

April 2019

Data Infrastructure and Analytics Insights

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Trends in Data Infrastructure and Analytics Software

Key Themes Driving Strategic Initiatives in Data Infrastructure & Analytics

| Trend | Before | Now | Outcome |
|--|--|--|--|
| Data collection, storage, and analysis for continuous, real-time analysis | Data was processed sequentially in batch mode, stored in a central data warehouse | Data from multiple sources streamed and analyzed in real-time using data pipelines | Highly interconnected, distributed data architectures analyzed on a continuous, streaming basis resulting in rapid decision making and innovation |
| Augmented analytics as a next-gen data and analytics paradigm | IT-defined data models and standardized analytics on historical data | AI/ML used to automate data discovery, collection, and categorization as well as predictive analytics | Data management providers augmenting capabilities using Al/ML, through organic development and M&A |
| Shift in data gravity— data management moving to the cloud | Data management and analytics tools were primarily license-based, deployed on-premise | Data management applications moving to the cloud (public/private), transitioning to a multi- tenant model | Data management providers seeking to build cloud capabilities, by re- architecting existing products and through M&A |
| Open-source data management and analytics tools becoming more prevalent | Data management and analytics tools were primarily license-based | Increasing use of open- source tools with varying revenue models (open core, services based, etc.) | Open-source software changing the economics and software lifecycle, spurring greater M&A |

Data Infrastructure and Analytics: Trends and Tailwinds

| Trend | Driver | | | |
|--|--|--|--|--|
| | Traditional enterprise data warehouse (EDW) model is evolving | | | |
| Modern DW/BI at Scale: Not Just Based on an Enterprise Data Warehouse | Driven by: | | | |
| | Proliferation of data sources, unstructured data, low latency requirements, end user expectations | | | |
| | Data from clickstreams, server logs, and social media sources, machine and sensor readings | | | |
| | In addition, enterprises now require data from cloud applications (Google Analytics, Salesforce, NetSuite, | | | |

Old Data Environment

Zendesk, etc.) integrated into organizational reporting

Implications

- Traditional EDW no longer functioning as sole data destination
- Analytics on a central EDW evolving into analytics focused on pipelines
 - Data Management centered around data pipelines vs. data buckets
- Need for new data capture and analysis strategies, new generation of data storage solutions aimed at:

Modern Data Environment

- Hardware scalability
- Moving of compute capability closer to (if not on top of) data stores themselves



Data Infrastructure and Analytics: Trends and Tailwinds (cont.)

| Trend | Driver |
|--|---|
| Augmented Analytics as Next-Gen Data and Analytics Paradigm | Augmented analytics, which uses ML to automate data prep, insight discovery, and insight sharing for a broad range of business users, and citizen data scientists |

Implications

- While innovators in data prep, integration, and Business Intelligence ("BI") now create new business-user oriented and ML assisted analytic environments, traditional vendors are building these capabilities as well
- Most BI vendors have acquired an auto-ML product or have developed this capability organically



Source: Gartner, Industry Research

Data Infrastructure and Analytics: Trends and Tailwinds (cont.)

| Trend | Driv | er | | |
|--|---|--|--|---|
| Emergence of the Citizen Data Analyst | Emerging trend of self-servic organizations of all sizes mea technical users (no formal IT/ both data discovery and repo | e analytics for ans that more non- ′data training) involved in rting | | IT in ' "fo Predation |
| Pointing to a providing a d | anomalies in data and diagnosis | 2 With a natural lang clarifications and guid | uage interface | to ask |
| Anon V A L U V V V V V V V V V V V V V V V V V V | noly Detection Using lachine Learning | NUMBER CRITERIA AUTOMATIC ALGORITHUS HEVALUATION AUTOMATIC AUTOMATIC AUT | COMPUTER IN INVESTIGATION OF THE PARTY OF TH | WITHOUT RESE PRODUCING MATURAL DEVOTED DEFINED JUDGES |

Implications

- IT teams embracing the idea that the movement of data, both in "batch" and "ad hoc query" mode is more important than the "fortified data bunker"
- Pressure on IT groups to ensure data governance and provide data analytics training and technology

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... And suggestions for how to respond to data trends as well as guidance on how to run small queries



Varying Data

TIME

Data Infrastructure and Analytics: Trends and Tailwinds (cont.)

| Trend | Driver |
|--------------------------|---|
| | As enterprises continue to move workloads to the cloud, they increasingly need to integrate on-premise data warehouses/data lakes with public/private cloud hosted data |
| Shift In Data | Cloud-native enterprises seeking to adopt data infrastructure hosted on public cloud |
| Deployments Moving to | Public clouds have several advantages over on- premise and Hadoop based systems |
| the Cloud | Public cloud providers (e.g. Amazon, Microsoft, Google) all have native data storage, transformation capabilities |
| | |
| | Open-source software deployments changing the economics and software lifecycle in analytics/BI |
| | ■ MongoDB |
| | CockroachDB |
| Open Source | Apache Kafka (Confluent) |
| Data | Apache Cassandra (Datastax) |
| Analytics | Open-source model being called into question given recent conflict between AWS, Confluent, and MongoDB |
| | |

Implications

- Majority of deployments to be on cloud by 2020
- Traditional on-premise data management tools will look to refactor and transition to a multi-tenant model on public/private clouds
- Likely consolidation of data management tools
- E.g., Cloudera + Hortonworks

- Evolving pricing models for open-source software:
 - Free/Open core/Professional-services based

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Trends in AI and ML Software

Artificial Intelligence and Machine Learning Proliferation

Growth driven by early adapters enjoying unprecedented success from adoption.

Prominence in use driven by increasing amount of data available to generate insights.

| Trend | Before | Now | Outcome |
|---|---|--|---|
| AI/ML moving to the "edge" | Al/ML models were deployed on a centralized server/cloud | Advanced ML models based on deep neural networks will be optimized to run at the "edge" of the network (sensor / endpoint) | Deployment at the edge will drive increased investment in IoT solutions, especially in the industrial and healthcare sectors |
| Automated ML (AutoML) gaining prominence | AutoML was used for the automatic selection of the best-performing algorithms for a given task, and for tuning the hyper parameters of those algorithms | AutoML is used for the whole data-to-insights pipeline, from cleaning the data to tuning algorithms through feature selection and feature creation | AutoML can add efficiency to large swaths of the data pipeline, resulting in faster analyses and greater operating leverage for data teams |
| AI automating IT/DevOps processes through "AIOps" | Data sets obtained from the IT systems used for reactive, post-facto analyses | Data from IT Operations can be aggregated and correlated to find insights and patterns | When AI/ML models are applied to IT data sets, IT operations transform from being reactive to predictive, thus redefining the way IT infrastructure is managed |

Key Trends in the AI and ML Landscape

| Trend | Driver | |
|--|---|---|
| I/ML loving to ne Edge | Deployment and training of ML models running outlier detection, root cause analysis + prediction maintenance will drive deployment to the edge computing layers Most of the models trained in the public cloud will be deployed at the edge | Adv optin Dep solu Earl Fog |
| utomated lachine earning aining rominence | Previously, AutoML was used for automatic selection of the best-performing algorithms for a task and for tuning hyper parameters of those algorithms Now, AutoML is used for the whole data-to-insights pipeline, from cleaning data to tuning algorithms through feature selection and creation | Autowith the second control of the second control of |
| l utomating r/DevOps rocesses nrough AlOps" | Massive log data sets obtained from the hardware, OS, server software, and application software can be aggregated and correlated to find insights When ML models are applied to these data sets, IT operations transform from being reactive to predictive | App infra AIO root Earl Auto |

Implications

- Advanced ML models based on deep neural networks will be optimized to run at the edge
- Deployment at the edge will drive increased investment in IoT solutions, especially in the industrial and healthcare sectors
- Early movers are Microsoft Azure + Qualcomm, Google Cloud, Foghorn, TIBCO Flogo
- AutoML can add efficiency to large swaths of the data pipeline, with the potential to impact the entire process and influence the structure of data teams long term
- Early movers are Data Robot, Microsoft Azure, Google Cloud AutoML, Amazon Comprehend

- Applying AI to IT Ops and DevOps will redefine the way infrastructure is managed
- AIOps will enable Ops teams perform precise and accurate root cause analysis
- Early movers are Data Robot, Microsoft Azure, Google Cloud AutoML, Amazon Comprehend

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Recent News and Takeaways

Tableau Adds Natural Language Interface, Streamlines Data Prep

- Long the purview of Google sentiment search and chatbot functionality, natural language processing (NLP) is now making headway into enterprise workflows
- Tableau's release of this functionality is part of the industry's larger push towards data democratization and putting actionable insights directly into the business user's hands

Snowflake Named by Gartner as a Leader in Data Management Solutions for Analytics

- Snowflake's zero-management, cloud-built data warehouse equips today's organizations with unique and powerful features in a cloud-native deployment
- Large, established vendors such as Oracle and SAP are introducing refreshed product offerings that build on their core strengths to compete with disruptive entrants such as AWS and Snowflake

Nvidia, Qualcomm, and Apple Are Building Chips Exclusively for Al Workloads at the "edge"

- Apple released its A11 chip with a "neural engine" for iPhone X, claiming it could perform machine learning tasks at up to 600 billion operations per second while Qualcomm launched a \$100M AI fund in Q4 2018 to invest in startups that "share the vision of on-device AI becoming more powerful and widespread"
- Running AI algorithms on edge devices, like a smartphone or a wearable device, instead of communicating with a
 central cloud or server gives devices the ability to process information locally and respond more quickly to situations

Data Infrastructure and Analytics Companies Have Performed Strongly in Public Markets



NTM Revenue Multiples (February 2018 – February 2019)



Public Data Infrastructure and Analytics Companies Have Performed Well



Broker consensus earnings estimates from Cap IQ as of 1/31/19

Strategic M&A Is Primary Exit for Data Infrastructure and Analytics Companies

(\$ in billions) Transaction Size — Deals \$6.4 118 108 99 \$4.5 86 85 79 \$2.7 \$2.0 \$1.6 \$0.9 2013 2014 2015 2016 2017 2018

Strategic M&A Summary (2013-2018)

Key Takeaways

- Key drivers of strategic M&A have included:
 - Consolidation to better compete with larger players (e.g., Cloudera/Hortonworks)
 - Acquisition of adjacent features/functions (Workday/Adaptive Insights, SAP/Callidus Cloud)
- Strategic acquisitions continue to be the favored exit for DA & BI software companies through 2018 and into 2019
- 2019 strategic activity continues to be strong in both deal volume and average transaction size

| Notable Transactions | | | | | |
|----------------------|-----------------------------|-------------------|---|-----------|-------------|
| Date | Acquirer | Target | Subsector | EV \$M | EV / Rev |
| 02/21/2019 | Qlik 🧕 | 🡌 ΑΤΤUNITY | Data Management | \$560 | 6.4x |
| 01/24/2019 | Microsoft | @ cītusdata | Relational Database Management | NA | NA |
| 12/04/2018 | TIBC | | Data Management | \$140 | 4.0x |
| 11/07/2018 | (DD) | bluedata: | Data Management | NA | NA |
| 11/07/2018 | >> talend | ≑ Stitch | Data Warehousing/ Information Management | \$60 | 20.0x |
| 10/03/2018 | cloudera | HORTONWORKS | Data Management | \$2,080 | 6.6x |
| 06/11/2018 | workday. | | Collaboration | \$1,556 | 13.6x |
| 5/16/2018 | ORACLE | DATASCIENCE COV | Data Analytics | NA | NA |
| 1/30/2018 | SAP | CallidusCloud | CRM Analytics | \$2,400 | 10.0x |
| 12/26/2017 | Ascential | CLAVIS INSIGHT | Corporate performance management | \$119 | NA |
| 12/17/2017 | ORACLE [.] | aconex | Information Management | \$1,200 | 9.7x |
| 11/2/2017 | vm ware [,] | velo cloud | Network Performance & Management | \$525 | NA |
| 5/15/2017 | TIBC | STATISTICR | Data Analytics | NA | NA |
| 5/14/2017 | é | 🐝 Lattice | Data Analytics | NA | NA |
| 4/25/2017 | infor | ≈ birst | Data Analytics | \$75 | 1.9x |
| 4/18/2017 | ORACLE | MOAT | Advertising Analytics & Enablement | \$600 | 13.3x |
| 04/13/2017 | Infosys | SKYTREE | Data Analytics | NA | NA |
| 03/14/2017 | GENPACT | | Data Analytics | \$125 | NA |
| 01/23/2017 | IBM | AGILE3 | Reporting | \$14 | NA |
| 1/18/2017 | service <mark>now</mark> | Dx Continuum | CRM Analytics | \$15 | NA |

Significant Private Equity Interest for Data Infrastructure and Analytics

| | | Notable Transac | tions | | |
|------------|----------------------------------|-----------------------------|-------------------------------------|-----------|-------------|
| Date | Acquirer | Target | Subsector | EV \$M | EV / Rev |
| 12/13/2018 | VECTOR CAPITAL | hostanalytics | Corporate Performance Management | NA | NA |
| 12/11/2018 | Vista Equity Partners | PPARK | Data Analytics | NA | NA |
| 06/04/2018 | Vista Equity Partners | Ad Science | Data Analytics | \$800 | NA |
| 04/12/2018 | SEP SUMERU EQUITY PARTNERS | Cotion | Corporate Performance Management | \$330 | 2.2x |
| 02/26/2018 | HGGC | helpsystems | Corporate Performance Management | \$1,200 | 11.4x |
| 10/26/2017 | MARLIN CEQUITY | | Data Analytics | \$130 | 3.7x |
| 09/25/2017 | Capital Partners | ACTUA | Data Analytics | \$354 | NA |
| 07/06/2017 | Centerbridge | s <u>yncsort</u> | Data Analytics | \$1,260 | 4.2x |
| 04/25/2017 | VERITAS | ≈ birst | Data Analytics | \$75 | 1.9x |
| 07/12/2016 | Luminate | ` Oversight | Data Analytics | \$25 | 2.5x |
| 06/28/2016 | Golden gate Capit | Predictix | Data Analytics | \$125 | NA |
| 06/02/2016 | THOMA BRAVO | Qlik Q | Data Analytics | \$3,000 | 4.2x |
| 04/25/2016 | VERITAS | Verisk Analytics | Data Analytics | \$820 | 2.7x |
| 09/03/2015 | THOMA BRAVO | Mede/Analytics [®] | Data Analytics | \$500 | 5.0x |
| 08/31/2015 | PERMIRA | informatica | Data Analytics | \$5,335 | 4.4x |
| 07/08/2014 | VISTA EQUITY PARTNERS | Social Solutions | Data Analytics | \$125 | 6.3x |

Private Equity M&A Summary (2013-2018)



Key Takeaways

- PE interest in data infrastructure and analytics underscores the long term, secular growth trends in the sector as well as the mission-critical functionality of the products that are entrenched within enterprise IT organizations
- PE activity in the DA and BI software space has been active in recent years and continued to show strength in 2018 and early 2019
- Deal volume has continuously grown since a brief plateau in 2015, and disclosed funding grew to reach nearly \$4.5 billion in 2016 alone

Data Infrastructure and Analytics Funding Environment



2018 Funding Deal Share Volume by Round



| Notable Transactions | | | | | |
|----------------------|-----------------------------|--------------------------------|------------------|-------------|--|
| Date | Target | Lead Investor | Subsector | Funding \$M | |
| 02/13/2019 | 🚱 influx data | NORWEST | Data Management | \$60 | |
| 02/05/2019 | atabricks | ANDREESSEN Horowitz | Data Warehousing | \$250 | |
| 01/25/2019 | * snowflake | ICONIQ | Data Warehousing | \$263 | |
| 01/23/2019 | confluent | SEQUOIA 뱯 | Data Analytics | \$125 | |
| 01/16/2019 | | Apax PARTNERS | Data Analytics | \$200 | |
| 12/19/2018 | 💋 data iku | ICONİQ | Data Analytics | \$101 | |
| 12/12/2018 | () at <mark>scale</mark> | Morgan Stanley | Data Analytics | \$50 | |
| 12/05/2018 | Amplitude | SEQUOIA 별 | Data Analytics | \$80 | |
| 10/25/2018 | DataRobot | B V Battery Ventures | Data Analytics | \$100 | |
| 10/11/2018 | * snowflake | SEQUOIA 별 | Data Warehousing | \$450 | |
| 09/12/2018 | | INSIGHT | Data Management | \$80 | |
| 05/15/2018 | MEMSQL | ventures | Data Management | \$30 | |
| 03/22/2018 | MATILLION | SAPPHIRE Ventures | Data Management | \$20 | |
| 02/13/2018 | 🖗 influx data | S <u>APPHIRE</u> Ventures | Data Management | \$35 | |
| 01/23/18 | ኛ dremio | NORWEST | Data Management | \$25 | |

AI/ML Funding Environment



AI/ML Deal Share Volume by Round



Notable Transactions Date Funding \$M Target Lead Investor Subsector / 12/13/2018 Healthcare 400 SoftBank **Robotic Process** AUTOMATION ANYWHERE 11/15/2018 SoftBank 300 Automation Machine Learning for SAPPHIRE 10/25/2018 100 **DataRobot** VENTURES Predictive Modeling WELLINGTON 10/04/2018 AI based HCM 156 ZipRecruiter MANAGEMENT® WELLINGTON 10/02/2018 AI for Security 200 TANIUM" MANAGEMENT Robotic Process AUTOMATION ANYWHERE 07/02/2018 250 Automation 商汤 05/31/2018 **Fidelity** Image Recognition 620 05/21/2018 BLUE POOL Healthcare 300 😍 ИВТЕСН 05/03/2018 820 Robotics GREEN PINE CAPITAL PARTNERS Data capture and 04/05.2018 DECLARATION 50 WorkFusion enrichment platforms HCA TriStar Digital Reasoning 03/19/2018 Internal Intel 30 Data capture and 48 01/31/2018 P COLUMBIA PACIFIC ADVISORS enrichment platforms Machine Intelligence Northgate Partners^{ud} 01/25/2018 ARUNDO 25 for Sensor Systems AI for Retail and 01/03/2018 rubikloud" 37 eCommerce 12/19/2017 MAANA Shell Technology Ventures Al for Sensor Systems 28 Deep Learning for khosla ventures 07/25/2017 50 V vicarious General AI 06/27/2017 **🛨 sumologic** AI for IT Ops 75 DFJ GROWTH

Notable Acquisitions in the Al/ML Space

| Date | Target | Acquirer | Subsector | Description | Enterprise Value \$M |
|------------|---|----------------------|---|--|----------------------|
| 2019-02-08 | GROKSTYLE | facebook | Vertical Machine Intelligence Applications | Provides AI-enabled image capture, recommendation, and customer analytics (SaaS) | NA |
| 2019-02-06 | signifai 🖒 | New Relic. | Horizontal Machine Intelligence Applications | Provides machine learning-based IT event analytics (SaaS) | 37 |
| 2019-01-24 | 🛾 abe | YEDLEE | Enterprise Chatbots and Virtual Assistants | Provides development software that enables financial institutions to build conversational AI applications | NA |
| 2018-12-05 | esquify | XACT DATA DISCOVERY | Vertical Machine Intelligence Applications | Provides AI-based corporate performance analytics (SaaS) | NA |
| 2018-10-22 | 💓 DataFox | ORACLE | Horizontal Machine Intelligence Applications | Provides AI-based predictive intelligence as a service | NA |
| 2018-10-14 | • | Ú | Vertical Machine Intelligence Applications | Provides an automated machine learning A&R and music management platform | NA |
| 2018-09-24 | ASTRO | <mark>‡</mark> slack | Horizontal Machine Intelligence Applications | Provides Al-based email applications to help Gmail and Office 365 users manage their inbox | NA |
| 2018-09-04 | () fido.ai | samurai | Vertical Machine Intelligence Applications | Deep analytics platform powered by a radically different approach to Al and language understanding | NA |
| 2018-07-16 | butter.ai | box | Enterprise Chatbots and Virtual Assistants | Uses natural language processing and machine learning to help customers search for content intelligently in the cloud | NA |
| 2018-07-16 | 🕼 datorama | salesforce | Horizontal Machine Intelligence Applications | Provides AI-powered marketing performance intelligence | 726 |
| 2018-07-02 | Bloomsbury AI | facebook | Vertical Machine Intelligence Applications | Provides natural language processing and text analytics (SaaS) | NA |
| 2018-06-20 | | Microsoft | Machine Intelligence Platforms | Provides AI-based development software for autonomous system developers | NA |
| 2018-05-29 | | PayPal | Horizontal Machine Intelligence Applications | Provides AI-powered customer product recommendation (SaaS) | NA |
| 2018-05-20 | semanticmachines | Microsoft | Machine Intelligence Platforms | Develops Al-based conversational computing software | NA |
| 2018-05-16 | DATA SCIENCE .COM | ORACLE | Machine Intelligence Platforms | Provides an enterprise data science platform | NA |
| 2018-05-01 | ACCOMPANY | cisco. | Horizontal Machine Intelligence Applications | Provides AI-enabled contextual professional relationship intelligence (SaaS) | 270 |
| 2018-04-24 | grapeshot | ORACLE | Horizontal Machine Intelligence Applications | Provides AI powered contextual advertising enablement (SaaS) | NA |
| 2018-01-30 | 🛎 mezi | AMERICAN | Enterprise Chatbots and Virtual Assistants | Provides an Al-based personal travel assistant | NA |

Houlihan Lokey's Team Focused on Data Infrastructure and Analytics

Fully integrated team, ensuring deep industry and sector knowledge



Tombstones included herein represent transactions closed from 2009 forward. Selected transactions were executed by Houlihan Lokey professionals while at other firms acquired by Houlihan Lokey, or by professionals from a Houlihan Lokey joint venture company. Houlihan Lokey is the trusted advisor to more top decision-makers than any other independent global investment bank.

1,300+ Employees**24** Offices Globally



Corporate Finance

| 2018 M&A Advisory Rankings All U.S. Transactions | | | | | |
|---|---------------------|-------|--|--|--|
| | Advisor | Deals | | | |
| 1 | Houlihan Lokey | 207 | | | |
| 2 | Goldman Sachs & Co | 197 | | | |
| 3 | JP Morgan | 154 | | | |
| 4 | Morgan Stanley | 135 | | | |
| 5 | Jefferies LLC | 117 | | | |
| Sour | ce: Thomson Reuters | | | | |

No. 1 U.S. M&A Advisor

Top 10 Global M&A Advisor **Leading** Capital Markets Advisor

Financial Advisory

| 1999 to 2018 Global M&A Fairness Advisory Rankings | | | | |
|--|-------------------------------|-------|--|--|
| | Advisor | Deals | | |
| 1 | Houlihan Lokey | 1,073 | | |
| 2 | JP Morgan | 971 | | |
| 3 | Duff & Phelps | 728 | | |
| 4 | Bank of America Merrill Lynch | 660 | | |
| 5 | Morgan Stanley | 659 | | |
| Source: Thomson Reuters. Announced or completed transactions. | | | | |

No. 1 Global M&A Fairness Opinion Advisor Over the Past 20 Years

1,000+ Annual Valuation Engagements

Financial Restructuring

| 2018 Global Distressed Debt & Bankruptcy Restructuring Rankings | | | | |
|--|-------------------|-------|--|--|
| | Advisor | Deals | | |
| 1 | Houlihan Lokey | 63 | | |
| 2 | PJT Partners Inc. | 45 | | |
| 3* | Moelis & Co. | 36 | | |
| 3* | Lazard | 36 | | |
| 3* | Rothschild & Co. | 36 | | |
| Source: Thomson Reuters * Denotes tie | | | | |

No. 1 Global Restructuring Advisor

1,000+ Transactions Completed Valued at More Than \$2.5 Trillion Collectively

ТМТ

| 2018 M&A Advisory Rankings U.S. Technology, Media, Entertainment & Telecom Transactions Under \$1 Billion | | | | |
|---|-----------------------------|-------|--|--|
| | Advisor | Deals | | |
| 1 | Houlihan Lokey | 35 | | |
| 2* | Duff & Phelps | 33 | | |
| 2* | Raymond James Financial Inc | 33 | | |
| 4 | Moelis & Co | 31 | | |
| 5 | Morgan Stanley | 30 | | |
| Source: Thomson Reuters * Denotes tie | | | | |

No. 1 U.S. TMT Practice under \$1 Billion

35 Completed Transactions in 2018



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