AI Unlocks The Business Intelligence In BI

Continuous Improvement: The Business Intelligence Playbook

by Boris Evelson and Kjell Carlsson, Ph.D.
March 1, 2018

Why Read This Report

Business intelligence (BI) technology is the foundation of an insights-driven business. But even enterprises committed to data-driven decision making and that utilize modern BI tools frequently fail to transform data into actionable insights and tangible business outcomes — they are not yet insights driven. This report will guide application development and delivery (AD&D) pros working on BI initiatives on which artificial intelligence (AI) technologies they can deploy to boost BI capabilities.

Key Takeaways

AI Drives More Value From BI
AI-enabled features help you leverage more data, extract insights more effectively, and turn it into actionable insights using your existing BI tools and applications.

Leverage Six AI Technologies To Close The Few Remaining BI Gaps
Use machine-learning-based data discovery, semantic data cataloging and preparation, conversational user interfaces, point-and-click predictive analytics, suggestive insights discovery, and unstructured data analysis to address gaps in older-generation BI.

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Table Of Contents

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Enterprises Want BI To Deliver More Insights With More Value

In most enterprises, data access is a fait accompli: 72% of global data and analytics decision makers say that they can access the data they need to obtain insights in a timely manner.[1] However, even the most modern BI tools that make data more accessible still require significant subject matter expertise to find the right data, ask the right question, and interpret the results correctly in order to achieve tangible business outcomes. A majority of data and analytics decision makers (52% on the business side and 63% on the technology side) say that they plan to recruit people with advanced data skills to support their enterprise data-driven initiatives.[2] But even if you did have these data experts, they still feel challenged navigating and interpreting the data.[3] The current generation of BI tools has gaps that prevent AD&D pros from helping their business stakeholders fully leverage them for valuable insights. Today's BI technologies are:

› **Not designed for nondata professionals.** Most BI applications are constructed using point-and-click, drag-and-drop graphical user interfaces (GUIs), but they still require end user training and long ramp-up times, although not to the extent of learning and writing SQL code. Few business decision makers access data directly, instead relying on trained business analysts, even for basic information. Modern BI tools have sophisticated and often complex instrumentation (for drilling, pivoting, sorting, and ranking the results) and require users to be at least somewhat familiar with the data sources and business metadata.[4] This poses a barrier for wider adoption of BI for different levels of users.

› **Not extending the value of predictive analytics.** Few companies have made extensive use of predictive analytics because it requires data scientists to use specialized tools that don't easily integrate with widely deployed BI applications. On the other hand, users without an in-depth knowledge of machine learning techniques and familiarity with analytics tools — such as R, Python, and SAS — struggle to build even simple predictive models using their older-generation, point-and-click, drag-and-drop BI tools.

› **Hitting a wall with how to interpret rich data visualizations.** Information workers' romance with data visualization is hitting its limits.[5] Over the last couple of years, Forrester clients, especially executives, have been complaining that they don't understand how to interpret graphs and charts. "I am not a data analyst — can't somebody just explain to me what it all means" is a very popular request from grumpy but insights-hungry executives. So even a great data visualization doesn't always mean great business insights.

› **Still dependent on a lengthy, often unreliable process to get to insights.** A perfectly oiled BI engine requires flawless alignment of three key steps. First, an analytical data store must include all relevant data sources (both structured and unstructured — and few BI tools are capable of analyzing unstructured data), and the data has to be modeled to support answers to all possible questions (a practical impossibility using earlier-generation technologies). Second, a business user

must access the right data source and ask a question correctly. Third, a business user must be aware that a relevant data pattern exists in order to ask a question in the first place. The bottom line: BI does not address the "I don't know what I don't know" quagmire.[6]

› **Providing insights based on only a small subset of data.** All of the challenges highlighted in the previous bullet have a critical negative impact: No large enterprise today is sourcing, curating, analyzing, and deriving insights from *all* of its transactional data. Anecdotal evidence shows that most enterprises manage to get about a fifth of their structured data into enterprise data warehouses and data marts. If one adds unstructured data to the equation, Forrester's estimate falls to below 10%.

› **Separated from systems on engagement that make insights actionable.** Capabilities, such as next-best-offer optimization, in customer-facing (B2C) analytics have been prescriptive and actionable for many years. However, that is not the case with employee-facing (B2E) BI applications. Earlier-generation BI tools largely rely on an employee to know what report or dashboard to pull up, what clicks/steps to take to analyze what is being presented, and what actions to take based on the employee's personal interpretation of the signals coming from these applications.[7] That means the BI tool is one step removed from a system of engagement that takes action on the insight interpreted by an employee.

Six AI-Enabled Capabilities Will Close BI Gaps

Given the inherent gaps in present-day BI technologies, AD&D pros working on BI initiatives are looking to make their BI applications more efficient and effective. Enter AI. Now enterprises can use AI-enabled techniques and tools to further extend the value of BI in six ways (see Figure 1 and see Figure 2):

1. **Leverage BI for data beyond the data warehouse.** Highly curated enterprise data warehouses (EDWs) will continue to serve a key role for BI, especially where a single version of the truth is an absolute requirement. However, EDWs usually store only a small subset of all enterprise data because of the significant effort required to build and maintain them. AD&D pros can now look to machine-learning-based automated data discovery, semantic data catalogs, data warehouse automation (DWA) tools, and data preparation tools to programmatically build analytical data repositories (see Figure 3).[8] While these may not create 100% accurate data models and may not be the right venue for analytics requiring a single version of the truth, they will get enterprises to analyze more data than they currently do.

2. **Automate data preparation tasks.** BI users have demanded, and most BI vendors now deliver, data preparation (AKA data wrangling) capabilities built right into BI tools.[9] But business users may not have all the necessary experience and expertise to profile and curate the data. Data preparation functionality based on machine learning will help. These tools will scan all relevant data sources; profile them to determine typical values in each column, ranges of values, outliers, nulls, and so on; and suggest fixes (see Figure 4).

3. **Interact with computers in a more natural, cognitive way.** Executives and nondata analysts have always wished for data to simply "tell them a story." This has largely come true with natural language processing (NLP) and natural language generation (NLG) technologies. Users can now ask a question in a natural language (where NLP translates a question into a query, AKA text-to-query) and get an answer via a programmatically generated narrative based on the result set returned by the query. The NLG narratives are especially effective when displayed side by side with a visualization (see Figure 5). In addition to NLP and NLG capabilities built into BI tools, some BI providers are also creating chatbots as separate applications. These can allow nontechnical BI users to ask questions and receive dynamically generated data visualizations and written highlights without knowing anything about the underlying data structures or metadata.

4. **Democratize the use of advanced analytics.** BI can democratize basic machine learning and predictive analytics with point-and-click tools for the most common advanced analytics techniques ranging from k-means clustering and association rules mining to regression analysis and forecasting. Some vendors are even building wizard interfaces for creating predictive models with guardrails to prevent novice users from making common mistakes. These techniques allow everyone to be a "citizen data scientist." Additionally, AI-enabled BI platforms now allow data scientists to embed more complex predictive models right into BI applications for everyone in the organization to use.

5. **Use machine learning to guide insights discovery.** When your business colleagues provide application specifications for BI, you can develop and design your BI application to deliver the insights they need. But what about all the insights hidden in the data that you didn't account for and weren't aware of during the specification, design, and build phases? Machine learning technologies can now plug these knowledge gaps. BI tools today can suggest areas of interest to explore based on data patterns, trends, trend reversals, outliers, and so on. These tools can also suggest the most-useful reports and dashboards and "next clicks" based on colleagues' usage patterns (see Figure 6). Lastly, BI tools are increasingly applying algorithms like decision trees and other techniques that suggest variables that are driving a key variable, such as sales or attrition.

6. **Leverage all data, not just structured data, for insights.** An emerging category of BI tools can analyze data stored in NoSQL database management systems such as index, graph, XML, and others. These BI tools use machine learning and deep-learning techniques to integrate all data, not just structured data, into an analytical repository. Then users can derive insights based on a truly complete view of customers and products.[10]

FIGURE 1 Earlier-Generation Business Intelligence Versus AI-Enabled BI Capabilities

Functionality	Earlier-generation BI	AI-enabled BI
Data management	Manual coding using tools and platforms like ETL, data cleansing, and data warehouses	Based on machine learning; largely automated data discovery, semantic data catalogs, semantic data lakes
Data preparation	Manual, point-and-click or scripted	Automated, based on machine learning
User interface	Point-and-click, drag-and-drop	Natural language processing (NLP) and natural language generation (NLG)
Advanced, predictive analytics	Manually coding in Python, R, SAS, etc., and integrating with BI tools and applications	Point-and-click model authoring, testing and deployment
Knowledge gaps	Does not address "I don't know what I don't know"	Uses machine learning and cooperative usage to suggest popular reports, dashboards, and areas of interest to explore
Insights	Derived mostly from structured data	Derived from all data, structured and unstructured

FIGURE 2 Six AI-Based Use Cases And Technologies Address Gaps In Earlier-Generation BI

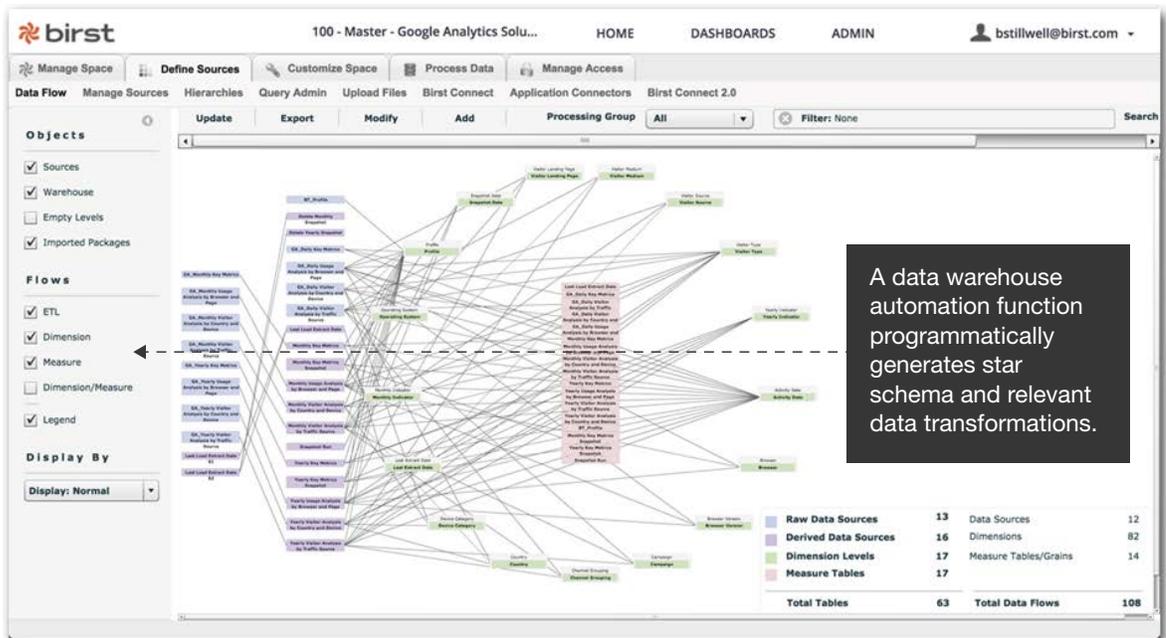| Use case	AI technology	BI gap addressed	Representative vendors
Data discovery and cataloging	Machine learning	While it is practically impossible to integrate all relevant data in analytical repositories (such as data warehouses), machine learning tools can discover, partially integrate, document, and catalog all or most of enterprise data.	Attivio, Birst, Cambridge Semantics, ClearStory Data, Pyramid Analytics, Squirro, SynerScope, TIBCO Software (Spotfire Data Catalog)
Data preparation	Machine learning	Reduces data preparation effort by automating some of the data cleaning and standardization as well as extracting specific structured data from unstructured data	1010data, Birst, ClearStory Data, Domo, GoodData, IBM, Information Builders, Oracle, Salesforce, SynerScope, TIBCO Software
Interacting with data, more intuitive human-machine interaction	Text analytics, speech analytics, deep learning, chatbots	Performs analysis, with no need to learn BI tool instrumentation or know anything about data, data sources, or metadata	BOARD International, IBM, Information Builders, Microsoft, Oracle, Qlik, Salesforce
	Natural language generation (NLG)	Complements data visualization to explain the meaning behind a chart or a graph	BOARD International, GoodData, IBM, Microsoft, MicroStrategy, Oracle, Qlik Technologies, Salesforce, SAP, Sisense, TIBCO Software, Yellowfin
	Text analytics, machine learning, deep learning	Explores data via cognitive and semantic search	Attivio, Squirro, Stratifyd
Drag-and-drop machine learning	Machine learning, text analytics	Allows a data analyst (not necessarily a data scientist) to create, test, and deploy predictive models without writing code	OpenText, Salesforce (Einstein), ThoughtSpot

FIGURE 2 Six AI-Based Use Cases And Technologies Address Gaps In Earlier-Generation BI (Cont.)

Use case	AI technology	BI gap addressed	Representative vendors
Suggestive/ prescriptive analytics	Machine learning	Application suggests areas of interest to explore, such as a data anomaly, a new pattern, or a change in trend	IBM (Watson Analytics), Salesforce (Einstein), SynerScope
		Application suggests a data source, report, dashboard, and next click/next step to take based on other users' actions — cooperative usage	Arcadia Data, GoodData, Panorama Software
Full view of a customer	Text analytics, machine learning, deep learning	Derives insights from all data, structured and unstructured	Attivio, Cambridge Semantics, OpenText, Squirro, Stratifyd

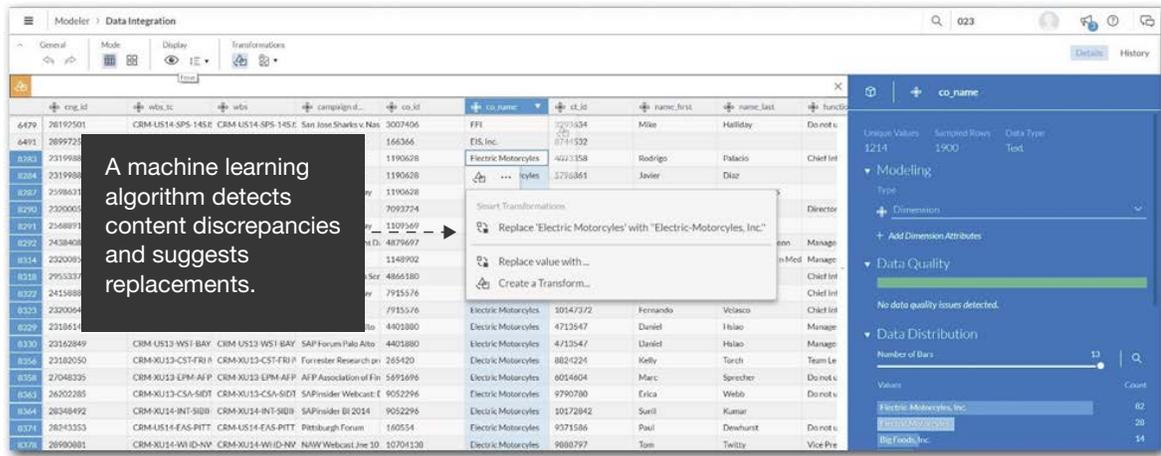**FIGURE 3** An Example Of Machine-Learning-Based Database Warehouse Automation

A data warehouse automation function programmatically generates star schema and relevant data transformations.

Source: Birst, an Infor company

FIGURE 4 An Example Of Machine-Learning-Based "Smart" Data Transformation

Source: SAP, SAP Analytics Cloud

FIGURE 5 Examples Of Natural Language Generation Narratives Side By Side With Data Visualizations

> Machine-generated natural language narratives change dynamically when users slice/dice data and visualizations.
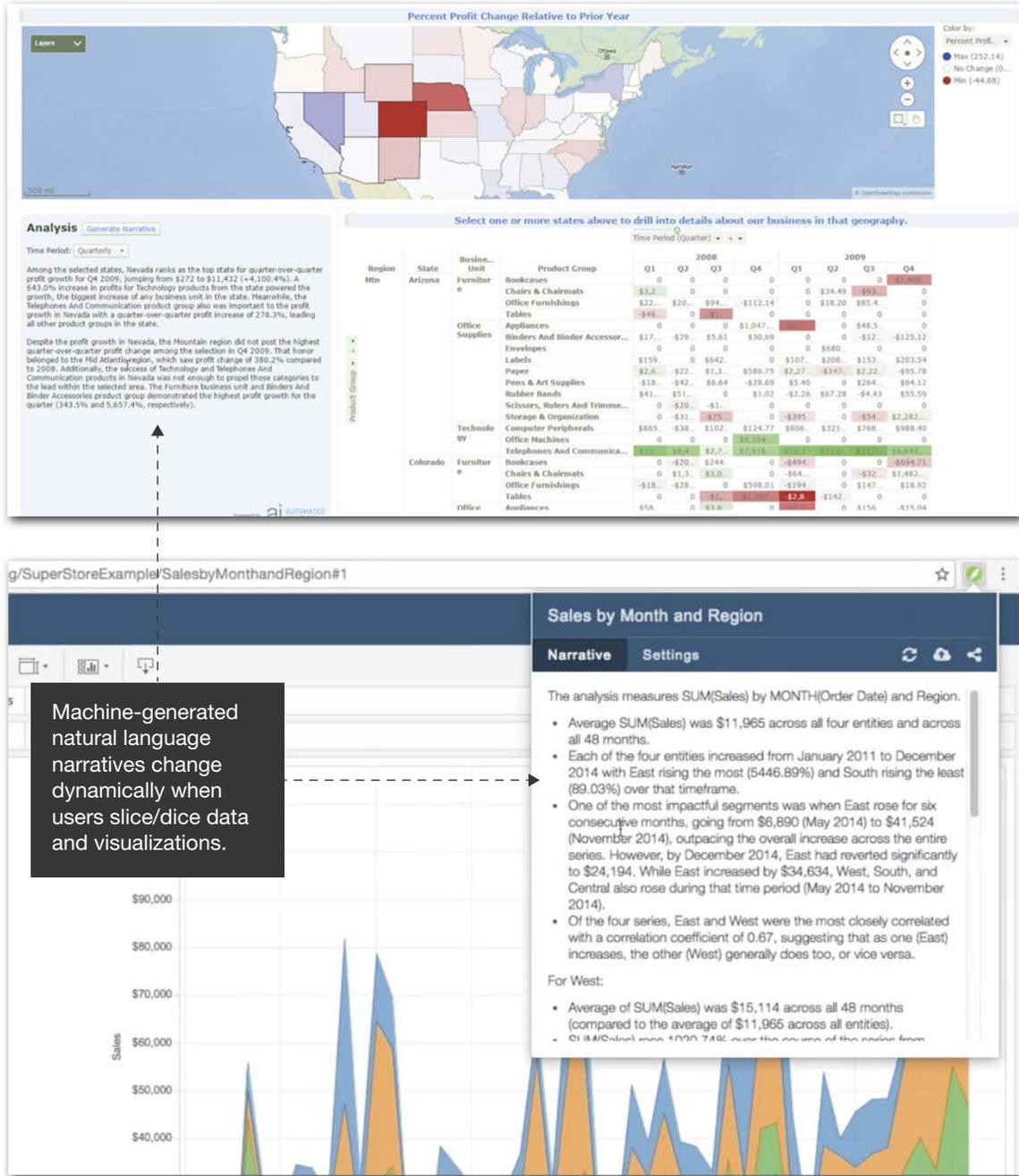
Source: TIBCO Software (top) and Tableau Software (bottom)

FIGURE 6 Examples Of Recommended Next Steps (Next Clicks To Take Or Explaining The Results)
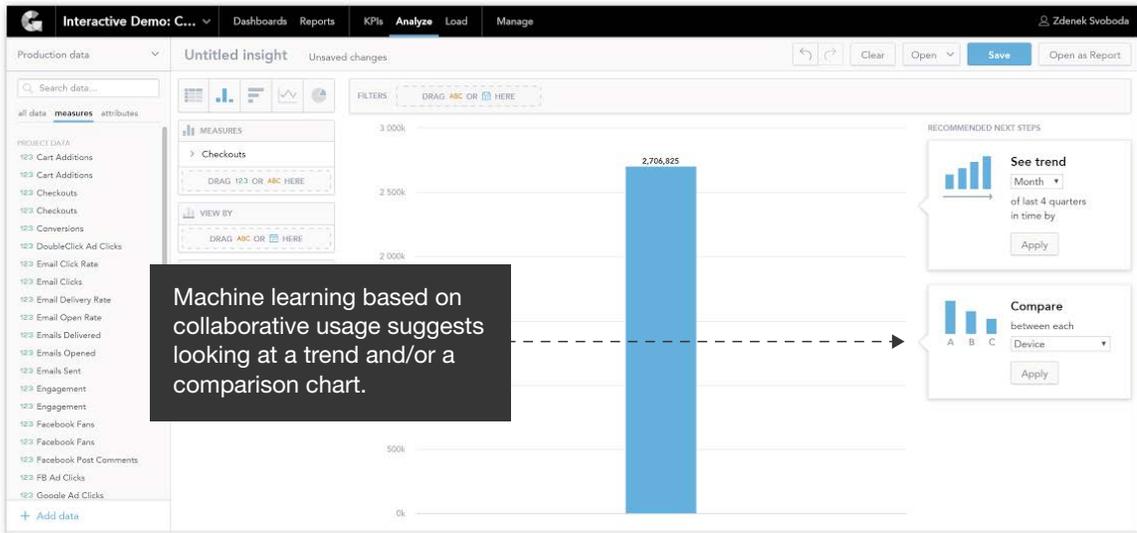
Source: GoodData (top) and Yellowfin (bottom)

Roll Up Your Sleeves: AI-Enabled BI Is Not A Panacea

AD&D pros must consider that AI-enabled BI is only a limited application of AI, and AI-enabled BI tools are not platforms for building AI applications. AI does not replace BI, nor is BI becoming an alternative to AI. AI-enabled BI is not effortless, nor does it address all gaps. AD&D pros and their BI colleagues deploying applications based on the new-generation BI tools will still need to invest in:

› **Data and BI governance processes.** To derive value from AI-enabled BI, you will still have to invest in data curation, such as data integration and data cleansing, as well as governance processes and architectures, such as data lakes, data warehouses, and semantic data catalogs.

› **Manual feedback and optimization processes.** You must still create mostly manual processes to monitor business outcomes and adjust BI functionality as necessary.[11] AI-enabled BI technologies — with a few exceptions where unstructured data analysis is involved — don't learn on their own and improve over time, like neural networks do. So don't confuse AI-enabled BI with AI in a classical sense, where one does not code rules and procedures but rather "trains" the AI application based on inputs and marked-up outputs (using neural networks, AKA deep learning).

› **Data science talent.** While BI platforms have functionality for simple advanced analytics and predictive models, they currently lack the breadth of features, configuration options, and horsepower necessary for applications relying on larger amounts of data or that require high degrees of predictive accuracy. As a result, most BI platforms offer, or are developing, features for incorporating custom R or Python code, but for now they offer only a subset of the functionality available with dedicated data science and machine learning platforms. So don't get rid of your data scientists just yet!

BI Team Roles Will Shift From Coding To Analysis

Forrester wholeheartedly agrees with a recent Harvard Business Review article predicting that "AI won't replace managers, but managers who use AI will replace those who don't."[12] Indeed, AI won't replace BI tools or teams, but BI tools and teams that leverage AI will replace those that don't. AD&D pros working on BI initiatives must get ready for this shift. AI-based automation of data discovery and data preparation will eliminate many processes that required manual coding. On the other hand, more data and more intuitive ways of interacting with data will open a floodgate of information and insights. Someone will have to interpret the insights, make decisions, and act on them. Therefore, Forrester predicts that over the next three to five years there will be a significant shift in BI jobs from coding to analysis. AD&D pros must retrain and reposition themselves for the shift or risk being left behind.

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Supplemental Material

Companies Interviewed For This Report

We would like to thank the individuals from the following companies who generously gave their time during the research for this report.

Birst	SAP
ClearStory Data	Tableau Software
GoodData	TIBCO Software
Panorama Software	Yellowfin
Salesforce	

Endnotes

[1] Source: Forrester Data Global Business Technographics® Data And Analytics Survey, 2017.

[2] Source: Forrester Data Global Business Technographics Data And Analytics Survey, 2017.

[3] See the Forrester report "Turn Data Monotony Into Data Mastery: Cultivate An Insights-Driven Culture."

[4] See the Forrester report "The Forrester Wave™: Enterprise BI Platforms With Majority Cloud Deployments, Q3 2017" and see the Forrester report "The Forrester Wave™: Enterprise BI Platforms With Majority On-Premises Deployments, Q3 2017."

[5] See the Forrester report "Improve Your Storytelling With Data Visualization Best Practices."

[6] See the Forrester report "Stay On Top Of New BI Technologies To Lead Your Enterprise Into The Not-Too-Distant Future."

[7] See the Forrester report "It's Time To Upgrade Business Intelligence To Systems Of Insight."

[8] See the Forrester report "Data Warehouse Automation Helps Close The Data-To-Insight Gap."

[9] See the Forrester report "The Forrester Wave™: Enterprise BI Platforms With Majority Cloud Deployments, Q3 2017" and see the Forrester report "The Forrester Wave™: Enterprise BI Platforms With Majority On-Premises Deployments, Q3 2017."

[10] See the Forrester report "Vendor Landscape: Graph Databases."

[11] See the Forrester report "Divide (BI Governance From Data Governance) And Conquer."

[12] Source: Walter Frick, "Why AI Can't Write This Article (Yet)," Harvard Business Review, July 24, 2017 (https://hbr.org/2017/07/why-ai-cant-write-this-article-yet).

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