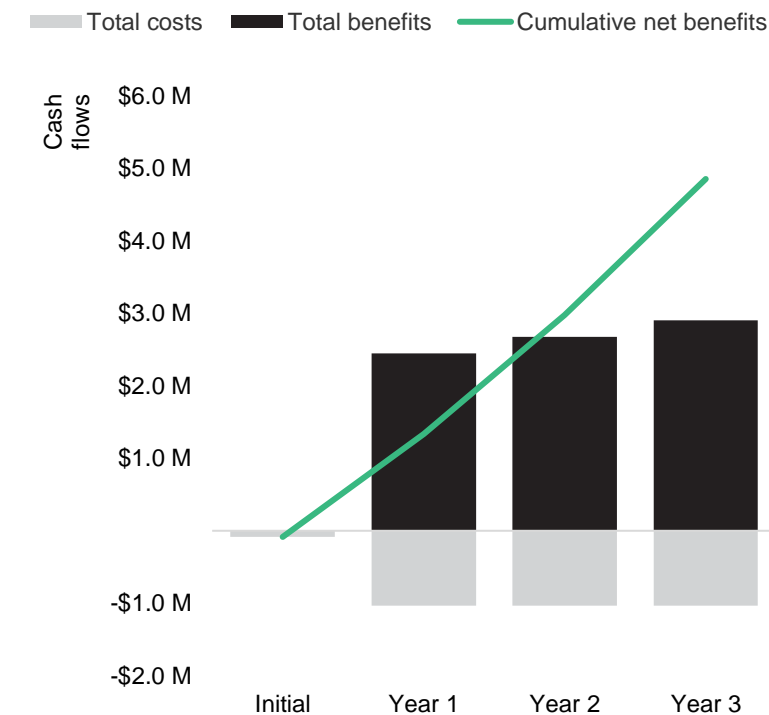
The financial results calculated in the Benefits and Costs sections can be used to determine the ROI and NPV for the composite organization's investment. Forrester assumes a yearly discount rate of 10% for this analysis.

These risk-adjusted ROI and NPV values are determined by applying risk-adjustment factors to the unadjusted results in each Benefit and Cost section.

Cash Flow Analysis (Risk-Adjusted Estimates)						
	Initial	Year 1	Year 2	Year 3	Total	Present Value
Total costs	($84,672)	($1,031,898)	($1,031,898)	($1,031,898)	($3,180,366)	($2,650,850)
Total benefits	$0	$2,479,103	$2,707,103	$2,935,103	$8,121,308	$6,696,192
Net benefits	($84,672)	$1,447,205	$1,675,205	$1,903,205	$4,940,942	$4,045,342
ROI						153%

Appendix A: Total Economic Impact

Total Economic Impact is a methodology developed by Forrester Research that enhances a company's technology decision-making processes and assists vendors in communicating the value proposition of their products and services to clients. The TEI methodology helps companies demonstrate, justify, and realize the tangible value of IT initiatives to both senior management and other key business stakeholders.

TOTAL ECONOMIC IMPACT APPROACH

Benefits represent the value delivered to the business by the product. The TEI methodology places equal weight on the measure of benefits and the measure of costs, allowing for a full examination of the effect of the technology on the entire organization.

Costs consider all expenses necessary to deliver the proposed value, or benefits, of the product. The cost category within TEI captures incremental costs over the existing environment for ongoing costs associated with the solution.

Flexibility represents the strategic value that can be obtained for some future additional investment building on top of the initial investment already made. Having the ability to capture that benefit has a PV that can be estimated.

Risks measure the uncertainty of benefit and cost estimates given: 1) the likelihood that estimates will meet original projections and 2) the likelihood that estimates will be tracked over time. TEI risk factors are based on "triangular distribution."

The initial investment column contains costs incurred at "time 0" or at the beginning of Year 1 that are not discounted. All other cash flows are discounted using the discount rate at the end of the year. PV calculations are calculated for each total cost and benefit estimate. NPV calculations in the summary tables are the sum of the initial investment and the discounted cash flows in each year. Sums and present value calculations of the Total Benefits, Total Costs, and Cash Flow tables may not exactly add up, as some rounding may occur.

PRESENT VALUE (PV)

The present or current value of (discounted) cost and benefit estimates given at an interest rate (the discount rate). The PV of costs and benefits feed into the total NPV of cash flows.

NET PRESENT VALUE (NPV)

The present or current value of (discounted) future net cash flows given an interest rate (the discount rate). A positive project NPV normally indicates that the investment should be made, unless other projects have higher NPVs.

RETURN ON INVESTMENT (ROI)

A project's expected return in percentage terms. ROI is calculated by dividing net benefits (benefits less costs) by costs.
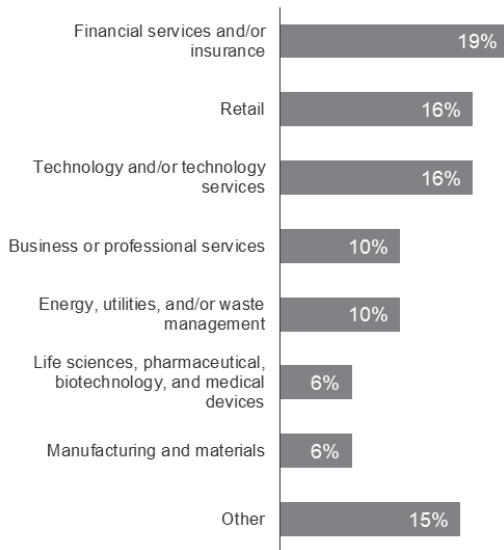
DISCOUNT RATE

The interest rate used in cash flow analysis to take into account the time value of money. Organizations typically use discount rates between 8% and 16%.
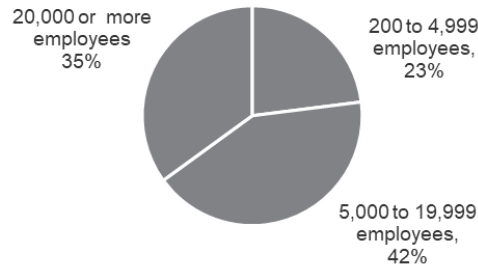
Appendix B: Survey Demographics

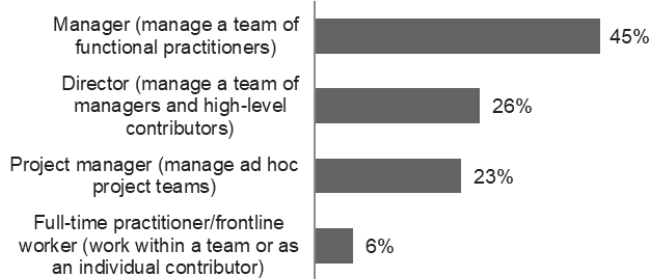**"Which of the following best describes the industry to which your company belongs?"**

Industry	Percentage
Financial services and/or insurance	19%
Retail	16%
Technology and/or technology services	16%
Business or professional services	10%
Energy, utilities, and/or waste management	10%
Life sciences, pharmaceutical, biotechnology, and medical devices	6%
Manufacturing and materials	6%
Other	15%

"Using your best estimate, how many employees work for your firm/organization worldwide?"

- 20,000 or more employees 35%
- 200 to 4,999 employees, 23%
- 5,000 to 19,999 employees, 42%

"In which country are you located?"

87%	United States
6%	United Kingdom
6%	Canada
3%	Philippines

"Which title best describes your position at your organization?"

Title	Percentage
Manager (manage a team of functional practitioners)	45%
Director (manage a team of managers and high-level contributors)	26%
Project manager (manage ad hoc project teams)	23%
Full-time practitioner/frontline worker (work within a team or as an individual contributor)	6%

Base: 31 IT decision-makers responsible for virtualization
Note: Percentages may not total 100 because of rounding.
Source: A commissioned study conducted by Forrester Consulting on behalf of Citrix, March 2021

Appendix C: Endnotes

[1] Microsoft Azure Virtual Desktop is formerly known as Windows Virtual Desktop.

[2] Total Economic Impact is a methodology developed by Forrester Research that enhances a company's technology decision-making processes and assists vendors in communicating the value proposition of their products and services to clients. The TEI methodology helps companies demonstrate, justify, and realize the tangible value of IT initiatives to both senior management and other key business stakeholders.

[3] For this TEI study, interviewed and surveyed organizations are all Citrix Virtual Apps and Desktops service customers, and they all have also hosted their Citrix cloud services on Microsoft Azure (though hosting on other cloud platforms is an option). Two of four interviewees and nearly all survey respondents have migrated from an on-premises Citrix virtualization solution — the rest were new to virtualization with the implementation of Citrix cloud services. One interviewee has also implemented Microsoft Azure Virtual Desktop entitlement for its Windows 10 licensing.

[4] Source: A commissioned study conducted by Forrester Consulting on behalf of Citrix, February 2021. The percentage referenced in this sentence is based on 23 worldwide IT decision-makers with desktop management responsibility responding to the statement: "Please quantify your potential estimated risk exposure as a percentage of revenue that could be at risk. This could be due to employee error, fraud, hacking, natural disaster, or any other potential reason."

[5] Source: A commissioned study conducted by Forrester Consulting on behalf of Citrix, February 2021. The percentage referenced in this sentence is based on 31 worldwide IT decision-makers with desktop management responsibility who have responded on a range of "Somewhat important" to "Very important" to the question, "How important was each issue or opportunity in the decision to implement the Citrix Virtual Apps and Desktops service with Microsoft Azure?" for the statement, "Windows 10 Enterprise multi-session."

[6] Source: A commissioned study conducted by Forrester Consulting on behalf of Citrix, February 2021. The percentage referenced in this sentence is based on 31 worldwide IT decision-makers with desktop management responsibility who have responded with "Somewhat important" or "Very important" to the question, "How important was each issue or opportunity in the decision to implement the Citrix Virtual Apps and Desktops service with Microsoft Azure?" for the statement, "Too many help desk support calls."

[7] Source: A commissioned study conducted by Forrester Consulting on behalf of Citrix, February 2021. The percentage referenced in this sentence is based on 31 worldwide IT decision-makers with desktop management responsibility who have responded on a range of "Somewhat important" to "Very important" to the question, "How important was each issue or opportunity in the decision to implement the Citrix Virtual Apps and Desktops service with Microsoft Azure?" for the following statements: "On-premises costs were too high (physical servers, maintenance, etc.)" and "At capacity for virtual machine density."

[8] Source: A commissioned study conducted by Forrester Consulting on behalf of Citrix, February 2021. The percentage referenced in this sentence is based on 23 worldwide IT decision-makers with desktop management responsibility responding to the statement, "Please quantify your potential estimated risk exposure as a percentage of revenue that could be at risk. This could be due to employee error, fraud, hacking, natural disaster, or any other potential reason. (Two years ago.)"

[9] Source: A commissioned study conducted by Forrester Consulting on behalf of Citrix, February 2021. The percentage referenced in this sentence is based on 31 worldwide IT decision-makers with desktop management responsibility who have responded on a range of "Somewhat important" to "Very important" to the question, "How important was each issue or opportunity in the decision to implement the Citrix Virtual Apps and Desktops service with Microsoft Azure?"

[10] Source: A commissioned study conducted by Forrester Consulting on behalf of Citrix, February 2021. The data referenced in this sentence is based on 20 worldwide IT decision-makers with desktop management responsibility who have responded to the question, "Of the total help-desk tickets today, what is the percentage share of tickets for each of the following categories?" for the categories of "Desktop, laptop, or thin client issues (hardware, drivers, etc.)" and "Application issues (installed or cloud)." And responding to the question "How many help-desk tickets does your organization receive on average per employee per month? (Today and two years ago.)"

[11] Source: A commissioned study conducted by Forrester Consulting on behalf of Citrix, February 2021. The data referenced in this sentence is based on 20 worldwide IT decision-makers with desktop management responsibility who have responded to the question, "How many hours of IT resource time does it take to provision a new or refurbished laptop or desktop? (Today and two years ago.)"

[12] Source: A commissioned study conducted by Forrester Consulting on behalf of Citrix, February 2021. The percentage referenced in this sentence is based on 31 worldwide IT decision-makers with desktop management responsibility who have responded on a range of "Somewhat important" to "Very important" to the question, "How important was each issue or opportunity in the decision to implement the Citrix Virtual Apps and Desktops service with Microsoft Azure?" for the following statements "At capacity for network bandwidth" and "At capacity for virtual machine density."

[13] Source: A commissioned study conducted by Forrester Consulting on behalf of Citrix, February 2021. The percentage referenced in this sentence is based on 25 worldwide IT decision-makers with desktop management responsibility who have responded to the question, "What is the estimated percentage of satisfied employees at your organization? (Today and two years ago.)"

[14] Source: A commissioned study conducted by Forrester Consulting on behalf of Citrix, February 2021. The percentage referenced in this sentence is based on 23 worldwide IT decision-makers with desktop management responsibility who have responded to the statement: "Please

quantify your potential estimated risk exposure as a percentage of revenue that could be at risk. This could be due to employee error, fraud, hacking, natural disaster, or any other potential reason. (Today and two years ago.)"

[15] Source: A commissioned study conducted by Forrester Consulting on behalf of Citrix, February 2021. The percentage referenced in this sentence is based on 25 worldwide IT decision-makers with desktop management responsibility who have responded to the question, "What is the estimated percentage of satisfied employees at your organization? (Today and two years ago.)"

[16] Source: A commissioned study conducted by Forrester Consulting on behalf of Citrix, February 2021. The percentage referenced in this sentence is based on 31 worldwide IT decision-makers with desktop management responsibility who have responded on a range of "Somewhat important" to "Very important" to the question, "How important was each issue or opportunity in the decision to implement the Citrix Virtual Apps and Desktops service with Microsoft Azure?" for the following statement, "Windows 10 Enterprise multi-session."

[17] Source: A commissioned study conducted by Forrester Consulting on behalf of Citrix, February 2021. Citrix and Microsoft licensing costs are estimated based on the composite organization's size and general use cases. The estimate totals are based on pricing guidelines from April 2021.

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