vmware® CLOUD™

The Complete Guide to Cloud Economics

Improve decision-making, avoid risk, reduce costs and accelerate cloud adoption.

Contents

1 Introduction

There are two leading reasons why companies move to the cloud and they're both tied to the bottom line

Economies of scale: Large cloud vendors can set up hardware and computing power in bulk and offer it to enterprises as a service at a substantially lower cost than on-premises.

Global reach: Cloud computing means IT resources don't have to reside in the same building, or even the same country as an organization. This means labor costs for creating, deploying, and maintaining resources can be optimized.

While the benefits of cloud adoption are clear, IT leaders still face a number of challenging questions when moving to the cloud:

- Is a public, private or hybrid model best for my business needs?
- What are the relative costs and risks of cloud adoption?
- How long will it take me to migrate to the cloud?
- What's the best way to make the move?

In this ebook, we'll give you the tools to answer these questions, exploring how to analyze cognitive biases and risks, and comparing the cost-effectiveness of different infrastructure options.

Read on to discover how to improve your decision-making with Cloud Economics and arrive at the ideal cloud infrastructure as quickly as possible.

2 What is Cloud Economics?

Economics is the study of decision-making in the production, distribution and consumption of goods and services. Economic theories are applied throughout society from business and finance to healthcare and government.

Cloud Economics is the application of this study to make better, more cost-effective decisions about cloud adoption and usage.

In Cloud Economics, we draw on a combination of traditional and behavioral economics.

Traditional economics

Traditional economics assumes humans are rational and will make the most logical choice when faced with a decision. In this theory, all choices have a real-number value, and the greatest value is the rational choice.

Traditional economic theory can be found in historical writings from the Mesopatamians and Greeks to Chinese and Arab civilizations. However, the field only emerged as its own discipline when Adam Smith published *The Wealth of Nations* in 1776, exploring theories on resource-allocation and diminishing returns. This model was developed further in the late 18th and early 19th centuries by thinkers including Thomas Malthus and John Stuart Mill.

We can think of traditional economics as the theory of decisions that people *should* make.

Behavioral economics

Behavioral economics, however, assumes humans aren't always rational. Rather, people have blind spots and cognitive biases that cause them to make mistakes.

The behavioral model of economics draws on psychology, neuroscience and microeconomic theory to examine the range of influences that affect economic decisions, beyond just the hard facts. Behavioral economics was founded by Daniel Kahneman in 1979, and later formalized by Richard Thaler.

The three prevalent themes of behavioral economics are:

- **Heuristics:** Most of the decisions people make are affected by mental shortcuts.
- **Framing:** People filter the world through biases and stereotypes that they use to understand events.
- **Market inefficiencies:** Markets can be impacted by mis-pricing or non-rational decision-making.

> We can think of behavioral economics as the theory of decisions that people *actually* make.

In summary

When making cloud decisions, you need to consider the best choice based on the real value of your options, as well as how biases might affect the way you weigh these options.

3 How to make better cloud decisions

In this section, we'll explore the most common biases affecting cloud decisions, introduce risk analysis theory, and share VMware's risk analysis process to help you weigh the pros and cons of your choices.

Blind spots and biases

Blind spots are a common form of cognitive bias, in which we ignore influential factors in a decision. Make sure you consider these blind spots, and measure their associated costs in any cloud decision you make.

Refactoring and rework

Refactoring applications to run on the public cloud can require significant investment in development, test, and deployment – sometimes taking years.

Talent reskilling

When incorporating native cloud platforms, prior investments in management and operations skills are not always transferable.

Environment lock-in

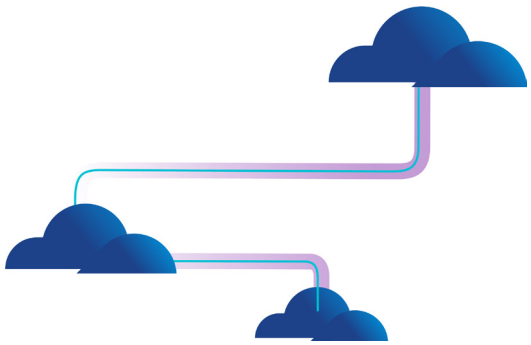
Reworking applications to fit one cloud environment can cause portability challenges across other environments, leading to environment lock-in.

Operational costs

Enterprises sometimes fail to consider ongoing operational costs as an element of the entire cost of a decision.

VMware Cloud on AWS helps to overcome many of these blind spots, by allowing your team to migrate to a seamless hybrid cloud without refactoring or upskilling

Find out more.



4 Understanding risk analysis theory

Risk is a factor in every decision.

To manage this reality, IT leaders need to balance their risk appetite with the reward required to make a risk worthwhile.

VMware uses three 'rules of risk analysis', to evaluate risk and make better decisions, faster.

Rule 1: The ratio of investment to expected return will influence your decision-making abilities.

Rule 2: Your level of risk tolerance should exceed the level of risk exposure.

Rule 3: The potential value of a decision should be greater than the cost of the risk.

Rule 1: The ratio of investment to expected return will influence your decision-making abilities

There are typically two kinds of risk that affect the way we make cloud decisions: financial, and performance risk.

Financial risk

As the money involved in an investment increases, so too does the emotionality of the investment. This is called financial risk because it is associated with the ratio of the investment to the outcome.

For example, the game of poker is the same whether you're playing for a few cents or for $1,000 chips. But when the stakes are high, you play the game very differently and are less willing to embrace risk.

Performance risk

Performance risk is determined by the range of different risks associated with any given action. This can include financial risk.

For example, when making a cloud decision, you might be faced with a number of questions:

- What if this doesn't turn out as expected?
- What if it ends up costing more and taking longer to implement?
- Am I getting locked into something I'll have trouble getting out of?

Each of these carries a 'performance risk'. As uncertainty increases, doing nothing might seem less risky, but this is a choice in itself and could cost lost opportunities and result in unexpected risk exposure.

> The solution? Reduce the relative size of each of your decisions. This will help you keep a clear head and override the 'fight or flight' resistance or the 'do nothing' reaction.

Rule 2: Your level of risk tolerance should exceed the level of risk exposure

Fear in decision-making can be countered by systematically identifying, quantifying, and forecasting each possible outcome. From here, you can add a numerical value to the risk exposure and a level of tolerance to each outcome.

The gap between the exposure and your risk tolerance is called 'inherent risk'. If the inherent risk is negative, then the risk involved in the decision is unfavorable. The inherent risk can also be used to create a risk-adjusted investment value.

Equation example

Risk tolerance - risk exposure = inherent risk

In summary

'Rule 2' helps you identify acceptable and non-acceptable outcomes to choose the pathway that best suits you.

Rule 3: The potential value of a decision should be greater than the cost of the risk

Having proceeded through Rules 1 and 2, you can use your findings in a comprehensive decision framework to determine the following:

Risk-adjusted investment

You can use the inherent risk determined in Rule 2 to adjust your investment figure to give you a risk-adjusted investment. In IT, we compare the inherent risk with the competing Total Cost of Ownership (TCO). The risk-adjusted TCO will reflect an increase or decrease depending on the inherent risk factors.

Equation example

TCO - (TCO * Inherent Risk) = Risk Adjusted TCO

Return on risk

The return on risk is comprised of your inherent risk (from Rule 2), and the ratio of the upside opportunity to the downside exposure, expressed as a factor. If the financial risk in this equation is small, then your inherent risk will carry larger weight in the result. Otherwise, a large financial risk will be more impactful than the inherent risk involved in your decision.

Equation example

Return on risk = inherent risk * [(TCO spend ratio) * (impacted revenue)]

A positive return on risk suggests the potential for success in your decision is good, while a negative suggests a higher likelihood of failure.

Estimation of value impact

You can use your findings to estimate the value impact of a range of options and make a decision that is less influenced by bias.

In summary

You can now apply the return on risk to the TCO of a project to ascertain where to reduce risk exposure (Rule 1), ensure the level of risk you're exposed to is lower than the level you're willing to accept (Rule 2), and ensure the upside value of a given decision is greater than the downside of the financial exposure (Rule 3).

Later we'll show you how VMware applies risk analysis to a real-world cloud scenario.

5 Comparing infrastructure costs

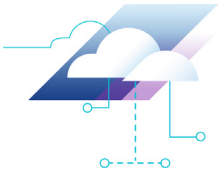
When deciding whether or not to move to the cloud, it's important to have a good understanding of the total cost of each option.

In this section we'll examine the economic pros and cons of four different cloud infrastructure models.

- Traditional 3-tier (private)
- Hyperconverged Infrastructure (private)
- Public cloud (public)
- VMware Cloud (hybrid)

Traditional 3-tier

Traditional 3-tier architectures are private infrastructure platforms in which compute, storage and networking processes are maintained as independent modules. In a 3-tiered architecture, each system component comes with its own management software. However, this can lead to increased overheads and a complex set of incompatible management tools.



Hyperconverged infrastructure

This is a software-defined data center (SDDC) platform that is based on general-purpose hardware, tightly-integrated with software that integrates functional processes into a unified solution. This solution differs from traditional 3-tiered architectures by including cloud automation tools and complete virtualization of every infrastructure layer – networking, compute, storage.

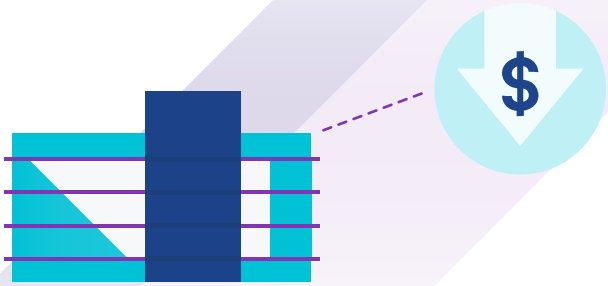
The benefits of hyperconverged infrastructure[2]

- Automated, simplified and rapid setup of the entire SDDC-based private cloud
- Automated lifecycle management of the entire SDDC Platform including day 0 to day 2 processes such as bring-up, configuration, provisioning, and patching/upgrades
- Workload Domain abstraction for isolating pools of resources into private cloud capacity, with different availability, performance and security attributes
- Integrated management of servers and virtualized resources from a single pane
- Operational simplicity and automation for health monitoring of both physical and virtual infrastructures
- Simplified IaaS service deployment and operations, similar to a public cloud

Public cloud infrastructure

This model includes 'mega-cloud' providers such as Amazon Web Services, Microsoft Azure or Google Cloud Platform. One of the biggest barriers to corporate adoption of public clouds is the time, effort, and cost to move and deploy applications. Organizations either use packaged, 'lift-and-shift' applications, or custom applications that require expensive and time-consuming refactoring.

When making your move to the cloud, it's crucial to factor this refactoring cost into your decision-making. Failure to consider refactoring cost is a common migration blind spot, and one that can cause significant expenses for organizations in the long run.



[2] Taneja Group, When Comparing Cloud Alternatives, For the Best TCO Leverage VMware Cloud Foundation, April 2019

VMware Cloud

A VMware-managed SDDC delivered as-a-service via a public cloud or a VMware Cloud Provider. This approach enables you to modernize, protect and scale vSphere-based applications via a seamlessly integrated hybrid cloud.

Benefits of VMware Cloud[2]

- Operational consistency across on-premises and public cloud
- Integrated hybrid cloud management
- Enterprise-grade application workload support
- Higher-than-average virtual machine (VM) density and efficiency
- Seamless network bridging and features
- Uncompromised workload portability
- Single-contact premium support included
- Direct access to AWS Services

Cost differences between the four approaches[2]

For public cloud, our analysis showed VMware Cloud held a major hosting and migration cost advantage over other solutions, which often required significant refactoring and reskilling costs.

	Traditional 3-tier	Hyperconverged Infrastructure	Public Cloud	VMware Cloud
How much do these cloud infrastructures cost?	Infrastructure cost: **$3,217,512**	Infrastructure cost: **$2,439,925**	Workload refactoring costs: **$996,912**	Workload refactoring costs: **NA**
	3-year operating cost: **$1,819,035**	3-year operating cost: **$1,169,122**	3-year cloud subscription cost: **$3,273,327**	3-year cloud subscription cost: **$3,062,248**
TCO over three years:	$5,027,547	**$3,609,048**	$4,270,239	**$3,062,248**
Savings compared to traditional 3-tier approach		**28%**	15%	**39%**

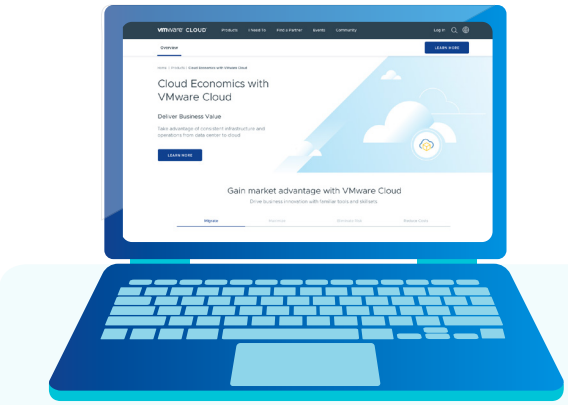
[2] Taneja Group, When Comparing Cloud Alternatives, For the Best TCO Leverage VMware Cloud Foundation, April 2019

6 Simplify and accelerate your path to cloud

Making cloud decisions doesn't have to be hard.

VMware Cloud Economics provides a foundation to help you understand the key drivers underpinning decisions, from blind spots, to risk appetite and TCO differences.

With a thorough understanding of these drivers, and by taking the appropriate steps to mitigate risk, you can confidently adopt the most cost-effective and efficient infrastructure solution for your needs.



For more information on how to assess risk and maximize the value of your cloud investments, visit **cloud.vmware.com/cloud-economics**