



Achieving Cloud Management Nirvana with Self-Optimizing Applications

FEATURING RESEARCH FROM FORRESTER

The Forrester Wave™: Cloud Cost Monitoring And Optimization, Q2 2018

ACHIEVING CLOUD MANAGEMENT NIRVANA WITH SELF-OPTIMIZING APPLICATIONS

The Public cloud provides agility, flexibility, efficiency and capacity on demand without expensive physical infrastructure. But organizations are facing a significant challenge in public cloud management — the inability to automate the process of quickly and correctly identifying the right public cloud resources for their applications. This inability to match application demands with the right cloud resources, at the right time, leads to:

- Application performance degradation and possible outages
- Increase in unnecessary cloud infrastructure usage
- Increase in staffing and complexity of managing large environments
- Up to 80% more in cloud bill expenses

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19 About Densify

Cloud vendor service offerings evolve constantly as new technologies and pricing variables are introduced. Densify's fundamental belief is that it is not humanly possible to manually solve this ever-changing, multidimensional equation. Without applying the right analytics, you will subscribe to suboptimal services, introduce operational risks, chance application performance issues, and waste company funds.

For example, many organizations not only purchase the wrong sizes of instances, but they also purchase the wrong types of instances, as they have no way to properly analyze the normalized resource requirements. They also purchase Reserved Instances based on what they are currently using, not predictive analysis of what they should be using. This can actually lock them into the wrong configurations, killing agility and inflating costs.

Densify also believes that any recommendations need to be precise enough to be automated and should not require constant review by infrastructure teams or app owners. It is only when these actions are actually taken that the gains are made, and many cloud solutions fall short on this front, providing reams of raw data and reports but not actually optimizing the cloud environments.

THE 5-STEP OPTIMIZATION PROCESS

You cannot optimize if you don't analyze. There are five levels of optimization that organizations must adopt, and the only way to achieve this level of optimization is through machine-learning automation.

1. Compute & Database sizing – analyse trends over time and right-size deadwood or resources that are not needed, or increase where they are needed.
2. Instance Family Optimization – Select the right cloud family based on the performance needs of applications at different times of day and hour.
3. Scale Group Optimization – Determine the right scale groups within the cloud providers' offerings, based on the demands of the applications.
4. Reserved Instances Optimization – Select the right RIs and ensure that investments in these purchases align to the needs of the applications future needs.
5. Container Optimization – Ultimately, leverage container technologies to achieve an even higher optimized environment.

MACHINE-LEARNING CLOUD OPTIMIZATION TO THE RESCUE

One application can run on over 1.7 million permutations on AWS alone, and its demands fluctuate hourly. Addressing the 5 key strategies listed above for every application is a daunting and impossible task to achieve manually. The only way to make the jigsaw puzzle of application demands perfectly fit into the right cloud supply is through machine learning that allows applications to optimize themselves, dynamically selecting what is best for them based on learned patterns of use.

Now, imagine if your apps could intelligently understand their resource demands every hour of the day, every day of the year. Imagine if they could use this to automatically match themselves to the best-suited cloud instances, container sizes, and nodes, and to adapt as their resource needs change and as better technologies become available.

And what if this application had the intelligence to tap into the entire cloud catalog across all public cloud alternatives, understanding pricing models and trade-offs, and honoring business policies. What if this application understood how to leverage burstable instances, provisioned IOPS, local storage, scale groups, and other key cloud capabilities. And what if it knew exactly how it should be purchased, including the use of reserved instances and whether convertible reserved instances make sense. This level of optimization is only possible when applications have the ability to self-select cloud resources.

Achieve this level of sophistication with Densify's machine-learning Cloud Optimization engine. Densify makes your applications self-optimizing - enabling them to automatically match their needs with perfectly matching cloud resources - driving down costs and improving performance, 24/7.

The Forrester Wave™: Cloud Cost Monitoring And Optimization, Q2 2018

The Nine Providers That Matter Most And How They Stack Up

by Lauren E. Nelson
May 30, 2018

Why Read This Report

In our 25-criteria evaluation of cloud cost monitoring and optimization providers, we identified the nine most significant ones — Apptio, Cloudability, CloudCheckr, CloudHealth Technologies, Densify, Microsoft, RightScale, Teevity, and Turbonomic — and researched, analyzed, and scored them. This report shows how each provider measures up and helps infrastructure and operations professionals make the right choice.

Key Takeaways

CloudHealth Technologies, RightScale, Turbonomic, And Densify Lead The Pack

Forrester's research uncovered a market in which CloudHealth Technologies, RightScale, Turbonomic, and Densify lead the pack. Apptio, CloudCheckr, and Microsoft offer competitive options. Cloudability and Teevity lag behind.

I&O Pros Are Looking For Accuracy And Fast Recommendations For Remediation

The cloud cost monitoring and optimization market helps I&O professionals shrink their swelling cloud spend. I&O pros seek accurate insights and timely remediation recommendations across their complicated landscape of cloud cost models.

Insights Across Cloud, Automated Fixes, And Savings Trackers Are Key Differentiators

Vendor and enterprise cloud portfolios are gaining more services and cost models. Breadth and depth in coverage across multiple clouds, granular cost breakdowns, automated remediation, and savings trackers will all prove differentiators in the cloud cost monitoring and optimization market.

The Forrester Wave™: Cloud Cost Monitoring And Optimization, Q2 2018

The Nine Providers That Matter Most And How They Stack Up



by [Lauren E. Nelson](#)
with [Glenn O'Donnell](#), William McKeon-White, and Peggy Dostie
May 30, 2018

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Cloud Cost Complexity Mandates Dedicated Management Efforts

Many organizations turn to the cloud to reduce spend on infrastructure or avoid steep upfront costs for new investments. Still, many have not achieved these goals. Success depends more on the maturity of cloud management and governance practices than the nature of the workload. With cost complexity continuing to increase alongside growing usage, users, accounts, and instance types, I&O professionals increasingly depend on tools to enable visibility, consistency, and scalability of management practices. Today, 45% of North American infrastructure technology decision makers at enterprises that have adopted cloud say their firms have taken steps to optimize workload configurations to reduce cloud spend, with another 37% stating this is in development.¹ While cloud cost is often included in multi-platform management tools — e.g., hybrid cloud management (HCM) tools — a standalone market dedicated to cloud cost monitoring and optimization continues to thrive. This is because:

- › **Starting cost is far lower.** Cloud cost monitoring and optimization (CCMO) tools typically correspond with amount of cloud spend managed, with many prices starting at \$50,000, whereas HCM tools often start at \$200,000 or higher. Cloud users looking for immediate cloud cost control find it easier to get approval for CCMO tools, because of the lower total cost and being specifically designed to solve this challenge. HCM vendors are starting to spin cost management into a separate product — to win customers in this market — and then expand usage into the full HCM suite.
- › **Return on investment (ROI) is much quicker.** Recommendations for remediation showing unused capacity or configuration corrections quickly pay off. CCMO customers quote ROI at between two and six months, which is far quicker than more costly tools that also cover compliance, orchestration, and other solutions. Some vendors track savings totals accrued due to using the tool, advocating for both the tool and the success of the operator monitoring these resources.
- › **Depth of cost monitoring and optimization is deeper.** CCMO customers expect deep granular capabilities for managing cloud costs. This includes support of reserved and spot instances, ability to set custom discounts, and normalize the results across each supported platform. From there, they provide remediation advice based on inputs from third-party monitoring tools, other customers, and the custom pricing inputs. HCM vendors that also serve the CCMO space typically deliver these same capabilities in both products, but this is not standard. HCM vendors are also seeking to invest in many more types of functionality.

CLOUD COST OPTIMIZATION SOLUTIONS BIFURCATE TO SERVE TWO DISTINCT STAKEHOLDERS

Startups and HCM vendors alike have identified the growing challenge of managing cloud costs. HCM vendors break out existing functionality while emerging vendors start with a single provider or a unique capability and build out from there. Both design their solutions around a distinct user or set of users, which can be challenging to clearly define. For most organizations, cloud cost management is still a new and unknown discipline.² As a new responsibility, it often adds another dimension to

existing roles across finance, procurement, capacity planning, and infrastructure management. Mature tools continue to add functionality that appeals to a broad user base, but solutions are often built around two central stakeholders:

- › **Financial managers focus purely on the money — and have no control.** Tools designed for financial managers focus on features like cost attribution, budget allocation and management, invoicing, and chargeback. With this directive, tools often are set up as read only and will not allow users to make changes to the infrastructure. While this will restrict remediation activities, it also allows administrators to provide direct access of the tool to a broader set of users across the organization.

“Our division has multiple cost centers — this tool gives us business logic and transparency to make bills more consistent. . . . Before, we used spreadsheets in a highly manual effort.” (A senior IT specialist at a global pharmaceutical company)

- › **Cloud managers manipulate resources — with money as a key factor.** Tools designed for infrastructure managers provide a broader view of cost and performance. Additional context informs remediation activities, allowing administrators to address capacity and cost inefficiencies without impacting performance or availability. Tools with this focus have invested heavily in policy-driven automation engines to help managers scale these practices.

“We wanted a tool that could optimize instance sizing for migrating workloads [and] reduce spend per workload.” (Director of engineering at a large telecommunications company)

ENHANCEMENTS POSITION COST INSIGHTS TO INFORM AUTOMATION AND GOVERNANCE PRACTICES

Regardless of how these tools are initially positioned, the central capability focuses on increasing visibility of cost and user dynamics across cloud platforms. This focus gives managers the means to organize, contextualize, and integrate this information into a variety of systems. As management practices mature, this information will become a critical element of governance and automation programs as both efforts rely heavily on consistent availability of data.³ Vendors will lead the market if they invest in:

- › **Tracking and visualization of success.** To compel continued use, CCMO solutions are including new ways to visualize and track the success and savings they generate. Some reports are merely for managers. Others are designed to be easily exportable so that I&O professionals can advocate for their own choices and role within their organization.
- › **Adding applicability to developers.** Developers access and launch cloud resources via many methods. Whether it's native, through a development platform, or through Kubernetes (K8s), CCMO vendors must support these decisions and choose the right point of integration for each.
- › **Building out deep analytics and automation.** More comprehensive analytics builds the accuracy of recommendations and instills confidence in I&O professionals seeking help. Eventually, many CCMO vendors want their customers to trust recommendations by default, choosing to

automatically implement recommendations in real time to more frequently squeeze incremental savings out of workloads. Such developments will fundamentally change the role of the cloud manager and these tools.

Cloud Cost Monitoring And Optimization Evaluation Overview

To assess the state of the cloud cost monitoring and optimization market and see how the vendors stack up against each other, Forrester evaluated the strengths and weaknesses of the top vendors. After examining past research, user need assessments, and vendor and expert interviews, we developed a comprehensive set of evaluation criteria. We evaluated vendors against 25 criteria, which we grouped into three high-level buckets:

- › **Current offering.** Forrester rated vendor solutions across a variety of functional categories including: the breadth of platforms and services supported; the administrative experience; reporting and cost manipulation options; policy and automation engines; the granularity of monitoring across cost, performance, and capacity; the breadth of recommendations and options for remediation; as well as features for cost planning, comparison, modeling, and forecasting. Forrester also compared platform availability, support experience, SLAs, and breadth of out-of-box integrations.
- › **Strategy.** We evaluated vendor strategy across product vision, planned enhancements, and go-to-market strategy including channel enablement, regional presence, and marketing efforts. Additionally, Forrester considered the breadth of partners and integrations available to extend the capabilities of the tool and services, as well as the scalability of their pricing and deployment model.
- › **Market presence.** These values were determined by a combination of customer base, product revenue, and technology spend under management as a measure of implementation size and customer usage.

EVALUATED VENDORS AND INCLUSION CRITERIA

Forrester included nine vendors in the assessment: Apptio, Cloudability, CloudCheckr, CloudHealth Technologies, Densify, Microsoft, RightScale, Teevity, and Turbonomic. Each of these vendors must (see Figure 1):

- › **Have core capabilities of cloud cost monitoring, optimization, and remediation.** Base features included cloud bill monitoring, instance rightsizing recommendations, reserved instance management, role-based access controls, as well as the ability to generate custom alerting and reports. The solution must provide cost monitoring as well as cost optimization and recommendation features.
- › **Support at least two public cloud platforms.** The solution must provide cost monitoring and optimization insights for at least two public cloud providers by January 1, 2018.

- › **Meet the minimal threshold of enterprise customers and solution revenue.** The solution must be actively purchased and used by at least 40 unique enterprise customers or have a solution revenue greater than \$10 million for 2017.
- › **Be sold as a standalone tool.** The solution should be a cloud cost monitoring and optimization solution that can be purchased as a standalone tool.
- › **Be generally available as of January 1, 2018.** The solution should be generally available by the first day of 2018. However, for SaaS products, vendors will receive credit for features that were available in the evaluated products by March 2, 2018.

FIGURE 1 Evaluated Vendors: Product Information And Inclusion Criteria

Vendor
Apptio
Cloudability
CloudCheckr*
CloudHealth Technologies
Densify
Microsoft
RightScale
Teevity
Turbonomic

Vendor inclusion criteria

Vendor solution supports at least two public cloud platforms
Vendor solution provides cost monitoring as well as cost optimization and recommendation features
Vendor has at least 40 enterprise customers or tool revenue greater than \$10 million US
Cost optimization solution can be purchased as a standalone tool
Solution capabilities must be generally available as of January 1, 2018

*CloudCheckr declined to participate in or provide information for our research. Scores are based on Forrester estimates.

Vendor Profiles

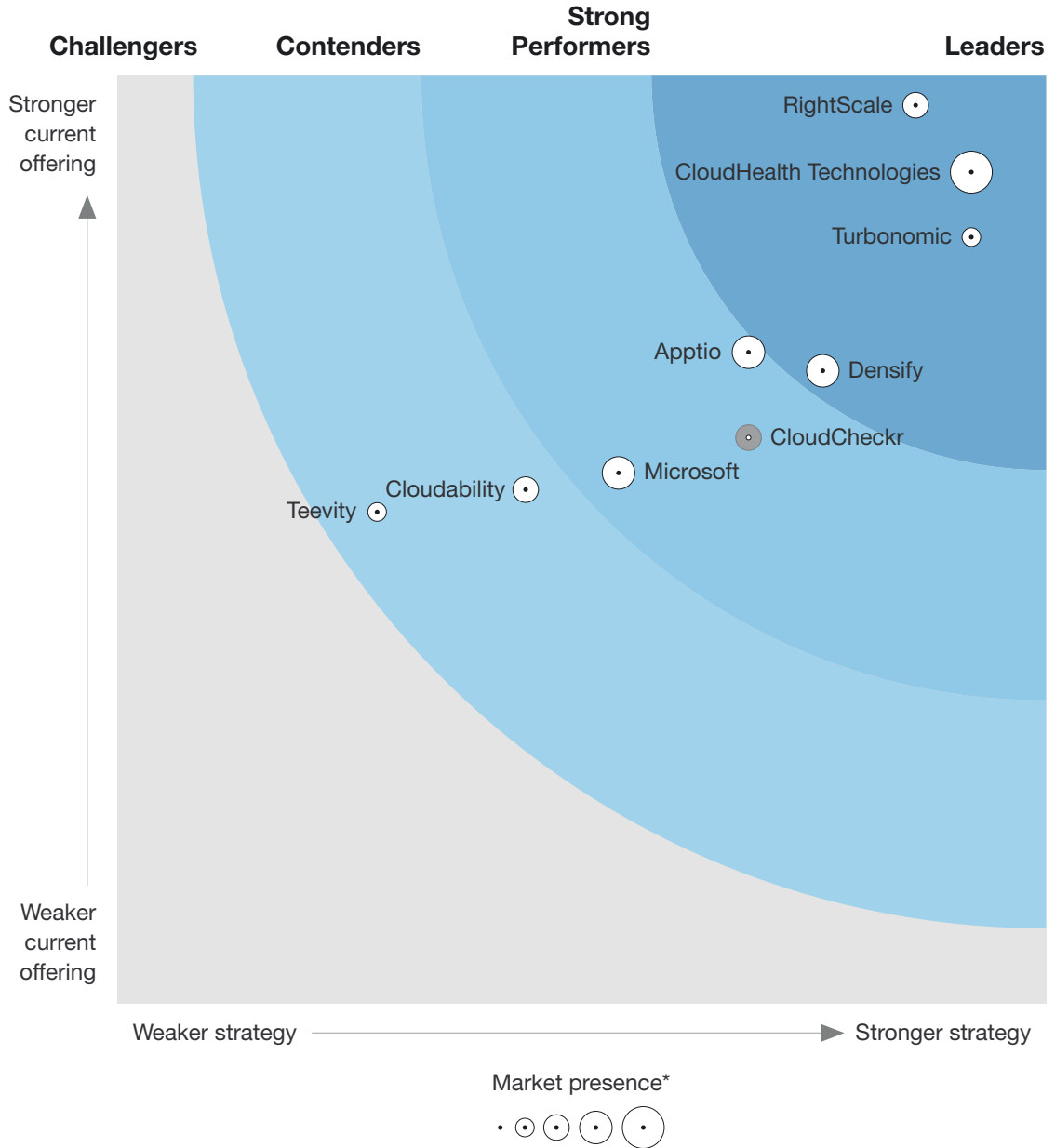
This evaluation of the cloud cost monitoring and optimization market is intended to be a starting point only. We encourage clients to view detailed product evaluations and adapt criteria weightings to fit their individual needs through the Forrester Wave Excel-based vendor comparison tool (see Figure 2 and see Figure 3). Click the link at the beginning of this report on Forrester.com to download the tool.

FIGURE 2 Forrester Wave™: Cloud Cost Monitoring And Optimization, Q2 2018

THE FORRESTER WAVE™

Cloud Cost Monitoring And Optimization

Q2 2018



*A grey bubble indicates a nonparticipating vendor.

FIGURE 3 Forrester Wave™: Cloud Cost Monitoring And Optimization Scorecard, Q2 2018

	Forrester's weighting	Apptio	Cloudability	CloudCheckr*	CloudHealth Technologies	Density	Microsoft	RightScale	Teevity	Turbonomic
Current offering	50%	3.51	2.77	3.05	4.48	3.41	2.86	4.84	2.65	4.13
Cloud platform resources supported	15%	5.00	3.00	3.00	4.34	3.02	3.00	5.00	4.34	4.34
Cloud service administration and governance	15%	3.20	3.50	3.70	5.00	2.20	3.40	5.00	1.70	3.60
Cloud monitoring	20%	4.00	3.60	2.20	5.00	4.50	3.00	4.20	3.70	4.20
Cost optimization	25%	2.50	2.50	3.00	4.50	3.10	3.00	5.00	2.60	5.00
Support services	10%	3.00	3.00	3.00	3.00	5.00	3.00	5.00	1.00	3.00
Platform experience and SLAs	5%	5.00	1.00	1.00	3.00	3.00	3.00	5.00	3.00	1.00
Integrations and APIs	10%	3.00	1.00	5.00	5.00	3.00	1.00	5.00	1.00	5.00
Strategy	50%	3.40	2.20	3.40	4.60	3.80	2.70	4.30	1.40	4.60
Product vision	35%	3.00	3.00	3.00	5.00	5.00	1.00	3.00	1.00	5.00
Market approach	25%	3.00	3.00	3.00	5.00	5.00	3.00	5.00	1.00	5.00
Partner ecosystem	20%	3.00	1.00	5.00	5.00	3.00	3.00	5.00	1.00	5.00
Commercial model	20%	5.00	1.00	3.00	3.00	1.00	5.00	5.00	3.00	3.00
Market presence	0%	3.64	3.00	3.00	5.00	3.66	3.68	2.36	1.68	1.66
Number of customers	34%	1.00	3.00	3.00	5.00	3.00	5.00	5.00	3.00	1.00
Product revenue	33%	5.00	1.00	3.00	5.00	3.00	1.00	1.00	1.00	3.00
Market share	33%	5.00	5.00	3.00	5.00	5.00	5.00	1.00	1.00	1.00

All scores are based on a scale of 0 (weak) to 5 (strong).

*CloudCheckr declined to participate in or provide information for our research. Scores are based on Forrester estimates.

LEADERS

- › **CloudHealth Technologies.** Beyond cloud cost management, CloudHealth Technologies aspires to be categorized as a multicloud management and governance platform for IT. To achieve this, CloudHealth focuses on supporting a broad set of pre-built integrations into popular infrastructure and application monitoring and management tools as well as ITSM and automation tools. To support governance, CloudHealth's platform is built around a robust policy engine that provides templated workflows for policy creation with a unique embedded quality assurance process. Additionally, CloudHealth's platform enables users to purchase AWS Reserved Instances directly through its interface. Also unique to CloudHealth is its Google Cloud Platform support, which is currently in beta. CloudHealth is working to achieve feature parity across all supported cloud platforms and more consistency throughout user experience.
- › **RightScale.** In 2017, RightScale carved out the cost management and governance features of its hybrid cloud management tool into a tool named Optima that can be purchased separately from the full cloud management platform. Similar to the full product, Optima's governance features are built around a strong policy engine that will automate a wide range of infrastructure asset scheduling and life-cycle management activities. In addition, Optima supports robust cost scenario analysis and forecasting capabilities. Going forward, Optima will continue to extend existing capabilities to all platforms supported as well as simplify policy creation and automation activities.
- › **Turbonomic.** Turbonomic's hybrid cloud workload automation solution tightly integrates with a variety of hypervisors, application performance monitoring, and management tools — in addition to cloud platforms. These connections provide context for managers to explore workload interdependencies displayed in a topological view. It can also import policies from integrated tools. The automation engine at the core of this platform allows users to automate cloud management activities as well as administrative tasks like role creation or bulk account uploads. While this tool focuses on automation and optimizing cost per performance, it lacks granularity of cost reporting and bill management available from tools more focused on financial management. No managed or as-a-service version of this tool currently exists, requiring users to install licenses on-premises or on a cloud provider's platform.
- › **Densify.** Densify's platform began as a software-defined infrastructure management tool named Cirba. With the rebrand, Densify's platform is now available as a SaaS solution, extending its coverage to cloud platforms and refocusing the tool on cloud cost optimization. With its legacy in on-premises tooling, Densify's platform can import tagging and business logic from CMDBs, as well as set policies to trigger workflows in integrated platforms. Additionally, Densify's platform views extend into software licensing and provide recommendations on software cost optimization. The Densify solution also comes with an assigned cloud expert advisor per account.

STRONG PERFORMERS

- › **Apptio.** Apptio's solution is positioned as an IT financial management solution. With added support for public cloud platforms, Apptio's customers benefit from a comprehensive view of costs that extend beyond platform fees, incorporating software and overhead costs that build a comprehensive model of total cost of ownership. In addition, Apptio supports plugins for SaaS applications to manage licensing fees and can ingest policies from other governance tools. While strong in financial visibility and value attribution, Apptio's platform lacks asset life-cycle management and automation capabilities and is thus positioned more for financial managers than IT managers.
- › **CloudCheckr.** A nonparticipating vendor in this Forrester Wave, CloudCheckr offers security management in addition to cost management features. The base tool comes with cloud security capabilities that can customize alerts, monitor activity, and perform custom compliance checks and scoring. In addition to user-defined criteria, CloudCheckr automatically runs over 500 different security best practices for any integrated account. Out-of-the-box APIs allow both northbound and southbound integrations, bringing in external data as well as allowing external tools to access and display its data. Going forward, CloudCheckr enhancements will focus on proactive recommendations and cross-cloud comparison models and forecasts.
- › **Microsoft.** Microsoft acquired Cloudfy in 2017 and rebranded it as Azure Cost Management. At its core, this tool offers robust budget management, cost allocation, and pricing manipulation features. Additionally, Azure Cost Management enables users that have overpurchased Amazon reserved instances to resell them on the AWS marketplace. As a Microsoft product, this tool is provided for free to Azure customers but continues to support AWS and Google Cloud Platform accounts for a fee. Going forward, it will directly integrate into a broader set of Microsoft tools but, as a result, will have less consistent tooling available for non-Azure platform usage.

CONTENDERS

- › **Cloudability.** As an early player in the market, Cloudability's solution was initially designed to solve nascent cloud cost management challenges around billing complexity and reserved instance planning and allocation. Cloudability has since added features around compliance monitoring, real-time usage reporting, and improved visualizations to help customers explore cost dynamics. New customers can expect a fast and easy onboarding experience as well as an intuitive user interface. Road map items include adding support for Google Cloud Platform, integrations for third-party management tools, enhanced security features, and support for containers.
- › **Teevity.** Stepping away from bill management, Teevity's solution focuses on cloud cost analytics. At first glance, the user interface lacks the expected graphical widget experience and often requires managers to make changes directly in code. However, accessing the code directly provides users with a vast amount of flexibility, including the ability to customize partition types, metrics, and

hierarchy models. Users can also create custom cost optimization scoring logic and parameters. While Teevity is behind the market on base functionality, its flexible platform appeals to advanced users with large environments that want to heavily customize this tool for their organization.

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Supplemental Material

ONLINE RESOURCE

The online version of Figure 2 is an Excel-based vendor comparison tool that provides detailed product evaluations and customizable rankings. Click the link at the beginning of this report on Forrester.com to download the tool.

DATA SOURCES USED IN THIS FORRESTER WAVE

Forrester used a combination of four data sources to assess the strengths and weaknesses of each solution. We evaluated the vendors participating in this Forrester Wave, in part, using materials that they provided to us by May 8, 2018.

- › **Vendor surveys.** Forrester surveyed vendors on their capabilities as they relate to the evaluation criteria. Once we analyzed the completed vendor surveys, we conducted vendor calls where necessary to gather details of vendor qualifications.
- › **Product demos.** We asked vendors to conduct live scripted demonstrations of their products' functionality. We used findings from these product demos to validate details of each vendor's product capabilities.
- › **Reference calls** with two to three of each vendor's current customers.
- › **Executive strategy briefings.** Vendors conducted a 1-hour executive strategy briefing to discuss planned enhancements, market approach, regional strategies, partnerships, and pricing models.

THE FORRESTER WAVE METHODOLOGY

We conduct primary research to develop a list of vendors that meet our criteria for evaluation in this market. From that initial pool of vendors, we narrow our final list. We choose these vendors based on: 1) product fit; 2) customer success; and 3) Forrester client demand. We eliminate vendors that have limited customer references and products that don't fit the scope of our evaluation. Vendors marked as incomplete participants met our defined inclusion criteria but declined to participate or contributed only partially to the evaluation.

After examining past research, user need assessments, and vendor and expert interviews, we develop the initial evaluation criteria. To evaluate the vendors and their products against our set of criteria, we gather details of product qualifications through a combination of lab evaluations, questionnaires, demos, and/or discussions with client references. We send evaluations to the vendors for their review, and we adjust the evaluations to provide the most accurate view of vendor offerings and strategies.

We set default weightings to reflect our analysis of the needs of large user companies — and/or other scenarios as outlined in the Forrester Wave evaluation — and then score the vendors based on a clearly defined scale. We intend these default weightings to serve only as a starting point and encourage readers to adapt the weightings to fit their individual needs through the Excel-based tool. The final scores generate the graphical depiction of the market based on current offering, strategy, and market presence. Forrester intends to update vendor evaluations regularly as product capabilities and vendor strategies evolve. For more information on the methodology that every Forrester Wave follows, please visit [The Forrester Wave™ Methodology Guide](#) on our website.

INTEGRITY POLICY

We conduct all our research, including Forrester Wave evaluations, in accordance with the [Integrity Policy](#) posted on our website.

SURVEY METHODOLOGY

The Forrester Analytics Global Business Technographics® Infrastructure Survey, 2017 was fielded in July and August 2017. This online survey included 3,923 respondents in Australia, Brazil, Canada, China, France, Germany, India, New Zealand, the UK, and the US from companies with two or more employees.

Forrester Analytics Business Technographics ensures that the final survey population contains only those with significant involvement in the planning, funding, and purchasing of business and technology products and services. Research Now fielded this survey on behalf of Forrester. Survey respondent incentives include points redeemable for gift certificates.

Please note that the brand questions included in this survey should not be used to measure market share. The purpose of Forrester Analytics Business Technographics brand questions is to show usage of a brand by a specific target audience at one point in time.

Endnotes

- ¹ Source: Forrester Analytics Global Business Technographics Infrastructure Survey, 2017.
- ² For more information on how enterprises are integrating cloud cost management into their organization, see the Forrester report “[Emerging Role Profile: Cloud Cost Manager](#).”
- ³ For more on the requirements for governance of the cloud, see the Forrester report “[Adapt Your Governance Framework For Cloud](#).”

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Densify's focus has been to develop analytics that help its customers automate the process of optimizing cloud applications. Using Densify, each application gains the intelligence needed to allow it to optimize itself based on learned behavior, using its unique demand profile and the types of resources available in the cloud providers to precisely align supply and demand. In summary, what is different about Densify include:

1) **Self-Optimizing Applications** – Its Cloud-Learning Optimization Engine, named Cloe, leverages a number of different analytics techniques to cross analyze many variables, including the application's workload pattern, the available supply of cloud resources, the cost of cloud resources and billing data, and the business policy requirements. This enables Densify to perfectly match application needs with cloud supply and give the application the power to self-optimize. Doing this is unique to Densify, and it does it across multiple public cloud providers.

2) **Densification Advisors** – Each Densify customer has a cloud expert called a 'Densification Advisor' assigned to them. The Densification Advisors leverage their experience and insight from working with other similar organizations in order to offer guidance on opportunities, risks, trends, and optimization strategies. Advisor insights are embedded in the Densify UI and help direct attention to underlying reasons for an issue, abnormal operations that require attention, and best practices that may relate to specific cloud technology. The Densification Advisors become an extension of the customer cloud team.

3) **Superior Results** – A unique set of patented analytics provides Densify customers the opportunity to perfectly match application demands with cloud supply. This includes cross-family optimization and pattern-based workload stacking analysis, which can only be done through deep, multi-layer analysis based on machine learning. Only Densify's Cloe technology can deliver this.

4) **Pure SaaS Based Technology** – With Densify, there is no software to install, no manuals to read and learn, and no additional staff to hire. Some Densify customers do not even need to login to the interface, as they can rely on the Densification Advisor to constantly communicate with their cloud teams, who leverage the recommendations to make the right decisions quickly and painlessly.

5) **Results Driven** – Densify's customers achieve a high level of automation that is unique to Densify and is easily measured against goals. Cloud consumption is constantly aligned with app demands, achieving true elasticity, better performance, and far higher efficiency. The corporate cloud bill is reduced by up to 80%, with the average customer monthly savings of 42%. The average ROI for Densify is less than 6 months.