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Fostering Business and Organizational Transformation to Generate Business Value with Amazon Web Services

Business Value Highlights

51%
lower cost of operations

62%
more efficient IT infrastructure staff

94%
less unplanned downtime

25%
higher developer productivity

Almost 3X
more new features delivered

$36.5 million
per year of additional revenue

6 months
to payback

637%
five-year ROI

EXECUTIVE SUMMARY

As cloud technology has matured, adoption rates have accelerated by demands from business to deliver transformational solutions faster and stave off unexpected competition. IDC has observed the migration to cloud technology resulting in significant benefits to the bottom line not just from cost savings but the ability to continuously deliver innovative solutions using capabilities like machine learning and Internet of Things (IoT).

IDC interviewed 27 organizations around the world running various enterprise workloads on Amazon Web Services (AWS) to understand the impact of AWS on their information technology (IT) and business operations. These interviews revealed that study participants are leveraging AWS to not only lower the cost of providing IT services but change how they deliver IT services and help them transform their business operations to better compete and address market demand. IDC's analysis shows that these AWS customers are achieving strong value at an average of $20.97 million per year per organization over five years. The benefits were achieved by:

- **Creating more cost-effective IT environments** by optimizing compute, storage, and database costs or moving away from running own IT infrastructures (IDC calculates that surveyed organizations will spend 31% less on AWS fees than running a comparable infrastructure.)
- **Shifting IT staff focus** to differentiated work and strategic business initiatives, including substantial gains in application developer productivity (IDC projects that IT infrastructure teams will be on average 62% more efficient and application developers will be 25% more productive with AWS.)

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- **Offering reliable and high-performing applications** that lead to operational efficiencies in the form of higher user productivity and fewer business disruptions, with an average of 94% less productive time lost to these outages with AWS
- **Instilling IT and business operations with the agility** required to deliver cost-effective IT resources on an on-demand basis to address business opportunities as they arise, with interviewed organizations delivering almost three times more new application features with AWS, helping them win more business and increase revenue

SITUATION OVERVIEW

Introduction

Using lessons learned from ecommerce where fluctuating demand for computing resources is common, Amazon kicked off the Amazon Web Services initiative in 2006. Service-oriented architecture (SOA) gained popularity in the mid-1990s to reduce the complexity of software by breaking them up into components delivered as services and connected through common standards. The SOA experience that predated the AWS launch gave Amazon an advantage in building a distributed services architecture offering that fits very well with end-user needs. Using customer feedback, the services offered by AWS have expanded from the initial portfolio that delivered base infrastructure services to higher-end services that are all based on a highly available infrastructure delivered in an abstracted and automated fashion. AWS also provides customers with multiple migration tools to assist them to move compute and database workloads to the public cloud. The success of Amazon is demonstrated by Amazon moving from number 29 on the Fortune 500 list in 2015 to number 12 in 2017.

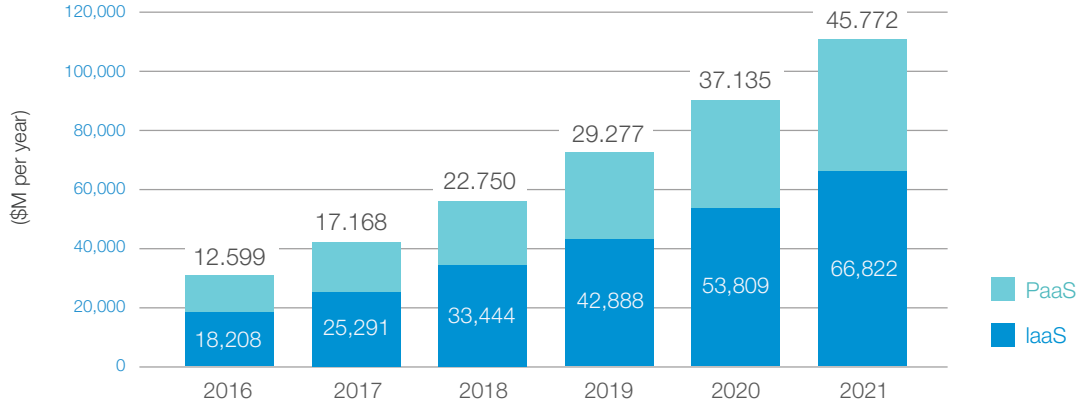
Business Challenges Today

Business processes enabled by cloud technology are moving from gains made by continuous improvement through digitization to increased automation of IT processes. The combination of lower-cost cloud-delivered hardware and agility from open source application development tools is leading to much lower infrastructure and labor costs. As a result, businesses that fail to take advantage of technological innovation often struggle to maintain their competitive advantage as technology innovation and competitiveness through automated processes are tightly linked. By taking advantage of cloud services, organizations can increase agility while decreasing their cost and risk. To surpass competition, today's CEO has to handle the complex task of digitally transforming the entire organization leveraging technology changing at a much faster pace than any time before. With the advent of cloud computing, automation through IT is at the forefront in helping corporations make this transition successful.

Key Cloud Computing Revenue Growth Trends

Figure 1 provides a graphical view of the worldwide public IT cloud services market segmented by primary market. Vendor revenue associated with IaaS and PaaS is projected to grow by about 36% through 2021. This growth illustrates cloud adoption and speaks to the immense value that organizations place on agility gained by developing and deploying innovative applications on highly available public infrastructure procured at lower costs.

FIGURE 1 Worldwide Public IT Cloud Services Revenue by Primary Market, 2016–2021



Source: IDC, 2018

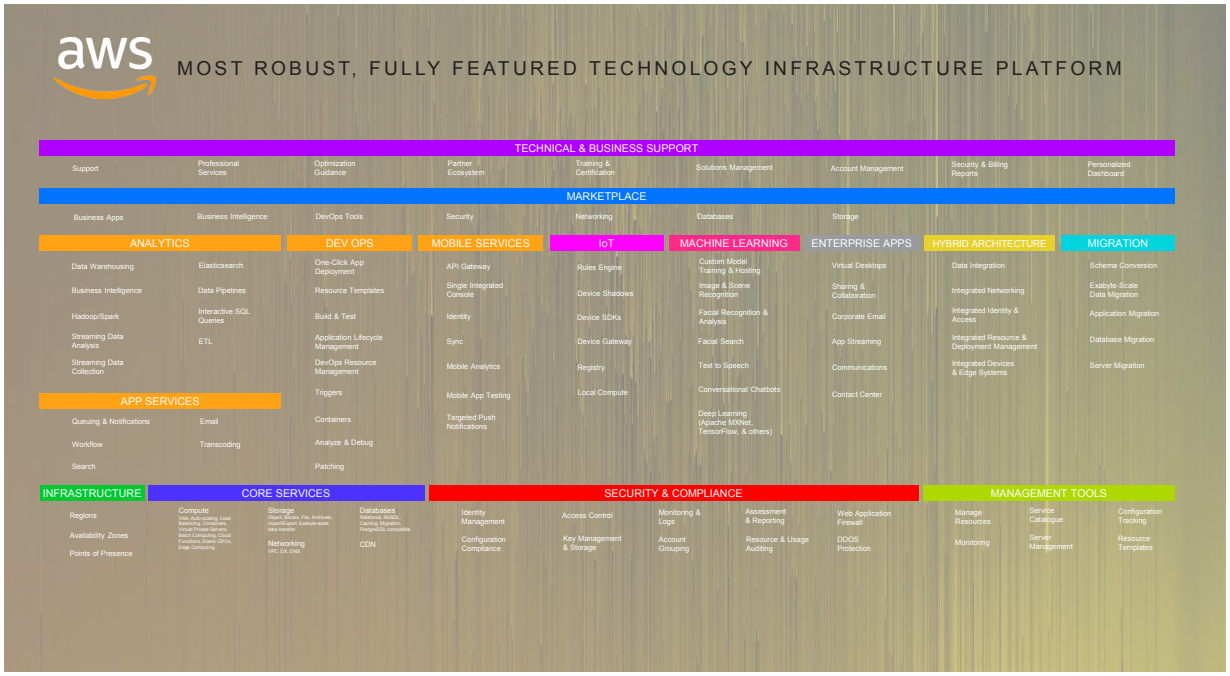
OVERVIEW OF AMAZON WEB SERVICES PORTFOLIO

Amazon Web Services started as a result of responding to Amazon's large-scale ecommerce operations need for a highly scalable infrastructure. In the early days, primarily a set of low-level services like Amazon Elastic Compute Cloud (Amazon EC2) and Amazon Simple Storage Service (Amazon S3) was abstracting the infrastructure for users. The delivery of cloud-delivered services led to rapid adoption by start-ups that found the platform to be flexible, agile, extensible, and available at a low cost. Responding to continuously evolving customer needs, over a period of time, Amazon built a wide array of higher-level services, leading to increased adoption by enterprises that found value in moving from a capex model to an opex model. Services like machine learning are the foundation for developing smarter applications making predictions from patterns detected by analyzing data. AWS' portfolio of services are as follows:

- **Core infrastructure:** Compute, storage, databases, networking, and content delivery
- **Security and compliance:** Identity management, web application firewall, monitoring and logging, key management and storage, and DDoS protection
- **Management tools:** Monitoring, service catalog, and configuration tracking
- **Analytics:** Data warehousing, business intelligence, and streaming data collection and analysis
- **Application services:** Workflow, queuing and notifications, and email
- **DevOps:** Application life-cycle management, resource templates, patching, and one-click app deployment
- **Mobile services:** API gateway, mobile analytics, and mobile app testing
- **IoT:** Rules engine, device solutions, and local compute
- **Machine learning:** Image and scene recognition, text to speech, deep learning, and conversational chatbots
- **Enterprise apps:** App streaming, contact center, and virtual desktops
- **Hybrid architecture:** Integrated networking, integrated devices, and edge systems
- **Migration:** Application, database, and server migration
- **Marketplace:** Business apps, DevOps tools, security, and databases
- **Technical and business support:** Security and billing reports, professional services, and partner ecosystem

Figure 2 identifies the key services provided by AWS today. IDC has found that the benefits from cloud adoption improve when customers align their business goals to take advantage of an on-demand infrastructure that allows rapid experimentation and iteration. The challenge is to transform the organization to remove silos while working in cross-functional teams to deliver on business priorities. Enterprises that complete a thorough portfolio analysis and undertake a journey to transform the most appropriate business processes are likely to position themselves with a competitive technology edge. AWS' portfolio of services provides the tools necessary, but organizations need to take timely action to take advantage of them.

FIGURE 2 Overview of AWS Architecture and Services



Source: AWS, 2018

THE BUSINESS VALUE OF AMAZON WEB SERVICES

Study Demographics

IDC conducted in-depth interviews with 27 organizations around the world running various enterprise-level workloads on AWS and asked them a variety of quantitative and qualitative questions to understand the impact of using AWS on their IT processes, business operations, and costs. The companies surveyed were enterprise level in size as indicated by the substantial number of employees (39,177 employees on average), and the average annual revenue of these organizations was $12.58 billion.

There was good diversity in terms of geographical location and industry. 20 organizations were based in the United States, 4 were located in the EMEA region, and 3 were located in the APAC region. Vertical industries whose experiences were represented included the retail, financial services, government, healthcare, higher education, logistics, manufacturing, natural resources, pharmaceutical, IT professional services, technology, telecommunications, and tourism sectors. The sample included no more than four interviews from any vertical, demonstrating the solid cross-section of industry experiences sampled (see Table 1).

TABLE 1 Demographics of Interviewed Organizations

	Average	Median
Number of employees	39,177	10,000
Number of IT staff	1,221	200
Number of business applications	1,994	96
Revenue per year	$12.58 billion	$3 billion
Countries	United States (20), Germany, Sweden, United Kingdom, Saudi Arabia, India, Malaysia, and New Zealand	
Industries	Consumer goods, financial services (3), government (2), healthcare (2), higher education, logistics, manufacturing (4), natural resources, pharmaceutical (3), IT professional services (4), technology (3), telecommunications, and tourism	

n=27 Source: IDC, 2018

Reasons for Choosing AWS

IT decision makers at interviewed organizations described various reasons for choosing AWS over other available solutions or approaches. Most study participants migrated workloads to AWS from various on-premise datacenter architectures, although several moved to AWS from hosted or from other cloud environments. Organizations looked at both the ability of AWS to serve as a common platform for extensive workloads and specific capabilities in selecting the solution:

- **Using as a common platform**: An APAC financial services organization explained: *"We needed life-cycle management and to manage quality testing and logic on one platform ... . We evaluated various cloud platforms, but chose AWS. The key was that with AWS we would not have to worry about the interoperability between different platforms anymore."*
- **Capabilities supporting scalability:** An EMEA professional services company commented: *"Our major business challenge was scaling. We're in project management for the natural resources industry, and our IT needs spike and fluctuate. So for us, the autoscaling feature of AWS was the big reason we chose it."*

Almost all organizations also said that they are leveraging AWS at least in part as a greenfield environment for IT and business expansion (i.e., net-new applications and services).

While optimizing operational costs was a prime business consideration for many organizations in choosing AWS, the fact that they concluded that AWS would enable process efficiencies and set the stage for business transformation also emerged as key themes. Study participants linked AWS to IT and business transformation and related these efforts to how they provide IT services and how they would like to shape IT services going forward. Interviewees discussed a range of selection criteria, including:

- Retiring or avoiding expansion of existing in-house datacenter resources
- Standardizing significant IT processes and application development on AWS, which helps IT organizations focus more on differentiated business-enabling activities and supports adoption of new approaches such as DevOps
- Running heterogeneous enterprise applications on a single platform to create efficiencies
- Gaining greater agility and speed for compute and storage deployments and reducing associated costs
- Providing business with the ability to meet changing demand and conditions and to have disparate offices and locations access applications and services from a common platform

How Surveyed Organizations Are Using AWS

Study participants are running and supporting substantial enterprise workload environments with AWS, as measured by the number of Amazon EC2 server instances as well as AWS database and storage environments. They reported using AWS for a variety of business-critical applications (245 on average) and databases (460 on average), and AWS was used by over 8,000 employees on average. The extent of the use of AWS by these organizations is reflected in annual spend of $2.31 million per organization, meaning that the aggregate survey sample spends more than $60 million per year on AWS (see Table 2 and refer to Table 9 for more details).

Snapshotting workloads running on AWS provides a glimpse of the breadth and depth of use cases of interviewed organizations. These use cases include but are not limited to:

- Data mining and data analytics (a North American telecommunications company)
- Quality assurance and testing (a North American manufacturer)
- Genome sequencing workloads (a North American pharmaceutical company)
- Customer-facing applications, SaaS, CRM, and ERP (a North American technology provider)

- eCommerce and virtual workspaces (a North American tourism company)
- Internet sales and database management (a North American healthcare provider)
- File sharing (an EMEA manufacturer)
- Application testing and modeling/simulation (an EMEA pharmaceutical company)
- ERP applications (an APAC government organization)
- Employee self-service and development archiving (an APAC financial services company)

TABLE 2 AWS Use by Interviewed Organizations

	Average	Median
Time using AWS (months)	36	36
Average number of Amazon EC2 server instances	848	60
Number of Amazon EC2 server instances (peak use)	1,236	60
Number of databases	460	10
Number of applications	245	20
Number of internal IT users	8,135	1,200
Spend per year on AWS	$2.31 million	$318,500

n = 27 Source: IDC, 2018

Business Value Analysis

Study participants reported achieving much more than cost savings with AWS. They explained that AWS has enabled them to provide IT services more cost effectively, but more importantly, AWS has helped them change the role IT plays in supporting their businesses. With AWS, these organizations have leveraged more cost-effective, efficient, reliable, and agile IT operations to spur improved business results and operational efficiencies at an organizational level.

Study participants returned to similar themes in describing the impact of AWS, such as:

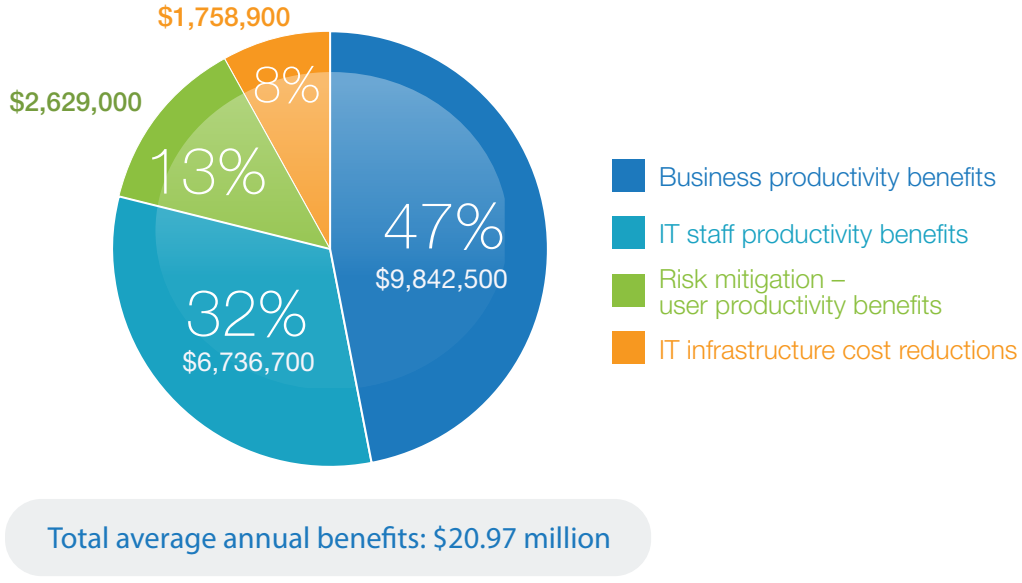
- **Leveraging cost efficiencies to deliver better results:** An EMEA government organization reported generating more value through data analytics: "We would not be providing the same type of broad, timely, and useful intelligence in as cost effective a manner without AWS."
- **Gaining true IT agility:** A United States–based technology company explained how AWS is enabling development flexibility: "AWS is allowing us to move from older technology that was piling up and getting in the way ... . It is easier getting up to speed on new deployments and spinning up new servers, and management is simpler on the business side with AWS."
- **Scaling to meet business demand without overprovisioning:** A U.S. pharmaceutical company commented: "AWS gives us scalability and elasticity... . We have scaled up to 5,000 instances, and being able to shut down most instances when demand falls is the major benefit for us."

AWS is helping study participants move IT from being a more static entity with real resource and performance constraints to an enabler of value through cost efficiency, flexibility, and performance. Based on the interviews with these 27 organizations, IDC puts the value of the use of AWS at an annual average of $20.97 million per year per organization over five years ($257,732 per 100 users), which is more than nine times average annual AWS fees, with benefits accruing in terms of (see Figure 3):

- **IT infrastructure cost reductions.** Organizations avoid up-front costs to buy and deploy server, storage, and network infrastructure. Further, they reduce ongoing costs associated with running IT environments, including licensing, power, and facilities costs. IDC projects that these organizations will save an average of $1.76 million per year per organization ($21,621 per 100 users) and will use AWS at a 31% lower cost over five years than a comparable on-premise infrastructure.
- **IT staff productivity benefits.** Organizations shift IT infrastructure and support teams' focus away from day-to-day support to other IT initiatives and business-focused projects. Further, development teams benefit from streamlined and unified IT environments and the ease of provisioning IT resources. The result is more agile development that enables delivery of significantly more features in less time, thereby increasing the value and productivity of development teams. IDC puts the value of IT staff productivity gains with AWS at an annual average of $6.74 million per organization ($82,809 per 100 users).

- **Risk mitigation — user productivity benefits.** Organizations experience fewer user- and business-impacting outages, therefore limiting the frequency with which employees do not have access to the applications they need to do their jobs, and revenue-generating business operations are interrupted. IDC calculates that these organizations will keep productive time and revenue worth $2.63 million per year per organization ($32,316 per 100 users).
- **Business productivity benefits.** Organizations leverage improved agility and performance to generate more business and enable employees. Businesses can rely on IT to have the capacity to help them identify and address business opportunities as they arise. Meanwhile, employees benefit from the speed with which new functionality is put in their hands as well as high performance across geographically dispersed operations. IDC puts the value of higher user productivity and revenue at an annual average of $9.84 million per organization ($120,986 per 100 users).

FIGURE 3 Average Annual Benefits per Organization



Total average annual benefits: $20.97 million

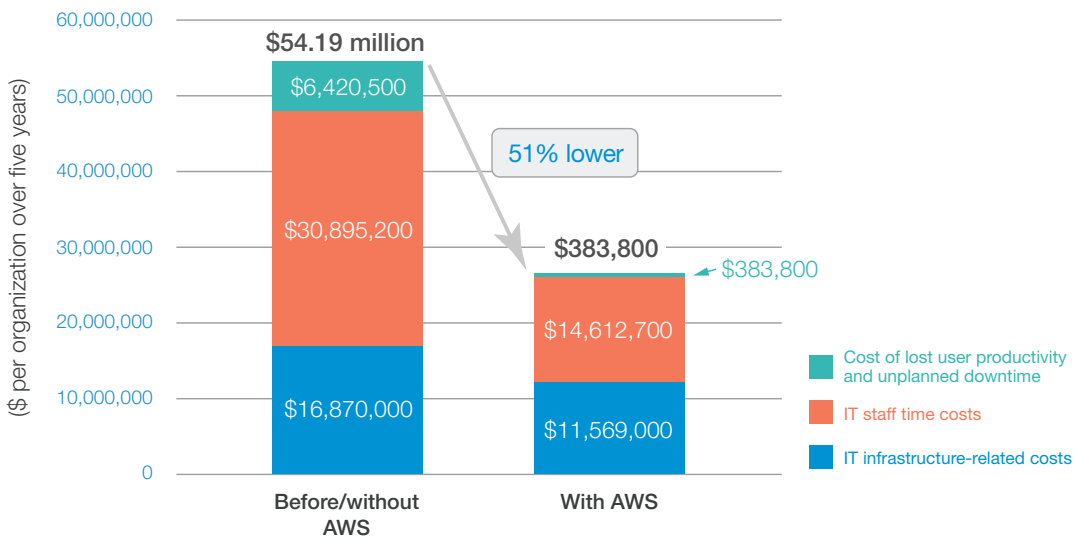
Source: IDC, 2018

AWS and Changing IT Cost Structures

Study participants reported that they are running a variety of enterprise workloads more cost effectively and efficiently on AWS. This is especially important in the context of their business expansion efforts that create increased demand for business applications and IT services and the IT resources that support these workloads. Across the board, these customers said that they would have spent substantially more to deliver comparable workloads with on-premise datacenter resources or hosting services, in terms of both hardware costs and staff time costs for running and supporting these environments.

Figure 4 shows that study participants will have a 51% lower overall five-year cost of running these workloads with AWS versus comparable on-premise environments when considering the total IT infrastructure costs/AWS fees, IT staff costs, and unplanned user downtime costs.

FIGURE 4 Five-Year Cost of Operations Using AWS



Source: IDC, 2018

Lower IT Infrastructure Costs

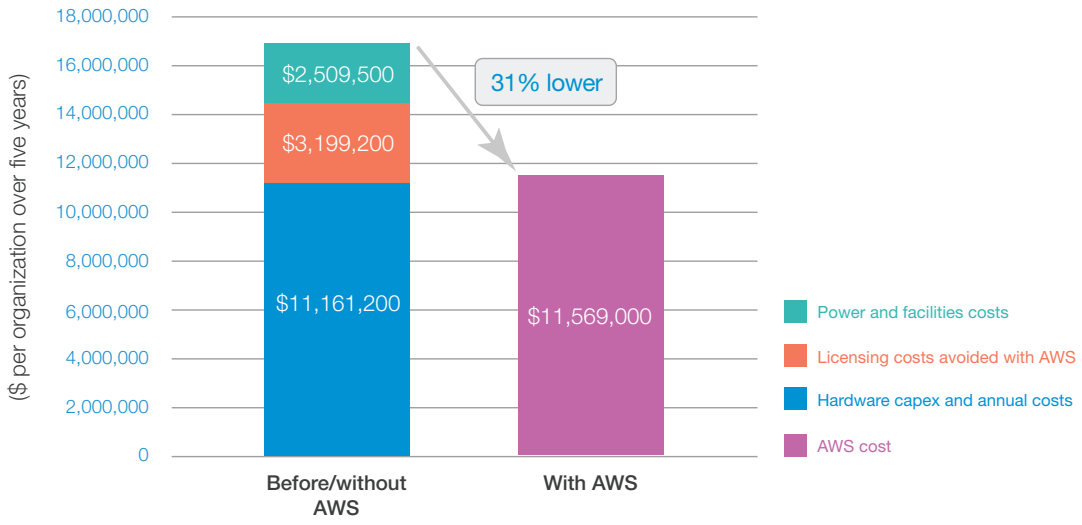
Study participants noted that, while cost alone did not necessarily drive their decision to use AWS, it generally cost less than trying to update and extend their legacy environments, which were mostly on-premise infrastructures. With AWS, they have been able to retire or reuse on-premise hardware and tie the IT resources provisioned more closely to actual use.

Study participants linked cost savings with AWS to bigger picture objectives such as changing how they deliver IT services or business enablement. One survey participant working for a North American financial services firm that is achieving 30% lower database and 20% lower infrastructure costs said: *"AWS allows us to lower the cost of infrastructure and running a datacenter. We can be more competitive deploying new products into the cloud and going to market more quickly."*

Another survey participant working for a North American logistics company explained how AWS enables the company to dynamically address demand without overprovisioning: *"We're definitely at more capacity now with AWS than we were. If we were going to do it on-premise, we'd need four times as much compute... . If we did this on-premise, we'd have to have a whole bunch of overhead and capacity that we don't have to have with AWS."* A North American professional services firm noted the salutary impact on its ability to deliver services: *"With AWS, we are able to save a lot from our budget. In the traditional alignment, it takes a lot of time, people, and money to get the resources you need. With AWS, we can allocate resources more effectively and offer more services within the same budget."*

As shown in Figure 5, IDC calculates a 31% lower five-year cost of infrastructure versus a comparable on-premise environment for these organizations. These costs included licensing, power and facilities, and hardware costs, compared with AWS fees.

FIGURE 5 Five-Year IT Infrastructure Costs Using AWS



Source: IDC, 2018

Higher Value from IT Staff

Interviewed organizations explained how AWS enables teams responsible for providing IT services to shift more of their focus to differentiated and higher-value activities, thereby increasing the value that they deliver to the business. These efficiencies translate into value by limiting the time required for activities such as monitoring, provisioning, and maintaining hardware and systems. Further, AWS provides agility and flexibility in the use and provisioning of IT resources, helping organizations redefine how they provide IT services and align IT with business demands. This impact is especially noticeable in implementing new and agile development approaches such as DevOps initiatives.

Table 3 shows that efficiencies for IT teams achieved with AWS substantially increase their productivity levels, contributing to the lower overall cost of running and supporting equivalent workloads (refer back to Figure 3) and providing the foundation for more cost-effective and robust IT operations. Study participants credited various AWS features and capabilities with enabling IT teams:

- Patch automation
- Automated scaling and monitoring
- Ease of deploying compute and storage
- Automation of security features
- Single API offering a common trail
- Ease of testing

In the aggregate, these AWS capabilities create space for IT teams to take on project work or drive other initiatives. Often, this furthers the transformation of IT in support of business goals by enabling teams to spend more time on activities focused on supporting the business. Among initiatives and activities that study participants reported undertaking through efficiencies achieved with AWS were:

- Spending more time on development activities
- Developing new solutions for customers and internal users
- Driving automation deeper into IT and business processes
- Planning and executing SAP HANA deployment

A North American logistics company described enabling development: *"With AWS, we have five staff members spending 10% of their time supporting applications compared with 50% of their time before... . With time freed up, we're developing our next generation of internal and external client-facing software."* A U.S. healthcare company explained how it has completed a reorganization to support its HR operations: *"With AWS, we're allocating IT staff freed up to do other things. Let me give you an example: We just incorporated a wing of the HR department into IT. And some of these individuals are now what we call API administrators, which means they're still doing things for IT, but they're supporting HR with their daily operations."*

Interviewed organizations are making all teams more efficient and effective by supporting or using AWS, including:

- **IT infrastructure management (62% more efficient on average), application management (43%), and IT support (59%):** An APAC government organization described the impact on its ability to support core ERP applications: *"Our IT team is spending less time on the ERP. There is less demand on their time. We no longer have a manpower issue. We would have had to have more people if we remained with the on-premise datacenters for ERP."*
- **Database administrators (19% more efficient on average):** A North American telecommunications provider commented: *"Our DBAs are saving time with AWS because of things like redundancy, security management, patch management... . Deploying new databases is so fast it's been reduced from two weeks to a few hours in the same day."*
- **Application developers (25% more productive on average):** A North American financial services company explained that the organization's 50-person development team can do what it would need 250 people to otherwise do: *"AWS is having a tremendous impact on what we've been doing... . We can do blue/green deployment, which means that we create two different stacks on the same application and don't need to take the application offline."*

Table 3 shows the average impact in terms of value gained for these IT teams from using AWS.

TABLE 3 IT Staff Impact Using AWS

	Number with AWS	Value with AWS	Increased Value with AWS	Efficiency with AWS (%)
Deployment (FTEs per organization)	18.2	25.5	7.3	28
IT infrastructure management (FTEs per organization)	10.7	28.0	17.3	62
Application management (FTEs)	11.1	19.4	8.4	43
IT support (FTEs)	3.8	9.3	5.5	59
Databases (FTEs)	10.5	13.0	2.5	19
Application development (FTEs)	129.0	173.0	44.0	25

n=27 Source: IDC, 2018

Enabling the Business Through Agility, Performance, and Resiliency

Study participants chose to use AWS in large part to enable their businesses. With legacy approaches, IT was too often a gating factor rather than a business enabler. Business opportunities require on-demand and timely delivery of compute, database, and storage resources to address and win. Study participants explained that their legacy IT approaches too often left them out in the cold when IT was called upon to support the business; delivering the resources required could either be cost prohibitive or wend through procurement and delivery processes, thereby muting IT's ability to deliver on business needs. Further, even when delivered, applications and services too often faced performance issues — including outages — that created additional friction for line-of-business (LOB) users.

Interviewed organizations almost uniformly reported that they are achieving their goal of enabling their businesses with AWS. They have the reliability, agility, and scalability, and performance required by their changing businesses. Most importantly, AWS offers the capability and flexibility they need to identify, create, and address business opportunities. Further, improved performance of important workloads and applications makes employees more productive and helps them ensure more satisfied customers.

More generally, the use of AWS by these organizations reflects how they are leveraging AWS to change the role of IT and drive business transformation. Commenting on this aspect, one survey participant working for a North American logistics company said: *"With AWS, IT has become more like a strategic partner with the business. Previously, we were an afterthought, until something broke." A participant from an APAC government organization noted: "We are covering markets from Australia to Brazil. With AWS, all the systems are operating no matter what time of day. Local offices can access their data, send their invoices, and post their accounts. They can function 24 x 7. We are able to function as a worldwide provider."* Other companies spoke about the ability to scale

and onboard new businesses quickly and to not just transform LOB units but transform and simplify IT systems themselves.

Study participants are achieving improved business results and more efficient operations in terms of higher employee productivity levels with AWS. In total, by winning more businesses, making employees more productive, limiting productivity and revenue losses associated with unplanned outages, and reducing the cost of regulatory compliance efforts, IDC projects that these organizations will achieve value worth an average of $12.47 million per year per organization (refer back to Figure 3 for the risk mitigation — user productivity benefits and business productivity benefits categories).

Enabling Agility and More Effective Development

Many interviewed organizations reported that the business and operational benefits of using AWS relate foremost to much improved IT and organizational agility. Study participants often found that their legacy infrastructures left them with the no-win choice of either overprovisioning IT resources — and incurring unnecessary costs — or going through time-consuming provisioning of new IT resources and then deploying these resources in more siloed infrastructure setups. Further, the inability to provision IT resources in a truly on-demand way challenged the ability of these organizations to change their development approaches to match business demand. Moving to AWS has helped study participants implement more agile development processes and frameworks, with many undertaking DevOps initiatives on AWS. The result has been the delivery of the applications, features, and functionality demanded by employees and customers in a more timely and consistent manner.

Nearly every surveyed organization reported gaining significantly in agility in terms of compute, storage, or database deployment with AWS:

- **Compute:** An EMEA pharmaceutical company commented: "Not having to wait for compute time with AWS is a big benefit. Sometimes we would wait weeks, and then we would have more time than we needed. The flexibility, scale, and timeliness improve our testing and simulation activities. It's a more efficient and timely use of compute resources."
- **Database:** A North American telecommunications provider said: "With AWS, we're able to turn up instances and databases a lot faster, and that's been a huge component of value. We don't have to go through acquisition of infrastructure."

Table 4 provides specific metrics on these agility benefits. For example, with AWS, staff time to deploy new storage is 90% lower, staff time to deploy compute showed an 82% level of improvement, and staff time to deploy a new database showed a 69% level of improvement.

TABLE 4 IT Agility Metrics Using AWS

	Before/Without AWS	With AWS	Difference	Change (%)
Compute deployment				
Time to deploy new compute (days)	2.8	1.3	1.5	55
Staff time to deploy new compute (hours)	2.2	0.4	1.8	82
Database deployment				
Time to deploy new database (days)	9.4	2.5	6.9	73
Staff time to deploy new database (hours)	7.1	2.2	4.9	69
Storage deployment				
Time to deploy new storage (days)	2.6	1.2	1.4	55
Staff time to deploy new storage (hours)	4.7	0.5	4.2	90

n=27 Source: IDC, 2018

Study participants have leveraged these agility benefits to make their application development efforts much more efficient and effective in support of their businesses with AWS. This results in delivery of more applications and features while ensuring more timely delivery. Interviewed organizations cited a number of ways that AWS enables their application development efforts, including much faster provisioning of resources for testing and development, having pre-built modules at their disposal, and ease of troubleshooting. Further, many of these organizations have adopted DevOps approaches on their AWS platforms.

Interviewed organizations reported that more efficient development with AWS represents a substantial value in terms of supporting business demand. A North American manufacturing firm whose 50 developers are 50% more productive with AWS said: *"The ability to give instant-on testing environments to developers with AWS gives them more opportunities to test new functionality with applications and gives us the ability to look at new ways to explore business opportunities that drive revenue."* Meanwhile, a North American technology company that has

reduced the time to market for new features by 75% explained: *"AWS helps run things quickly, and there's no requesting for server times. Everything gets tested on the cloud and then deployed. You can keep the pipeline going on the Amazon side, and security and staging are done in the cloud."*

Study participants also explained how AWS has facilitated the adoption of a DevOps approach, thereby improving the ability of their development teams to meet business demand. In particular, companies found it is easier to deploy applications on AWS, thereby speeding up the transition to active production environments. A North American technology company commented: *"AWS is allowing us to move away from older technology that was piling up and getting in the way. AWS is perfect for DevOps. It is easier getting up to speed on new deployments and spinning up new servers."*

Table 5 demonstrates the important impact of AWS on these organizations' development efforts in terms of both their ability to deliver new functionality and the time required to do so. For example, they are delivering on average almost three times more features (185%) and have shortened development life cycles for new applications with new logic (38% faster), new applications leveraging existing logic (36% faster), and new features (42% faster).

TABLE 5 Application Development KPIs Using AWS

	Before/Without AWS	With AWS	Difference	Change (%)
New applications with new logic				
Number of applications developed per year	10.7	13.1	2.5	23
Development life cycle (weeks)	25.1	15.6	9.6	38
New applications with existing logic				
Number of applications developed per year	6.0	7.3	1.3	22
Development life cycle (weeks)	11.1	7.1	4.0	36
New features				
Number of applications developed per year	94	269	263	185
Development life cycle (weeks)	6.3	3.6	2.7	42

n=27 Source: IDC, 2018

Leveraging Agility and Enhanced Development Efforts to Improve Business Results

Survey participants also described leveraging AWS to generate new revenue streams and enable users, both of which go to effectuating business transformation with AWS. Business enablement benefits include:

- Better time to market via agility in the deployment/development process
- Testing new concepts more quickly
- Improved access to services/applications
- The ability to grow the IT environment to address latent demand
- The ability to expand geographically with ease and address new markets
- Better R&D leading to the identification of new business opportunities

A North American manufacturing firm noted how AWS has helped it get to market faster with products: *"In our R&D organization, when prototyping new digital products, the ability to create infrastructure and services with AWS, up and down for prototyping, is really beneficial ... . We're certainly getting faster time to market."* As a result, this company is realizing higher revenue of $1 million to $2 million per year.

Another participant working for a North American technology company explained how it can now meet customer demand cost effectively, helping it capture millions of dollars in additional revenue: *"We have seasonal workloads where we need to scale AWS to stabilize our performance. This means that we're able to realize all the revenue versus not being able to scale to meet customer demands, so we're not leaving revenue on the table."* A participant with a North American pharmaceutical firm talked about revenue enhancement through enablement of activities that require substantial compute and storage resources: *"We have a genomics application running on AWS that processes large amounts of data. We are expanding that as our needs grow, and AWS helps meet that need. The technology gets better and helps us expand and create more value. This is big. This will create a lot of revenue."*

Table 6 presents specific metrics on business productivity benefits. For example, in terms of the revenue impact of addressing business opportunities, AWS enabled an average additional revenue of $36.5 million per year per organization. Similarly, the ability of study participants to better keep business operations going within interruption on AWS has translated to substantial value. IDC puts the revenue impact in terms of minimizing revenue losses related to unplanned outages on an average of $8.28 million per year per organization.

TABLE 6 Business Productivity Benefits: Increased Revenue Using AWS

	Per Organization	Per 100 Users
Revenue impact of better addressing business opportunities		
Additional revenue per year	$36.5 million	$448,246
Recognized revenue per year (using IDC model)	$5.47 million	$67,237
Revenue impact of unplanned downtime		
Additional revenue per year	$8.28 million	$101,760
Recognized revenue per year (using IDC model)	$1.24 million	$15,264

Note: The IDC model assumes a 15% operating margin for all additional revenue.

Source: IDC, 2018

Enabling Operational Efficiencies Through Timely and High-Performing Applications

In addition to generating higher revenue by better addressing business opportunities, study participants confirmed the impact of AWS on employees. These benefits include but are not limited to:

- Getting requests for new features done in a timely manner
- Faster deployment so that users can optimize functional tools for task completion
- Strong application performance — employees can work more efficiently and effectively
- The ability to access applications regardless of geographical location

One survey participant working for an APAC government organization said: *"Analytics is specifically where the ease of adding compute resources with AWS makes a difference. Big Data analysis requires bursts of compute that we are able to spin up without worrying about cost or availability."* As a result, 20 data scientists and technical staff were at least 50% more productive at this company. A North American company in the tourism sector explained how faster delivery of new features enables employees: *"Employees are around 5% more productive because we can generally get new features live much faster with AWS."* Meanwhile, a North American logistics company referenced the higher quality of releases with AWS, thereby limiting the impact of errors: *"AWS definitely helps with debugging and improving applications... . It saves time fixing them — it takes maybe half a day now versus a couple days before."* Meanwhile, an EMEA pharmaceutical company noted the impact of improved performance

on supporting its R&D initiatives: *"From an R&D perspective, we are able to meet our objectives more efficiently with AWS. For us, it is all about testing and modeling. We can provide results and feedback to the development team in a more predictable time."*

The impact of AWS in terms of more timely delivery of new features and improved performance is substantial. Table 7 shows that study participants were able to identify over 2,800 employees who have increased their productivity levels, meaning that they are working more efficiently and effectively in pursuit of business objectives.

TABLE 7 Business Productivity Benefits: Increased User Productivity Using AWS

	Per Organization	Per 100 Users
User productivity impact		
Number of users impacted	2,808	35
Productivity gain	14%	14%
Equivalent FTE gain	55.3	0.7

Source: IDC, 2018

Benefiting from Reduced Risk Related to Application Availability, Security, and Regulatory Compliance

The use of AWS has also had a measurable impact in terms of application reliability and performance and the extent to which these organizations have reduced risk related to application availability, security, and regulatory compliance in a cost-effective manner. Many organizations considered reducing these types of risk with AWS to be a key differentiator in terms of value. Among the benefits of AWS related to reliability and risk management cited by participants were:

- Ease of deploying clusters to ensure performance with additional resources
- Failover services more reliable
- Automated scaling to avoid performance issues
- Multizone capabilities to move workloads as needed
- Precertified to comply with industry-specific regulations

The overall impact for these organizations of using AWS has been to increase confidence in the security and resiliency of their operations. A North American pharmaceutical company noted: *"The trust is the most significant benefit for us with AWS — we're developing trust in the security and trust in the technology."* Several organizations cited security automation as an important functionality that AWS offers them, both saving staff time and helping them create more secure environments.

Commenting on the impact of moving to AWS on availability, one survey participant from a North American logistics company said: *"Before AWS, we'd have disk drives die in the servers, which would put us dead in the water. With AWS, we can always shift from one zone or sector to another one. Now we use the metrics of having the 99% uptime — agility for us is about resilience."* As a result, this company experienced a downward shift from one to two instances of impactful unplanned downtime per month to one to two instances per year. A North American healthcare provider described the difference in having AWS to support a business-critical project: *"We used AWS to transfer data for a very time-sensitive project. We had to get it right. This contained critical data, and we didn't have a hiccup with AWS. It was just amazing how the data flowed from one system to the other. If we don't deliver this type of data in a timely manner, it will mean fines."* An APAC government organization stated that it had no downtime in four years of using AWS, thereby saving millions of dollars in potential fines.

Table 8 provides detailed information on unplanned downtime improvements using AWS. Particularly noteworthy is that outages showed a 73% level of improvement per year per organization, which has translated to study participants losing 94% less productive time due to unplanned outages.

TABLE 8 Impact on Unplanned Downtime

	Before/Without AWS	With AWS	Difference	Change (%)
Number of unplanned outages per year per organization	7.0	1.9	5.1	73
MTTR (hours)	3.7	1.5	2.2	58
Availability (%)	99.9988	99.9999		
Lost productivity per year (hours per user)	4.2	0.3	3.9	94
Lost user productivity per year (FTE impact)	18.3	1.1	17.2	94

n=27 Source: IDC, 2018

Meanwhile, study participants also reported that AWS has helped them ensure compliance with various regulations in a cost-effective and timely manner. For these organizations, this translates to value not only by reducing risk related to regulatory matters but by enabling them to avoid investing staff time in ensuring compliance and limiting their need to bring on third parties to support their efforts. A North American pharmaceutical company is saving the time of 10 staff members in regulatory compliance due to precertification with AWS: "It's much easier to ensure compliance with AWS. Amazon goes out and gets things certified so that we don't have to. It's a big thing, and we'd have to do a lot of work if we didn't have AWS doing that." A North American company in the tourism sector explained that it is avoiding spending on third-party consultants to help its PCI compliance efforts: "The fact that the PCI compliance infrastructure is already in compliance with AWS is important to us; we used to have to use consultants to do this, so we're avoiding paying them." On average, study participants are saving almost $180,000 per year per organization through reducing compliance-related costs and increasing team efficiencies through use of AWS (refer to Table 11 in Appendix B).

ROI Analysis

IDC based the return-on-investment (ROI) analysis on 27 in-depth interviews with organizations that are running a variety of application and database workloads on AWS. Based on these interviews, IDC has calculated the benefits and costs to these organizations of using AWS. Appendix A provides additional details about IDC's ROI methodology.

Table 9 presents IDC's analysis of the benefits and investment costs of using AWS for study participants. IDC calculates that these organizations will invest a five-year discounted average of $9.89 million per organization ($121,583 per 100 users of applications running on AWS) and can expect to achieve benefits worth a discounted average of $72.88 million per organization ($895,903 per 100 users). This would mean a strong five-year return on investment of 637% and breakeven on investment in AWS occurring in six months on average.

TABLE 9 ROI Analysis

	Five-Year Average per Organization	Five-Year Average per 100 Users
Benefit (discounted)	$72.88 million	$895,903
Investment (discounted)	$9.89 million	$121,583
Net present value (NPV)	$62.99 million	$774,320
Return on investment (ROI)	637%	637%
Payback period	6 months	6 months
Discount rate	12%	12%

n=27 Source: IDC, 2018

CHALLENGES AND OPPORTUNITIES

Amazon has been providing a wide variety of cloud services, and enterprises need to change their culture to undertake a transformative journey to fully take advantage of these technologies. Organizational structures with extensive experience in rigid on-premise IT implementation struggle to take advantage of a fully automated and abstracted cloud architecture. While forward-thinking enterprises have embarked on a long-term journey, a majority of organizations still struggle with the traditional top-down IT department management structure that inhibits the acceptance of rapid innovation. Amazon's challenge is to deliver relevant professional services for customers with in-house or partners' resources to educate them on the best practices of cloud adoption.

With higher-than-average cloud market growth, there is a significant opportunity for AWS to capture the existing IaaS and PaaS segments valued at $56 billion in 2018. A number of customers have embarked on a transformative cloud journey with the intent of shutting down their own datacenters while taking advantage of an agile, reliable, and scalable cloud infrastructure. Risk-averse customers like to see best practices proven in their specific industry for specific use cases before applying cloud technology in their digital transformation. Amazon needs to be much more specific in its industry messaging to provide proof for such customers and can take advantage of the unaddressed market opportunity.

CONCLUSION

Transformation opportunities leveraging cloud resources have not been experienced by organizations in the recent past. New business models enabled by the low cost and agility of cloud services are disrupting most industries. Organizations that adopt cloud are able to be more competitive, increase customer satisfaction, innovate faster, and achieve greater productivity with resources that focus on core business enablement.

The cost savings benefits of cloud computing have been well documented and understood by businesses, with a number of proven use cases documenting results. Over the past few years, enterprises implementing business agility initiatives significantly differentiate themselves from competitors. It is important for readers to understand the potential value beyond dollars and cents from the technology. Beyond cost savings, the following benefits observed in the survey are important while justifying cloud computing in an organization:

- Better security options
- Increased productivity through automation
- New revenue streams through differentiating solutions
- Higher availability leading to improved user satisfaction
- Rapid response to business changes
- The ability to experiment and innovate much more rapidly
- Reduced costs with better performance
- Faster innovation and time to market
- Open standards that reduce the risk of getting locked into one vendor

Furthermore, the rapid increase of connected devices is changing current business environments and providing opportunities to fully digitizing enterprises. To handle the huge volumes of information generated, analytics and machine learning are important to automate and complement decision making. In the current dynamic business environment, organizations have to adapt at a very rapid pace. Business agility enabled by lower-cost cloud computing technology offers the unique ability to address this disruptive shift.

APPENDIX A: AMAZON WEB SERVICES USE BY INTERVIWED ORGANIZATIONS

TABLE 10 AWS Use by AWS Product

	Average	Median
Number of Amazon EC2 server instances	848	60
Number of Amazon RDS databases	371	6
Amazon Redshift (TB)	5	0
Amazon Elastic MapReduce (TB)	431	5
Amazon S3 (TB)	806	0
Amazon DynamoDB (TB)	10	0

n=27 Source: IDC, 2018

APPENDIX B: BUSINESS VALUE CALCULATIONS

Table 11 provides an overview of the value IDC has quantified for purposes of its ROI analysis (average per year over five years) as well as the costs incurred by study participants from using AWS.

Benefits and costs achieved/incurred on a per-year basis are discounted for the first year to account for an average deployment period of 4.4 months.

The ROI is calculated based on applying a 12% discount rate to the benefits and investment costs, which results in:

- $104,835,900 in five-year benefits = $72,884,200 in five-year discounted benefits
- $13,131,200 in five-year investment costs = $9,891,100 in five-year discounted investment costs

Subtracting discounted investment costs from discounted benefits results in a five-year net present value (NPV) of $62,993,100.

The five-year ROI is then calculated by dividing the NPV by the five-year discounted investment costs ($62.99 million divided by $9.89 million), which results in a five-year ROI of 637%.

TABLE 11 Business Value Calculations

	Value per Year per Organization
IT infrastructure cost reductions	
Ongoing hardware costs (warranty/maintenance)	$663,700
Database licensing costs	$339,100
Infrastructure licensing costs	$254,200
Power costs	$333,000
Facilities costs	$168,900
IT staff productivity benefits	
IT infrastructure and application management efficiencies	$1,555,600
Database administration efficiencies	$247,900
Application development productivity benefits	$4,387,000
Help desk support efficiencies	$546,100
Risk mitigation — user productivity benefits	
Productivity loss avoided benefits	$1,207,300
Revenue loss avoided benefits	$1,241,800
Regulatory compliance cost savings and efficiencies	$179,900
Business productivity benefits	
Business analytics team achieving higher productivity	$500,600
Other users achieving higher productivity	$3,872,000
Increased revenue	$5,469,900
Total benefits (average per year over five years)	$20,967,200
Total five-year benefits	$104,835,900
Investment costs	
Initial staff deployment time cost (one time)	$1,823,200
Initial deployment consulting cost (one time)	$155,800
Initial training time and other costs (one time)	$75,900
AWS cost	$69,700
Total five-year investment costs	$13,131,200

APPENDIX C: METHODOLOGY

IDC's standard ROI methodology was utilized for this project. This methodology is based on gathering data from organizations that IDC identified as currently using AWS as the foundation for the model. Based on interviews with these study participants, IDC performs a three-step process to calculate the ROI and payback period:

1. Measure the benefits associated with using AWS in terms of infrastructure-related cost savings, IT staff efficiency and productivity benefits, higher user productivity, and increased revenue.
2. Ascertain the investment made in deploying and using AWS.
3. Project the costs and benefits over a five-year period and calculate the ROI and payback for AWS.

IDC bases the payback period and ROI calculations on a number of assumptions, which are summarized as follows:

- Time values are multiplied by burdened salary (salary + 28% for benefits and overhead) to quantify efficiency and manager productivity savings. For purposes of this analysis, IDC has used its standard Business Value assumptions of an average fully loaded $100,000 per year salary for IT staff members and an average fully loaded salary of $70,000 for non-IT staff members. IDC assumes that employees work 1,880 hours per year (47 weeks x 40 hours).
- Downtime values are a product of the number of hours of downtime multiplied by the number of users affected.
- The impact of unplanned downtime is quantified in terms of impaired end-user productivity and lost revenue.
- Lost productivity is a product of downtime multiplied by burdened salary.
- The net present value of the five-year savings is calculated by subtracting the amount that would have been realized by investing the original sum in an instrument yielding a 12% return to allow for the missed opportunity cost. This accounts for both the assumed cost of money and the assumed rate of return.

- Because every hour of downtime does not equate to a lost hour of productivity or revenue generation, IDC attributes only a fraction of the result to savings. As part of our assessment, we asked each company what fraction of downtime hours to use in calculating productivity savings and the reduction in lost revenue. IDC then taxes the revenue at that rate.
- Because IT solutions require a deployment period, the full benefits of the use of AWS are not available during deployment. To capture this reality, IDC prorates the benefits on a monthly basis and then subtracts the deployment time from the first-year savings.

Note: All numbers in this document may not be exact due to rounding.

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