The Total Economic Impact™ Of Migration To Microsoft Azure SQL Managed Databases

Cost Savings And Business Benefits Enabled By Azure SQL Managed Databases

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Executive Summary

Key Benefits

Avoided on-premises infrastructure costs:
$5.4 million

Improved DBA productivity:
$2.2 million

Improved IT productivity:
$2.6 million

According to a February 2020 Research Overview by Forrester Research, the infrastructure-as-code movement has emerged as the new management model. The ability to programmatically create and manage infrastructure alters the whole game of infrastructure. It also changes the roles of the people involved — most notably the admins.[1]

Microsoft Azure SQL is a portfolio of SQL services on Azure comprised of SQL Server on Azure virtual machines, Azure SQL Managed Instance and Azure SQL Database. Azure SQL Managed Instance and Azure SQL Database (collectively referred to as "Azure SQL managed databases") enable organizations to migrate their on-premises SQL Server infrastructure onto a fully managed SQL Server in the Azure Cloud. Migration provides the financial and operational benefits of a cloud database as a service. Financial (opex/capex) benefits are derived from offloading infrastructure and daily IT management costs. Operational benefits show up as productivity gains from using a managed service with built-in intelligence that performs tasks on the customer's behalf — such as database provisioning, backups and recovery, patch management, and optimization. Customers have the flexibility to choose which Azure SQL hosting options will work best for their needs. This study focuses on customers who migrated their data to Azure SQL managed databases and chose managed instances and single databases to host their data. Customers who migrate to managed instances may save time and money related to rearchitecting applications for the cloud, given the nearly 100% compatibility with SQL Server on-premises.

Microsoft commissioned Forrester Consulting to conduct a Total Economic Impact™ (TEI) study and examine the potential return on investment (ROI) enterprises may realize by migrating on-premises databases to Azure SQL's managed databases. While migration to the cloud often involves the full stack (including underlying data stores and applications), the purpose of this study is to provide readers with a framework to evaluate the potential financial impact or ROI of database migration. To better understand the benefits, costs, and risks associated with this investment, Forrester interviewed four customers with experience using Azure SQL.

Prior to using Azure SQL, interviewees said their organizations managed their SQL Server database environments on-premises. That approach required substantial ongoing investments in infrastructure (compute, storage, network, and data center costs) and placed heavy administrative burdens on database administrators and other IT staff members who planned, provisioned, deployed, and managed the database environments.

By migrating those on-premises databases to Azure SQL, the organizations replaced the substantial sunk costs of on-premises database infrastructure with a more elastic "pay as you go" cloud pricing model. They can now scale their Azure SQL consumption costs up and down monthly as business needs evolve, without needing to maintain unused capacity for peak or disaster recovery scenarios. Customers who maintain Software Assurance can use the Azure Hybrid Benefit to decrease their usage costs. They can also provision databases quickly for faster time-to-market and manage them more efficiently. With many time-consuming manual tasks automated or eliminated, database administrators (DBAs) and IT staff members see their roles transformed, and they have more time to apply to higher business-value initiatives.

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Two quotes from interviewees sum up Azure SQL's impact. The chief information officer of a government agency said: "Our capacity is elastic now. We can deploy new infrastructure in minutes. When we need less, we pay for less. We can optimize our costs by using the correct level of capacity." And the IT architect at a healthcare nonprofit organization noted, "Our DBAs and IT staff can tackle initiatives they didn't have time for prior to migration."

Key Findings

Quantified benefits. The following risk-adjusted present value (PV) quantified benefits are representative of those experienced by the companies interviewed:

› **Avoided on-premises infrastructure costs of $5.4 million.** By moving database infrastructure to the cloud, organizations eliminated the related ongoing on-premises infrastructure costs such as computing power, storage, networks, and data center space and energy.

› **Avoided prior costs of SQL licenses of $695,438.** With SQL databases migrated to Azure SQL managed databases, organizations no longer paid for their on-premises database licenses.

› **Improved DBA productivity of $2.2 million.** Azure SQL managed databases automated or eliminated time-consuming DBA tasks, increasing DBA productivity by 40%.

› **Improved IT productivity of $2.6 million.** Productivity for the varied IT roles supporting the SQL environment increased 25% after migration due to significant efficiencies in deploying and managing SQL databases.

Unquantified benefits. The interviewed organizations experienced the following benefits, which are not quantified for this study:

› **Ability to focus DBAs and IT staff on higher business-value activities.** With Azure SQL managed databases reducing the burden of repetitive and time-consuming tasks, organizations transformed the roles of their DBAs and IT staff.

› **Greater agility and shorter time-to-market.** Faster provisioning and ease of scaling enabled DBAs and IT staff to respond faster to requests from the business to support new business initiatives.

› **Ease of adjusting infrastructure, saving time and costs.** Organizations can easily monitor Azure usage and quickly adjust usage levels as needs shift.

› **Stronger security, higher availability, and better compliance**. Relying on Microsoft's scale and expertise increased the availability and security of organizations' databases. The Azure ecosystem simplified compliance efforts.

Costs. The interviewed organizations experienced the following risk-adjusted PV costs:

› **Azure SQL managed databases consumption costs of $3.0 million over three years.** Total pricing for compute and storage for managed instances and single databases was $1.1 million per year when using the Azure Hybrid Benefit.

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ROI
238%

Benefits PV
$10.9 million

NPV
$7.6 million
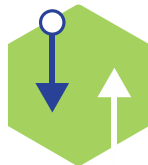
Payback
<3 months
post migration

› **Internal labor costs of $252,138 for migration.** An internal team of DBAs, cloud engineers, architects, and security staff members planned and executed the migration.

Forrester's interviews with four existing customers and subsequent financial analysis found that a composite organization based on these interviewed organizations experienced benefits of $10,858,655 over three years versus costs of $3,216,899, adding up to a net present value (NPV) of $7,641,756 and an ROI of 238%.

Financial Summary
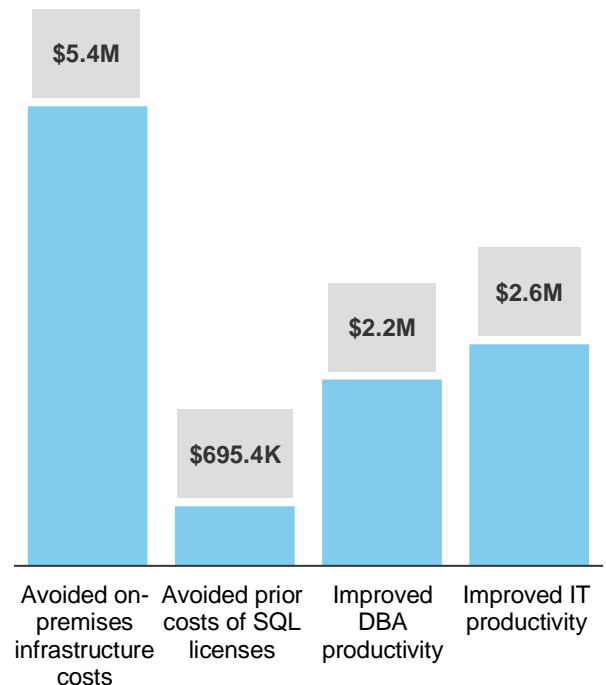
Payback period:

Total benefits PV, $10.9M

Total costs PV, $3.2M

Initial   Year 1   Year 2   Year 3

Benefits (Three-Year)

$5.4M

$695.4K

$2.2M

$2.6M

Avoided on-premises infrastructure costs

Avoided prior costs of SQL licenses

Improved DBA productivity

Improved IT productivity

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TEI Framework And Methodology

From the information provided in the interviews, Forrester has constructed a Total Economic Impact™ (TEI) framework for those organizations considering implementing Microsoft Azure SQL managed databases.

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 Azure SQL managed databases can have on an organization:

The TEI methodology helps companies demonstrate, justify, and realize the tangible value of IT initiatives to both senior management and other key business stakeholders.

DUE DILIGENCE
Interviewed Microsoft stakeholders and Forrester analysts to gather data relative to Azure SQL managed databases.

CUSTOMER INTERVIEWS
Interviewed four organizations using Azure SQL managed databases 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 Azure SQL managed databases' impact: benefits, costs, flexibility, and risks. Given the increasing sophistication that enterprises have regarding ROI analyses related to IT investments, Forrester's TEI methodology serves to provide a complete picture of the total economic impact of purchase decisions. Please see Appendix A for additional information on the TEI methodology.

DISCLOSURES

Readers should be aware of the following:

This study is commissioned by Microsoft 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 report to determine the appropriateness of an investment in Microsoft Azure SQL managed databases.

Microsoft 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.

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

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The Azure SQL Managed Databases Customer Journey

BEFORE AND AFTER THE AZURE SQL MANAGED DATABASES INVESTMENT

Interviewed Organizations

For this study, Forrester conducted interviews with four Microsoft Azure SQL Managed Databases customers. Interviewed customers include the following:

INDUSTRY	REGION	INTERVIEWEES	MIGRATION OBJECTIVES
Financial services	Headquartered in North America; global operations	Chief architect	More staff time for higher-value activities, scalable and lower IT costs, latest versions, stronger security, business agility
Business services	Headquartered in North America; global operations	Manager, enterprise data analytics	Alignment with corporate "cloud-first" strategy, improved availability, faster time-to-market
Government agency	Europe	Chief information officer	Better customer experience, business continuity, faster provisioning, scalability, cost optimization
Nonprofit association (healthcare)	Europe	IT director IT architect Manager of IT administration	Expanded capacity without on-premises investment, automatic scaling to reduce costs, decreased staff effort

Key Challenges

The interviewed organizations described a range of challenges with their on-premises SQL databases that drove their decisions to migrate those databases to Azure SQL managed databases:

› **Managing the on-premises SQL database environments was time-consuming.** Interviewees felt their DBAs and IT staff spent too much time planning, provisioning, deploying, and managing the SQL database environments (which spanned custom applications, packaged applications, supporting activities — like ETL, staging, and processing — and development and testing activities). It was time-consuming to maintain data centers while ongoing version upgrades, backups, tuning, security patches, security optimizations, and other tasks put a heavy burden on staff. Interviewees wanted to reduce the growing efforts and direct costs of maintaining increasingly complex underlying infrastructure and the expanding volume and variety of data.

› **DBAs and IT staff lacked time for higher-value initiatives.** The heavy operational load prevented DBAs and IT staff from addressing more strategic business needs such as improving the customer experience. Organizations wanted to free up their DBAs and IT resources to focus on higher-value projects, new business initiatives, and strategic priorities (like innovation) by reducing the heavy burden of day-to-day database management.

> "We needed our DBAs and IT staff to focus on improving the customer experience and other things critical to our company, not on patching databases and trying to manage our own infrastructure."
>
> *Chief architect, financial services company*

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- **Infrastructure was expensive and lacked scalability.** On-premises infrastructure represented a substantial investment that was difficult to adjust when needs varied. It also required substantial effort and lead time around capacity planning and deployment. Organizations wanted to be able to quickly and easily scale capacity up or down as required by business needs, without having to overprovision in order to ensure enough capacity for peak times (especially for high-availability needs). They sought to optimize the overall costs for their SQL database environments by not paying for capacity that could often sit unused.

- **Organizations lacked business agility.** When new business needs arose, it took the IT teams months to plan, procure, provision, and deploy additional infrastructures. Organizations wanted to respond faster to business needs in order to accelerate time-to-market of new initiatives.

- **Ensuring availability and security was difficult.** Interviewees sought to reduce database downtime and improve availability, particularly for customer-facing applications that determined the customer experience. They also wanted to feel more confident about the security of their IT systems.

- **On-premises infrastructures did not align with organizationwide pursuits of a "cloud-first" strategy.** Several of the interviewed organizations were pursuing a cloud-first strategy, and migration of SQL databases was one component of a larger cloud migration.

Solution Requirements

The interviewed organizations searched for a solution that offered:

- All the benefits of a platform-as-a-service (PaaS) model including automated upgrades, patches, and backups.

- Elimination or substantial reduction of time-consuming DBA and IT deployment and management efforts.

- Ability to quickly and easily scale infrastructure (databases, compute, storage) as needs varied.

- A flexible pricing model that could be aligned with business needs.

- Migration to managed instances with low effort and minimal application changes.

- High availability to ensure business continuity.

- Strong security.

Key Results

The interviews revealed that key results from the Azure SQL managed databases investment include:

- **Reduced data center infrastructure costs.** Interviewed organizations no longer require significant on-premises infrastructure for their SQL environments after migrating to Azure SQL managed databases. They could also stop overprovisioning for peak times or disaster recovery purposes since they can readily scale Azure SQL managed databases capacity as needed.

> "When I needed to spin up something new on-premises and had to go through our entire procurement process, it took more than six months to get that new hardware deployed."
>
> *Manager, enterprise data analytics, business services company*

> "We were spending too much on licensing and infrastructure that was underutilized."
>
> *Chief architect, financial services company*

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- › **Avoided prior costs of SQL licenses.** By migrating to Azure SQL managed databases, organizations could retire their on-premises SQL database licenses and stop paying the costs associated with those licenses.

- › **Freed up time for DBAs and IT staff to invest in higher-value efforts instead of managing infrastructure.** With Azure SQL managed databases, many manual and time-intensive tasks associated with on-premises SQL databases are either automated or offloaded to Microsoft. Improved productivity enables organizations to redirect staff time to higher-value activities like innovation, special IT projects, or new business initiatives.

- › **Time and cost savings through flexibility to adjust infrastructure.** Because organizations can readily modify their Azure SQL managed databases infrastructures, they are able to shorten time-to-market and adjust Azure resources to keep costs well-aligned with business needs.

- › **Better security, availability, and compliance.** By migrating to Azure SQL managed databases, organizations felt they had better database security and more availability with far less effort. The chief architect for a financial services company explained: "We have to be very careful where our data lives and how it's protected. Microsoft is much better equipped than we are to deal with the potential security threats that are out there." Higher availability translates into a better customer experience, and the Azure ecosystem makes it easier to comply with standards and meet reporting requirements.

Composite Organization

Based on the interviews, Forrester constructed a TEI framework, a composite company, and an associated ROI analysis that illustrates the areas financially affected. The composite organization is representative of the four companies that Forrester interviewed and is used to present the aggregate financial analysis in the next section. The composite organization that Forrester synthesized from the customer interviews has the following characteristics:

Description of composite. The composite organization is a US-based services company with operations across North America, Europe, and Asia. Prior to migrating its databases to Azure SQL managed databases, it used primarily on-premises database solutions and spent a significant portion of its annual budget on on-premises hardware, software, upgrades, and data center space. Moving to Azure SQL managed databases reduced those database costs and provides flexibility to quickly scale up, downsize, or change its database infrastructure in other ways to align with business needs and ensure a compelling customer experience. The organization can readily handle spikes in activity across its database infrastructure from seasonal business needs, limited-term initiatives, or exploration of big data and artificial intelligence by purchasing and provisioning infrastructure in hours instead of months. Simplified IT operations and a decreased administrative burden on DBAs and IT staff enable those team members to focus on higher-level and more strategic initiatives instead of provisioning and maintenance. The organization also moved to Azure SQL managed databases to improve the availability and security of its database infrastructure.

Deployment characteristics. The migration took around three months of continuous effort including deployment, integration, testing, and

Key assumptions:
- Global operations
- Over 700 databases transitioned onto Azure cloud
- Transitioned both business-critical and general-purpose applications and workloads across 25 Azure SQL Managed Instances and 20 Azure SQL Databases

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rollout, after which the organization began to experience the benefits of its Azure SQL managed databases environment. The organization continues to refine its Azure SQL managed databases operations in order to improve efficiency.

Technical specifications. The organization has transitioned over 700 SQL databases from its on-premises environment onto Azure SQL Managed Instance and Azure SQL Database. Although the organization's Azure SQL infrastructure varies based on workload requirements, it deploys an average of 680 databases across 25 Azure SQL Managed Instances of business critical and general-purpose applications and workloads with an average of eight vCores of computing power and up to eight terabytes of storage per instance, with the actual storage amount varying by service tier. Further, it deploys 20 Azure SQL Databases for use in nonproduction dev-test operations. These Azure SQL Databases are distributed across both the Database Transaction Unit (DTU)-based and vCore-based purchasing models, providing a mix of flexible and preconfigured resourcing options. Computing power is up to four vCores and storage is up to one terabyte per database.

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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	Avoided on-premises infrastructure costs	$2,166,000	$2,166,000	$2,166,000	$6,498,000	$5,386,521
Btr	Avoided prior costs of SQL licenses	$279,646	$279,646	$279,646	$838,937	$695,438
Ctr	Improved DBA productivity	$877,500	$877,500	$877,500	$2,632,500	$2,182,213
Dtr	Improved IT productivity	$1,043,280	$1,043,280	$1,043,280	$3,129,840	$2,594,483
	Total benefits (risk-adjusted)	$4,366,426	$4,366,426	$4,366,426	$13,099,277	$10,858,655

Avoided On-Premises Infrastructure Costs

By migrating SQL databases to Azure SQL managed databases, interviewed organizations eliminated the need to build out their own SQL database infrastructure either on-premises or in a co-location facility. They avoided the substantial initial purchase costs and ongoing maintenance fees of the hardware and software needed for their previous database environments (compute, storage, network) and the expenses for data center space and energy. These and other avoided expenses are a gross benefit; ongoing consumption costs for Azure SQL managed databases are noted in the cost section of this study. However, the net impact is positive as ongoing consumption costs are less than the combined infrastructure and SQL license costs prior to migration.

In addition, the interviewed organizations no longer need to overprovision for disaster recovery systems or to accommodate seasonal peaks or other significant variations in their database usage. They can instead dial their Azure SQL managed databases capacities up or down as needs shift. The manager of enterprise data analytics for a business services company said: "Prior to migration, we had to procure and maintain enough capacity to meet our peak needs, even though we didn't need all that year-round. We always overbuilt because we didn't know what might go wrong. Now we can flex our database environment as needed, based on the business forecast."

For the composite organization, Forrester models the avoided on-premises infrastructure costs as:

› Annual expenditures for the SQL environment averaging $1.9 million annually prior to the migration to Azure SQL managed databases.

› Maintenance fees calculated at 20%.

Avoided on-premises infrastructure costs will vary based on:

› The nature and scope of an organization's prior SQL database infrastructure.

› The extent to which seasonal or intermittent peaks previously drove overprovisioning.

The table above shows the total of all benefits across the areas listed below, as well as present values (PVs) discounted at 10%. Over three years, the composite organization expects risk-adjusted total benefits to be a PV of nearly $10.5 million.

$5.4 million
three-year benefit PV

50%
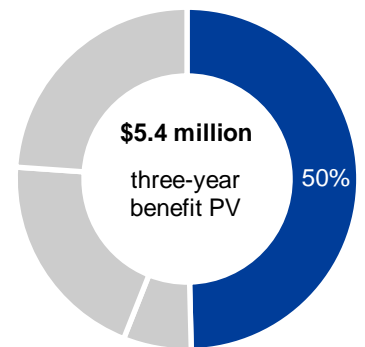
Avoided on-premises infrastructure costs: **50%** of total benefits

Impact risk is the risk that the business or technology needs of the organization may not be met by the investment, resulting in lower overall total benefits. The greater the uncertainty, the wider the potential range of outcomes for benefit estimates.

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- › The organization's preferred refresh cycle.
- › How efficiently the organization managed SQL database infrastructure prior to migration.

To account for these risks, Forrester adjusted this benefit downward by 5%, yielding a three-year risk-adjusted total PV of $5,386,521.

REF.	METRIC	CALC.	YEAR 1	YEAR 2	YEAR 3
Avoided On-Premises Infrastructure Costs: Calculation Table					
A1	Avoided infrastructure costs		$1,900,000	$1,900,000	$1,900,000
A2	Avoided maintenance on legacy on-premises environment	20%	$380,000	$380,000	$380,000
At	Avoided on-premises infrastructure costs	A1+A2	$2,280,000	$2,280,000	$2,280,000
	Risk adjustment	↓5%			
Atr	Avoided on-premises infrastructure costs (risk-adjusted)		$2,166,000	$2,166,000	$2,166,000

Avoided Prior Costs Of SQL Licenses

With their on-premises SQL databases migrated to Azure SQL managed databases, the interviewed organizations avoided the prior expenses for those on-premises licenses. These and other avoided expenses are a gross benefit; ongoing consumption costs for Azure SQL managed databases are noted in the cost section of this study. However, the net impact is positive as ongoing consumption costs are less than the combined costs associated with infrastructure and SQL licenses prior to migration.

For the composite organization, Forrester models the avoided prior costs of SQL licenses as:

- › A total of 200 core licenses (covering more than 700 on-premises databases migrated to Azure SQL managed databases).
- › No remaining license fees or maintenance fees due for the paid-up on-premises licenses.
- › Annual cost of $294,364 for Software Assurance on 100 Enterprise Edition two-core license packs.

Avoided prior costs of SQL licenses will vary based on:

- › The number of licenses an organization needs for ongoing operations.
- › The SQL Server edition required.

To account for these risks, Forrester adjusted this benefit downward by 5%, yielding a three-year risk-adjusted total PV of $695,438.

$695,438
three-year
benefit PV

6%
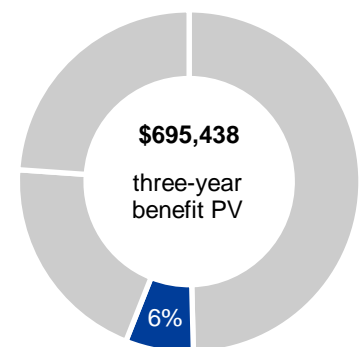
Avoided prior costs of
SQL licenses:
6% of total benefits

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| Avoided Prior Costs Of SQL Licenses: Calculation Table					
REF.	METRIC	CALC.	YEAR 1	YEAR 2	YEAR 3
B1	Annual SQL on-premises license costs		$294,364	$294,364	$294,364
Bt	Avoided prior costs of SQL licenses	B1	$294,364	$294,364	$294,364
	Risk adjustment	↓5%			
Btr	Avoided prior costs of SQL licenses (risk-adjusted)		$279,646	$279,646	$279,646

Improved DBA Productivity

The interviewed organizations each experienced improved DBA productivity because, with Azure SQL managed databases, many manual and time-intensive tasks associated with the prior on-premises SQL database environment are either automated or offloaded to Microsoft. Interviewees cited the following as some of the most time-consuming tasks that were eliminated or greatly reduced by migrating on-premises SQL databases to Azure SQL managed databases:

› **Monitoring, managing, and maintaining the SQL database environment.** Prior to the migration, DBAs spent time on an array of ongoing management and maintenance tasks. Database backups and security patching were particularly burdensome. In tallying the estimated average time savings per DBA after the migration to Azure SQL managed databases, the manager of enterprise data analytics at a business services company cited four hours per application per week no longer spent on monitoring back-ups and three hours each week no longer spent on security patching for SQL servers. Other ongoing efforts that organizations eliminated or reduced include updates, re-indexing, global replications, ensuring availability, maximizing performance, and meeting service level agreements (SLAs).

› **Provisioning and deploying new infrastructure.** Expansion or refreshment of on-premises database servers and associated other infrastructure previously took substantial time from a team of DBAs and IT staff. Planning, provisioning, and deployment took five to eight months, whether prompted by organization growth or a scheduled periodic refreshment to maintain performance levels (typically every three to five years). Because of the fully automated deployment, what used to take weeks to set up new on-premises database servers now takes just hours with Azure SQL managed databases.

In addition to eliminating or reducing the time required for many DBA responsibilities, migrating databases to Azure SQL managed databases enables a wider range of the DBA staff to address the remaining or modified needs. The IT architect for a healthcare nonprofit association observed, "With Azure, less-skilled colleagues can handle tasks they couldn't have handled before."

For the composite organization, Forrester models improved DBA productivity as:

› A team of 25 DBAs supporting the SQL database environment globally.

› Automation and efficiency enabled by Azure SQL managed databases that improves DBA productivity by 40%.

$2.2 million

three-year benefit PV

20%
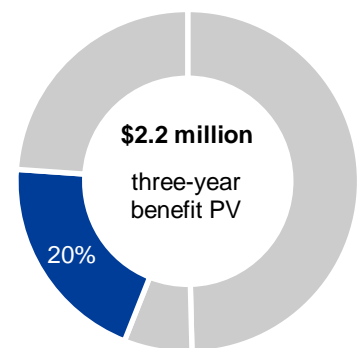
Improved DBA productivity:
20% of total benefits

"Deployment of new infrastructure and regular management activities are automated, basically translating manual efforts into code."

IT architect, healthcare non-profit association

"We are able to do much more on the database side with the same number of people. Their freed-up time has been utilized to do other important things."

Manager, enterprise data analytics, business services company

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> A 75% productivity capture of those time savings (to be conservative), reflecting DBAs' mix of task-related and knowledge-related activities.

DBA productivity improvement will vary based on:

> The number of DBAs needed based on scope and complexity of the databases, workloads, and applications.

> The frequency of infrastructure refreshment.

> The organization's ability to leverage additional productivity from freed time.

> Prevailing compensation rates.

To account for these risks, Forrester adjusted this benefit downward by 10%, yielding a three-year risk-adjusted total PV of $2,182,213.

REF.	METRIC	CALC.	YEAR 1	YEAR 2	YEAR 3
**Improved DBA Productivity: Calculation Table**
C1	Number of DBAs		25	25	25
C2	Percentage of efficiency improvement for DBAs		40%	40%	40%
C3	Average fully loaded annual compensation for DBAs		$130,000	$130,000	$130,000
C4	Productivity capture		75%	75%	75%
Ct	Improved DBA productivity	C1*C2*C3*C4	$975,000	$975,000	$975,000
	Risk adjustment	↓10%			
Ctr	Improved DBA productivity (risk-adjusted)		$877,500	$877,500	$877,500

Improved IT Productivity

The interviewed organizations also experienced significant productivity gains across the varied IT roles supporting the SQL database environment. Those roles included network administrators, system engineers, system administrators, developers, change/release managers, security resources, general support staff, and managers. Time-intensive manual tasks that were eliminated or greatly reduced for IT staff by the migration to Azure SQL managed databases included:

> **Monitoring, managing, and maintaining the SQL database environment.** Prior to migration, the IT staff spent substantial time managing the broader SQL database environment (data centers and associated infrastructure) including updates and security patches for operating systems, detecting threats and optimizing security, other maintenance at the server level of Windows and other software associated with SQL databases, ensuring application compatibility, setting up networks, and system analytics.

> **Provisioning and deploying new infrastructure.** Adding or refreshing infrastructure previously took substantial time from IT staff members collaborating with DBAs as mentioned above to plan, budget, procure, and deploy.

24%

$2.6 million

three-year benefit PV
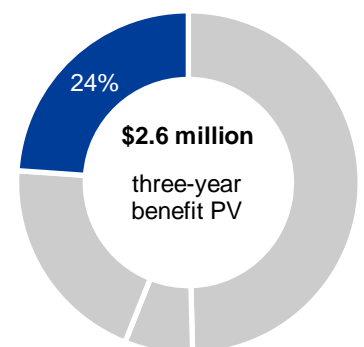
Improved IT productivity: **24%** of total benefits

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In addition to these ongoing benefits, for workloads migrated to Azure SQL Managed Instance, the organizations had a one-time productivity benefit around the migration process. They were able to quickly move entire instances to corresponding environments in Azure without needing developers to rearchitect applications, given the nearly 100% compatibility with SQL Server because of the full SQL Server programming surface area. The manager of enterprise data analytics at a business services company explained, "With Managed Instance, we can just take a backup of the database and move it to Azure with very little additional effort."

For the composite organization, Forrester models improved IT productivity as:

› A total of 120 individuals across varied IT roles spending on average 35% of their time supporting the SQL environment.

› A 25% increase in productivity reflecting less time required for both day to day and periodic support of the SQL environment.

› A 100% productivity capture, reflecting the task-related nature of the pertinent IT activities.

IT productivity improvement will vary based on:

› The number of IT staff members needed to support the database environment based on scope and complexity of the databases, workloads, and applications.

› The frequency of infrastructure refreshment.

› The organization's ability to leverage additional productivity from freed time.

› Prevailing compensation rates.

To account for these risks, Forrester adjusted this benefit downward by 10%, yielding a three-year risk-adjusted total PV of $2,594,483.

> "In migrating to Managed Instance, we were able to rehost applications in hours instead of spending weeks to rearchitect them."
>
> *Chief information officer, government agency*

> "Our IT staff can now spend time advancing the state of the art instead of patching systems."
>
> *Chief architect, financial services company*

REF.	METRIC	CALC.	YEAR 1	YEAR 2	YEAR 3
Improved IT Productivity: Calculation Table					
D1	Number of IT staff managing on-premises SQL database environment		120	120	120
D2	Percentage of time spent provisioning, deploying, and managing on-premises SQL		35%	35%	35%
D3	Percentage of efficiency improvement for IT staff		25%	25%	25%
D4	Blended fully loaded annual compensation for IT staff		$110,400	$110,400	$110,400
Dt	Improved IT productivity	D1*D2*D3*D4	$1,159,200	$1,159,200	$1,159,200
	Risk adjustment	↓10%			
Dtr	Improved IT productivity (risk-adjusted)		$1,043,280	$1,043,280	$1,043,280

Unquantified Benefits

Interviewed organizations described other significant benefits that are not quantified for this study:

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> **Ability to focus DBAs and IT staff on higher-value activities.** Because of the significant productivity improvements that Azure SQL managed databases enables, interviewed organizations have transformed the roles of their DBAs and IT staff. With many time-consuming and repetitive tasks now automated or offloaded to Microsoft, organizations can leverage those individuals' expertise on higher-value activities — often around special projects, new business initiatives, innovation efforts, or tuning database operations to reduce costs. In addition, DBA contributions have expanded from largely administrative efforts to deeper integrations with application teams, improving the quality of what they jointly deliver. Interviewed executives perceived that greater job satisfaction translated into less turnover of DBAs and other IT staff. The manager of enterprise data analytics for a business services company said, "We always need smart people, and we retain them longer when their jobs are more interesting and they like what they're doing."

> **Greater agility and shorter time-to-market.** Faster provisioning and the ease of scaling enabled DBAs and IT staff to respond to requests from the business sooner, thus decreasing time-to-market for new initiatives. The manager of enterprise data analytics for a business services company said, "Now we can increase capacity almost immediately."

> **Ease of adjusting Azure SQL managed databases resources, which saves time and costs.** Especially when launching new initiatives or revising existing efforts, organizations valued the ease with which they could modify their Azure SQL managed databases resources. As a result, DBAs and IT staff spent less time on capacity planning. In addition, costs could be reduced by applying automatic scaling (i.e., using a minimal set of resources but autoscaling to more as needed) and by monitoring Azure usage to understand workloads and their timing in order to further tune resources where feasible (e.g., by combining databases or rescheduling jobs, adjusting service tiers, or decreasing compute and storage). According to the IT architect for a healthcare non-profit organization, "By scaling Azure resources (Data Throughput Units or vCores) up and down, we have been able to adjust the performance to the service level agreement, so that we save costs and still meet the agreed-upon service level. Our performance had been good before, but now we achieve that performance at lower cost." The chief architect at a financial services company noted, "We can take advantage of the scale that Microsoft has, to lower our costs by having Microsoft provide and manage the resources on our behalf."

> **Stronger security.** In addition to saving staff time previously spent on security patching, organizations cited as a benefit the effort Microsoft made to ensure the security of their databases. The chief architect at a financial services company said: "How do you put a price tag on a secure environment? The value lies in Microsoft being much better equipped to deal with the potential security threats that are out there. It's basically economies of scale. Microsoft can attract talent, and it invests much more in preventive measures. Microsoft is more proactive about security than we could be."

"Because people do not have to spend so much time on repetitive tasks and administrative details, they can use their brains on higher value efforts."

Chief information officer, government agency

"Once you procure and deploy physical servers, you're stuck. It's not easy to change. But with Azure SQL managed databases, we can easily try something new and decide whether it makes sense to continue."

Manager, enterprise data analytics, business services

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> **Higher availability.** The CIO of a government agency with extensive public interaction noted that the reliability of Azure SQL managed databases enabled the agency to improve its availability to constituents and perceptions of the agency. Organizations also avoided the internal disruption and loss of end user productivity previously caused by maintenance and cut-over windows.

> **Better compliance.** The IT architect for a healthcare nonprofit organization explained how the Azure ecosystem improved auditability and control, making it easier to comply with information security management standards. The CIO of a government agency, citing a heavy level of compliance requirements as a public entity, indicated that Azure SQL managed databases made it easier to meet reporting requirements.

Flexibility

The value of flexibility is clearly unique to each customer, and the measure of its value varies from organization to organization. There are multiple scenarios in which a customer might choose to implement Azure SQL managed databases and later realize additional uses and business opportunities, including:

> **Immediate access to new features and functionality**. With Azure SQL managed databases, organizations are always using the latest version of the product. As the chief architect for a financial services company explained: "We don't have the option of lagging behind. We have to be on the current version of the product and take advantage of Microsoft's investment in things like protection from possible security vulnerabilities and improvements in analytics, dashboards, and tools."

> **Ability to accommodate temporary resource spikes.** Customers deemed Azure SQL managed databases as well-suited to complex IT scenarios that require a burst of resources for a limited time, like business intelligence, big data, machine learning, or artificial intelligence. Supporting those resources in an on-premises database environment would have been prohibitively expensive.

> **Deeper analytics.** The manager of enterprise data analytics for a business services company noted that having applications and analytics now both running on the Azure platform makes it easier to do substantial analytics.

> **Ease of experimentation and innovation.** The IT architect at a healthcare nonprofit organization noted: "Azure is much more flexible. With on-premises databases, you must invest in hardware and do a lot of work before it's operative. But in Azure we can spin up a new environment and try it. We can be creative and innovative. If something doesn't work, we can drop it and find something else."

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

Flexibility, as defined by TEI, represents an investment in additional capacity or capability that could be turned into business benefit for a future additional investment. This provides an organization with the "right" or the ability to engage in future initiatives but not the obligation to do so.

"In the past, we had to migrate an entire cluster to get new functionality. But with Azure, you get every new feature directly as soon as it becomes available."

IT architect, healthcare nonprofit organization

"When our databases were on-premises, we couldn't access the large amount of compute capacity needed to try working with artificial intelligence or other compute-intensive initiatives. Now we can buy 64 cores for a few hours, perform a task, and then shut down that system

Chief information officer, government agency

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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
Etr	Azure SQL managed databases consumption costs	$0	$1,192,174	$1,192,174	$1,192,174	$3,576,523	$2,964,761
Ftr	Internal labor costs for migration	$252,138	$0	$0	$0	$252,138	$252,138
	Total costs (risk-adjusted)	$252,138	$1,192,174	$1,192,174	$1,192,174	$3,828,660	$3,216,899

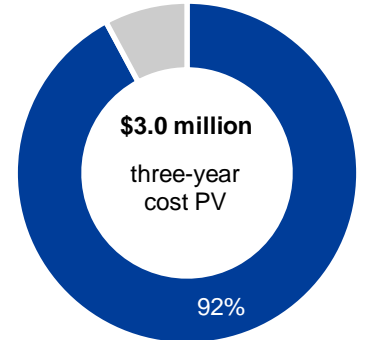## Azure SQL Managed Databases Consumption Costs

Azure SQL managed databases consumption costs can vary substantially depending on the size of the deployment and other factors specific to each organization, and they may change from month to month based on an organization's usage. Because the number of licenses can be adjusted as needed after an organization migrates to Azure SQL managed databases, fewer cores may be required compared to when the databases were on-premises.

Costs are also determined by an organization's contract terms and eligibility for Microsoft programs and discounts. For instance, organizations previously using SQL Server licenses with active Software Assurance can maximize the value of their investments in those on-premises SQL Server licenses by using the Azure Hybrid Benefit to get discounted rates on Azure SQL managed databases. (Organizations must maintain active Software Assurance on Azure SQL managed databases to remain eligible for Azure Hybrid Benefit.) Consult with Microsoft for likely consumption costs specific to your organization when conducting your own analysis.

For the composite organization, Forrester models Azure SQL managed databases consumption costs as:

› Average annual consumption costs of $1,135,404.

› A total of 25 Azure SQL Managed Instances across two service tiers (23 general-purpose, two business-critical) and 20 Azure SQL Databases distributed across both Database Transaction Unit (DTU) and vCore-based purchasing models.

› An average of eight vCores of computing power and up to eight terabytes of storage per Azure SQL Managed Instance in the general-purpose tier and up to one terabyte of storage per managed instance in the business-critical tier.

› Azure SQL Databases that are vCore-based average four vCores of computing power and up to 1 terabyte of storage each. DTU-based Azure SQL Databases average less than one core of computing power and storage of up to 250 gigabytes per single database.

› Software Assurance fees paid on Azure SQL managed databases.

The table above shows the total of all costs across the areas listed below, as well as present values (PVs) discounted at 10%. Over three years, the composite organization expects risk-adjusted total costs to be a PV of more than $3.2 million.

$3.0 million

three-year cost PV

92%

Azure SQL managed databases consumption costs: 92% of total costs

Implementation risk is the risk that a proposed investment may deviate from the original or expected requirements, resulting in higher costs than anticipated. The greater the uncertainty, the wider the potential range of outcomes for cost estimates.

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- › Consumption costs discounted through the Azure Hybrid Benefit.

Azure SQL managed databases consumption costs will vary based on:

- › The number of managed instances and single databases.

- › The service tier(s) selected.

- › Compute needs.

- › Storage needs.

- › How effectively an organization manages its Azure consumption.

To account for these risks, Forrester adjusted this cost upward by 5%, yielding a three-year risk-adjusted total PV of $2,964,761.

REF.	METRIC	CALC.	INITIAL	YEAR 1	YEAR 2	YEAR 3
**Azure SQL Managed Databases Consumption Costs: Calculation Table**
E1	Monthly consumption costs			$94,617	$94,617	$94,617
E2	Number of months			12	12	12
Et	Azure SQL managed databases consumption costs	E1*E2	$0	$1,135,404	$1,135,404	$1,135,404
	Risk adjustment	↑5%				
Etr	Azure SQL managed databases consumption costs (risk-adjusted)		$0	$1,192,174	$1,192,174	$1,192,174

Internal Labor Costs For Migration

Most interviewed organizations conducted the migration to Azure SQL managed databases using internal labor and informal help from Microsoft. The overall migration processes typically included assessment/planning, defining requirements, migration, testing, and deployment.

Interviewed organizations took varied approaches to migration. Some completed the migration as essentially a single continuous project taken from initiation to completion, while others opted for a phased migration to accommodate organizational or technical factors such as interdependencies between applications, the complexity of the application/database, migration time, and the time required to adjust the application. The costs shown below capture the effort needed. Elapsed time may be longer. Some organizations did an initial proof of concept before a broader migration.

For the composite organization, Forrester models internal labor costs for migration as:

- › A team of six (DBAs, cloud engineers, architects, and security staff) working 50% time on the migration for a continuous three months.

    Internal labor costs for migration will vary based on:

- › The scope and complexity of the migration, including the number of servers.

- › Whether or not migrated databases are mission-critical.

- › Local compensation rates.

To account for these risks, Forrester adjusted this cost upward by 15%,

8%

$252,138

three-year
cost PV
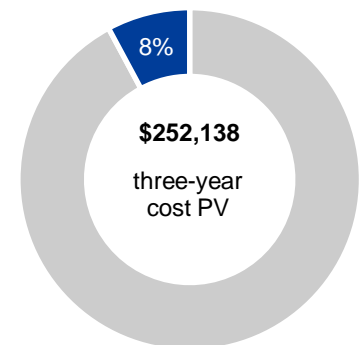
Internal labor costs for migration:
8% of total costs

"The migration was easy enough that we were able to try things on our own. But Microsoft was always there to informally support us through an occasional conversation. It was a very good experience."

Manager, enterprise data analytics

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yielting a three-year risk-adjusted total PV of $252,138.

Internal Labor Costs For Migration: Calculation Table						
REF.	METRIC	CALC.	INITIAL	YEAR 1	YEAR 2	YEAR 3
F1	Number of months to migrate, test, and deploy		3			
F2	Number of DBAs		5			
F3	Number of IT FTEs		10			
F4	Percentage of time dedicated to Azure SQL managed databases migration		50%			
F5	Average fully loaded monthly compensation for DBAs	$130,000	$10,833			
F6	Blended fully loaded monthly compensation for IT staff	$110,400	$9,200			
Ft	Internal labor costs for migration	(F1*F2*F4*F5)+ (F1*F3*F4*F6)	$219,250	$0	$0	$0
	Risk adjustment	↑15%				
Ftr	Internal labor costs for migration (risk-adjusted)		$252,138	$0	$0	$0

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Financial Summary

CONSOLIDATED THREE-YEAR RISK-ADJUSTED METRICS

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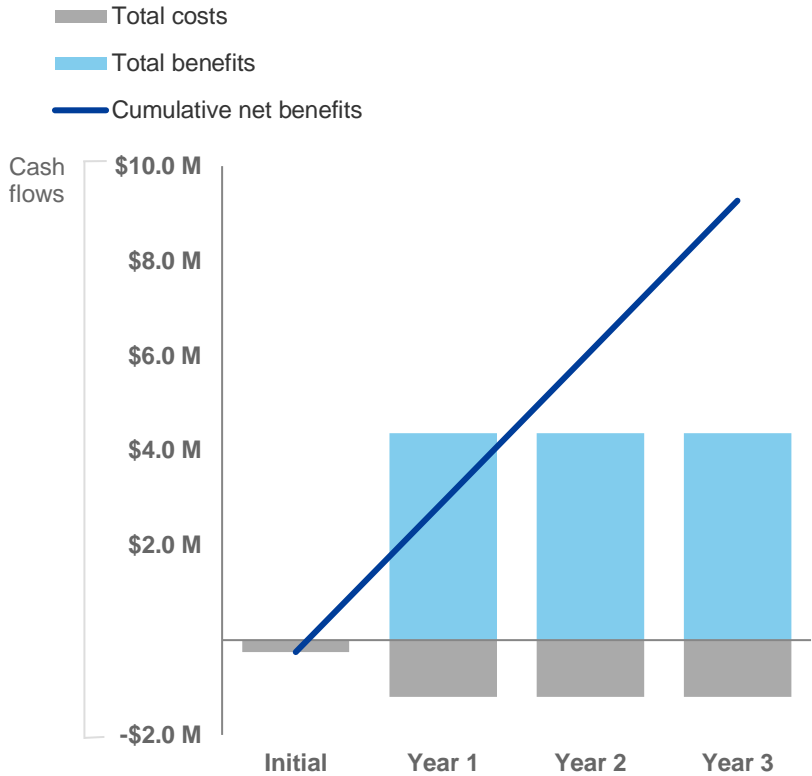
The financial results calculated in the Benefits and Costs sections can be used to determine the ROI, NPV, and payback period for the composite organization's investment. Forrester assumes a yearly discount rate of 10% for this analysis.

Legend:
- Total costs
- Total benefits
- Cumulative net benefits

Cash flows axis: $10.0 M, $8.0 M, $6.0 M, $4.0 M, $2.0 M, -$2.0 M

X-axis: Initial, Year 1, Year 2, Year 3

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

Cash Flow Table (Risk-Adjusted)

	INITIAL	YEAR 1	YEAR 2	YEAR 3	TOTAL	PRESENT VALUE
Total costs	($252,138)	($1,192,174)	($1,192,174)	($1,192,174)	($3,828,660)	($3,216,899)
Total benefits	$0	$4,366,426	$4,366,426	$4,366,426	$13,099,277	$10,858,655
Net benefits	($252,138)	$3,174,252	$3,174,252	$3,174,252	$9,270,617	$7,641,756
ROI						238%
Payback period						<3 months post migration

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Microsoft Azure SQL Managed Databases: Overview

The following information is provided by Microsoft. Forrester has not validated any claims and does not endorse Microsoft or its offerings.

Microsoft Azure SQL is a modern SQL portfolio, powered by the industry-leading SQL Server engine that has evolved and been perfected over 25 years. Azure SQL is evergreen, meaning it is always up to date with the latest automated updates and patches, and because it has the SQL code base at its foundation, database administrators and developers can confidently use the tools and resources they are already familiar with. The Azure SQL portfolio provides a consistent and unified management experience across SQL Server on Azure virtual machines (IaaS) and Azure SQL managed databases (PaaS).

Azure SQL managed databases, comprised of Azure SQL Database and Azure SQL Managed Instance, are intelligent, fully managed relational database services that support structures such as relational data, JSON, spatial, and XML. Azure SQL managed databases deliver dynamically scalable performance and options such as columnstore indexes for extreme analytic analysis and reporting, and in-memory OLTP for extreme transactional processing. High availability is built-in and deeply integrated with the Azure platform. Combined with intelligent performance tuning and security features trained on the telemetry from millions of databases, Azure SQL managed databases optimize performance, security, and reliability on your behalf. Because Microsoft manages the maintenance and updates of the database and infrastructure, Azure SQL managed databases are always up to date, making end of support events a thing of the past. In addition, the day-to-day management of underlying infrastructure is abstracted away, so you can focus more on driving growth for your business — efficiently and cost-effectively.

Azure SQL Database provides both single databases and elastic pools of databases, each with their own sets of resources and managed by a logical server. The service provides a variety of compute and storage options, including serverless and Hyperscale storage, which can scale up to 200 TB. Azure SQL Database is widely used for developing cloud-native applications.

Azure SQL Managed Instance combines the rich SQL Server surface area with the operational and financial benefits of an intelligent, fully managed service. It provides high compatibility with SQL Server engines (2005 through current versions), streamlining on-premises SQL Server database migration while reducing or eliminating the need to rearchitect applications. It also includes native virtual network (VNET) support to promote secure data communications.

Microsoft offers economic incentives to maximize the return on investment of migrating SQL Server workloads to Azure SQL and provide a competitive total cost of ownership for building new apps in the cloud. The Azure Hybrid Benefit lets you use your on-premises SQL Server licenses with active Software Assurance to obtain discounted rates in Azure SQL. Reservation pricing provides further discounts for prepaying upfront for a one- or three-year term commitment. When combining these incentives, you can experience savings of up to 80 percent versus license-included pricing. Learn more at aka.ms/azure_hybrid_benefit.
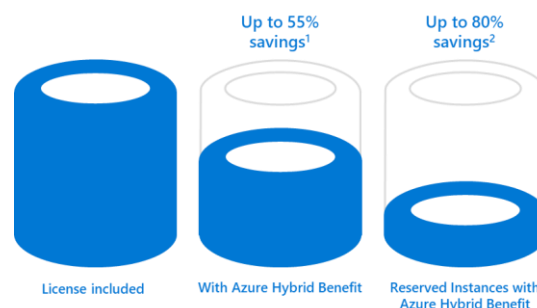
Organizations can accelerate migrations to Azure SQL managed databases by using Azure Database Migration Service (DMS) — a fully managed service that streamlines the tasks required to move existing databases to Azure. DMS enables seamless migrations from heterogeneous database sources to Azure database platforms with minimal downtime. For more information, please visit aka.ms/databasemigration.

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Azure SQL managed databases provide the operational and financial benefits of managed services and the consistency that comes from a common SQL code base. Confidently migrate your SQL Server workloads to Azure and continue to use the skills, tools, and resources you're accustomed to. Build modern apps in the cloud on databases that adapt to the pace of your business and provide near limitless scale to support future growth. For more information on Azure SQL, please visit aka.ms/azure_sql.

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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%.

Payback period

The breakeven point for an investment. This is the point in time at which net benefits (benefits minus costs) equal initial investment or cost.

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Appendix B: Endnotes

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[1] Source: "Research Overview: Infrastructure Technology For 2020," Forrester Research, Inc., February 2020.

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