

CASE STUDY: ANALYTICS AT FORD MOTOR CO.

Ford Analytics Team Democratizes Data- Driven Analysis

**Ford Global Data Insight and Analytics Unit Expands
the Use of Data throughout the Enterprise**



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TABLE OF CONTENTS

AT A GLANCE 3

THE COMPANY 4

THE CHALLENGES 5

THE SOLUTION 6

THE IMPACT 9

THE TAKEAWAYS 10

THE RECOMMENDATIONS 11

ANALYST BIO 13

ABOUT CONSTELLATION RESEARCH 14



AT A GLANCE

Ford Motor Co. has relied on data analysis for decades, but like many companies, it did so in pockets of the business, with little oversight to ensure consistency and coordination across the organization. In January 2015, Ford formed the Global Data Insights and Analytics (GDIA) unit, a centralized data science team organized to share analytical best practices and to spread optimized, data-driven decision-making across the organization. Growing from a staff of one at launch to more than 600 professionals, GDIA shares its expertise across every aspect of Ford’s business, including human resources, manufacturing, research and development, warranty, supply chain and accounting. GDIA is also applying its expertise in emerging areas as Ford expands to be both an auto and mobility company.

Ford Motor Co.

- **Headquarters:** Dearborn, Mich.
- **2016 Revenue:** \$152 billion
- **No. Employees:** 201,000
- **Industry:** Automotive
- **Other:** Public company founded in 1903 and ranked ninth on the Fortune 500 list in 2016.

Business Themes



Data to Decisions



Technology Optimization

At a Glance

Problems

- Analytics expertise was contained within pockets of the organization.
- Data management and governance practices were inconsistent.
- Some business units lacked access to analytics expertise.

Solutions

- Ford formed Global Data Insight and Analytics, a centralized unit to work with all aspects of the business, in January 2015.
- GDIA centralizes knowledge of data sources, tools, techniques and analytics best practices across the organization.

Benefits

- Promotes consistent data management, governance and security practices across the organization.
- Applies consistent data-to-decisions methodology across hundreds of projects each year.
- Fosters a disciplined, business-problem-focused approach while eliminating redundant and inconsistent dashboards and reports.
- Promotes shared learning and the correct, consistent use of analytical tools and best practices.

This case study examines how GDIA helps Ford solve problems, drive savings and transform the company with data science. The report also examines GDIA's efforts to democratize data analysis by using self-service tools, including Alteryx, Qlikview and Tableau. Finally, the report details ancillary benefits of GDIA projects, such as promoting better data quality, ensuring consistent analysis, promoting embedded prescriptive analytics and eliminating overlapping, conflicting analyses, dashboards and reports.

THE COMPANY

Ford Motor Co. is an icon of American manufacturing and no stranger to data-driven decision making. It did the math back in 1913, when it adopted assembly line production methods that slashed the time required to produce a vehicle from 12 1/2 hours to one hour and 33 minutes.

By 2014, analytical tools, methods and processes were in wide use throughout the company. But in the age of big data, and with digital transformations including mobility,

continuous connectivity and autonomous vehicles emerging, Ford recognized the need to take a more comprehensive and strategic approach to data-driven decision making throughout the entire enterprise. To spearhead that initiative, Ford hired Paul Ballew, a veteran of Dun & Bradstreet, Nationwide Insurance, General Motors and J.D. Power and Associates, to serve as Global Chief Data and Analytics Officer.

Ballew's challenge is to "take big data and analytics to the next level inside Ford... establishing an enterprise-wide vision for analytics and integrating all research, analytics, processes, standards, tools and partner engagement," according to a company press release.

In January 2015, Ford established Ford Global Data Insights and Analytics (GDIA) unit, a centralized data science team organized to share best practices and drive optimized, data-driven decision-making across the organization. Drawing on a mix of experts including veterans formerly embedded within departments as well as new hires, GDIA has

grown to a staff of more than 600. Through consultative engagements, it has supported all aspects of the business, from manufacturing, research and development and supply chain to marketing, customer service and administrative, legal and accounting teams.

THE CHALLENGES

Emerging trends such as autonomous vehicles, ride sharing, new propulsion systems and continuously connected sensors promise to transform the automobile industry and disrupt established companies. However, with GDIA, Ford can quickly plan and establish corporate-wide, data-driven strategies to respond to emerging trends, help shape new services in the mobility space and head off threats.

Centralized coordination promotes consistency and sharing of best practices. “It wasn't efficient to have individual pockets of the business going about analytics in inconsistent ways,” said Adam Blacke, Lead Data Scientist at Ford GDIA. “We knew we could learn from each other. Previously, we had individual teams learning different things, but they weren't

sharing across pockets of analytic exploration.”

Ford is in the process of building out a data lake using next-generation data infrastructure, including Hadoop. The idea is to fuel analytics by replicating and retaining data, including unstructured information, from many of Ford's more than 4,600 data sources. “With all of the data now available, there are new opportunities to support business decisions,” said Blacke, noting another advantage of GDIA's centralized approach. “As we scale up the amount of data we have, we really needed a bigger, more structured environment to support analytics.”

“With all of the data now available, there are new opportunities to support business decisions,” said Adam Blacke, Lead Data Scientist at Ford GDIA.

Two years after its formation, GDIA's challenges have been numerous and diverse. Here's a sampling of just three representative projects:

- **Logistics and purchasing.** As part of Ford’s “Rates & Routes” process, the company tended to renegotiate parts, commodity and distribution shipping contracts as they came up for annual renewal. But shipping cost can change quickly as fuel prices, tariffs, customs, duty fees and available shipping capacity fluctuate. Ford retains the contractual right to rebid contracts, but it lacked the ability to quickly analyze changing conditions at scale. Established methods were manual and locked in people’s heads. What’s more, relevant data could not be quickly gathered and prepared for analysis. Thus, Ford was not proactive about renegotiating shipping contracts and it was potentially overpaying for services.

- **Manufacturing.** A key assembly plant was losing unit production per hour due to scheduling inefficiencies. The challenge was that the plant manufactures both long and short vehicles, but it has a constraint whereby a spacer is required on the assembly line when two long vehicles are built back to back. Using a spacer means losing production capacity, but spacers are

not required when building a long vehicle and a short vehicle or two short vehicles in a row. Managers tried optimizing schedules manually, but complicating variables made it a difficult task. GDIA was asked to apply data science to the problem.

- **Supply chain.** Severe weather can wreak havoc on supply chains, causing parts shortages that can crimp manufacturing. GDIA was asked to help supply chain managers identify risks and develop contingency plans in anticipation of hurricanes and other storms. It was a large-scale data analytics challenge that required in-database analysis and big data computing capacity.

THE SOLUTION

GDIA helps Ford solve challenges across the organization with fewer data scientists than would otherwise be required with analytics teams embedded within business units. GDIA makes efficient use of data science resources and also promotes sharing of best practices across the enterprise. Many companies are

forming centralized analytics groups to realize these same benefits.

Ford's GDIA organization is akin to a human resources or finance department that serves the entire organization. The group has autonomy to identify and go after high-priority challenges on its own, but it also works with business units that seek out its expertise. "They know we can help them gain efficiencies," said Alan Jacobson, Director of Global Analytics. In these instances, GDIA relies on the support of business units. "We've had business units put people on projects to work with us because we're delivering great efficiencies," added Jacobson.

Oversight is crucial to how GDIA can promote efficiency, but its goal is to act as a consultancy, not a bureaucracy. "When you want to publish a report or dashboard on the server, you come back to us, but it's not for gate keeping," said Jacobson. "We can simplify it, if possible, and we also know if five people just tried to build the same thing."

Helping people solve business challenges is GDIA's first priority, but in the process, it can also make sure that people are using the right information to answer their questions. GDIA probes about underlying needs when someone in the business asks for help with, say, a new dashboard or report.

"The first question is 'Why do you want this new dashboard? What's the real problem you're trying to solve?'" said Jacobson. "They might say, 'I think we have too much inventory.' Well, then, let's talk about the inventory problem, because the solution may not be a dashboard. Maybe we'll find that we can fix the problem by applying predictive analytics to the ordering process."

In short, GDIA is trying to get the mindset away from "I want a Tableau output" or "I want an interactive Qlikview dashboard" or "I want a (fill-in-the-blank)." GDIA aims to change the conversation to focus on the business challenge itself. Once the real analytic needs are identified, Alteryx, Qlikview and Tableau are the tools that can support broad, self-

service analysis and GDIA offers training and guidance on which tools to use for which tasks.

“We don't give out the software until people meet with us,” said Jacobson. “I'll show them Tableau, Alteryx and Qlik and I'll explain when they should use which one.” Alteryx is often used to handle data preparation, blending and transformation into Qlik- and Tableau-compatible data sets.

How did GDIA help solve the three specific problems outlined in the “The Challenges” section? Here's a closer look:

- **Logistics and purchasing.** To solve the Rates & Routes challenge, GDIA codified previously manual data-collection and analysis processes into automated and repeatable workflows using Alteryx. These enhanced analyses included geospatial analyses and visual workflows so all stakeholders in purchasing and logistics could analyze rates, routes and costs. The output of the analysis is placed on a QlikView dashboard and linked to a SharePoint site. Buyers update the

SharePoint site with their actions and this new data is blended through Alteryx and shown on the dashboard – preventing the team from investigating the same item twice. The new approach greatly accelerated analysis.

“The amount of information we used to process by hand once per year we're now analyzing on a weekly basis,” said Blacke. “If fuel prices change or other economic factors change, we can adapt the model within a single week. So now we're focused on current market conditions, constantly looking at benchmarks versus what we're paying with current contracts. We're rebidding where there's a variance, armed with information that helps us win better terms.”

- **Manufacturing.** To solve the problem of losing production capacity on an assembly line, GDIA created a workflow that takes each day's schedule from the scheduling system and runs it through an IBM CPLEX optimizer, orchestrated through Alteryx. The results are then fed back into the

scheduling system, which uses advanced calculations to produce and optimize the schedule, greatly reducing the use of spacers. As a result, the plant is no longer losing production capacity.

“There's no dashboard or report. It's prescriptive analytics built right into the scheduling process,” said Jacobson. “These are our favorite sort of analytics because they're the most efficient for everyone.”

- **Supply chain.** To analyze the potential impact of severe weather on Ford's supply chain, GDIA modeled the projected path and severity of a predicted hurricane and tied the results to its shipping routes and logistics network. The goal was to identify the suppliers and Ford plant destinations most likely to be affected. Ford has more than 60,000 suppliers, so it was a challenge involving big data.

GDIA used Alteryx to orchestrate the required data movement and in-database/in-cluster processing within a Teradata data warehouse and within a Hortonworks

Hadoop cluster. Relevant logistics network data was extracted from Teradata and then pushed down into and merged with the weather models, which ran on Hadoop. A high-performance computing environment within Hadoop then churns through the combined data set to identify high-priority targets for the supply-chain management team to track during and after the storm. The entire analysis took 48 hours and created a repeatable approach for future weather events.

THE IMPACT

Ford created the centralized Global Data Insights and Analytics unit to take better advantage of data and to better share best practices and data science expertise. Two years into the initiative, GDIA has grown exponentially to a staff of 600 and it's expected to continue to grow in the next few years. The unit is ramping up in response to demand and to ensure that it can serve every aspect of Ford's business. To get some idea of the companywide impact, consider the results of just the three projects detailed:

- **Logistics and purchasing.** The Rates & Routes rebidding process now operates on analytic steroids. “We've lowered the cost of our routes in North America and globally,” said Blacke. “We went from what we used to get in a single year in dollar reductions in shipping cost and we're now doing that in slightly less than a quarter.”
- **Manufacturing.** The scheduling optimization project at a single assembly plant has led to significant cost savings. Ford didn't disclose the dollar value of the savings, but the result is increased efficiency.
- **Supply chain.** Ford can now quickly perform complex in-database and in-cluster analyses at scale to assess the potential impact of severe weather on the supply chain. It has used this capability to shift production schedules and avoid costly production downtimes, according to Blacke.

Citing these examples, Jacobson said, “We literally have more than 1,000 examples where we're applying this sort of in-depth analysis - and we're doing it across the business.”

THE TAKEAWAYS

Analytics expertise is too expensive and too scarce not to share. It's also important to develop a holistic understanding and institutional knowledge of data sources, best practices and lessons learned.

With the appointment of a Chief Data and Analytics Officer, Ford elevated data-driven decision-making to C-Level status, a crucial step in the journey to digital transformation. With the creation of the Global Data Insights and Analytics unit, Ford invested in making data and data science talent strategic assets that can be shared and applied across the organization.

“We literally have more than 1,000 examples where we're applying this sort of in-depth analysis - and we're doing it across the business,” said Alan Jacobson, Director of Global Analytics.

There are many ways to achieve centralized oversight of data analysis and the chief takeaways are that centralization is key to:

- Establishing consistent data management, data quality and data governance practices.
- Gaining comprehensive knowledge of available data and acquiring experience with how that data is best used.
- Avoiding redundant and inconsistent analyses and, therefore, the dreaded problem of multiple versions of the truth.
- Sharing scarce data science talent by not confining experts to serve in a single area of the business.
- Developing broadly capable and experienced analytics experts who have been exposed to many aspects of the business.
- Spreading lessons learned so that successes can be replicated and repetition of mistakes avoided.

THE RECOMMENDATIONS

Centralize, centralize, centralize.

Constellation agrees it's an imperative, but there's more than one way to achieve centralized oversight. Facebook, for example, has developed a hybrid approach whereby data science experts are embedded within specific business areas, yet they also report to a chief analytics officer and meet regularly with their peers from other business units.

In the hybrid approach, experts develop deep expertise in one business domain and are always available to (and are funded by) that group. They also regularly share what they are working on with their analytics peers and trade ideas and lessons learned across business units. The chief analytics officer promotes the development of talent, sets and coordinates analytic priorities and champions infrastructure and data investments to the benefit of all business units.

Ford's approach to centralization is equally valid and it does not prevent individual

business units from retaining dedicated analytical resources. The centralized team approach is particularly beneficial in spreading data-driven decision making and optimization to departments and business units that are too small or otherwise ill-equipped to support analytics initiatives on their own. Data analytics teams can take on prioritized lists of projects across the organization and team members can be temporarily embedded within specific business units. What's more, business units can appoint subject-matter experts or data-savvy power users to serve as liaisons to the centralized analytics team.

Whatever centralization approach you take, it's essential to invest in data and analytics - to treat them as strategic assets and capabilities. It's equally important to spread the power of optimization and data-driven decision making beyond isolated pockets of the business.

ANALYST BIO

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 multi-disciplinary 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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Organizational Highlights

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- 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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