The Forrester Wave™: Insight Platforms-As-A-Service, Q3 2017

Google's Powerful Combination Of Machine Learning, Real-Time, And Insight Application Tools Makes It A Leader

by Brian Hopkins

August 2, 2017

Why Read This Report

In our 36-criteria evaluation of insight platform-as-a-service (PaaS) providers, we identified the eight most significant ones — 1010data, Amazon Web Services (AWS), Databricks, GoodData, Google, IBM, Microsoft, and Qubole — and researched, analyzed, and scored them. This report shows how each provider measures up and helps enterprise architecture (EA) professionals make the right choice.

Key Takeaways

Google Leads The Pack

Forrester's research uncovered a market in which Google leads the pack. IBM, GoodData, and Databricks offer competitive options. AWS, Microsoft, and 1010data are evolving quickly in the market, and Qubole, primarily a data platform, lags behind.

EA Pros Are Looking For Big Data Platforms In The Public Cloud

The market for insight platforms-as-a-service is growing because enterprise architects see them as a better way to exploit big data than on-premises alternatives. Why? To create an iteratively developed and continuously optimized closed-loop system of insight.

Vendors Differentiate On Platform Integrations, Artificial Intelligence, And Real-Time Analytics

As on-premises big data analytics, business intelligence (BI), and streaming technology become outdated, cloud platforms for building real-time hybrid solutions will dictate which vendors win. Vendors that can provide both batch and streaming analytics and advanced machine learning — and offer simplified, serverless PaaS capabilities — will serve customers best.

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by Brian Hopkins
with Srividya Sridharan, David Bartoletti, and Sara Sjoblom

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Insight PaaS Will Help You Exploit Big Data In The Cloud

The market for big data services in the cloud is booming; we forecast 39.5% annual growth through 2021.[1] It is not hard to see why — it takes a lot of effort to manage on-premises big data solutions. Clients also tell us that their on-premises data lake usage is lower than they expected and they want to use public cloud more (see Figure 1).[2]

Enterprise architects must consider insight platforms-as-a-service as part of their big data cloud strategy.[3] Forrester defines an insight PaaS as:

> *An integrated set of data management, analytics, and insight application development and management components, offered as a platform the enterprise does not own or control.*[4]

An insight PaaS offers the same broad benefits as any "aaS": less complexity, no upgrades, greater agility, and faster innovation cycle time. Specific to big data, an insight PaaS makes it easier to:

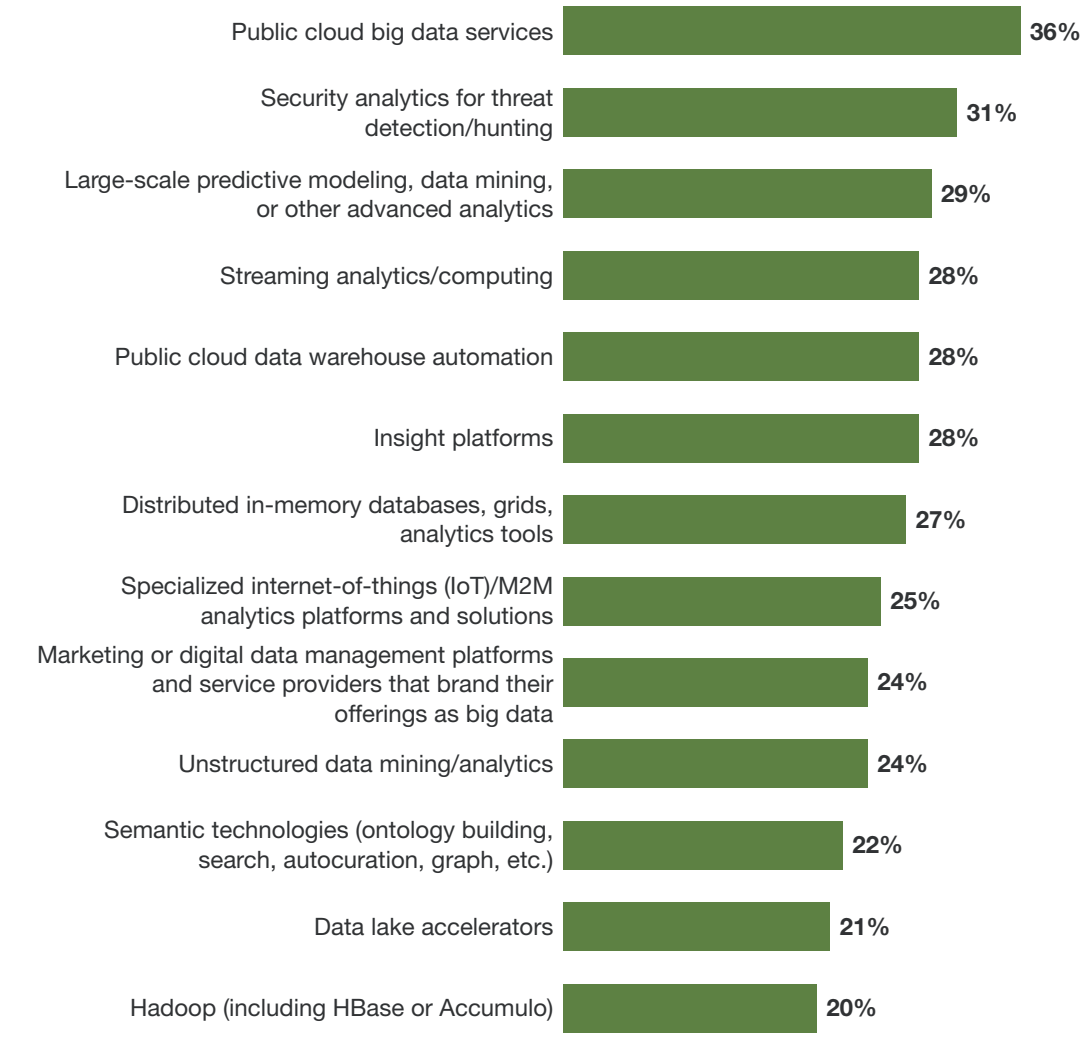
- **Manage and access large, complex data sets.** An insight PaaS lets insight teams manage and analyze large data sets without open source server hassles. For example, Google's BigQuery lets developers query petabytes in milliseconds while making only a few schema design and cluster size decisions.[5] 1010data's platform can capture all of your structured data without an ETL process and make it available in a few minutes for analysis through its Trillion-Row Spreadsheet, with no infrastructure considerations at all.[6]
- **Update and evolve applications that deliver insight at the moment of action.** An insight PaaS provides insight application development and life-cycle management tools. For example, GoodData's insights governance framework and insight application life-cycle management features let customers easily build and continuously optimize solutions without extensive code debugging or query tuning.
- **Update and upgrade technology.** An insight PaaS provides new features frequently — often on a weekly basis — and new versions of components are available for use quickly without server upgrades. For example, Databricks makes the current and older versions of Spark accessible by URL at the same time. Existing applications can keep using older versions until they are ready to migrate, then they simply point to the new version. No server upgrade required.
- **Integrate and coordinate team member activities.** An insight PaaS handles integrations between components, which otherwise your engineers must worry about. Thus, insight team members can collaborate more easily.[7] For example, IBM's Watson Data Platform provides role-specific interfaces like the Data Science Experience while sharing common project information, metadata, and the Bluemix and Watson Cloud Platform service catalog with other team members, such as analysts and data engineers.

FIGURE 1 Public Cloud And Insight Platforms Are A Hot Combination

97% of enterprise architects surveyed say their firm has at least some activity involving emerging data analytics (insight) platforms.*

No. 1 Public cloud tops the list of technologies planned for use in big data analytics.

"Which of the following are included in your plans for big data?"



Base: 2,106 data and analytics technology decision makers
*Base: 163 enterprise architects
Source: Forrester Data Global Business Technographics® Data And Analytics Survey, 2017
*Source: Forrester's Q3 2016 Global State Of Enterprise Architecture And Portfolio Management Online Survey

Insight PaaS Vendors Come From Three Different Backgrounds

Most data analytics technology vendors claim to be "platforms" and support "cloud."[8] But we don't think they are all insight PaaSes. Our research found three types of vendors that have legitimate claims to the label, but which also have very different strengths and weaknesses (see Figure 2):

- **Global cloud providers evolve their building blocks.** Global cloud providers like AWS, Google, IBM, and Microsoft have a rich heritage of big data services, such as AWS EMR and Microsoft Azure HDInsights; however, buyers can be overwhelmed by the number of options. To improve their offerings' overall platform behavior, these vendors are building serverless (or function-as-a-service) offerings that simplify development, and they are unifying metadata, governance, and development tools across services.
- **Big-data-as-a-service providers leverage notebooks as a development environment.** Big data software-as-a-service (SaaS) vendors like Databricks and Qubole provide open source software as a set of managed services on cloud platforms. Today they are going further by offering notebook-based analytics, machine learning libraries, and application development tools. For example, both of the above vendors let you access notebooks via an API or publish notebooks to dashboards.
- **BI cloud platform vendors add insight application development tools.** BI cloud platform vendors have traditionally focused on structured data analytics and the one-way push of insights to reports and dashboards.[9] Vendors like 1010data and GoodData have moved into advanced analytics and application development. For example, 1010data's QuickApps framework and GoodData's SmartApps concept let customers quickly build complex analytics applications using built-in machine learning capabilities.

FIGURE 2 Insight Platform-As-A-Service Vendors Have Varied Backgrounds And Strengths

	Global cloud provider — Amazon Web Services, Google, IBM, Microsoft	**Big data platform-as-a-service —** Qubole, Databricks	**BI-as-a-service —** 1010data, GoodData
Insight application services	■□□	■□□	■□□ to ■■■
Analytics services	■■■	■□□ to ■■■	■■■ (Structured data, batch, microbatch)
Big data management services	■■□	■■□ to ■■■	■■□
Platform services	■■□	■■■	Vendors seek to reduce the need

■□□ = Vendor has emerging capabilities
■■□ = Vendor competency
■■■ = Vendor's core strength

Insight Platform-As-A-Service Evaluation Overview

To assess the state of the insight PaaS market and see how the vendors stack up against each other, Forrester evaluated the strengths and weaknesses of top insight PaaS vendors. After examining past research, user need assessments, and vendor and expert interviews, we developed a comprehensive set of 36 evaluation criteria, which we grouped into three high-level buckets:

- **Current offering.** We evaluated the state of each vendor's current data management, analytics, insight application, and platform management services. We considered vendors' ability to address both batch and real-time scenarios with a wide variety of data management and analytics tools. We also strongly weighted vendors' insight application development tooling as well as their platform's ability to function as an integrated whole.
- **Strategy.** We evaluated vendors' vision for alignment with our definition of a system of insight and considered both the strengths of their road map and their ability to execute against it. We also evaluated the enhancements they are planning against our knowledge of what customers say they need. Lastly, we looked critically at each vendor's commercial model and the ecosystem of partners it has built.

› **Market presence.** We evaluated each vendor's footprint in the market by scoring the number of enterprise customers it has and the reach of its cloud offerings in three regions — North America, Europe, and Asia. We also considered how each brand captures market mindshare by surveying customers. Lastly, we looked at financials to ensure they were sound.

Evaluated Vendors And Inclusion Criteria

Forrester included eight vendors in the assessment: 1010data, AWS, Databricks, GoodData, Google, IBM, Microsoft, and Qubole. Each of these vendors has (see Figure 3):

› **A public cloud offering with platform features.** To clarify the muddy waters of vendors' "cloud" claims, we only included vendors that have a multitenant cloud offering. Many also offer private, virtual private, bare metal, and managed cloud alternatives. Lastly, we included vendors whose offerings work together as a unified platform with common services like security, metadata, monitoring, and operations management.

› **Data management, a variety of analytics, and PaaS services.** For their offering to be considered an insight platform, included vendors must offer data management services like file stores, data stores, data governance, data flow management, or data blending tools. They also must provide more than one of the following: structured business analytics, predictive analytics and machine learning, decision management, or AI services. Lastly, vendors must offer insight application development tools such as continuous development/continuous integration tool chains, model runtimes, development libraries, or application life-cycle governance.

› **Enough large customers to claim "enterprise" grade capability.** We included vendors that have at least 100 customers with over 1,000 employees or $1 billion in total revenue.

FIGURE 3 Evaluated Vendors: Vendor Service Information And Selection Criteria

	Insight application services	Analytics services	Big data management services	Platform management services
1010data	QuickApps Framework; SDKs for Python, Java, .NET, VBA, C, C++	Trillion-Row Spreadsheet; Consumer Insights Portal (CIP); Excel Add-in; G-Functions; R1010; SDKs for Python, Java, .NET, VBA, C, C++	TenUp, TenDo, PowerLoader, Table Builder & Editor, Customer Uploader	Insights Platform
Amazon Web Services (AWS)*	Elastic Search, Lambda, Kinesis Elastic Beanstalk, API Gateway, EC2 Container Service	Athena, Kinesis Analytics, Quicksite, Machine Learning, Lex, Poly, Rekognition	S3, EFS, EMR, DynamoDB, Kinesis, Redshift, Aurora, Data Lake Solution, Data Pipeline	Autoscaling, Deep Learning AMIs, Management Console, Service Catalog, Cloudwatch, CLI, OpsWorks, Cost Explorer, Security, Identity and Compliance Services
Databricks	Unified Workspace with Notebooks and Dashboards, Apache Spark, Matplotlib, GGPlot, Bokeh, and Plotly Native BI integration with Tableau, Qlik, Looker	Apache Spark, MLlib, Tensorflow, MXNet, BigDL, Caffe, Theano, Keras, CNT Python, Scala, Java, SQL and R Scikit Learn and R Structured Streaming with DBIO	Apache Spark, HCatalog, Hive Metastore Structured Streaming with DBIO Unified Workflows and Production Jobs	Apache Spark, Databricks Serverless, Databricks I/O (DBIO) connectors, Databricks Enterprise Security (DBES), Unified Workspace Production Jobs
GoodData	Platform and UI SDKs, Developer Market, REST API console, Real-Time Notifications REST API	Analytic Designer, KPI Dashboard, Model Editor, Metric Editor, REST API	ETL Process Editor, Data Integration Console, Data Transformation (SQL) Editor, REST API	Enterprise Insights Platform, Lifecycle Management Console, Data Scientist Console, Business Expert Console, REST API

*Not an inclusive list due to sheer volume of services and vendors' propensity to change them frequently.

FIGURE 3 Evaluated Vendors: Vendor Service Information And Selection Criteria (Cont.)

	Insight application services	Analytics services	Big data management services	Platform management services
Google	Container Engine, App Engine, Machine Learning Engine, Cloud Data Flow, Cloud APIs, Cloud Functions	Big Query, CloudSQL, Cloud Datalab, Cloud Data Flow, Cloud Machine Learning Engine and APIs	Cloud Storage, Google BigQuery, Dataproc, Cloud Datastore, Cloud Pub/Sub, Cloud Dataflow, Cloud SQL, Spanner	Stackdriver, Deployment Manager, Cloud Endpoints, Cloud Console, Cloud Shell, Identity and security services, Apigee
IBM	Bluemix, WatsonML, Watson Cognitive Services	Watson Analytics, Data Science Experience, Streams	Data Connect, Watson Data Platform, Db2 Warehouse on Cloud, Cloudant, Streams	Watson Data Platform, Watson Cloud Platform, Identity and access management
Microsoft*	App Service, Container Service, API Management	Azure Machine Learning, Stream Analytics, Data Lake Analytics, AI + Cognitive Services	Batch, Data Factory, Data Lake, Table storage, Redis Cache, SQL Data Warehouse, HDInsight, Data Catalog, Blob and File storage	Security and identity management, Resource Manager, Application Insights, Scheduler, Azure Portal
Qubole	Zeplin Notebooks, Analyst Workbench	HIVE, SparkSQL, Presto, Zeplin Notebooks, Tensorflow, Cafe	Hadoop, Spark, Presto, AirFlow	Qubole Data Service

Vendor inclusion criteria

1. The vendor must offer a multitenant platform-as-a-service (PaaS) that is maintained, upgraded, and serviced by the vendor.

2. Services must include: 1) several data management services, 2) a variety of different kinds of "analytics" services, and 3) insight execution services that help deliver analytic insights to other applications and processes.

3. Vendors must have significant integrations between their data management and analytics services.

4. Vendors must have multiple enterprise customers (1,000 or more employees) that have built their own custom data analytics solutions using the vendor's insight PaaS offering and that currently run these as production applications on the vendor's PaaS.

*Not an inclusive list due to sheer volume of services and vendors' propensity to change them frequently.

Vendor Profiles

This evaluation of the insight PaaS 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 4). This is especially important for insight platforms-as-a-service because they come from such diverse backgrounds and have a wide range of strengths and weaknesses.

FIGURE 4 Forrester Wave™: Insight Platforms-As-A-Service, Q3 '17

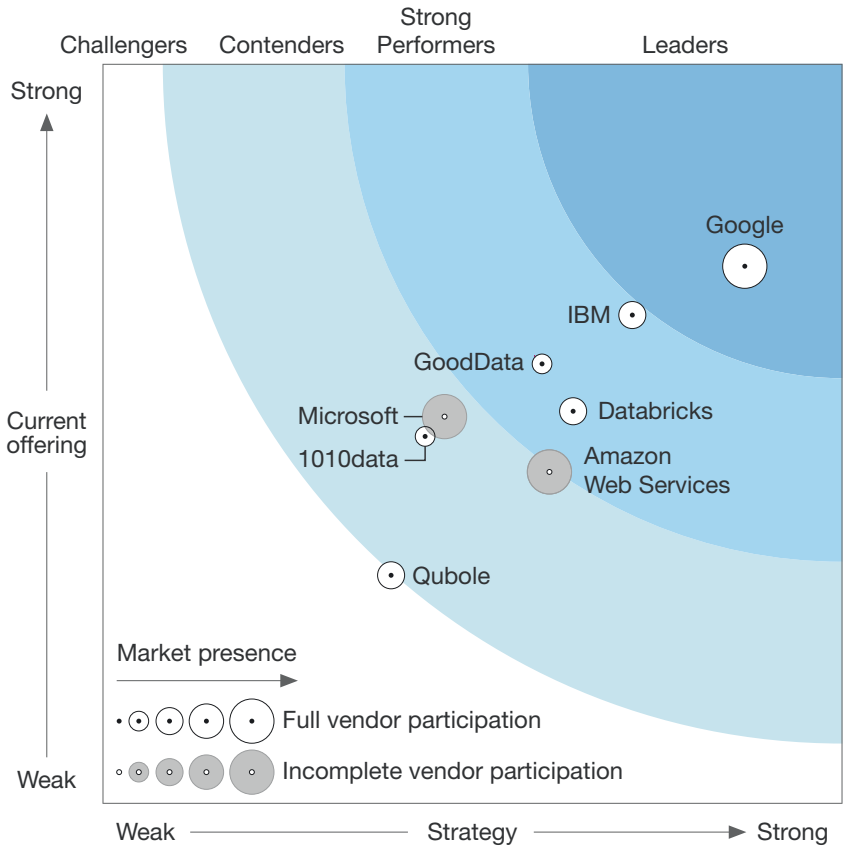


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FIGURE 4 Forrester Wave™: Insight Platforms-As-A-Service, Q3 '17 (Cont.)

	Forrester's weighting	1010data	Databricks	GoodData	Google	IBM	Qubole	AWS	Microsoft
Current offering	50%	2.48	2.65	2.97	3.63	3.30	1.54	2.24	2.62
Data management	10%	1.70	2.20	1.90	3.80	2.80	2.80	2.40	2.70
Analytics	20%	1.20	2.60	1.80	3.20	3.80	0.80	2.10	2.30
Insight applications	35%	3.05	2.80	4.20	3.85	2.70	1.60	2.40	2.40
Platform	35%	2.85	2.65	2.70	3.60	3.75	1.55	2.10	3.00
Strategy	50%	2.18	3.18	2.97	4.34	3.58	1.95	3.02	2.31
Product vision	30%	3.00	4.00	3.00	5.00	4.00	1.00	2.00	2.00
Execution road map	10%	3.00	1.00	3.00	3.00	1.00	5.00	1.00	1.00
Performance	10%	3.00	4.00	2.00	5.00	2.00	1.00	3.00	2.50
Planned enhancements	25%	1.10	2.90	3.40	4.70	3.90	2.00	4.50	3.40
Commercial model	15%	2.00	3.00	2.80	2.40	4.00	3.00	2.60	1.40
Partner ecosystem	10%	1.00	3.00	3.00	5.00	5.00	1.00	5.00	3.00
Market presence	0%	1.95	2.90	1.50	4.30	3.00	2.60	5.00	5.00
Number of enterprise customers	45%	3.00	3.00	1.00	5.00	3.00	1.00	5.00	5.00
Global reach	35%	0.00	3.00	1.00	3.00	3.00	5.00	5.00	5.00
Mind share	10%	3.00	3.00	5.00	5.00	3.00	3.00	5.00	5.00
Revenue	10%	3.00	2.00	2.00	5.00	3.00	1.00	5.00	5.00

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

Google Is A Leader

Our evaluation identified one vendor as a Leader based on the strength of its PaaS strategy, advanced tools for batch and real-time solutions, and machine learning and AI offerings.

› **Google extends its PaaS with advanced analytics and insight execution tools.** Google has built its offering around highly performant, highly scalable PaaS components such as App Engine and Google BigQuery. It also features advanced platform features like autoscaling for most of its services. Its efforts at integrating leading Hadoop cloud services are paying off as well — managed

Hadoop and Spark are just an API call away, and its data flow service works on both batch and streaming data. Furthermore, Google was the only vendor in our evaluation to offer insight execution features like full machine learning automation with hyperparameter tuning, container management, and API management. Google will appeal to firms that want flexibility and extreme scalability for highly competent data scientists and cloud application development teams used to building solutions on PaaS.

Google needs to further simplify its portfolio of services. Also, its structured business analytics tools and real-time analytics tools are immature. While Cloud Bigtable's flexibility is great, it can also be an issue. Customer references told us they could easily get data in, but querying can become an issue. As a cloud operator, customers complain that part of Google's billing process is arcane and drives them crazy as well.

IBM, GoodData, And Databricks Are Strong Performers

Three Strong Performers differentiate themselves through their support of systems-of-insight application development.

- **IBM supports insights teams with integrated, AI-assisted experiences.** IBM's Spark-based Watson Data Platform combines cognitive services with data management, analytics, and the entire suite of Bluemix developer tools. Uniquely, it also provides AI-guided "experiences" for business analytics and data scientists via a common application framework. The platform is also part IBM's larger cloud suite, which will help firms meet enterprise requirements. IBM's new partnership with Hortonworks will further improve platform performance over time. Firms can get a developer version free, making it attractive for any firm looking to experiment with building systems of insight.

  Some of IBM's tools are not as fully integrated or mature as customers would like. For example, its Spark-based machine learning feature was not generally available at the time of our evaluation.[10] Watson Analytics still requires manual data loading and is not yet a replacement for general-purpose business analytics, according to customers. IBM's integration service, Data Connect, also needs more flexibility. Finally, with so many options through Bluemix and Watson Cloud Platform, it is hard to pick the right architecture.

- **GoodData's platform is a foundation for building business analytics applications.** GoodData's excellent structured data management and analytics tools are supplemented by machine learning algorithms. The vendor's platform also separates logical and physical data, which helps create and manage many contextual views — a handy feature for common customer use cases. Its application development approach focuses on managing the agile delivery of visual insights at scale — a good approach for building systems of insight and data products. Firms looking to implement a lightweight PaaS solution for business analytic systems of insight in the cloud should consider GoodData.

GoodData lacks real-time analytics at intervals of less than 15 minutes; most clients update the platform in intervals measured by hours or daily. It also lacks tools for the full data-science life cycle. Furthermore, its process for managing data through ETL and Vertica instances can require professional services for initial solution setup to avoid data ingestion performance issues.

- **Databricks offers a next-generation platform for insight applications.** Databricks' Unified Analytics Platform, running on Amazon Web Services, provides the benefits of enterprise Spark while reducing the need for complex tuning. Furthermore, the vendor has added many other features — for example, its notebooks are not just open source but rather feature support for most data analytics development languages, including SQL, and boast a comprehensive set of machine learning and visualization libraries. They are also API accessible, and thus they can be published as dashboards or chained to form complex applications. Databricks' polished user interface and advanced features make it ideal for teams of citizen data scientists.

  Databricks does make big data and advanced analytics simple for less mature data scientists, but your unicorns may need more. Business analysts will find coding in notebooks challenging as well, and its approach to real time is limited to Spark. Customers told us it is not a cost-effective way to do low-level data management, either. Lastly, while the vendor's notebooks are superb, they are limited as insight application development environments.

Amazon Web Services, Microsoft, And 1010data Are Contenders

Contenders tend to have strong individual services but have made less progress than Strong Performers in unifying their services or implementing PaaS development tools.

- **Amazon Web Services provides an insight application Erector Set.** As a cloud pioneer, AWS is often the standard by which all other cloud offerings are judged. But for insight platforms, don't make this mistake. The strongest reason to select Amazon's tools for insight application development is its pace of innovation and the completeness of its big data and analytics services. For example, Amazon Athena and AWS Greengrass are pushing the serverless trend into big data analytics and the internet of things, respectively. That said, its current offering lacks unifying services such as metadata management and data governance. Many insight tools are still low level, with all the knobs and dials that some power users need; however, many firms will find it overwhelming. Advanced cloud developers and data scientists will likely find all they need in AWS's huge and evolving service catalog. AWS was a nonparticipating vendor in this evaluation.
- **Microsoft targets enterprises as it adds big data services to its Azure PaaS.** Microsoft made a bold move in its shift to become a cloud vendor, and its decision to build Azure HDInsights on Hortonworks Data Platform has paid off. Microsoft scored as best in class in our Forrester Wave evaluation of Hadoop cloud solutions.[11] Today it is aggressively adding more services like Azure Data Lake, Azure Data Catalog, and Azure Cloud Functions. Furthermore, it is keeping pace in the race for AI dominance through Azure Machine Learning. The problem with Microsoft is that its services can be confusing and somewhat redundant. While it has made progress unifying metadata

management and data governance, more is needed. Firms that want to balance infrastructure-as-a-service (IaaS) flexibility with some PaaS tools and enterprise requirements should consider Microsoft. Microsoft was a nonparticipating vendor in this evaluation.

› **1010data lets you build fast applications that work with all of your data.** 1010data started as a SaaS BI solution that allowed customers to access all of their data for exploration and fast aggregations — trillions of rows, even — replacing the need for ETL and data warehousing. Our evaluation confirmed that this is the case, but it has gone further: The platform enables business analytics on all your data and near-real-time data loading. Its new QuickApps framework lets customers rapidly assemble analytics solutions without code. 1010data will appeal to firms that want a SaaS plus lightweight PaaS for business analytics against large structured data sets.

1010data's multitenant cloud database is its high-performance secret ingredient, but this also makes it difficult to tune on its own. It also does not require definition of metadata or schema, which creates garbage-in/garbage-out data issues — new users may have trouble understanding what is in the database. 1010data also has few data science tools other than a limited R processor, and it is not capable of streaming analytics. Finally, it runs solely on its own data center and will have no hybrid cloud capabilities until the end of 2017.

Qubole Is A Challenger

Our one Challenger was a Strong Performer in our Forrester Wave on big data Hadoop solutions, but as an insight platform, we feel it needs to make more progress with its analytics and application development.[12]

› **Qubole reaches beyond big-data-as-a-service with some analytics.** Qubole continues to innovate in the big-data-as-a-service market with plans to implement features like agent-based predictive autoscaling. It has also begun to move beyond just data management with a SQL workbench, integrated Zeplin notebooks, SQL against Kinesis streams, and some machine learning tools preinstalled on Spark. Users can also cache Qubole's notebooks to cloud storage and call them via APIs. Big data teams that want a strong Hadoop cloud solution with some analytics tools will find Qubole attractive.

Qubole's strength in big-data-as-a-service is offset by its analytics and insight application immaturity. Its SQL workbench is just one tool data engineers will need. Furthermore, its notebooks, as an analytics and application development environment, don't compare well with other vendors in this evaluation. To get the insight platform capabilities they need, customers may need to add their own BI, streaming, and advanced analytics tools to Qubole.

Supplemental Material

Online Resource

The online version of Figure 4 is an Excel-based vendor comparison tool that provides detailed product evaluations and customizable rankings.

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 July 17, 2017.

- **Vendor customer 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.

- **Vendor questionnaires.** Forrester collected detailed information from each vendor. The question we asked probed in to the specifics of each criteria in our evaluation model.
- **Product demos.** We asked vendors to conduct demonstrations of their products' functionality. We used findings from these product demos to validate details of each vendor's product capabilities.
- **Customer reference calls.** To validate product and vendor qualifications, Forrester also conducted reference calls with three of each vendor's current customers.

The Forrester Wave Methodology

We conduct primary research to develop a list of vendors that meet our criteria to be evaluated in this market. From that initial pool of vendors, we then 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.

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.

Endnotes

[1] According to Forrester Data: Big Data Management Solutions Forecast, 2016 To 2021 (Global), the cloud deployment model for big data solutions will grow 39.5% annually between 2016 and 2021.

[2] In the fall of 2016 we evaluated on-premises insight platforms in our report "The Forrester Wave™: Enterprise Insight Platform Suites, Q4 2016." The one complaint all reference customers had was how big, complex, and costly the vendor tools and their required infrastructure was. See the Forrester report "The Forrester Wave™: Enterprise Insight Platform Suites, Q4 2016."

For a discussion of the Hadoop-and-friends ecosystems of tools provided by vendors such as Cloudera, Hortonworks, and MapR, see the Forrester report "The Cloudy Future Of Hadoop."

[3] For further analysis of the different approaches for big data analytics in the cloud such as IaaS, PaaS, and SaaS, see the Forrester report "Move Your Big Data Into The Public Cloud."

[4] See the Forrester report "The Three Faces Of Platform-As-A-Service."

Source: Peter Mell and Timothy Grance, "The NIST Definition of Cloud Computing," National Institute of Standards and Technology, September 2011 (http://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf).

[5] Compare this to on-premises Apache Spark tuning for petabyte performance, where developers have to carefully design their data workflows to consider cluster partitioning and avoid Spark operator sequencing.

[6] ETL: extract, transform, load.

[7] Insight teams are the people component of a system of insight, consisting of data scientists or other analysts, data engineers, application developers, and business experts. See the Forrester report "Digital Insights Are The New Currency Of Business."

[8] See the Forrester report "The Platform Explosion: Harness It Or Lose Agility."

[9] See the Forrester report "The Forrester Wave™: Cloud Business Intelligence Platforms, Q4 2015."

[10] The service was scheduled to go live on August 1, 2017, according to IBM.

[11] See the Forrester report "The Forrester Wave™: Big Data Hadoop Cloud Solutions, Q2 2016."

[12] See the Forrester report "The Forrester Wave™: Big Data Hadoop Cloud Solutions, Q2 2016."

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