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BIG IDEA

Why Data-Driven Innovators Choose Embedded Analytics

Enterprises Shouldn't Start From Scratch When Developing Insight-Rich Software or Services

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EXECUTIVE SUMMARY

Organizations of every description are pursuing digital innovation. As a result, business and tech leaders, including chief data officers, chief digital officers, chief information officers, and chief technology officers, are increasingly looking for ways to deliver data-driven software and services. It's a route to differentiation that can be intimidating, but even if your organization is new to delivering software or services, rest assured that it doesn't have to start the data and development work from scratch.

This report is about embedded analytics platforms, which have long been used by software and software-as-a-service (SaaS) companies to accelerate development and data-driven innovation. CxOs should know this about embedded analytics platforms: Not only do they power business-changing and revenue-generating digital services, but they also help organizations deliver analytical insights that cement customer loyalty and increase the innovator's share of customer spending.

This report explains embedded analytics capabilities and how they are evolving to support cloud deployment, modern development approaches, and workflow and automation needs. The report includes real-world examples of how companies are delivering descriptive, diagnostic, and predictive insights in the context of applications and decision points. Early adopters should use this report to better understand and to consider the possibilities for using embedded analytics to power differentiating software and services.

Business Themes

Next-Generation Customer Experience | Future of Work | Data-to-Decisions | Technology Optimization

DIGITAL INNOVATION IS DRIVEN BY DATA

Perhaps you've heard the saying "Every company is now a software company" or "Software is eating the world"? These aren't just musings from a tech giant CEO and a renowned Silicon Valley venture capitalist. A quick look at the web and mobile applications with which most people do business every day confirms that customer interactions and customer relationships are now decidedly digital and data-driven:

- Insurance companies routinely offer data-driven dynamic pricing programs whereby customers pay premiums based on their mileage or driving behavior. Data from their vehicles is automatically downloaded and analyzed, and the results are reported via phone-based apps that also support billing and claims.

- Airlines and car rental companies report customer mileage records and progress toward rewards and loyalty levels via apps that also support bookings, check-ins, seat and flight changes, and upgrades.

- Banks and credit card companies use websites and phone apps to break out customer spending by month and category while also supporting ad hoc searching for individual transactions and drill-down analysis of spending patterns by category.

- Gas station and grocery chains report on loyalty points via apps while also offering personalized discounts and cross-sell and up-sell offers based on past buying behaviors.

- Car and appliance manufacturers offer connected experiences, giving customers insight into performance and maintenance requirements, loan status reporting, and support for parts ordering and service bookings.

- Utilities, telecommunications companies, and media services providers deliver insights on efficiency compared with like households, consumption patterns, and service utilization alongside billing information and customer services.

- Retailers, restaurants, and other customer-facing organizations have upped their games to interact with customers online and via smartphones. Most redoubled their efforts when the COVID-19 pandemic hit, quickly adding support for curbside pickup, touchless transactions, and new discount and incentive options.

The types of organizations listed above would never identify themselves as being software companies or SaaS providers. Yet they all have teams that are developing differentiating software or services or, at the very least, are keeping them competitive with pioneering rivals that have developed data-driven services.

When companies decide to innovate, they almost always turn to data to explore what might be possible. If a company can analyze data and harness insights in a timely way, it can offer targeted rewards and offers, personalized services, and automated product and service upgrades. Data-driven innovation can even become the foundation for new business models and new sources of revenue. So how can you innovate with data and do so quickly? That's where embedded analytics come in.

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EMBEDDING EVOLVES TO PUT INSIGHT INTO ACTION

Tech companies that do identify as software or SaaS companies have long exploited a not-so-secret weapon to innovate with data: embedded analytics platforms. These platforms are offered both by specialist vendors focused entirely on original equipment manufacturer (OEM) and "white label" offerings and by mainstream business intelligence (BI) and analytics vendors that also address embedding with capabilities and subscription approaches geared toward software and service providers.

Harnessing prebuilt, embedded analytical capabilities enables software and SaaS vendors to focus on developing the functionality that is unique and differentiating, rather than reinventing reporting, dashboarding, and other analytical features from scratch. The approach reduces the need for specialized

developers and expensive data engineers. It also speeds overall product development and thus reduces time to market. And, at the risk of stating the obvious, what's good for software and SaaS providers will benefit any company that is innovating with software and services.

Embedded analytics offerings have evolved in recent years. Some changes have been sparked by larger tech trends, such as the move toward cloud computing and related changes in software development. Embedding has also evolved in sync with changes in data integration and BI as well as analytics expectations and best practices. Figure 1 highlights the key trends, but here's closer analysis along with observations on how these trends are interrelated and interdependent:

- **Cloud Trends**

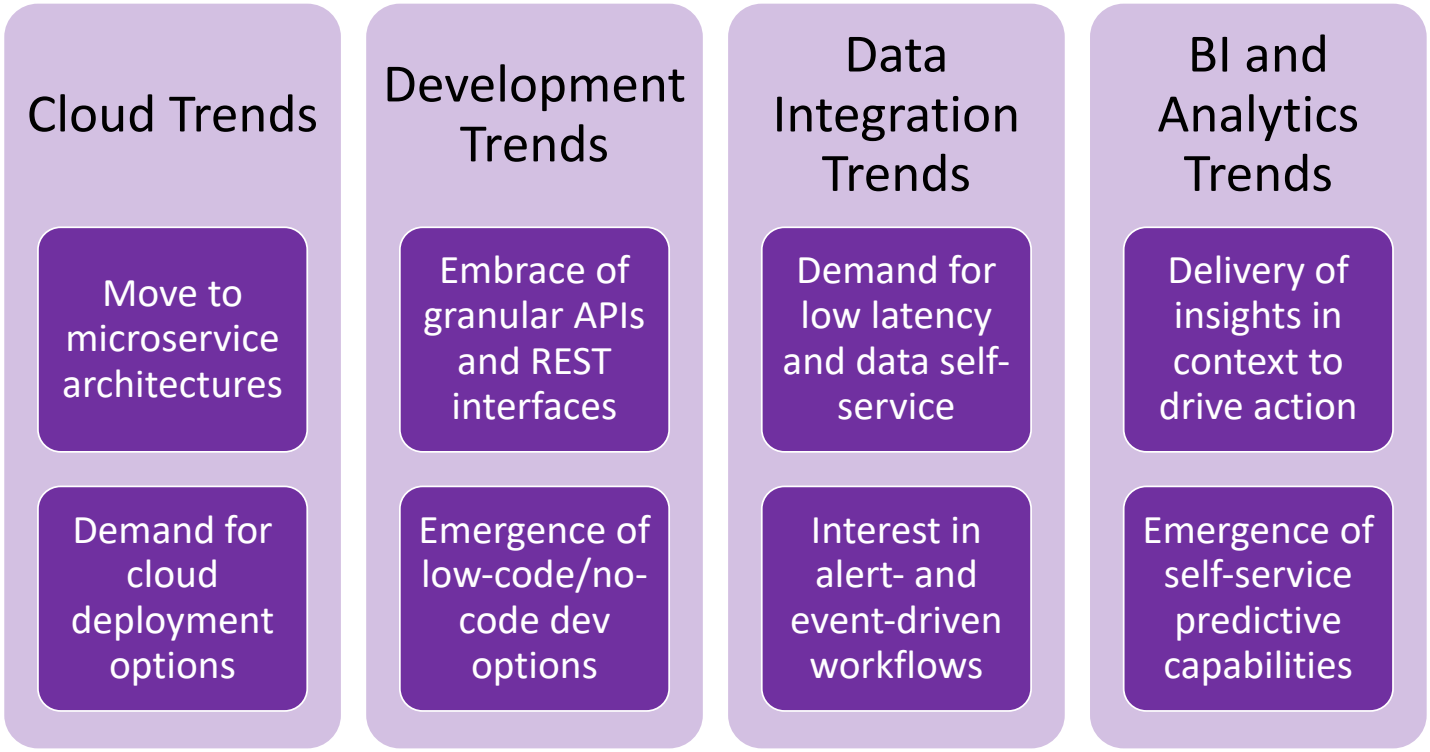
  - Architectures are the foundation of modern cloud computing, supporting the delivery of fine-grained, composable services that can be flexibly swapped in and swapped out without rewriting entire applications. When software—including BI and analytics platforms—has been "(re)written for the cloud," it generally means it has been redeveloped or conceived from scratch via fine-grained, microservices architectures.

  - Customers want cloud deployment flexibility, so they often want offerings that are available both as software (so they can deploy on clouds as they do on-premises) and as services (so they are liberated from deployment and ongoing administration). All the better if deployment options include software in multiple public cloud marketplaces and services on multiple public clouds. The most sophisticated, cutting-edge companies also want containerization options that support consistent on-premises and cloud-based deployment via container platforms and services.

- **Development Trends**

  - Agile, cloud-centric organizations are bridging the gap between development and operations with DevOps approaches including continuous integration and continuous deployment (CI/CD). Fine-grained APIs and RESTful interfaces (synonymous with microservices architecture) support these approaches by enabling developers to weave together services programmatically and automate

Figure 1. Trends in Four Areas Have Evolved Embedded Analytics Approaches



Source: Constellation Research

steps in building, testing, and deploying applications. Evolved embedded BI and analytics platforms offer fine-grained APIs and REST end points.

- Low-code and no-code development options are flourishing to help democratize application development. These low-code and no-code options enable nondevelopers to build or extend applications, and they're emerging in BI and analytics and the embedded arena as well.

- **Data Integration Trends**

  - Customers, partners, and internal constituents increasingly expect low-latency delivery of data and insights. Change data capture, microbatch and streaming data integration, and self-service data-prep options are gaining ground. Modern embedded analytic platforms offer low-latency data integration and self-service data-prep capabilities.

- Interest in automation is on the rise, so data integration and BI and analytics vendors are adding workflow capabilities with automation options including event triggers and analytic thresholds and alerts.

- **BI and Analytics Trends**

  - Whether it's because of lack of skills or, increasingly, lack of time, many users do not want to have to navigate to separate analytical interfaces, such as reports and dashboards, and then look for and interpret the salient insights. Taking advantage of their microservices architectures and granular APIs, evolved embedded platforms support the delivery of concise, action-driving analytics at key decision points within software and services.

  - It's crucial to understand what happened and why something happened—the descriptive and diagnostic insights BI traditionally delivers. But customers, partners, and internal constituents increasingly want to know what will happen and what they can do about it. These sorts of predictive insights and prescriptive recommendations were formerly left to data scientists, but Constellation is increasingly seeing self-service options for forward-looking analysis.

CASE EXAMPLES HIGHLIGHTING INNOVATIVE EMBEDDING

All of the trends detailed above show up in the four real-world case studies that follow. The first example features a SaaS company; the three remaining examples highlight companies in the healthcare, telecommunications, and retail industries that have innovated with software and services. The last use case features a sophisticated data-monetization platform that's enabling retailers to capture a new source of revenue. What unites all these examples is the use of embedded analytics.

Franchise Application Supports Action-Driving Workflows

Configurable workflows can be triggered by dates, events, or analytical alerts. If a franchisee isn't performing as expected, for example, alerts can trigger a marketing campaign, a proactive coaching session, or a review of the franchisee agreement.

As its customers steadily moved into the cloud, a franchise-focused software company followed suit and became a SaaS provider. The company's flagship SaaS application connects brands and franchisees, delivering helpful analytics as well as action-driving workflows. The application draws on data from enterprise resource planning (ERP) and customer relationship management (CRM) applications and point-of-sale and marketing systems at both the brand and franchisee level.

The primary role of the application is to report on franchisees' performance, whether they have one location or dozens of locations. Powered by a cloud-ready embedded BI and analytics platform, the application delivers analyses both for the brands and the franchisees. Dashboards keep the brands abreast of compliance with franchise agreements and royalty payments. Franchisees monitor their overall performance and drill down to location-specific analyses. User-, role-, and company-based security and access controls—also supported by the embedded BI and analytics platform—ensure that the right users at the right companies see only the insights they're entitled to see.

> *"Configurable workflows can be triggered by dates, events, or analytical alerts. If a franchisee isn't performing as expected, for example, alerts can trigger a marketing campaign, a proactive coaching session, or a review of the franchisee agreement."*

Configurable workflows can be triggered in three ways. Triggers could be dates, such as the pending expiration of a franchise agreement, or events, such as a payment alert from an ERP system. Analytical thresholds and alerts—powered by the embedding platform—offer a third way to trigger workflows. If a franchisee isn't performing as expected, for example, an alert can trigger a location-specific marketing campaign or a proactive coaching session. If performance still isn't improving, an analytic alert can trigger a review of the franchisee agreement. In short, this SaaS app goes beyond reports and dashboards via analytical alerts tied to action-driving workflows.

Healthcare Consulting Firm Optimizes Purchasing

This European healthcare consulting firm doesn't advertise itself as a software or services firm, but it's increasingly delivering analytical expertise via customized applications. Working for a major

European pharmaceutical company, the firm built a smart supply chain application that delivers optimized recommendations for purchasing of raw materials. The raw materials go into the hundreds of products the company manufactures and distributes throughout Europe. Profitability and production considerations have a big impact on when it's best to buy which raw materials and in what quantities.

The application relies on manufacturing and supply chain data from the pharmaceutical's SAP ERP system, sales planning data from its Veeva CRM system, and historical data from the company's data warehouse. An embedded BI and analytics platform is the heart of the application. The consulting firm started with a conventional dashboard for purchasing agents that showed product sales goals and available manufacturing capacity along with insights—broken out by supplier—on raw material availability, delivery lead times, material costs, and historical supplier reliability.

Optimized purchasing recommendations are calculated based on available production windows, supplier lead times and reliability, the profitability of the associated product, the cost and quantity of materials to be purchased, and available working capital.

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The dashboard certainly delivered relevant information and insights, but the consulting firm and its client wanted to go further to make these insights actionable for purchasing agents. Thus, the consulting firm developed an algorithm—built in behind the scenes and transparent to the users—to provide raw materials purchasing recommendations, including the specific suppliers to choose and the quantities to purchase. The optimized recommendations are calculated based on available production windows, supplier lead times and reliability, the profitability of the associated product, the cost and quantity of materials to be purchased, and available working capital.

The application is truly actionable in that it enables suppliers to execute the recommended purchases, supported via integrations with the ERP system. As each purchase and associated production commitment is logged and the data warehouse is updated, the application's purchasing

recommendations are automatically revised to reflect changes in available production capacity, working capital, and product availability. It's not just an analytical application: It's a closed-loop recommendation system.

Mobile Phone Services Provider Optimizes Promotions and Offers

In the highly competitive mobile phone business, you win and keep customers via service promotions and product offers. They're the kind of deals you see advertised in newspapers and on TV offering unlimited talk, text, and data for x dollars per month or a new Android or Apple phone for y dollars per month. At one major carrier, the process of tracking and approving these offers was decidedly old school: spreadsheets and email. It decided to find a better way.

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Using new low-code/no-code development and workflow capabilities from its BI and analytics vendor, the telecommunications giant built what is essentially a custom project-management application supercharged with analytics. The company also took advantage of the BI vendor's embedded styling capabilities to give the internal-facing application its own branding and look and feel.

The low-code-developed internal application gives constituents including marketing, sales, and business leaders a single place for tracking and approving new service offers and device promotions. It lists the details of each initiative, including timelines, contacts, and links to supporting documents. The BI and analytics platform provides developers with prebuilt data connectors, data-modeling capabilities supporting data-formatting rules and drop-down options, and user- and role-based security and access controls.

The application offers an approval workflow with analytics coming into play at two levels. First, there are analytics on the progress of each project, including insights on work completed and work remaining. Second, the application delivers trend and drill-down analysis on the marketing success of current and recent offers and promotions with terms similar to those of each project being considered.

With the advantages of low-code development and all the prebuilt features, functions, and capabilities provided by the embedded platform, the mobile phone company was able to build its customized application in a matter of weeks. The app not only streamlined tracking and approvals of offers and promotions but also consolidated reporting on the success of those offers and promotions. Most importantly, the app guides the approval of new offers and promotions based on analytical insight into market success, rather than whichever project happens to be next in line.

Retailers Leverage a Platform for Monetizing Data and Insights

Consultants see the patterns within industries, so they're in a good position to offer repeatable advice. A global consulting firm serving retailers in Europe and South America recognized that advice alone was no longer enough. Its customers were struggling to digitally transform and compete against the likes of Walmart and other sophisticated giants that know how to use supply chain data to crush competitors and generate more revenue.

The consulting firm decided to build a repeatable, software-based platform that retailers could license (aka white-label) from the company. The platform is designed to enable retailers to use data from their suppliers to better understand purchasing trends and then sell insight services back to the suppliers. That's called data and insight monetization, but it's beyond the resources and sophistication of most retailers. The consulting firm used an embedded BI and analytics platform to build a customizable, quick-to-deploy platform retailers could use to improve business results while also generating incremental revenue.

Platform benefits begin with the incremental revenue generated by selling access to data and insights back to suppliers…but the platform also helps category managers improve profitability and store managers to increase inventory turns.

Data sharing between retailers and suppliers is a common practice, but the giants harness sophisticated low-latency platforms while smaller retailers rely on spreadsheets and email. Latency makes a huge difference when you're trying to inform stocking decisions, allocate resources, and track the success of in-store promotions. Spreadsheet and email approaches take as long as six weeks, but retailers and suppliers alike need to see and analyze daily results to make timely, proactive decisions.

The consulting firm settled on supermarket chains as the most promising initial target for the platform. This choice also focused the set of supplier and customer loyalty system integrations required, although the hundreds of prebuilt data connectors available from the BI and analytics vendor gave developers a head start. The choice also narrowed the BI and analytical development to well-understood analyses based on sales, inventories, margins, and promotions from both the retailer and supplier perspective.

> *"Platform benefits begin with the incremental revenue generated by selling access to data and insights back to suppliers… but the platform also helps category managers improve profitability and store managers to increase inventory turns."*

The finished platform delivers key insights based on anonymized customer profiles from retailer loyalty programs. It enables suppliers to track and better plan their inventories at a stock-keeping-unit (SKU) level at each store. Forecasting models support dynamic inventory allocation, so suppliers can send stock to the stores where it's needed most, avoiding stock-outs. Suppliers can also use the platform to monitor the performance of their promotions, gaining insight into brand switching. Suppliers are willing to pay for these insights—a small percentage of their total sales—because the platform also lets them see how their competitors' brands, products, and promotions affect their own performance.

The benefits of the platform for retailers begin with the incremental revenue generated by selling access to data and insights back to suppliers. The first retailer to white-label the platform—a 100-store supermarket chain with $500 million in annual sales—generated $2 million in incremental revenue from the service. The platform benefits retailers in other ways, helping category managers to analyze and improve profitability and supplier relationships, and helping store managers to increase inventory turns.

As for the consulting firm, it now has a repeatable business centered around software. It typically takes the firm four to six months to customize the platform to the unique needs of each new retail chain. Work with supermarket chains has only just begun, and there's the potential to extend the platform to drug and convenience store chains.

RECOMMENDATIONS

The first challenge for organizations wishing to create innovative, data-driven software or services will be to identify potential use cases and associated user communities. Once these are identified, consider associated user skill levels and development and deployment constraints. With a clear understanding of goals and the intended user community, you can consider how embedded analytics might speed development and drive innovation. Here's a list of steps to take:

Identify opportunities for harnessing data and insights. Are internal user groups or customers making decisions based on intuition? Does your organization have data that could power differentiating applications or services? Gather a cross-functional team, including business constituents, to identify potential projects. Detail the problems that could be solved or the company, partner, or customer benefits that could be realized.

Understand intended user groups and skill levels. With the list of potential projects in hand, document the skill levels of the targeted users of new interfaces, applications, or services. Are they internal or external users, and what is their demonstrated adoption of reports and dashboards? Are they using available analytics assets, and if adoption is lagging, is that lag due to a lack of skills; a lack of relevant, actionable insights; or a lack of time to interact with separate interfaces?

Consider analytic delivery options. Will conventional reports and dashboards suffice, or should you embed personalized insights or specific views with preset filter settings within an application? Can you make use of analytic thresholds or alerts to trigger action or embed concise, actionable analytics at key decision points? Will mobile interactions be desirable or required?

Consider build-versus-buy options. If the list of potential embedded projects is short and the requirements are very simple, you could consider custom development without the benefit

of an analytics platform, but carefully weigh the functionality needed, development time, skill requirements, and ongoing upgrade and maintenance requirements this will place on your development team.

Choose the right BI and analytics platform. What are the capabilities of your incumbent BI and analytics platforms, and are they being fully exploited? Are there upgrades and/or embedded capabilities and licensing options you should consider? It's ideal to find one platform that can serve both conventional and embedded BI and analytics needs and requirements. If the incumbent BI standard is being phased out, consider platforms that have kept pace with cloud, development, integration, and BI trends and modern embedding approaches.

- **Check the architecture and deployment flexibility.** Does the platform have a modern, microservices-based architecture with granular APIs for delivering focused analytic services? Does the platform support multitenancy for deploying business unit–, partner-, or customer-specific instances? What are the mobility options, and do they support both iOS and Android devices?

- **Explore the data management and data science features.** Does the platform offer a broad set of data connectors and prebuilt integrations as well as data-transformation and data-prep features? Does the platform support data modeling, data certification, and repeatable metrics and measures? Is there support for embedding R or Python code, and does the platform include an embeddable analytical execution engine? Are integrations available for popular automated machine learning (AutoML) products and public cloud services?

- **Investigate customization capabilities.** Can interfaces and analytic assets be styled and skinned to match your application and company branding, with customizable colors, fonts, logos, buttons, and menu styles? Is a software development kit (SDK) available for customizing and extending the platform, and what development languages are supported? Does the vendor offer prebuilt widgets and other customizable user interface components? Can you pass context or event triggers between the analytics platform and the rest of your application? Does the platform offer workflow capabilities and low-code/no-code development options?

- **Assess security provisions and ongoing maintenance requirements.** Does the system have provisions and/or integrations for single sign-on; host-application authentication; identity management; and fine-grained, row-level access-control? What are the ongoing administrative demands of managing, scaling, and monitoring the platform, and can administration be integrated with the host application?

- **Investigate licensing options and subscription terms.** Embedded scenarios often call for licensing flexibility, particularly when software and services are developed for partners or customers. Having more licensing and subscription options is better, so look for user-, core-, instance-, usage-, and event-based options and unlimited-usage terms. Also consider the terms and availability of support options.

These recommended steps present lots of research to be done. But once you have a clear use case for innovative software or services and once the embedded BI and analytics platform is selected, it's all a matter of execution. You'll be well on your way with the aid of embedded platform accelerants, including low-code/no-code development options, prebuilt data connectors and APIs, data-modeling capabilities, prebuilt widgets and visualizations, access and security controls, customization capabilities, and more.

Doug Henschen

Vice President and Principal Analyst

Doug Henschen is vice president and principal analyst at Constellation Research Inc. focusing on data-driven decision-making. His Data to Decisions research examines how organizations employ data analysis to reimagine their business models and gain a deeper understanding of their customers. Data insights also figure into tech optimization and innovation in human-to-machine and machine-to-machine business processes in manufacturing, retailing, and services industries.

Henschen's research acknowledges the fact that innovative applications of data analysis require a multidisciplinary approach, starting with information and orchestration technologies, continuing through business intelligence, data visualization and analytics, and moving into NoSQL and big data analysis, third-party data enrichment, and decision-management technologies. Insight-driven business models and innovations are of interest to the entire C-suite.

Previously, Henschen led analytics, big data, business intelligence, optimization, and smart applications research and news coverage at *InformationWeek*. His experiences include leadership in analytics, business intelligence, database, data warehousing, and decision-support research and analysis for *Intelligent Enterprise*. Further, Henschen led business process management and enterprise content management research and analysis at *Transform* magazine. At *DM News*, he led the coverage of database marketing and digital marketing trends and news.

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ABOUT CONSTELLATION RESEARCH

Constellation Research is an award-winning, Silicon Valley–based research and advisory firm that helps organizations navigate the challenges of digital disruption through business model transformation and the judicious application of disruptive technologies. Unlike the legacy analyst firms, Constellation Research is disrupting how research is accessed, what topics are covered, and how clients can partner with a research firm to achieve success. Over 350 clients have joined from an ecosystem of buyers, partners, solution providers, C-suite, boards of directors, and vendor clients. Our mission is to identify, validate, and share insights with our clients.

Organizational Highlights

- Named Institute of Industry Analyst Relations (IIAR) New Analyst Firm of the Year in 2011 and #1 Independent Analyst Firm for 2014 and 2015.
- Experienced research team with an average of 25 years of practitioner, management, and industry experience.
- Organizers of the Constellation Connected Enterprise—an innovation summit and best practices knowledge-sharing retreat for business leaders.
- Founders of Constellation Executive Network, a membership organization for digital leaders seeking to learn from market leaders and fast followers.

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